HUDSON

MECHANICAL
PROCEDURE
MANUAL

1940

HUDSON MOTOR CAR COMPANY, DETROIT, MICH.

INTRODUCTION

PURPOSE

The purpose of the Mechanical Procedure Manual is to supply information of value in diagnosis and repair including information on changes which affect procedure in servicing.

FLAT RATE

The procedures given in this manual are identical to those followed in setting time allowances for Flat Rate Schedules and should be valuable as a guide where actual shop time does not compare favorably with the schedules. A study of the operations together with the tool equipment used in their performance should enable each Hudson Service Station to offer its owners reliable service at a reasonable cost.

INSPECTION SERVICE

This manual does not go into the details of pre delivery, 500 and 1500 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 for each model.

The items included in these inspections are those which experience has shown require attention during the early life of the car to insure long, carefree service, in addition to items, which though checked carefully at the time of manufacture require additional checks to insure proper operation. The owner when accepting delivery of the car expects it to be in perfect condition. A good first impression will aid you in your future contacts as well as do much to insure satisfactory performance of the car. Make these inspections carefully and file the inspection card as a permanent part of the record of the car.

KEYS AND LOCKS

A record of the key numbers made on the pre delivery card, in the space provided, will help you render a valuable service to your owners in cases of lost keys.

WARRANTY AND OWNERS SERVICE POLICY

The Warranty and Owners Service 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.

SPECIAL TOOLS

All special tools referred to or illustrated in this manual have been developed through the cooperation of the Hudson Motor Car Company Service Department with the Hinckley Myers Co. of Jackson, Michigan.

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

The tools are of highest quality and are sold direct by the tool manufacturer to make them available to Hudson Distributors and Dealers at minimum cost.

For complete list of tools and shop equipment refer to the Hudson Tool Manual.

PARTS BOOKS

Individual parts lists are available for each yearly model while a master Parts Book showing interchangeability of parts is also available. These books and the numerical parts price list should be used as reference for parts information.

SERVICE BULLETINS

Service Bulletins issued from time to time should be filed in the Bulletin Binder. These references will serve to keep the Mechanical Procedure Manual up to date.

HUDSON SERVICE MAGAZINE

The service Magazine is published monthly and contains timely service information, which should be tied in with the material in this manual.

MATERIAL FOR MAGAZINE

The technical information in the magazine is based on the experience of the Engineering, Manufacturing and Service divisions at the factory and also on reports and suggestions received from Distributor and Dealer Service Departments. Any suggestions for improved methods of servicing, short cuts, special tools, etc., developed in the Servicing of Hudson cars which will assist you in your work will also assist the thousands of other Service Men. Submit your suggestions to the Technical Division of the Factory Service Department, so that they may be passed on through the medium of Hudson Service.

Printed in U. S. A.

SPECIFICATIONS

1940 MODELS

The 1940 Hudson cars are built in 3 distinct lines and mounted on chassis of 3 different wheelbase lengths.

The independent front suspension, center point steering, rear lateral stabilizer (except on Travelers models) and other items are common to all cars in the 1940 line.

MODEL 40

The model 40 line is produced in two types. I.E. The DeLuxe and the Traveler series.

Model 40 DeLuxe is known as "40 P".
Model 40 Traveler is known as "40 T".
Wheelbase 113".

Engine 6 cylinder 3" bore 4 1/8" stroke.

Piston displacement 175 cu. inch.
Actual Horsepower 92 at 4000 R.P.M.
Taxable Horsepower 21.6.
Compression ratio 7 to 1.

Weight

3 Pass. Coupe Traveler	2800 lbs.
3 Pass. Coupe DeLuxe	2840 lbs.
Two door touring sedan Traveler	2895 lbs.
Two door touring sedan DeLuxe	2930 lbs.
Four door touring sedan Traveler	2940 lbs.
Four door touring sedan DeLuxe	2965 lbs.
Victoria Coupe Traveler	2830 lbs.
Victoria Coupe DeLuxe	2865 lbs.
Convertible Coupe DeLuxe	2860 lbs..
Convertible Two door sedan DeLuxe	2920 lbs.

MODELS 43 (SIX) 47 (EIGHT)

Country Club Series.

The model 43 (six) and 47 (eight) use the same engine as the 41 and 44 on a 125" wheelbase chassis.

Wheelbase 125".
Engine (6 cyl.) 3" bore 5" stroke.
Engine (8 cyl.) 3" bore 4 1/2" stroke.
Piston displacement 6 cyl. 212 cu. in.
Piston displacement 8 cyl. 254 cu. in.
Actual horsepower 6 cyl. 102 at 4000 R.P.M.
Actual horsepower 8 cyl. 128 at 4200 R.P.M.
Taxable horsepower 6 cyl. 21.6.
Taxable horsepower 8 cyl. 28.8.
Compression ratio 6.50 to 1.

Weight

5 Pass. Sedan 6 cyl.	3240 lbs.
5 Pass. Sedan 8 cyl.	3285 lbs.
7 Pass. Sedan 6 cyl.	3355 lbs.
7 Pass. Sedan 8 cyl.	3400 lbs.

MODEL 41 (SIX), 44 (EIGHT)

The models 41 and 44 are identical as far as body and chassis are concerned with the exception of the engine.

Wheelbase 118".
Engine(6 cyl.) 3" bore, 5" stroke.
Engine (8 cyl.) 3" bore, 4-1/2" stroke.
Piston displacement 6 cyl. 212 cu. in.
Piston displacement 8 cyl. 254 cu. in.
Actual horsepower 6 cyl. 102 at 4000 R.P.M.
Actual horsepower 8 cyl. 128 at 4200 R.P.M.
Taxable horsepower 6 cyl. 21.6.
Taxable horsepower 8 cyl. 28.8.
Compression ratio 6 and 8 cyl. 6.50 to 1.

Weight

3 passenger coupe 6 cyl.	2950 lbs.
3 passenger coupe 8 cyl.	3040 lbs.
Victoria coupe 6 cyl.	2980 lbs.
Victoria coupe 8 cyl.	3075 lbs.
Two door touring sedan 6 cyl.	3020 lbs.
Two door touring sedan 8 cyl.	3140 lbs.
Four door touring sedan 6 cyl.	3050 lbs.
Four door touring sedan 8 cyl.	3185 lbs.
Convertible coupe 6 cyl.	2980 lbs.
Convertible coupe 8 cyl.	3065 lbs.
Convertible Two door sedan 6 cyl.	3020 lbs.
Convertible Two door sedan 8 cyl.	3130 lbs.

MODEL 45 (EIGHT DELUXE)

The model 45 is identical with model 44 as far as chassis is concerned.

Body has deluxe appointments.

Weight

Two door touring Sedan	3185 lbs.
Four door touring Sedan	3215 lbs.

GENERAL DIMENSIONS

Car overall length including bumpers.

Model 40	190-3/8"
41, 44, 45	195-3/8"
43, 47, 48	202-3/8"

Car overall width including fenders.

Front	71"
Rear	72"

Tread

Front	56-1/2"
Rear	59-1/2"

Road Clearance	Front	Rear
Model 40,41,44,45,48	9-1/2"	8-7/16"
Model 43	9-5/8"	8-5/8"
Model 47	9-3/4"	8-11/16"

Turning Radius

Model 40	20' 6"
41,44,45	20' 9"
43,47,48	21' 7"

COMMERCIAL MODELS

The commercial line on model 40 chassis consists of:

Cab Pick up	2945 lbs.
Panel Delivery	3225 lbs.
Wheelbase	113"
Engine 6 cylinder	3" bore x 4-1/8" stroke
Piston displacement	175 Cu. in.
Actual horsepower	92 @ 4000 R.P.M
Taxable horsepower	21.6
Compression ratio	7 to 1

The commercial line on model 48 chassis consists of:

Cab Pick up	3045 lbs.
Panel Delivery	3310 lbs.
Carry All	3245 lbs.
Wheelbase	125"
Engine 6 cylinder	3" bore x 5" stroke
Piston displacement	212 cu. in.
Taxable horsepower	21.6
Compression ratio	6.50 to 1

GENERAL INDEX

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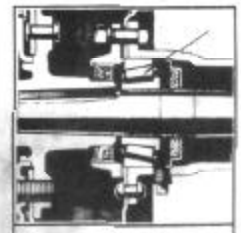
A DETAILED INDEX IS AT THE BEGINNING OF EACH SECTION

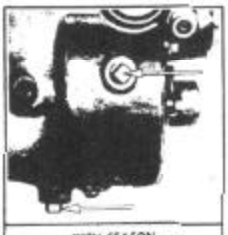
HUDSON

1 LUBRICAT



10,000 MILES
REAR WHEEL BEARING
USE MILLS SODIUM SOAP BASE LUBRICANT
CAPACITY—13½ OUNCES

1000 MILES
AUTOMATIC CLUTCH CONTROL GOVERNOR ADAPTER—OPTIONAL
USE VISCOUS GREASE



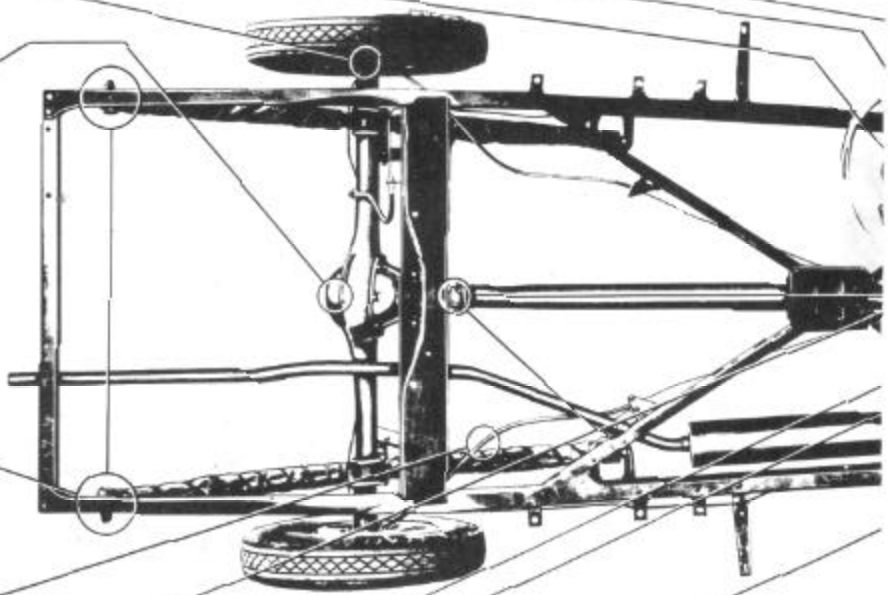
WITH SEASON TRANSMISSION
USE GEAR OIL
SUMMER S.A.E. 90 E.P.
WINTER S.A.E. 80 E.P.
CAPACITY—3¼ POUNDS
WITH OVERDRIVE—3 POUNDS
CHECK LEVEL FREQUENTLY

5000 MILES
CLUTCH
USE HUDSONITE CLUTCH LUBRICANT
CAPACITY—½ PINT

1000 MILES
BRAKE AND CLUTCH PEDAL BEARINGS FITTING
USE VISCOUS GREASE
2000 MILES
BRAKE, CLUTCH AND THROTTLE CONTROL LINKAGE
USE ENGINE OIL

1000 MILES
BRAKE MASTER CYLINDER
USE ONLY GENUINE HUDSON HYDRAULIC BRAKE FLUID
NO. 21 FOR ALL TEMPERATURES

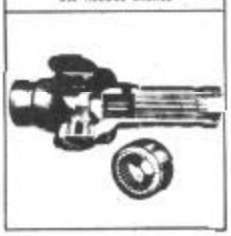
WITH SEASON DIFFERENTIAL
USE GEAR OIL
SUMMER AND WINTER
S.A.E. 90 E.P.
CHECK LEVEL FREQUENTLY
CAPACITY—3¼ POUNDS



1000 MILES
SPRING SHACKLE
USE VISCOUS GREASE

5000 MILES
BRAKE CONDUITS AND CABLES
GRAPHITE GREASE

1000 MILES
UNIVERSAL JOINT SPLINE
USE VISCOUS GREASE
20,000 MILES
DISASSEMBLE CLEAN AND REPACK NEEDLE ROLLER BEARINGS
USE VISCOUS GREASE

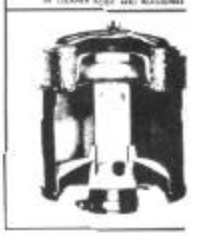


1000 MILES
CLUTCH RELEASE BEARING
USE VISCOUS GREASE

2000 MILES
DISTRIBUTOR
ADVANCE CAM—HIGH TEMPERATURE GREASE
CONTACT ARM PIVOT—ENGINE OIL
TOP OF SHAFT—ENGINE OIL
6-CYL.—SHAFT GREASE CUP
HIGH TEMPERATURE GREASE
8-CYL.—SHAFT OIL CUP—ENGINE OIL

2000 MILES
GENERATOR BEARINGS
USE ENGINE OIL

2000 MILES
AIR CLEANER—STANDARD
WASH IN GASOLINE, LUBRICATE WITH ENGINE OIL—S.A.E. 10
AIR CLEANER—OIL BATH
NORMAL RATE AND WASH PARTS IN GASOLINE
FOUR TIMES THE GRADE AS BY DU
IN CLEANER BODY AND REASSEMBLE



ENGINE LUBRICATION

	CAPACITY	REFILL
6 CYLINDER	5½ QTS. (4½ LQ.—5½ L)	4½ QTS. (3¾ LQ.—4½ L)
8 CYLINDER	9 QTS. (7 LQ.—8½ L)	7 QTS. (6 LQ.—6½ L)

CHECK LEVEL FREQUENTLY

OIL SPECIFICATIONS

MINIMUM ATMOSPHERIC TEMPERATURES EXPECTED	VISCOSITY
70° FAHRENHEIT	S.A.E. 30
32° FAHRENHEIT	S.A.E. 20
10° FAHRENHEIT	20 W.
—10° FAHRENHEIT	10 W.
—30° FAHRENHEIT	10 W. PLUS 10% KEROSENE

BODY LUBRICATION

USE ENGINE OIL

SATURATE WICKS AT THE FOLLOWING POINTS:
DOOR DOVETAIL (MALE), DOOR LOCK STRIKER ASSEMBLY—2 PLACES, HINGE PINS —OIL AT TOP OF BODY HALF OF HINGE (ACCESSIBLE WITH DOOR OPEN).

O
N CHART

HUDSON

2000 MILES
STARTING MOTOR
FRONT AND REAR
BEARINGS
USE ENGINE OIL

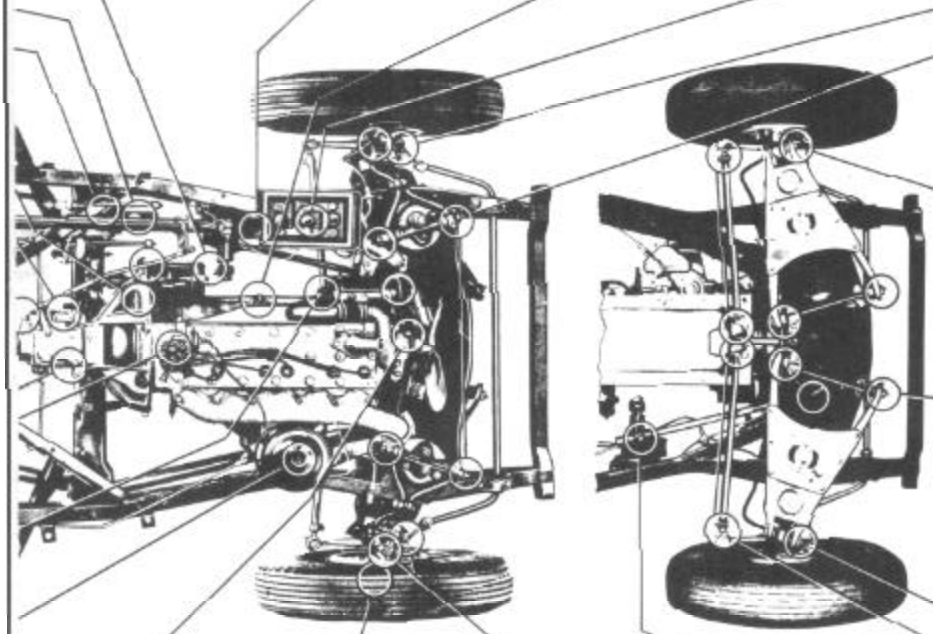
WITH SEASON
STEERING GEAR
USE GEAR OIL
SUMMER AND WINTER
S.A.E. 90 E.P.

2000 MILES
CRANKCASE
DRAIN AND REFILL
ENGINE OIL
CHECK LEVEL FREQUENTLY

1000 MILES
BATTERY
ADD DISTILLED WATER
TO KEEP PLATES COVERED

1000 MILES
UPPER SUPPORT ARM
ECCENTRIC BUSHING
1-FITTING
STEERING SPINDLE PIVOT PIN
1-FITTING
USE VISCOUS GREASE

1000 MILES
UPPER SUPPORT ARM
PIVOT BUSHING
4-FITTINGS
USE VISCOUS GREASE

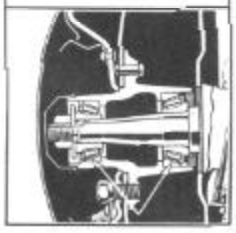


1000 MILES
LOWER SUPPORT ARM TO
SUPPORT PIVOT BUSHING
1-FITTING
USE VISCOUS GREASE

1000 MILES
LOWER SUPPORT ARM
PIVOT BUSHING
4-FITTINGS
DRAG LINK—FRONT END
1-FITTING
USE VISCOUS GREASE

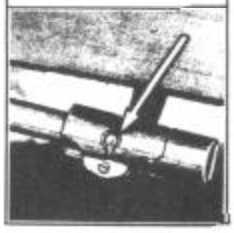
1000 MILES
WATER PUMP SHAFT
E ALUMINUM SOAP GREASE

10,000 MILES
FRONT WHEEL
BEARINGS
USE MILLED SODIUM SOAP
BASE LUBRICANT
CAPACITY—3 OUNCES



1000 MILES
UPPER SUPPORT ARM
ECCENTRIC BUSHING
1-FITTING
STEERING SPINDLE PIVOT PIN
1-FITTING
USE VISCOUS GREASE

1000 MILES
DRAG LINK—REAR END
1-FITTING
USE VISCOUS GREASE



1000 MILES
TIE ROD ENDS
4-FITTINGS
USE VISCOUS GREASE

1000 MILES
LOWER SUPPORT ARM TO
SUPPORT PIVOT BUSHING
1-FITTING
USE VISCOUS GREASE

SPRING COVERS

EVERY 10,000 MILES

REMOVE, REPACK WITH VISCOUS
CHASSIS LUBRICANT AND
REPLACE

TIRE PRESSURES

Keep Tires Properly Inflated at All Times

THE FOLLOWING INFLATION PRESSURES ARE RECOMMENDED:

	FRONT		REAR	
	COLD	HOT	COLD	HOT
ALL SIZES	26 LBS.	29 LBS.	30 LBS.	33 LBS.

IF CAR HAS BEEN STANDING FOR SEVERAL HOURS USE COLD PRESSURES. IF CAR HAS BEEN DRIVEN AT HIGH SPEEDS USE HOT PRESSURES.

COOLING SYSTEM

6 CYLINDER MODELS.....13 QTS. (10¾ LQ.—12½ L.)

8 CYLINDER MODELS.....18 QTS. (15 LQ.—17 L.)

IN WINTER CHECK ANTI-FREEZE

LUBRICATION

INDEX

LUBRICATION SCHEDULE

After First 500 Miles

Engine Oil — See "When to Change Engine Oil," Pages 2 and 3.

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 End	Viscous Chassis Lubricant	4 fittings
Drag Link	Viscous Chassis Lubricant	2 fittings
Clutch and Brake Pedal Shaft	Viscous Chassis Lubricant	1 fitting
Clutch Throwout Bearing	Viscous Chassis Lubricant	1 fitting
Automatic Clutch Vacuum Control Switch Adapter (Optional)	Viscous Chassis Lubricant	1 fitting
Universal Joint Spline	Viscous Chassis Lubricant	1 fitting
Rear Spring Rear Shackle Bushing	Viscous Chassis Lubricant	4 fittings
Water Pump	Aluminum Soap Base Lubricant	1 fitting
Rear Axle	Check level	
Transmission	Check level	
Brake Master Cylinder	Check level	
Steering Gear	Check level	

2,000 Miles

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

Generator	Light Engine Oil	2 cups
Starting Motor	Light Engine Oil	2 cups
Distributor 6 cylinder	Aluminum Soap Base Lubricant	Turn grease cup 1 turn
Distributor 6 cylinder	Light Engine Oil	2 places
Distributor 6 and 8 cylinder	High Temperature Grease	Cam lobe
Distributor 8 cylinder	Light Engine Oil	3 place
Throttle Linkage	Light Engine Oil	14 places
Door Hinges	Light Engine Oil	4 places Two Door Sedans and Coupes 8 places Sedans
Door Dovetails and Locks	Light Engine Oil	6 places Two Door Sedans and Coups 8 places Sedans 8 places Sedans
Bonnet Support and Lock Support	Light Engine Oil	8 places
Brake Operating Linkage	Light Engine Oil	9 places
Carburetor Air Cleaner	Same Grade Oil as Used in Engine	Clean and re oil

5,000 Miles

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

Transmission	S.A.E 90 E.P. Summer S.A.E. 80 E.P. Winter	2-1/4 lbs. with Overdrive 3 lbs.
Rear Axle	S.A.E. 90 E.P. Summer and Winter	2-3/4 lbs.
Steering Gear	S.A.E. 90 E.P. Summer and Winter	Fill to level
Clutch	Hudsonite	1/3 pint
Rear Brake Cables	Graphite Lubricant	2 places
Distributor - 6 cylinder	High Temperature Grease	Fill cup

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	3 ounces per wheel
Rear Wheel Bearings	Milled Sodium Soap Base Lubricant	1-1/2 ounces per wheel
Spring Covers	Viscous Chassis Lubricant	Rear only
Automatic Clutch Control Cylinder (Optional)	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	Viscous Chassis Lubricant	2 repack

LUBRICATION

The high speeds and long distances coverer(in the present day automobile makes it imperative that a great deal of attention be given to the proper lubricants to use and to guide you in their selection we have given the detailed specifications in the following chart (Figure 2).

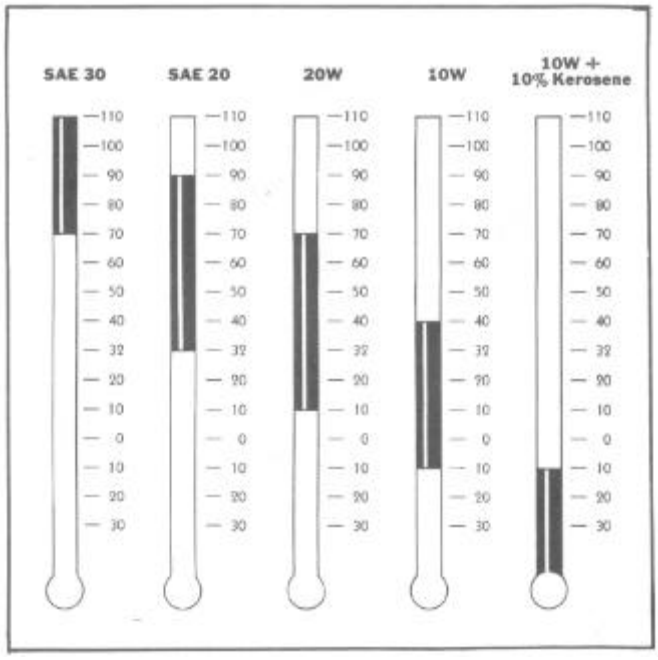


Figure 2 Engine Oil Recommendations

In using this chart (Figure 2) do this:

1. Select the lowest temperature that is probable, before next oil change.
2. Consider speeds at which car will be driven.
3. Use the oil whose viscosity best meets the conditions.

Proper consideration should be given to the grade of oil used in order to insure adequate engine proection and economy of operation.

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

S.A.E. oil viscosity recommended are as follows:
Temperature averaging 90° F.....S.A.E 30
Temperature of minimum of 32° F. plus.....S.A.E. 20
Temperature of minimum of 10° F. plus..... 20 W
Temperature of minimum of 10° F. minus.....10 W
Temperature of below 10° F...10 W plus 10% kerosene

The oil selection should be made on the basis of the minimum temperature which may be encountered before the next oil change.

SPECIAL LUBRICANTS

It is not necessary to use Special Break in oils or lubricants containing graphite or oil concentrates either in the crankcase or gasoline during the breaking in period. A light viscosity oil was put in the engine when shipped from the factory and need not be removed until the first 500 miles of driving has been completed.

LUBRICATION AFTER FIRST 500 MILES

At the end of the first 500 miles the crankcase oil should be drained, preferably while the oil is hot, and refilled to the proper level with the recommended proper viscosity oil. The oil should be changed every 2,000 miles thereafter, unless conditions in the locality make it advisable to change more frequently. Dusty roads; severe changes in temperature; long trips at high speeds (particularly in hot weather) will make it advisable to change oil more often than every 2,000 miles.

During the winter months the selection of crankcase oil should be based on easy starting qualities. The highest grade engine oils are good lubricants at all engine temperatures, however, high speed driving or in hot weather the amount of oil consumed may be some

what less if heavier oils are used.

Driving over dusty roads or thru dust storms will introduce abrasive grit into the engine. The Air Cleaner will decrease the amount of dust that may enter the crankcase, however, if there is any doubt in your mind regarding the necessity of draining the oil to get the dust grit out, drain the oil It is better to be safe than sorry.

Crankcase oil becomes thinned or diluted due to gasoline leaking by the pistons and rings and mixing with the oil. Short runs in cold weather, such as city driving, do not permit the thorough warming up of the engine and water may accumulate in the crankcase from condensation of moisture produced by the burning of the fuel. Water in the crankcase may freeze and interfere with proper oil circulation. It also promotes rusting and may cause clogging of oil screens and passages. Under normal driving conditions this water is removed by the crankcase ventilator. If water accumulates it must be removed by draining the crankcase as frequently as may be required. The Hudson engine is

designed to draw unburned gasoline and condensation from the crankcase by vacuum, created by the ventilator tubes located on the right side of the engine and leading from the valve chamber. The Hudson automatic exhaust manifold heat control valve and the automatic choke both tend to minimize the amount of gasoline that finds its way into the crankcase oil.

Hudson Duo Flo Engine Lubrication is a highly developed and perfected engine lubricating system.

As the engine is started and the piston goes down a "finger" or scoop on the bottom of the connecting rod swishes thru a trough which is constantly filled with oil. This scoop throws a spray of oil throughout the crankcase, all vital friction surfaces receiving an instant coating of lubricating oil. Details of oil pump; oil delivery lines and oil check valve will be found under heading of Engine. The oil pan tray is an entirely separate part from the main oil pan reservoir and is assembled into the oil pan with a gasket between the flanges of the two parts. If the oil pan tray is removed and emptied it will require one extra quart of oil for the 6 cylinder engine and 2 extra quarts for the 8 cylinder engine to refill it.

ENGINE OIL CAPACITY OF THE 6 CYLINDER ENGINE

Crankcase capacity	5 1/2 quarts
	4 1/2 imperial quarts
	5 1/4 liters
To refill after draining add	4 1/2 quarts
	3 3/4 imperial quarts
	4 1/4 liters

ENGINE OIL CAPACITY OF THE 8 CYLINDER ENGINE

Crankcase capacity	9 quarts
	7 1/2 imperial quarts
	8 1/2 liters
To refill afterdraining add	7 quarts
	5 3/4 imperial quarts
	6 1/2 liters

NOTE: The oil pan tray is constantly supplied fresh oil from the main oil pan reservoir yet when the crankcase is drained the oil remains in the oil pan tray which assures instant lubrication when the engine is started. There is no wait for oil to circulate.

Oil level gauge is of the bayonet type attached to the oil filter cap. When the bayonet gauge is in place the bottom is in line with the bottom of the suction line. The top mark on the gauge is the normal level of oil with the recommended quantity. The middle mark (bottom of oil level range) is the level when two quarts less than the capacity is in the reservoir. When the oil level reaches this point, oil should be replaced or two quarts added to bring the level up to the top line.

Cleaning oil pan and screen is recommended at 10,000 mile intervals or any other times that it is removed for internal operations.

All of the engine oil passes thru the oil pan and screen before reaching the oil pump. Foreign matter that may be in the oil is both screened out and permitted to settle out at this point so that the oil reaching the pump is quite free from grit particles.

The importance of this operation increases in dusty territories.

WATER PUMP AND DRAG LINKS

Lubricate every 1,000 miles. Use an aluminum soap base grease of the following specifications and physical characteristics:

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	3% maximum
Moisture	None
Ash	1.5%
Separating point of Grease	425° F. minimum

This grease must be a smooth uniform product free from fillers and grit, it must not separate under ordinary conditions or usage and must be free from offensive odors.

DISTRIBUTOR

Distributor is lubricated with a few drops of light zero pour test motor oil in the oil cup and wick in top of distributor drive shaft under the rotor. Place one drop of oil on contact arm stud and apply a light coating of high temperature grease on contact arm fibre block. Do not over oil. Every 2,000 miles is sufficient.

TRANSMISSION AND DIFFERENTIAL

Transmission and Overdrive The lubricant should be drained and replaced with fresh lubricant of the correct grade at the beginning of cool weather in the fall (60° F. and below) and the beginning of warm weather in the spring.

Use a good grade of mineral oil to which there has been added not less than 15% of Extreme Pressure Base. This base 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 three hours.

The following physical characteristics should be specified to all transmission and differential lubricant suppliers

Summer S.A.E. 90 E.P.		Winter S.A.E. 80 E.P.
4000 F. Minimum	Flash Point	350º F. Minimum
450° F. Minimum	Fire Point	400º F. Minimum
+20° F. Maximum	Pour Point	10º F. Maximum
125 150 Seconds	Saybolt Viscosity at 210° F.	75 80 Seconds
Not greater than 15 times the viscosity at 210º F.	Saybolt Viscosity at 100º F.	Not greater than 9 times the viscosity at 210º F.
Nil	Free Sulpher	Nil
5% Maximum	Ash	3% Maximum
Nil	Free acids	Nil
Nil	Water	Nil
Smooth and free from bubbles	Appearance	Smoth and free from bubbles

Capacity of transmission is 2 1/4 pints or 2.20 pounds.
Capacity of differential is 2 3/4 pints or 2.69 pounds.
Capacity of transmission and overdrive is 3 pints or 3 pounds.

STEERING GEAR

Use S.A.E. 90 E.P. and add whenever necessary. The level of the lubricant should be checked twice yearly or every 5,000 miles. There is no necessity for draining and replacing except in the event of a disassembly of the steering gear.

CLUTCH

Use only Hudsonite which is a special lubricant developed and compounded in the Hudson Engineering Laboratories. Its use insures maximum smoothness of operation and maximum life of the clutch.

Change every 5,000 miles. Refill capacity is 1/3 of a pint.

WHEEL BEARINGS

Due to the high temperatures generated at the wheel bearings under severe brake usage, the wheel bearing lubricant must not thin out at high temperatures. It should be Sodium Soap Grease, smooth, non fibrous and uniform, free from fillers and grit and must not separate under ordinary conditions of operation. Lubricate every 10,000 miles front wheels have a refill capacity of 3 ounces per bearing and the rear wheels 1 1/2 ounces per bearing.

SPECIFICATIONS AND CHARACTERISTICS

Sodium Soap.....19 20%
Mineral Oil.....Remainder
Saybolt viscosity of oil at 210° F. .....100 seconds
Pour test of oil.....0° or under

GREASE CHARACTERISTICS

Free Fatty Acids.....3% maximum
Moisture.....Trace
Ash .....2.00% maximum
Penetrometer (worked consistency).....280 310
Melting Point.....300° F. plus

Free from offensive odors and it shall show a negative test for corrosion on the copper strip.

GENERATOR

Use a few drops of a light, zero pour test, motor oil.

HOOD LOCKS, DOOR HINGES, DOOR DOVETAILS

Use a few drops of a light, zero pour test, motor oil every 2,000 miles.

THROTTLE CONTROL RODS, LEVERS, CLEVIS PINS AND LINKAGE, BRAKE OPERATING LINKAGE

Use a light engine oil every 2,000 miles.

STEERING SPINDLES, SPRING SHACKLES, AND ALL OTHER ZERK FITTINGS

Lubricate every 1,000 miles using viscous chassis lubricant.

Calcium or Aluminum Soap.....3 1/2-4.00%
Mineral Oil.....Remainder
Saybolt viscosity of oil at 100° F. 400-450 seconds
Pour test of oil.....0° F. or under
Melting point of Grease.....160° F. Minimum

This grease must be of a rubbery texture and uniform in body. It must be free from fillers and grit and offensive odors, and must not separate under ordinary conditions of usage. It shall show a negative test for corrosion on the copper strip.

CHASSIS SPRING COVERS

Use the same lubricant as specified for Steering Spindles, Spring Shackles and all other Zerk Fittings and lubricate every 10,000 miles.

UNIVERSAL JOINTS

Lubricate spline every 1,000 miles. Repack needle bearings every 20,000 miles, using the same lubricant as specified for steering spindles, spring shackles, and all other Zerk fittings.

INDEX

ENGINE TUNE UP

A complete engine tune up performed every 5,000 miles will assist in maintaining maximum engine performance and gasoline economy, and is also assurance against failures in the electrical and fuel systems.

The engine tune up group has been divided into two separate sections. The first is the over all check up to determine the need for a tune up and help the service salesman show the owner the need for it. The second section is the step by step procedure for making a complete tune up.

ENGINE OVER ALL CHECK UP

The instruments used are an accurate ammeter and voltmeter, ignition high tension tester and vacuum gauge. Figure 1 shows the correct connections for the over all check up.

ENGINE OVER ALL CHECK UP TO DETERMINE NEED FOR ENGINE TUNE UP

Instruments Used Shown Properly Connected in Diagram

(A) Vacuum Gauge Connect to windshield wiper manifold connection. Warm up engine to normal operating temperature. Gauge reading should be 18 to 21 inches with engine idling.

(a) Low and uneven reading poor compression or ignition (Tests 1 2 3 49 10 11 12 13).

(b) Jerky action of gauge hand sticky or burned valve valve tappet adjustment too close (Test 4).

(c) Gauge hand vibrates more at high speed than at idle weak valve springs.

(d) Low steady reading late ignition timing or manifold lock (Test 11).

(e) Floating motion of gauge hand rich carburetor mixture check idle screw adjustment check float level and float valve (Tests 21 22).

(f) Constant vibration of gauge hand early ignition (Test 11).

(B) Ignition Starting Circuit Check battery gravity with hydrometer and voltage with voltmeter with positive voltmeter lead to positive battery terminal and negative voltmeter lead to negative battery terminal.

(a) If battery gravity is less than 1250 at 70° F. or voltage is less than 6 volts, remove and recharge (Test 5).

(b) With negative voltmeter lead connected to "B" terminal of fuse block positive voltmeter lead to ground, voltage drop should not be more than .2 volt when headlights are turned on. If drop is greater make tests 6 7 8.

(c) Connect positive voltmeter lead to starting motor frame negative voltmeter lead to starting motor field terminal post. With engine warm and cranking ignition off, voltage should be 5 volts. If 4 ½ volts or less and battery is known to be in good condition make tests 6 7 8.

C) Ignition Test Test coil last.

(a) Ignition on distributor points closed. Voltage reading distributor to engine ground should not be greater than 1/10 volt.
If reading is higher than this it indicates poor breakear points make test 9 (1 to 6 inclusive).

(b) Ignition on distributor points open. Voltage reading distributor terminal to ground should be exactly same as battery voltage.
If reading is lower, condenser is leaky or grounded make test 9 (6 to 10 inclusive).

(c) Engine running at idle open high tension test gap to 7 M.M. Irregular spark in tester indicates poor high tension wires, cracked distaributor cap, rotor shorted or poor coil make tests 12 13.

(D) Generator Charging Rate. Battery run down make tests 14 15.

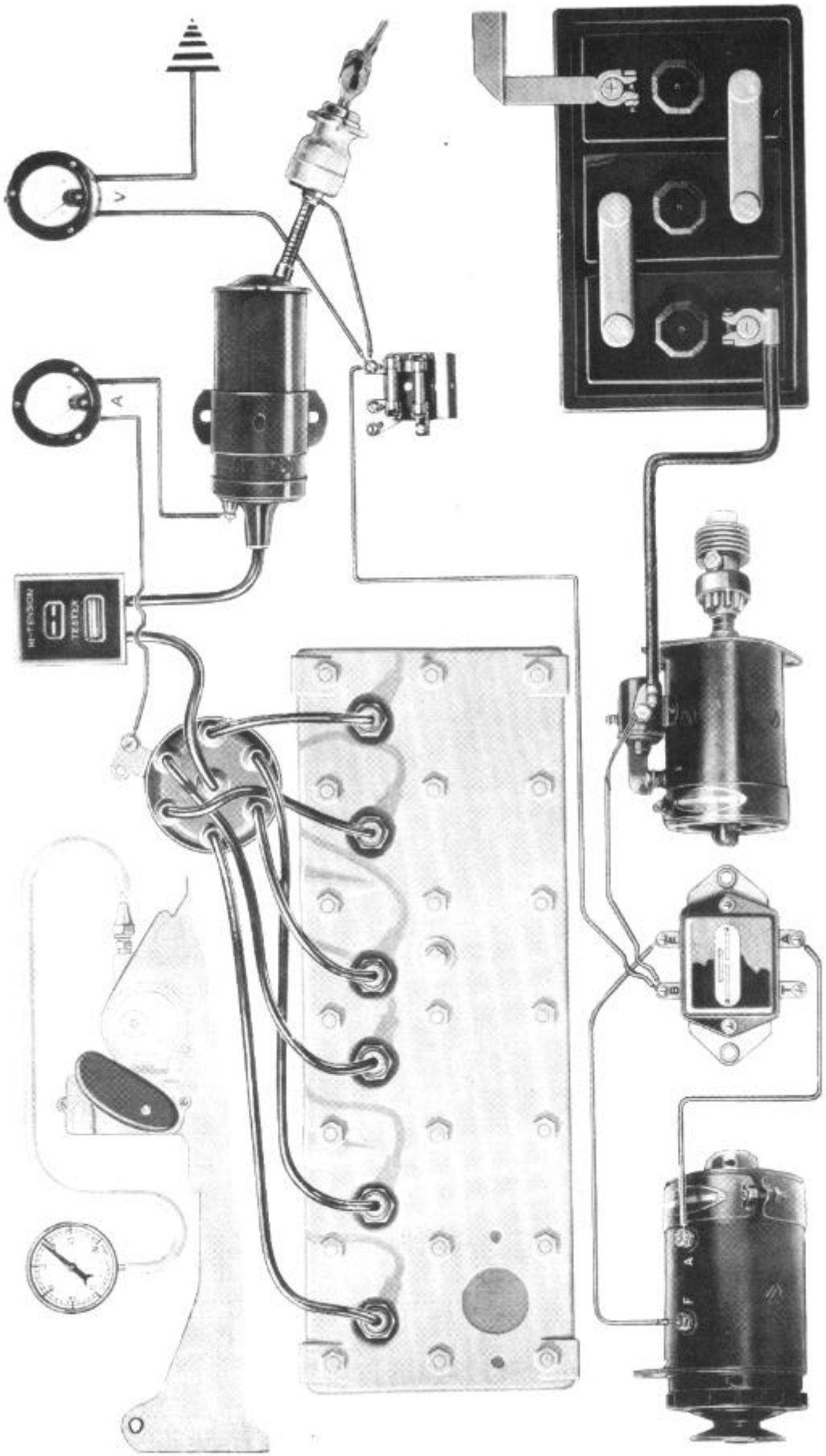


Figure 1 - Engine Overall Check

TUNE UP PROCEDURE VACUUM READING TEST 1

1. With engine at normal operating temperature connect vacuum gauge hose to windshield wiper manifold connection.
2. Idle engine at approximately 500 R.P.M. Gauge reading should be between 18 and 21 inches and hold steady or have a very slight flutter for an efficient idle speed.
3. If gauge reading is not steady between 18 and 21 inches it indicates carburetor idling adjustment may not be correct, some spark plugs are not firing, valves are sticky, valve seats are burned, valves are adjusted too tight, intake manifold leaks, distributor timing incorrect, or valve timing incorrect and a complete engine tune up is in order to correct the difficulty.

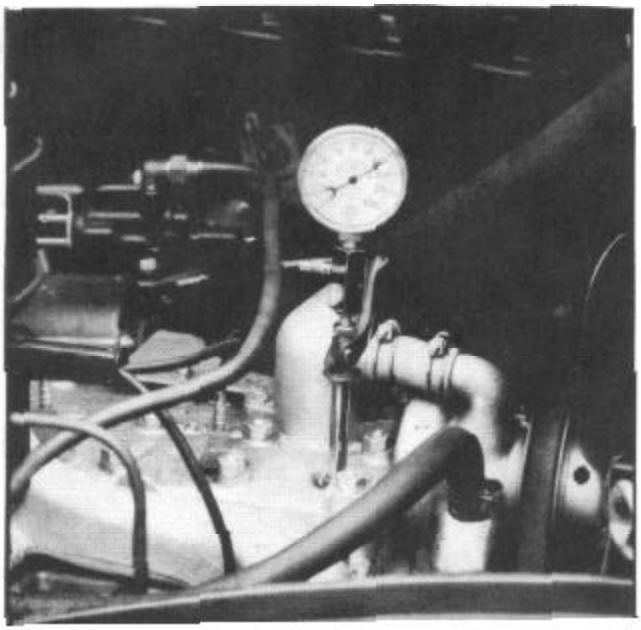


Figure 2 - Compression

COMPRESSION TEST 2

1. With engine warm remove all spark plugs. Close 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 90 pounds with maximum allowable variation of 10 pounds.
4. Low readings may indicate sticking valves, burned valve seats, worn pistons or rings.

SPARK PLUG INSPECTION TEST 3

1. Inspect spark plugs to be sure they correspond to factory specifications.
2. Clean, regap to .032" and test. Plugs should fire under 75 lbs. pressure in tester.

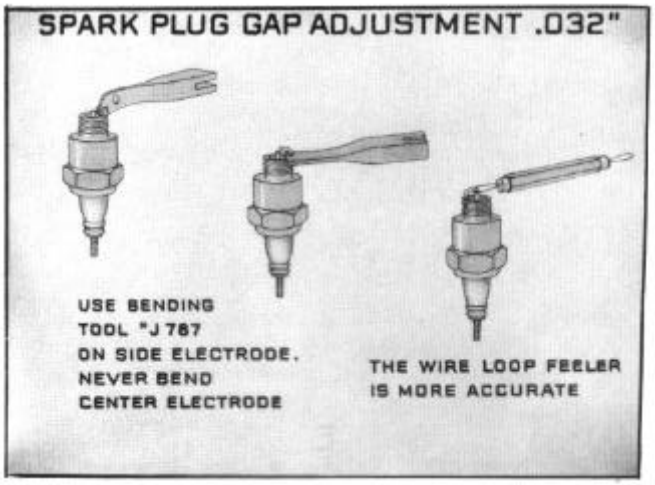


Figure 3 - Spark Plug Test

3. Replace plugs with burned electrodes, chipped or cracked porcelain or if they have been in service over 10,000 miles.
4. Always use new spark plug gaskets.

VALVES TEST 4

1. Check valve tappet clearance with engine hot and running.
   Intake tappet clearance .006".
   Exhaust tappet clearance .008".

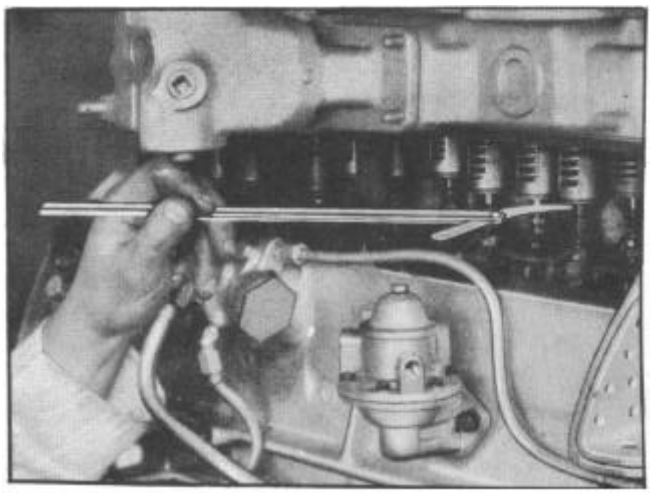


Figure 4 - Valve Tappet Adjustment

2. Inject oil having gum dissolving properties into intake manifold with engine running above idle speed to remove deposits from valve guides. Recheck compression.
3. If compression is still low, grind valves, replacing guides and valves if worn. Replace cylinder head gasket.

BATTERY CAPACITY TEST - TEST 5

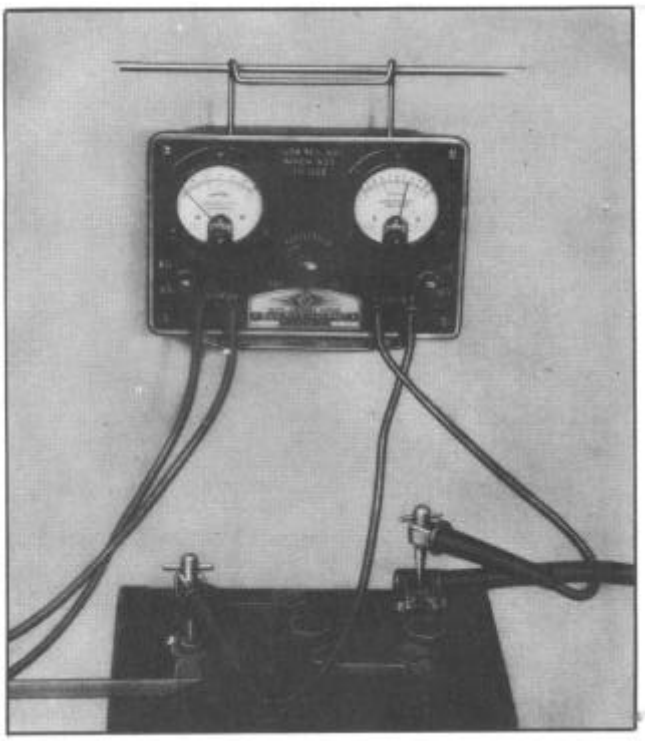


Figure 5 - Battery Capacity Test

1. Take hydrometer gravity reading. Gravity should be 1250 to 1290 at 70° F.
2. Connect positive voltmeter lead to positive battery terminal negative voltmeter lead to negative battery terminal.
3. Without current draw voltmeter reading should be 6 to 6 1/2 volts.
4. If gravity or voltage is low recharge battery.

BATTERY VOLTAGE DROP STARTER SYSTEM - TEST 6

1. Connect positive voltmeter lead to positive battery terminal negative voltmeter lead to negative battery terminal. Ignition "off", engine cranking read voltage.
2. Connect positive voltmeter lead to ground on engine negative voltmeter lead to starting motor switch "BAT" terminal. Ignition "off", engine cranking read voltage.
3. Difference between first and second readings should not be greater than .25 volt. If greater than this, make test 7.
4. Check and tighten screws at "B" terminals of fuse block, voltage regulator and "BAT" terminal of starter switch.

BATTERY CABLE AND CABLE CONNECTIONS - TEST 7

1 Connect positive voltmeter lead to positive battery terminal negative voltmeter lead to ground on engine.
2 With engine cranking voltage reading should not be more than .1 volt. If higher than this, check positive battery cable connection at battery terminal, ground strap tightness and engine to frame ground connections.
3 Connect positive voltmeter lead to "BAT" terminal of starting motor switch negative voltmeter lead to negative battery terminal.

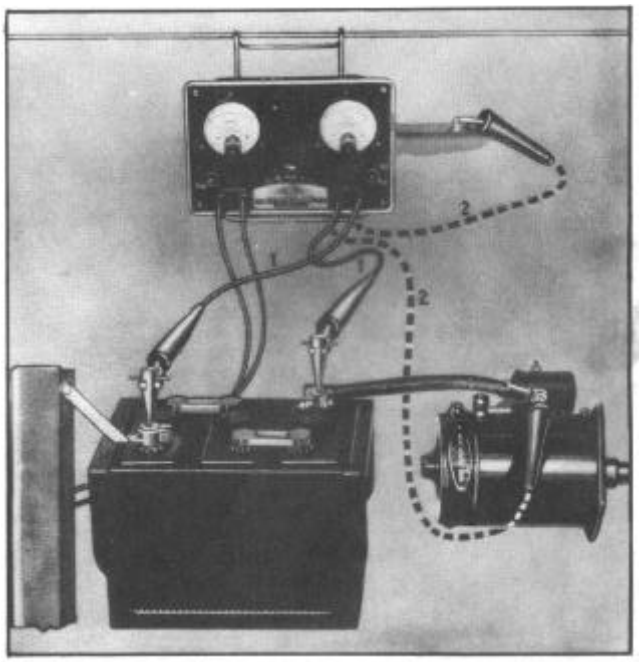


Figure 6 - Battery Voltage Drop Starter System

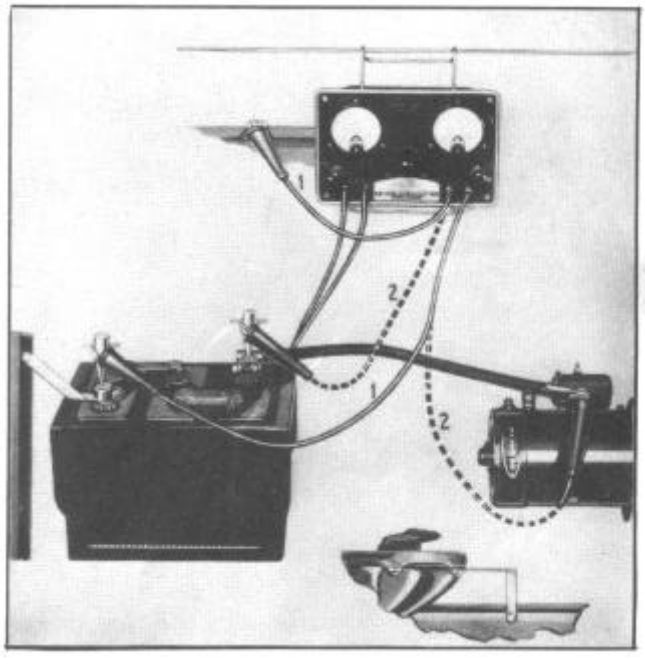


Figure 7 - Battery Cable and Cable Connection Test

4. With engine cranking voltage reading should not be higher than .1 volt. If higher than this, check negative battery cable connection at battery terminal and cable connection at "BAT" terminal of starting motor switch.
5. If cranking speed is slow it indicates starting motor switch trouble. Make test 8.

STARTING MOTOR SWITCH - TEST 8

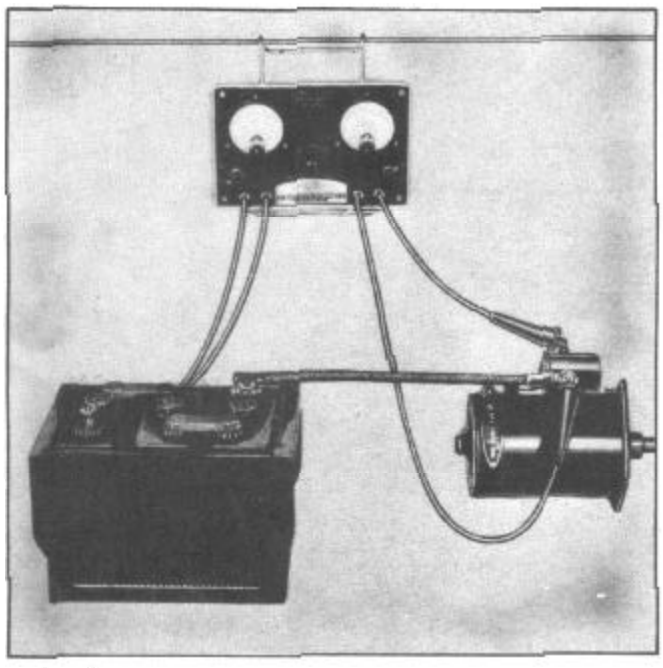


Figure 8 - Starter Switch

1. Connect positive voltmeter lead to starting motor terminal of solenoid switch negative voltmeter lead to "BAT" terminal of solenoid switch.
2. Crank engine with starter. Voltmeter reading should not be more than .2 volt. If more than this check connections or replace switch.

DISTRIBUTOR GROUND - TEST 9

1. Connect positive voltmeter lead to ground on engine negative voltmeter lead to terminal of distributor.
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 1/10 volt.
6. A reading of more than 1/10 volt indicates poor breaker point contact, poor distributor point plate contact or poor distributor housing contact to engine.

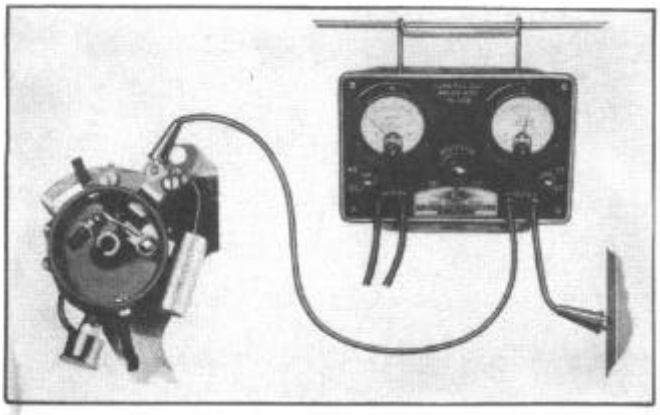


Figure 9 - Distributor Ground Test

7. Turn distributor shaft until points are open.
8. Turn ignition switch on.
9. Voltage between distributor terminal and ground should be exactly same as battery voltage.
10. If lower, condenser is leaky or grounded.

DISTRIBUTOR - TEST 10

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 arm block lightly with high temperature grease.
4. Place one drop of engine oil on breaker arm pivot.
5. Check automatic advance governors must work freely.
6. Clean breaker points replace if burned or pitted.
7. Align points.
8. Check breaker arm spring tension should be 18 to 20 ounces.
9. Adjust breaker points gap six cylinder models .020" eight cylinder models .017".

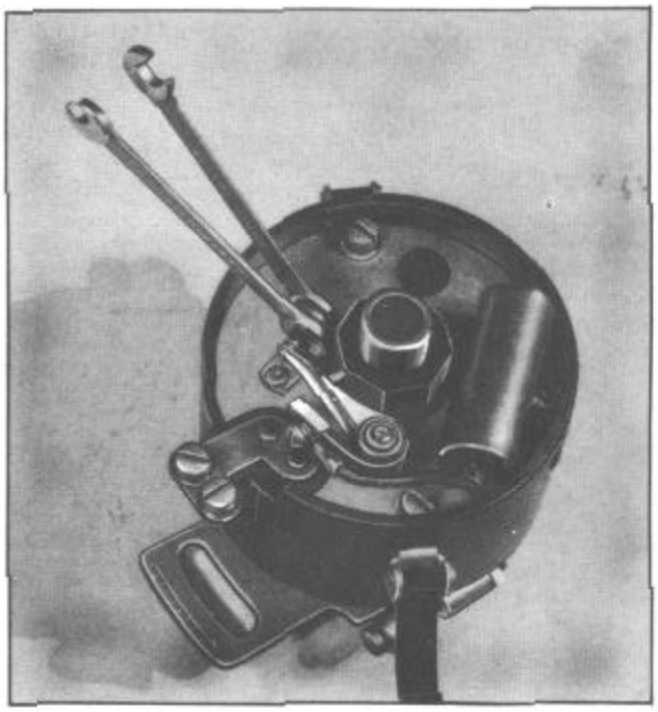


Figure 10 - Distributor Test

DISTRIBUTOR TIMING - TEST 11

1. Attach synchroscope ground lead to engine attach remaining lead to No. 1 spark plug.
2. Run engine at idle speed and if ignition timing is correct, the dead center line will be in line opposite pointer on rear motor support plate.
3. If timing is not correct rotate distributor body on six cylinder distributor clockwise to advance and counter clockwise to retard. On eight cylinder distributor rotate distributor counter clockwise to advance and clockwise to retard.
4. As engine is speeded up note increase in degrees of advance on flywheel. Mark on flywheel should move up as engine speed is increased and return to pointer when engine idles.

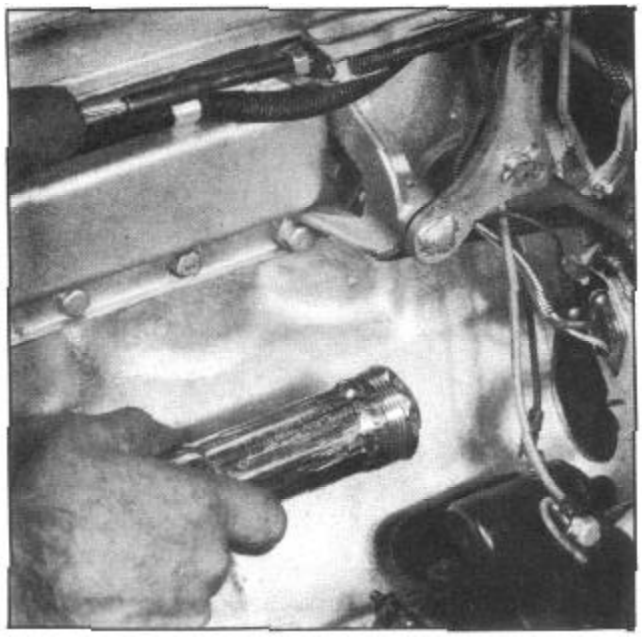


Figure 11 - Distributor Timing Test

HIGH TENSION CABLE - TEST 12

1. Connect tester to No. 1 spark plug cable and ground. Run engine at idle and set tester at 7 M.M.
2. If spark is weak or irregular connect tester to No. 1 socket of distributor. A regular spark across 7 M.M. gap indicates poor No. 1 cable. Repeat test on all plug wires.
3. If regular spark is obtained on some but not all tests, check distributor cap for crack or burned sectors.
4. If regular spark is not obtained on any tests, check rotor for short to shaft and wide gap.

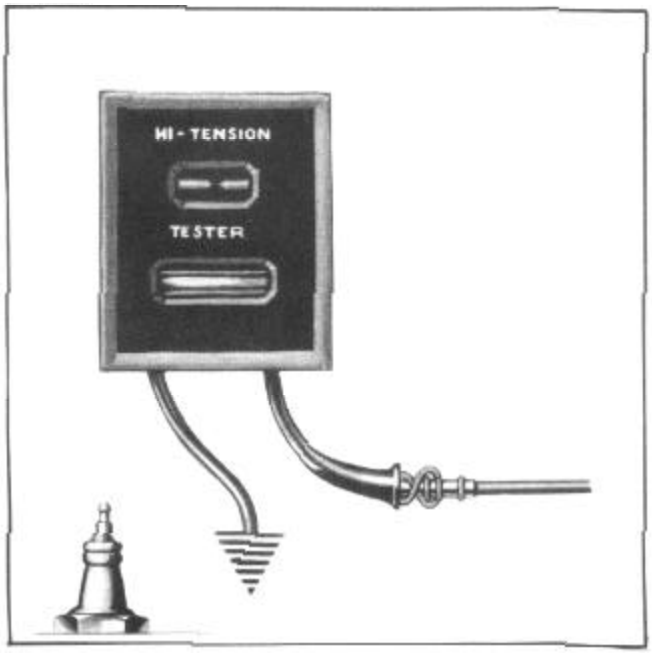
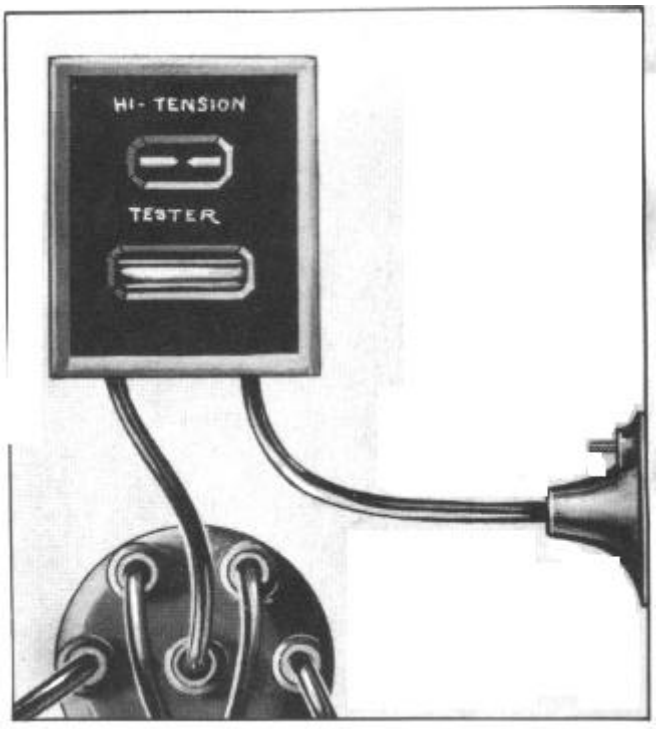


Figure 12 - High Tension Cable Test

COIL - TEST 13

1. If regular spark is not obtained in test 12, remove cable from distributor central terminal and connect tester to cable and distributor. Close tester gap and run engine at idle speed. Open gap to 7 M.M. and note spark.
2. Remove cable from coil and connect tester direct to coil and distributor. Repeat test. If spark is more regular than before, install new cable.
3. If regular spark is not obtained with 7 M.M. gap, replace coil.



13 - Ignition Coil Test

GENERATOR CHARGING RATE - TEST 14

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.
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 m.p.h. for 15 minutes to warm up.
6. With resistance turned "out" and engine running at speed corresponding to 35 m.p.h., at 8 volts, generator charging rate should be not less than 27 amperes on models 40 and 48. On all other models charging rate should be not less than 34 amperes. Adjust third brush in a counter clockwise rotation to increase output.

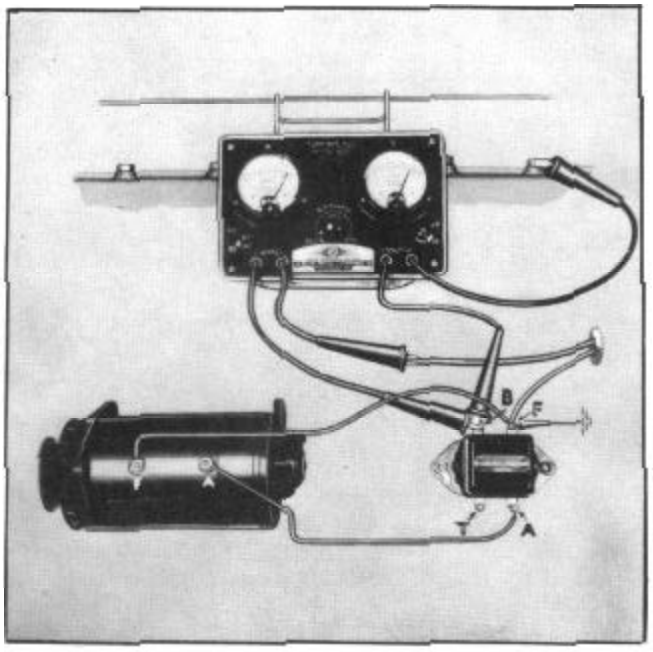


Figure 14 - Generator Charging Rate

VOLTAGE REGULATOR TEST - 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.
3. Connect negative voltmeter lead to "B" terminal on regulator positive voltmeter lead to ground on engine. Omit jumper wire from regulator to ground.
4. Run engine at speed corresponding to 20 m.p.h. for 15 minutes to warm up.

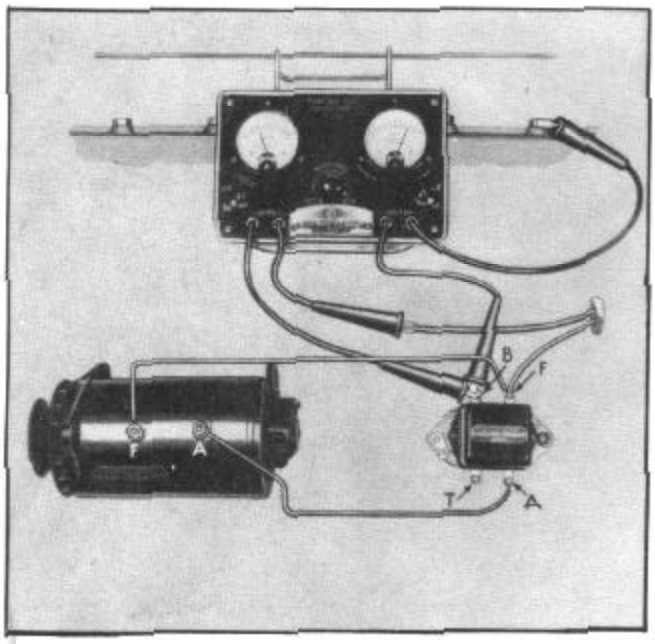


Figure 15 - Voltage Regulator Test

5. Run engine at speed corresponding to 35 m.p.h. Turn "in" resistance until ammeter reads 10 amperes.
6. 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 Auto Lite Service Station. DO NOT ADJUST.

FUEL PUMP - TEST 16

1. Remove glass sediment bowl and clean.
2. Carefully remove screen and clean. If damaged replace. Check gasket.
3. Tighten fuel pump connections.
4. Check for diaphragm leaks tighten cover screws.

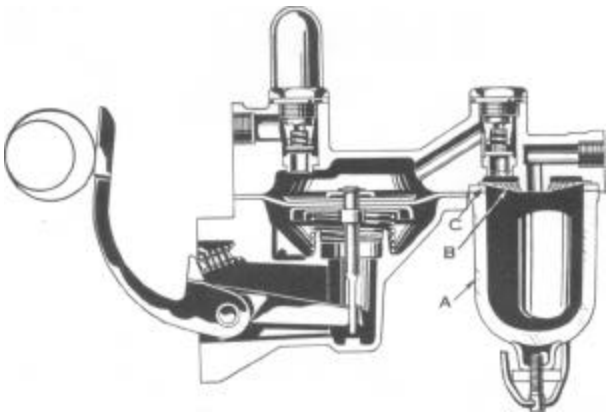


Figure 16 - Fuel Pump

FUEL PUMP TEST - TEST 17

1. Connect gas per mile gauge to fuel pump outlet and carburetor inlet. Connect pressure gauge into gauge line as shown. Set gauge valve to position 3 and start engine.
2. On pumps with inverted bowl pressure should show from 2 to 3 1/2 lbs. On pumps with appended bowl and combination fuel and vacuum pumps pressure reading should be from 3 to 4 1/2 lbs.
3. High pressure will cause carburetor to flood and low pressure will cause vapor lock.

CLIMATIC CONTROL - TEST 18

1. Remove cover clean screen or replace.
2. Check heat box tube for plugged condition and loose connection.
3. Check choke valve for free movement.
4. Choke valve should open from own weight when cover is removed.
5. When cover is reinstalled, adjust to middle graduation. If engine runs lean during warm up, turn housing counter clockwise. If rich, turn housing clockwise.

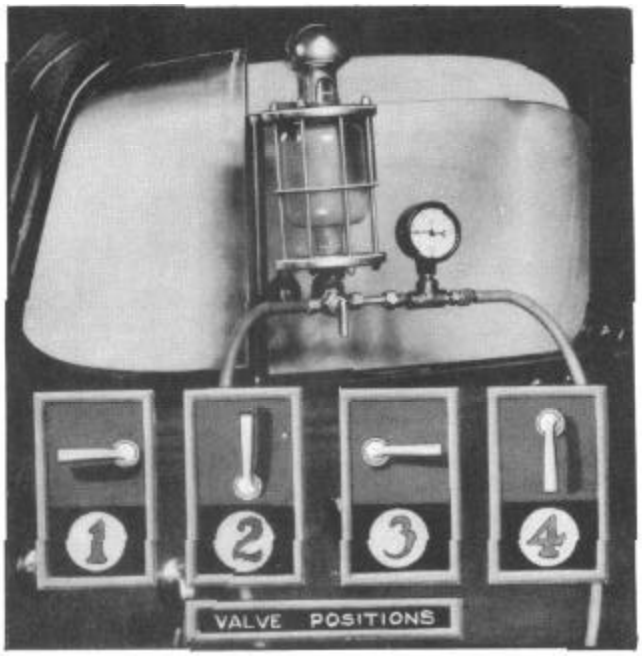


Figure 17 - Fuel Pump Test

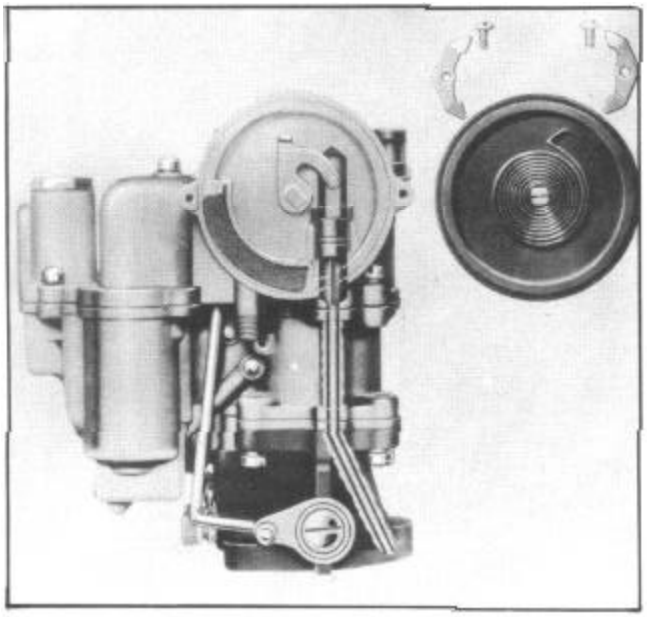


Figure 18 - Climatic Control

AIR CLEANER - TEST 19

Dry Type (Illustrated)

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

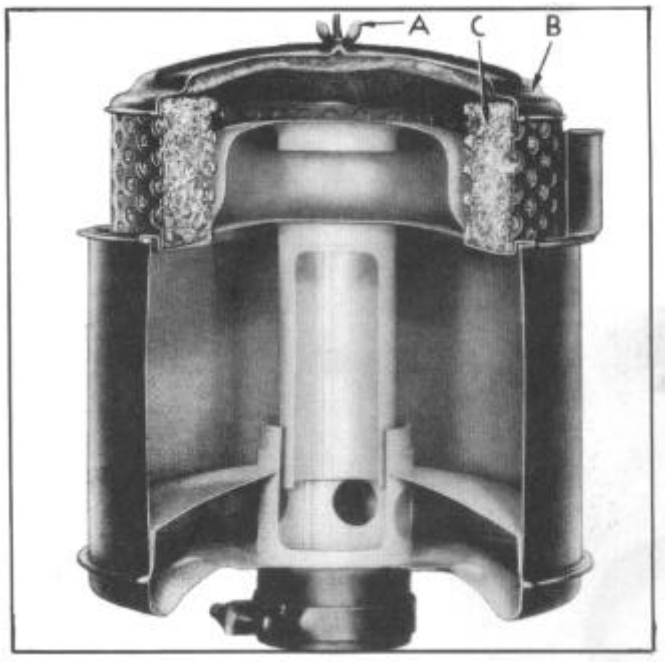


Figure 19 - Air Cleaner--Dry Type

Oil Bath Type

1. Remove cleaner from engine.
2. Remove wing nut and cover and filter unit.
3. If necessary, wash filter unit in gasoline and blow dry. DO NOT RE OIL.
4. Clean old oil and sediment out of sump.
5. Refill with one pint of engine oil, same grade as used in engine.
6. Reinstall parts in reverse order of removal.

TUNING CHECK - TEST 20

1. Thoroughly warm engine. Adjust throttle stop screw for 7 m.p.h. in high gear.

Figure 20 - Tuning Check

2. Attach vacuum gauge to windshield wiper manifold connection.
3. Turn carburetor idle adjusting screw or screws to seat and back out 1/2 turn.
4. Start engine. Turn one idle screw until maximum gauge reading is obtained. Then turn other for maximum steady reading.
5. Reading of 18 to 21 should be obtained with idle screw on single carburetor from 3/4 to 1 1/2 turns open on six cylinder duplex carburetor 1/4 to 1 1/4 turns open - on eight cylinder duplex carburetor 1/2 to 1 1/2 turns open.

FLOAT LEVEL - TEST 21
Single - Used on Models 40, 48

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. This dimension should be 3/8" and can be measured with Float Level Gauge J 818 2.
2. Bend lip of arm to adjust.
3. With float chamber cover upside down, draw on inlet. If leakage exists, replace valve needle and seat.

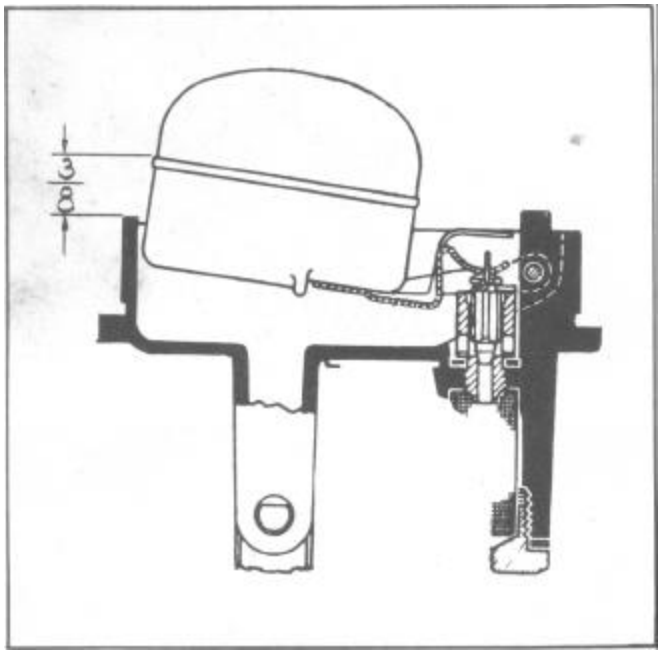


Figure 21 - Float Level Adjustment
Models 40, 48

FLOAT LEVEL - TEST 22
Duplex - Used on Models 41, 43, 44, 45, 47

1. Remove float chamber cover and remove gasket from cover. Hold cover upside down and place Float Level Gauge J 818 7 (3/32") between bottom of float and cover.
2. Bend lip of arm to adjust.
3. With float chamber cover upside down, draw on inlet. If leakage exists, replace valve needle and seat.

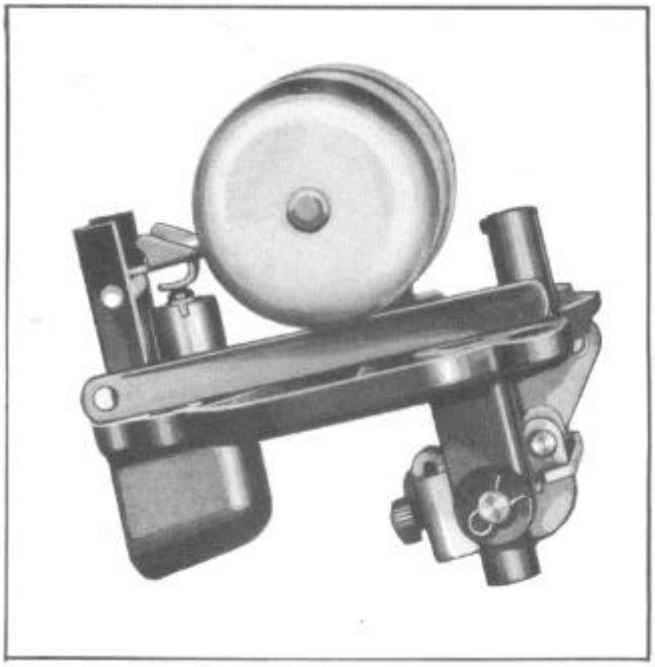


Figure 22 - Float Level Adjustment
Models 41, 43, 44, 45, 47

METERING ROD SETTING - TEST 22
Single - Used on Models 40, 48

1. Remove the metering rod and insert gauge J 1265 (2.468") (A) in its place.
2. Back out throttle screw, close throttle valve tight. Press lightly on piston link (B) until metering rod pin rests in shoulder (C) of gauge.
3. Bend lip (D) of piston link so that less than .005" clearance obtains between lip and pump arm (E).

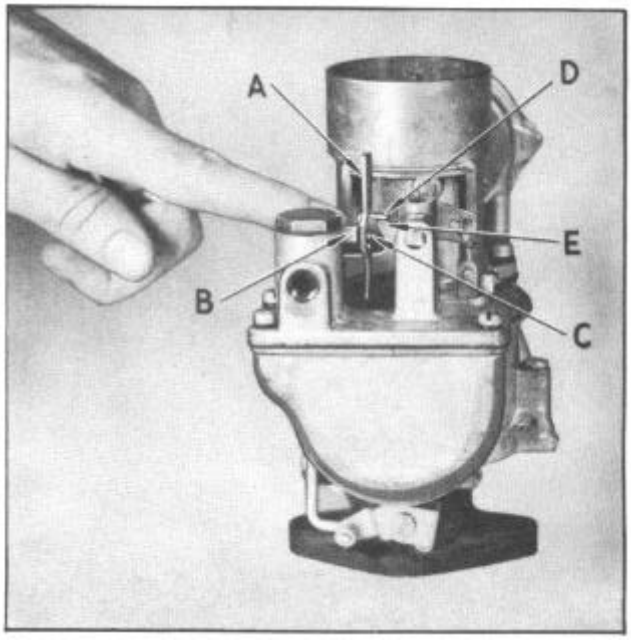


Figure 23 - Metering Rod Setting Models 40, 48

METERING ROD SETTING TEST 24
Duplex - Used on Models 41, 43, 44, 45, 47

1. Remove one metering rod and insert gauge J 1305 (2.2809) in its place.
2. Back out throttle screw. Press lightly on piston link until piston rests on bottom of cylinder. There should now be less than .0059 clearance between metering rod pin and shoulder of notch in gauge.
3. Adjust by bending tongue on anti percolator arm.

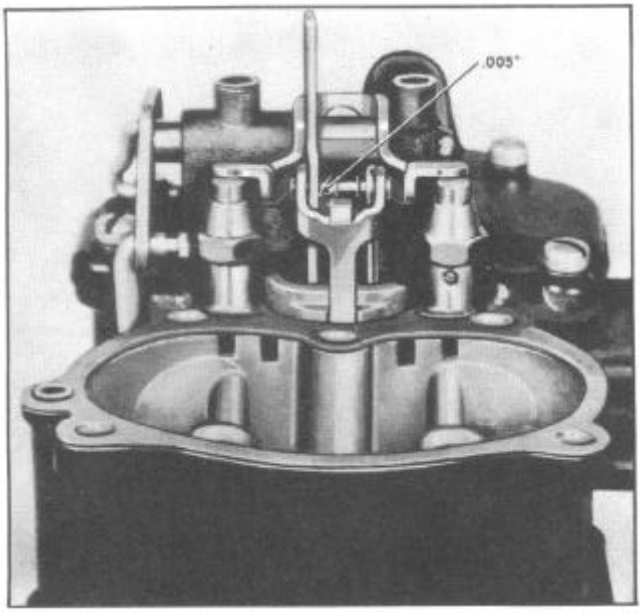


Figure 24 - Metering Rod Setting
Models 41, 43, 44, 45, 47

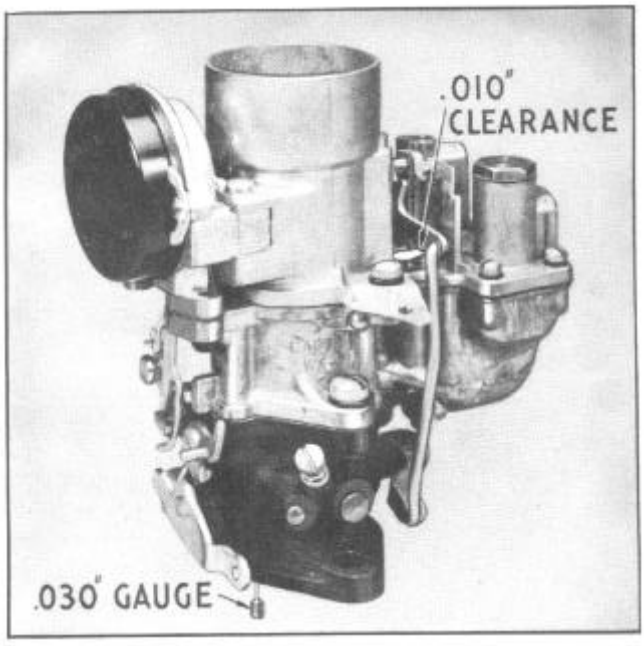


Figure 25 - Anti Percolator Valve Adjustment
Models 40, 48

ANTI PERCOLATOR VALVE TEST 25
Single Models 40, 48

1. Insert a .0309 diameter gauge between lower edge of throttle valve and bore of carburetor (opposite port).
2. Adjust lip of rocker arm so that .010" clearance obtains between lip and pump arm.
3. The anti percolator valve must close with only a slight throttle opening and seal the passage air tight. An air leak at the valve will cause faulty acceleration and high speed performance.

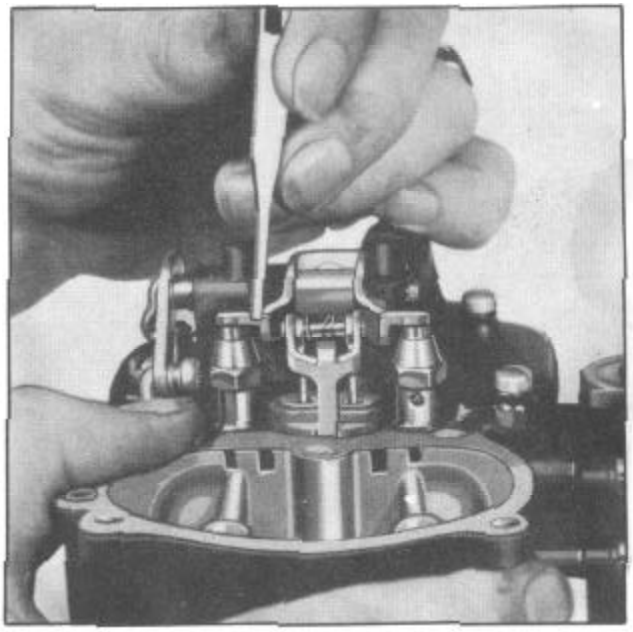


Figure 26 - Anti Percolator Valve
Models 41, 43, 44, 45, 47

ANTI PERCOLATOR VALVES - TEST 26
Duplex - Used on Models 41, 43, 44, 45, 47

1. Back out throttle screw and close throttle.
2. Bend lips of anti percolator arm until center of indicator lines on valves are just flush with top of plugs.

FAST IDLE ADJUSTMENT - TEST 27
Single - Used on Models 40, 48

1. With fast idle cam (A) held in normal idle position tighten throttle lever adjusting screw (B) until it just seats against cam.
2. Hold throttle lever (C) closed and pull cam (A) back until first (or lower) step on cam is against (not on) set screw.
3. There should now be 5/8" clearance between the inside wall of the air horn and the lower edge of the choke valve.
4. Adjustment can be made by bending at the offset of the fast idle link (D).

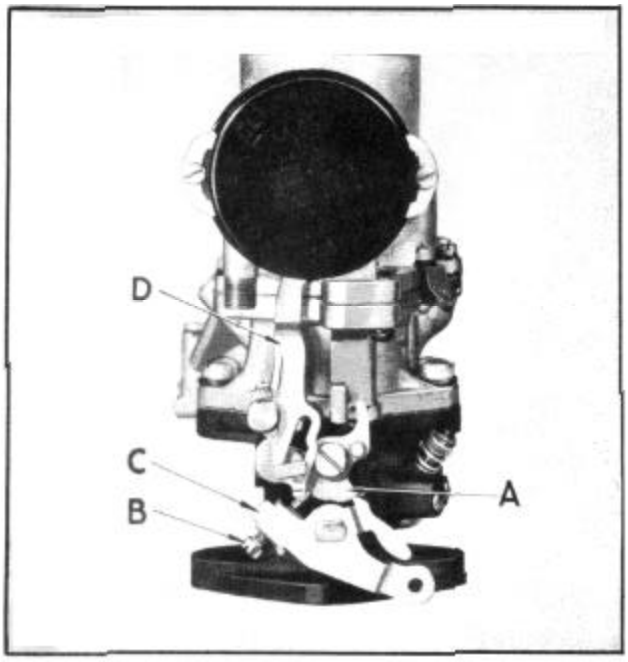


Figure 27 - Fast Idle Adjustment Models 40, 48

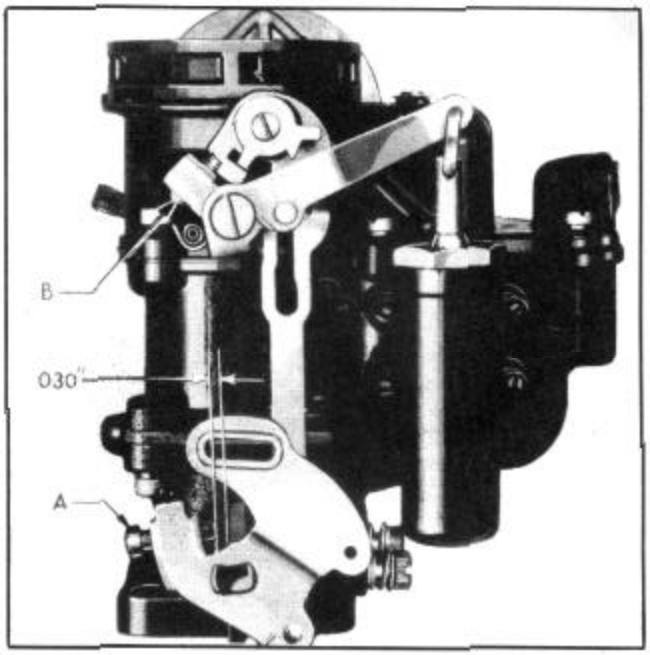


Figure 28 - Fast Idle Adjustment
Models 41, 43, 44, 45, 47

FAST IDLE ADJUSTMENT - TEST 28
Duplex - Used on Models 41, 43, 44, 45, 47

1. Set throttle stop screw (A) for normal idle.
2. With choke valve closed, turn fast idle screw (13) until throttle stop screw is held .030" from stop.

FINAL TUNING CHECK

1. After replacing the carburetor repeat test No. 20 with the vacuum gauge.
2. If the vacuum gauge reading is not steady or is low refer back to section (A) for the cause of the trouble.
3. The vacuum gauge is the final check on the accuracy of adjustments made.

INDEX

FUEL SYSTEM SPECIFICATIONS

Carburetor make.....Carter
Carburetor type models 40,48.....Down draft 1 1/4" Single
Carburetor type models 41,43.....Down draft 1" Duplex
Carburetor type models 44,45,47....Down draft 1 1/4" Duplex

Heat control
Models 40,48.....Manual
Models 41,43,44,45,47.....Automatic

Choke control
All models.....Automatic
Fuel delivery.....Pump
Pump driven from camshaft by...Cam
Air cleaner and Silencer
Oil wetted standard.....A C
Oil bath optional.....United

Gasoline tank capacity
Models 40 T, 40 P, 40 UCo, 40 Ucpe.....12 1/2 gallons
Models 41,43,44,45,47,48 40 Cab, 40 CabPu, 40 Panel....16 1/2 gallons

CARBURETOR SPECIFICATIONS Models 40, 48

Dimensions.....Flange size 1 1/4" Single S.A.E. Primary venturi 11/32" I.D. - Secondary venturi 11/16" I.D. Main venturi 1 1/4".

Float Level.....Distance from float at free end to float chamber cover to be 3/8" when needle is seated Use tool J818 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 No. 48 drill size. Idle bleed No. 50 drill size.

Idle Port.....Length .165" Width .032".

Idle Port Opening..... .122" above valve with valve closed tight.

Idle screw seat.....No. 46 drill.

Vacuum Spark Port..... .040"

Set Idle Adjustment Screw.....1 to 1 1/2 turns open. For richer mixture turn screw out. Do not idle engine below 350 R.P.M.

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.

Metering Rod (vacumeter type).....Economy step, .072" diameter Middle step tapers to .064" Power step .044" diameter Length 3 9/64".

Metering Rod Jet..... .096" diameter drill.

Metering Red 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 strcke.

Vacuum Spark Port..... .039" to .041" diameter. Bottom of port .021" to .029" above valve.

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.

Choker Valve.....In air horn butterfly type with compensating poppet air valve.

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

Fast Idle and Unloader.....On left side.

CARBURETOR SPECIFICATIONS Models 41, 43

There have been two types of carburetor used on these models that are interchangeable in every way. The Carter Model 430 SV was used up to car 413116 and 433116 and Carter Model 461 S was used thereafter. The operation of the two types are identical.

Dimensions .....1" Dual 4 bolt flange Primary venturi 11/32" Secondary venturi 21/32" Main venturi 1 1/16".

Float Level.....Distance from float to bowl cover to be 3/32" when needle is seated Use tool J 818 7.

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.....5/16" weatherhead nipple.

Low Speed Jet Tubes.....Jet size No. 69 drill. By pass (plug) No. 53 drill. Economizer in body No. 56 drill. Idle bleed No. 54 drill.

Idle Port.....Length .150" Width .030".

Idle Port Opening..... .108" to .112" above valve with valve tightly closed.

Idle Screw Seat No. 52 drill.

Set Idle Adjustment Screw.....1/4 to 1 1/4 turns open. For richer mixture turn screw out. Do not idle engine below 350 R.P.M.

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.....Economy step .063" diameter Middle step tapers to .056" diameter Power step .052" diameter Length 2 59/64".

Metering Rod Jet..... .082" drill.

Metering Rod Setting.....Use gauge J 1305 (2.280").

Accelerating Pump.....High pressure type spring operated lever, with adjustable pump stroke. Discharge jet twin No. 74 drill. Intake ball check No. 40 drill. Discharge ball check No. 50 drill. Relief passage (to outside) No. 42 drill.

Pump Adjustment.....9/32" plunger travel in long stroke.

Vacuum Spark Port..... .040" Top of port .029" to .033" above valve.

View carburetor with flange down and float chamber in rear.

Throttle Lever.....Adjusting, on right side. Length 1 1/4", in center of travel. Points forward. Slow closing throttle.

Choke.....Climatic control on left side. Set on center index.

Choke Heat Suction Holes.....Location, in body. Size No. 34 drill.

Choke Valves.....In air horn. Butterfly type (offset type).

Fast Idle and Unloader.....On right side.

CARBURETOR SPECIFICATIONS Models 44, 45, 47 (8 cylinder)

Dimensions.....1 1/4" Dual 4 bolt flange Primary venturi 11/32" Secondary venturi 19/32" Main venturi 1 3/16".

Float Level.....Distance from float to bowl cover to be 3/32" when needle is seated Use tool J 818 7.

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. 66 drill. By pass (plug) No. 54 drill. Economizer in body No. 56 drill. Idle bleed No. 54 drill.

Idle Port.....Length .175" Width .030".

Idle Port Opening..... .135" above upper edge of valve with valve tightly closed.

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 350 R.P.M.

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.....Economy step .0625" diameter Middle step tapers to .055" diameter Power step .046" diameter Length 2 59/64".

Metering Rod Jet..... .086" drill.

Metering Rod Setting.....Use gauge J 1305 (2.280").

Accelerating Pump.....High pressure type (spring operated) with adjustable pump stroke. Discharge jet twin No. 74 drill. Intake ball check No. 40 drill. Discharge ball check No. 50 drill. Relief passage (to outside) No. 42 drill.

Pump Adjustment.....9/32" plunger travel (in long stroke).

Vacuum Spark Port.....None.

View 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 forward. Slow closing throttle.

Choke.....Climatic control on left side. Set on center index.

Choke Heat Suction Hole.....Location, in body. Size No. 36 drill.

Choke Valve.....In air horn. Butterfly type (offset type).

Fast Idle and Unloader.....On right side.

CARBURETOR

All carburetors are Carter downdraft using vacuum controlled metering rod operation and a strainer or filter built into the float chamber.

Carter No.		Used On
WA 1 454S	Single 1 1/4" Downdraft manual heat control automatic choke	40,48
WDO 461S	Dual 1" Downdraft automatic heat control and choke	41,43
WDO 455S	Dual 1 1/4" Downdraft automatic heat control and choke	44,45,47

CARBURETOR CIRCUITS

There are 5 circuits in the carburetor that require checking and they are as follows:

1. Float circuit see Figures 10 and 11.
2. Low speed circuit Single type carburetor see Figure 14. Low speed circuit Duplex carburetor see Figure 15.
3. High speed circuit see Figures 18 and 19.
4. Pump circuit see Figure 24.
5. Choke circuit see Figure 25.

CARBURETOR INSTALLATION All Models

On mounting a carburetor the following arrangement of gaskets and insertion of heat deflector must be followed. Place four gaskets between the carburetor and intake manifold, then the heat deflector, then three more gaskets, 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 (see Figures 1 and 2).

SINGLE CARBURETOR MOUNTING

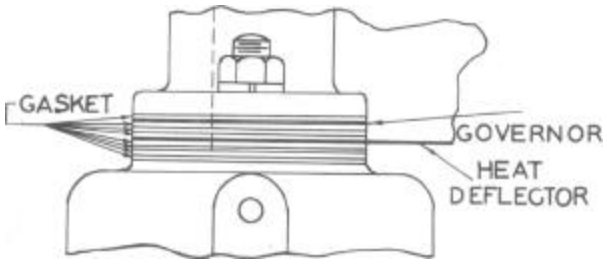
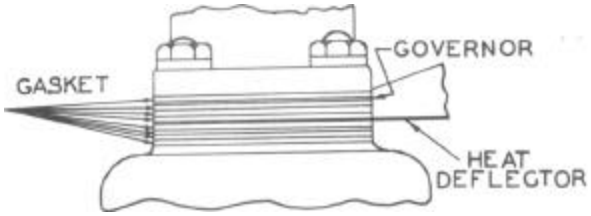


Figure 1--Single Carburetor Mounting Models 40,48



DUPLEX CARBURETOR MOUNTING

Figure 2 Duplex Carburetor Mounting Models 41, 43, 44, 45, 47

CARBURETOR DISASSEMBLY Models 40, 48 (Fig. 3)

1. Remove dust cover, lockwasher and attaching screw.
   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 dust cover.
2. Remove fast idle cam attaching screw and the fast idle cam.
3. The following parts are the "choke" circuit and should be kept in a separate group as they are removed.
   Remove two screws on top and one beneath the climatic control housing holding the air horn and its gasket.
   Remove thermostatic coil and housing (retainer screws and retainers).
   Remove piston housing strainer.
   Remove choke valve screws and choke valve.
   Loosen screw on choker lever, screw and links assembly four full turns. Pry the lip on the lever away from the shaft with a screwdriver or pliers.
   Revolve choke shaft counter clockwise until the piston is free from the cylinder and remove the assembly intact.

   CAUTION: Do not remove the pin holding the piston housing and air horn castings together because they are line reamed at the factory and should not be disassembled.

4. Keep the following parts in a separate "Pump" group. Remove the pin spring, spring retainer and retainer spring from the throttle connector rod and remove the rod.

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

5. Keep the following parts in a separate "Low Speed Circuit" group.

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

Remove the piston from the link by revolving a quarter turn. Place parts in High Speed Circuit group.

Remove piston link and metering rod from the bowl cover assembly and disassemble rod and link. Do not lose the small metering rod disc. Place parts in High Speed Circuit group.

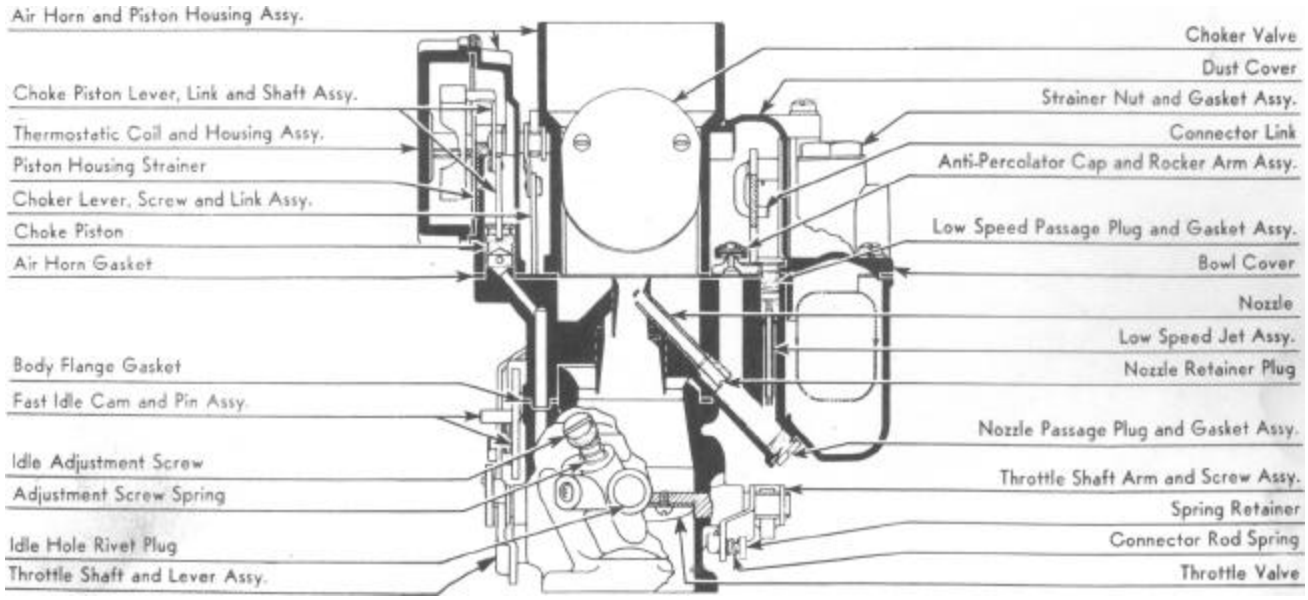


Figure 3-Carburetor—Single — Models 40, 48

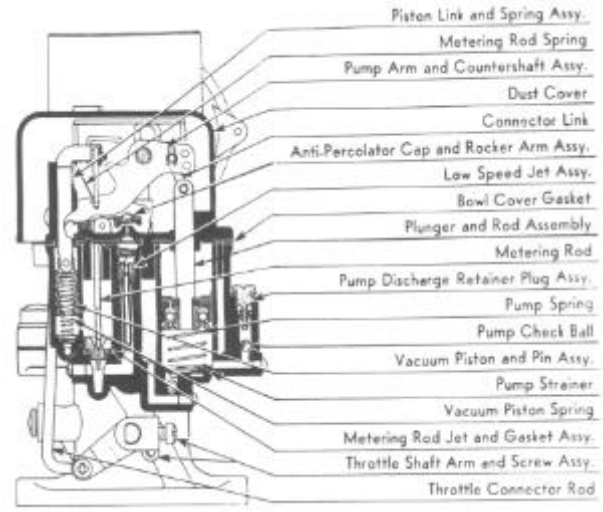


Figure 4-Carburetor Single - Models 40, 48

6. Keep the following parts in a separate "Float Circuit" group "High Speed Circuit" or "Pump Circuit"

Remove the bowl cover attaching screws and lockwashers, lift off bowl cover assembly intact and remove vacuum piston spring from vacuum cylinder in the casting. (This spring is a High Speed Circuit item and the rest are Float Circuit.)

Remove bowl cover gasket and place in Float Circuit group. Remove pump arm and countershaft assembly and place parts in Pump Circuit group.

Remove float and lever assembly, needle and seat assembly, strainer nut and gasket assembly and strainer. Place parts in Float Circuit.

7. Remove anti percolator cap and rocker arm assembly and spring by removing anti percolator pin, see Figure 4. Place parts in High Speed Circuit group.

7. Remove pump plunger and rod assembly and the pump spring. Remove pump strainer and check ball from bottom of pump cylinder. Place parts in Pump Circuit group.

8. Remove nozzle passage plug and gasket assembly, nozzle retainer plug and nozzle using tool J 508. Make sure that the small nozzle gasket is removed from the nozzle passage. Place parts in High Speed Circuit group.

8. Remove the metering rod jet and gasket assembly. Place in High Speed Circuit group.

8. Remove the pump jet passage plug and gasket assembly. Remove pump jet. Place parts in Pump Circuit group.

8. Remove pump discharge ball retainer and gasket assembly. Remove check ball. Place parts in Pump Circuit group.

9. Remove low speed jet assembly. Place in Low Speed Circuit group.

9. Remove body flange assembly and gaskets.

9. Remove idle adjusting screw, spring and idle port rivet plug. Place parts in Low Speed Circuit group.

9. Remove throttle shaft arm and screw assembly. Place parts in Low Speed Circuit group.

17. Remove throttle valve screws, throttle valve, and throttle shaft with lever assembly. Place in Low Speed Circuit group.

CARBURETOR REASSEMBLY Models 40, 48

Clean all parts except the cork parts with clean gasoline using a small brush and a clean pan.

Blow through all passages in the casting with an air hose and use a compressed air hose on all parts before reinstalling.

Replace any worn parts and use new gaskets.

Carbon in the bore of the carburetor must be cleaned off by using sand paper (not emery cloth) or by scraping.

All parts must be tight after installing.

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

2. Hang the needle by the clip on the float lip and lower into position. Install float lever pin. Then set float level as shown on Pages 9 10.

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.

NOTE: A throttle shaft that is worn or a lever that is loose on shaft should be replaced.

4. Install the throttle valve and it is recommended that new valve screws be used. The trademark on the throttle valve should be facing up and to the idle port side. With the valve screws loose tap the 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. Examine throttle shaft arm and if the holes are worn replace it. 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. It is recommended that a new idle port plug be used and if the idle adjusting screw is burred it should be replaced. There is no copper washer used on the port plug. Adjust the idle adjusting screw according to instructions on Page 12.

7. Install body flange assembly 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. Reinstall.

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

10. Install discharge check ball and pump discharge ball retainer and gasket assembly.

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

12. Install metering rod jet assembly. If either the metering rod or the metering rod jet show wear replace both the rod and the jet. New part should never be used with an old part.

13. Assemble a new gasket on the bowl cover. Install the anti percolator cap and rocker assembly; pump arm and countershaft assembly in the bowl cover. Install piston link assembly in the bowl cover and attach piston. Invert carburetor casting as assembled onto the bowl cover and then install the screws and lock washers.

14. Install low speed passage plug and gasket assembly located next to anti percolator cap in the bowl cover.

15. Install connector link in the lower hole in the pump arm and pump shaft with pin spring at top and ends of the link away from the bore. Install throttle connector rod.

16. Adjust Pump see Page 16.

17. Adjust Metering Rod see Page 14.

18. Adjust Anti Percolator see Page 15. 19. 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.

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

21. Install the choke shaft assembly and piston. Install choker lever; screw and link assembly behind the piston housing with the choke shaft and piston.

22. 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.

23. Install strainer in the piston housing. If the strainer is dirty or clogged it is suggested that it be replaced.

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

25. Install fast idle cam with attaching screw.

26. Adjust fast idle see Page 12.

27. Adjust unloader see Page 17.

28. Adjust lock out see Page 18.

29. Pack the dust cover attaching screw hole in the bowl cover with graphite grease and install the dust cover and attaching screw and the lockwasher. Never use oil or grease any where else on the carburetor or on the linkage.

CARBURETOR DISASSEMBLY Models 41, 43, 44, 45, 47

1. Remove dust cover (Figure 5)

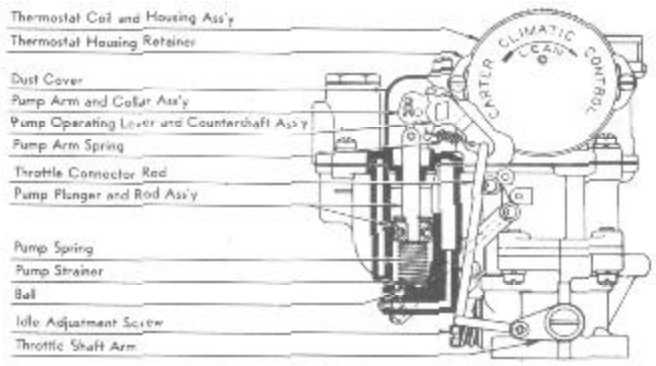


Figure 5--Carburetor Duplex
Models 41, 43, 44, 45, 47

2. Remove dashpot connector link, dashpot arm, pin and screw assembly and spring.

3. Remove air horn assembly intact. The screw inside air horn beneath choke valve must be removed. Discharge needle inserted in this hole. (See operation 7).

4. Disconnect throttle connector rod at both. ends.

5. Remove bowl cover assembly intact and pump plunger spring.

6. Remove from bowl cover, metering rods and vacuum piston assembly intact. Do not lose metering rod discs. Then lift out vacuum piston spring and dash pot plunger and rod assembly.

7. Remove strainer from bottom of pump cylinder (invert carburetor; strainer and pump discharge needle will drop out), ball retainer ring and pump check ball beneath strainer. Use tool J 816 6. DO NOT ATTEMPT TO REMOVE PUMP JETS.

8. Remove anti percolator valve assemblies.

9. Remove both low speed jet bleeder plugs and both low speed jets (see Figure 6). (Use tool J 816 1 to remove low speed jets.)

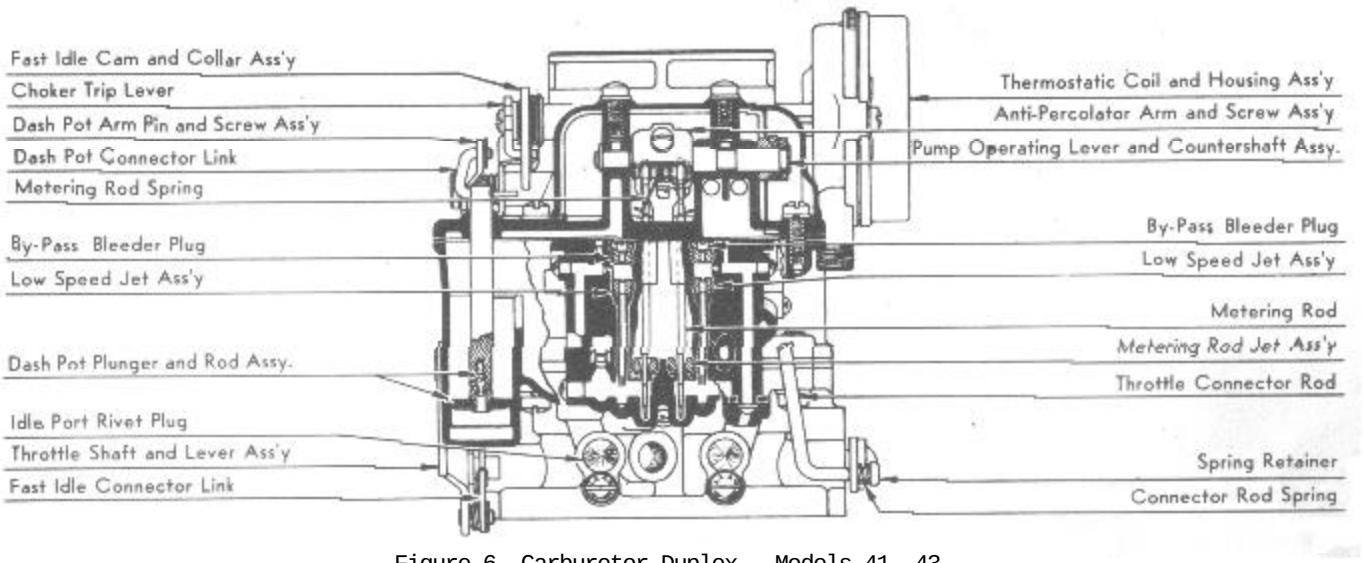


Figure 6--Carburetor Duplex - Models 41, 43
NOTE: The models 44,45,47 (8 cylinder) carburetor does not have the hole shown for the vacuum line to the distributor vacuum control.

10. Remove both metering rod jet assemblies.
11. Remove body flange assembly intact. Remove three rubber gaskets beneath float bowl.
12. Remove both nozzle passage plugs.
13. Remove both nozzle retainer plugs and nozzles and nozzle gaskets.
14. Remove both idle adjusting screws from flange assembly and idle port rivet plugs.
15. Remove throttle shaft arm attaching screw, washer and throttle shaft arm.
16. Remove throttle valve screws and throttle valves and throttle centering screw.
17. Remove throttle shaft and lever assembly, fast idle link and spring. Disassemble.
18. Remove float pin, float assembly, needle and needle seat from bowl cover.
19. Remove connector link from pump arm and plunger shaft.
20. Loosen anti percolator arm screw, pin spring and slide out pump arm and shaft assembly and dismantle.
21. Remove strainer nut and gasket and strainer.
22. Remove thermostatic coil and housing assembly and gasket from air horn and lift out screen (see Figure 7).
23. Remove choker trip lever screw from choke shaft and lift off trip lever, washer and fast idle cam and spring assembly.

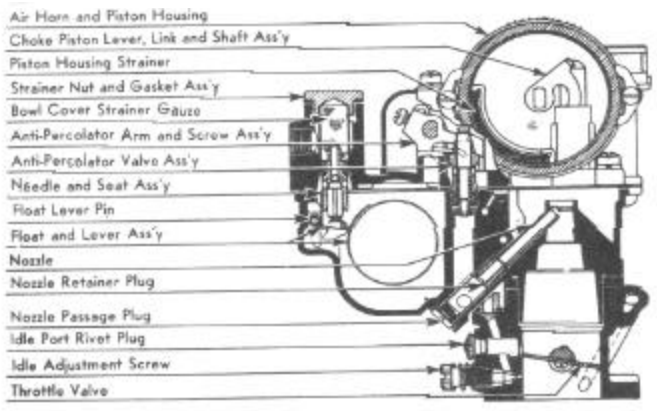


Figure 7--Carburetor Duplex
Models 41, 43, 44, 45, 47

24. Remove choke valve screws and choke valve.
25. Turn choke lever until piston is free from cylinder and remove assembled parts. Do not lose piston pin.

NOTE: Wash all parts in a good gum solvent, except coil and housing assembly. Blow out all passages with compressed air and scrape carbon from bores of flange and replace all worn and damaged parts. Don't remove or damage pump jets.

CARBURETOR REASSEMBLY Models 41, 43, 44, 45, 47

Use all new gaskets when reassembling.
1. Group all float circuit parts removed in operations 18 and 21.
2. Group all low speed circuit parts removed in operations 9 11 14 15 16 and 17.
3. Group all high speed circuit parts removed in operations 4 6 8 10 12 and 13.
4. Group all pump circuit parts removed in operations 2 7 19 and 20.
5. Group all choke circuit parts removed in operations 2 22 23 24 and 25.
6. Install float circuit parts in bowl cover. (Needle seat and gasket, needle, float assembly, float pin, bowl cover strainer and nut and gasket assembly.)
7. Set float lever to 3/32". Use gauge J 818 7. Gauge both ends of float from machined surface of casting.
8. Low speed circuit reassembly: First, insert throttle shaft and lever assembly and throttle centering screw.
9. Back out throttle lever adjusting 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. Don't release this grip until all four screws are tightened.
10. Install idle adjusting screws and new idle port plugs.
11. Install three new rubber gaskets and body flange gasket on under side of body casting.
12. Attach flange assembly to bowl.
13. Install bowl low speed jet assemblies and low speed jet bleeder plugs in casting. Work jets well into

casting to insure good seat.

14. Install anti percolator valve assemblies.

15. Install pump intake check ball and retainer ring at bottom of pump cylinder. Install strainer.

16. Install pump plunger spring, pump plunger and dashpot plunger assembly.

17. Install both metering rod jet assemblies.

CAUTION: Do not attempt to tighten metering rod jets too tightly. Seat them firmly in casting.

18. Install vacuum piston spring and vacuum piston assembly (see Figure 8)

18. Install vacuum piston spring and vacuum piston assembly (see Figure 8).

CARBURETOR CHECK UP Models 41,43,44,45,47

If carburetor loads up after considerable service, float level should be checked. Wear on lip of float will raise float level. Float level may be reset by bending lip down to raise float level or bending lip up to lower float level. Only a very slight bend is needed.

If motor stalls while idling, reset throttle adjusting screw and idle adjustment screws to specifications. If this adjustment does not correct the trouble, remove low speed jets and clean

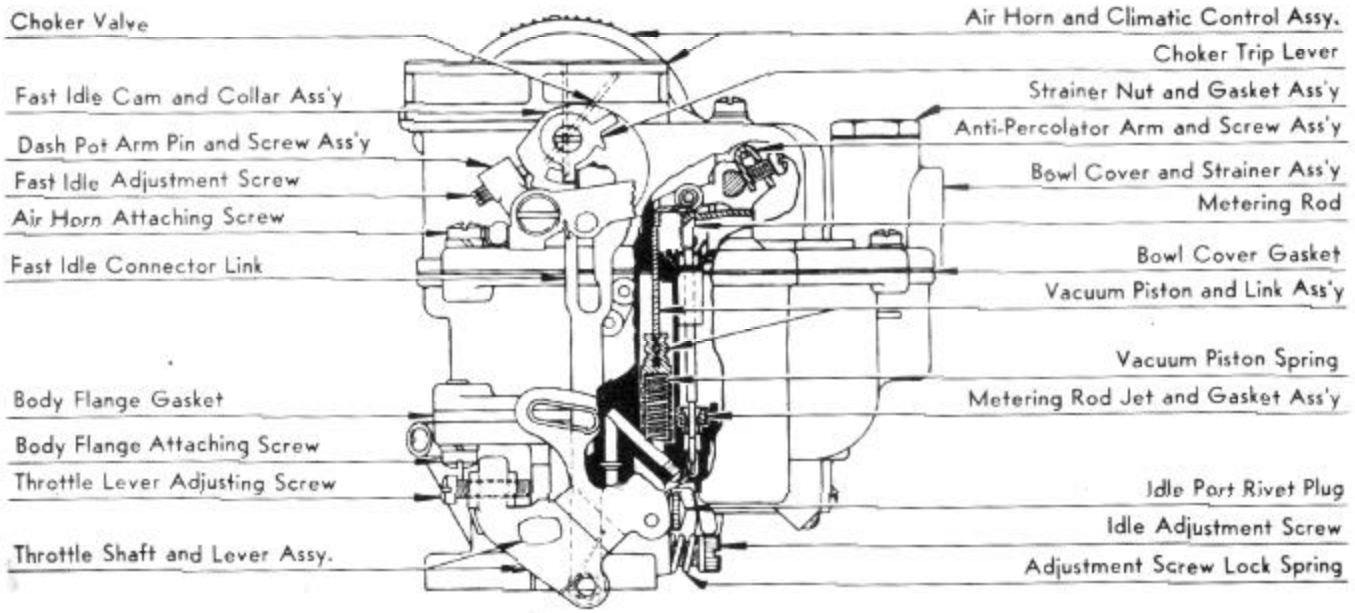


Figure--8 - Carburetor Duplex
Models 41, 43, 44, 45, 47

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

20. He 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.

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

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

23. Install throttle connector rod, spring and• spring retainer.

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

25. Install choke shaft assembly and piston.

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

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

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

29. Install dashpot arm, pin and screw assembly, spring and dashpot connector link.

30. Install climatic control screen and thermostatic coil and housing assembly. For average driving and climatic conditions, coil housing should be set on index.

31. Install dust cover, using a little light graphite grease in screw holes.

thoroughly with compressed air. Examine and see that jets seat gasoline tight in body. If not, replace with new jet of identical specifications.

Poor acceleration may be due to damaged or worn plunger leather in accelerating pump, loose plunger, corrosion or sediment in pump cylinder, or incorrect adjustment.

Pump needle passage inside air horn should be cleaned with compressed air. All check valves must be seated gasoline tight. He sure that retaining ring at bottom of pump cylinder retains check ball in place.

CARBURETOR CHECK UP All Models

When servicing either the single or duplex carburetors the following procedure should be used in the order given.

1. Gauge port opening.
2. Set idle adjustment screw.
3. Set float level.
4. Check pump travel.
5. Gauge metering rod setting.
6. Adjust anti percolator valve.
7. Adjust fast idle.
8. Adjust unloader.
9. Adjust lockout.
10. Set throttle lever adjusting screw.

CARBURETOR TOOLS All Models

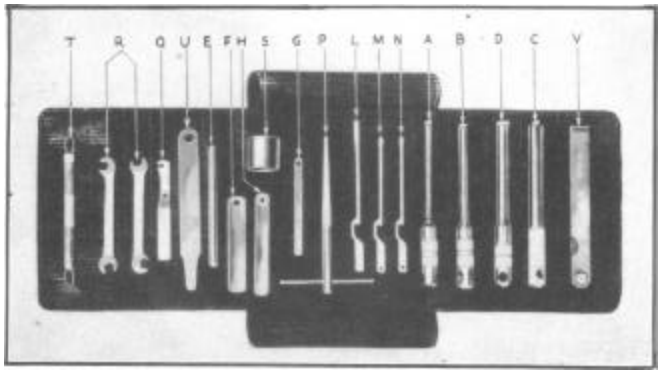


Figure 9--Tune up kit J 819 D contains the following:

Figure 9--Engine Tune Up Kit
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 above 4 wrenches.
F. J 818 1 Float level gauge 1/2".
G. J 819 B 1 Float level gauge 15/64".
H. J 818 2 Float level gauge 3/8".
G. J 818 7 Float level gauge 3/32".
L. J 509 Metering rod gauge 2.795".
M. J 510 Metering rod gauge 2.359".
N. J 1305 Metering rod gauge 2.280".
M. 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") and carburetor air valve gauge.
U. J 1062 Anti Percolator valve adjusting gauge. V. J 815 Feeler gauge set.

FLOAT CIRCUIT OPERATION - All Models

The float circuit Figure 10 and 11 is the most important of all five circuits because it controls the height of the gasoline level in the bowl and also in the nozzle.

A gasoline level that is too high or too low will cause trouble in the other circuits and makes difficulties very hard to trace.

The float circuit consists of the fuel pump (gives a gasoline pressure); the needle valve and seat with its gasket; float; float bowl; float bowl cover with its gasket and vent hole.

The float bowl acts as a reservoir to hold a supply of gasoline throughout the entire range of the performance of the engine.

The level of the gasoline in the bowl is controlled by a combination of all of the above parts.

FLOAT LEVEL ADJUSTMENT - Model 40,48

Invert the bowl cover.

Gauge the vertical distance from the top of the machined surface of small projection on the bowl cover to the top of the soldered seam at the front end of the float, see Figure 12.

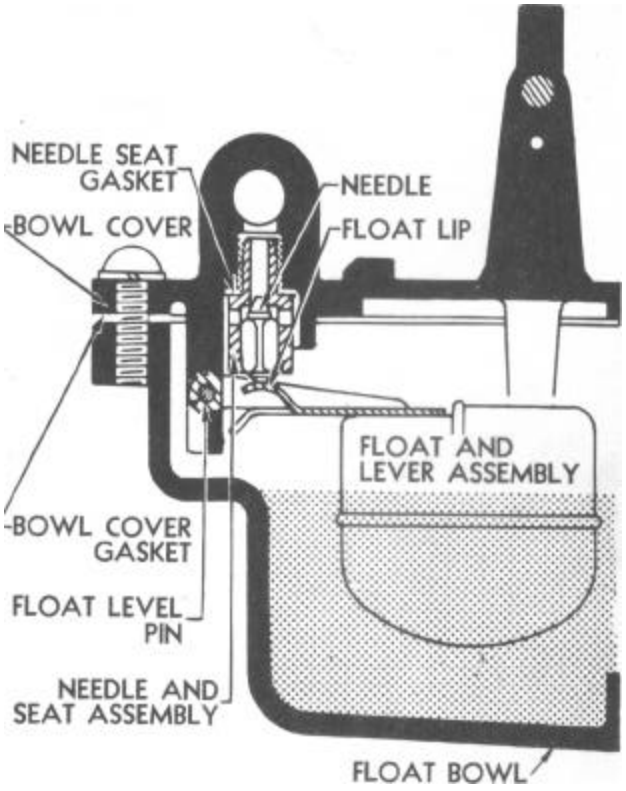


Figure 10--Float Circuit
Models 40,48

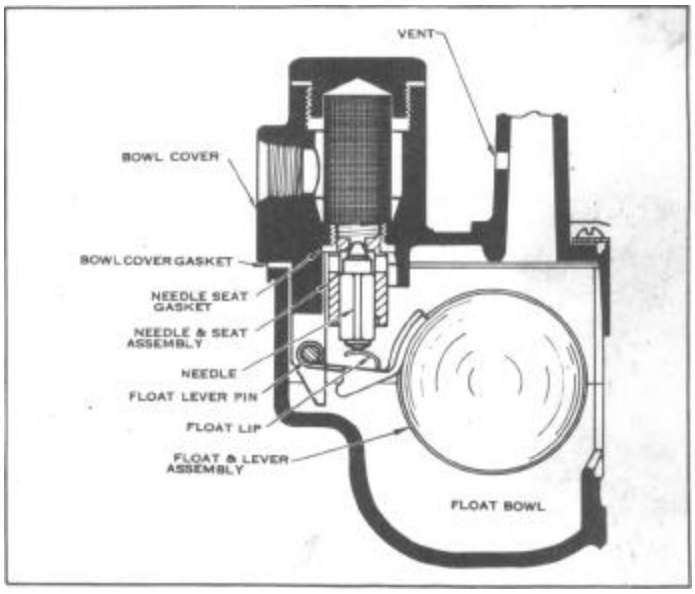


Figure 11--Float Circuit
Models 41,43,44,45,47

The correct setting is 3/8" with the needle seated. Use Gauge Number J 818 2 in Tune Up Kit J 819 D

Adjustment is obtained by bending the lip on the float which contacts the needle.

Do not bend on the front of the float in adjusting it as damage will result.

If the intake needle or seat show wear or damage

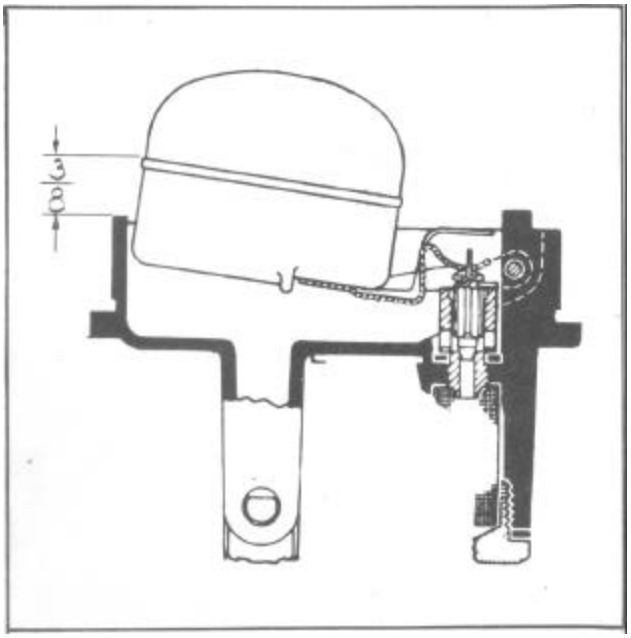


Figure 12--Float Level Adjustment
Model 40,48

both must be replaced as they are supplied in matched sets.

If the holes in the float for the float pin are worn or out of round; if the float is loaded with gasoline then replace the float.

The float pin should be replaced if it shows wear.

The free end of the float should have a minimum drop of 1/2" with the bowl cover in its normal position. Adjustment can be made by bending two small float stop lips at the anchored end of the float.

FLOAT LEVEL ADJUSTMENT - Models 41,43,44,45,47

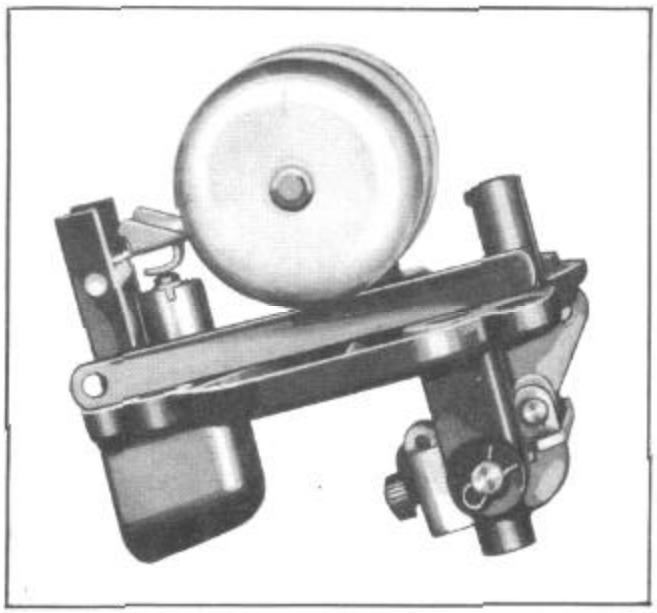


Figure 13--Float Level Adjustment
Models 41,43,44,45,47

The float circuit should always be checked whenever any carburetor work is being done because wear in the carburetor results in a raised float level.

Invert float chamber cover and gauge distance between top of cover (gasket removed) and bottom of float as shown in Figure 13.

Be sure to gauge the float at both ends using tool J 818 7 which gives a setting of 3/32", see Figure 13.

If it is necessary to make a change in the float level, press down with a screw driver on the brass lip of the float. Do not use pliers to bend this lip and bend only a small amount at a time.

If the float is loaded with gasoline or damaged and if the holes for the float pin are out of round then replace the float.

If the float lip is worn or has a ridge in it smooth the rough spot by placing a strip of fine emery cloth between the finger tip and the lip of the float and draw the emery cloth through. Do not use a file. The contour of the float lip is

very important for a smooth operation of the needle and should not be changed.

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 similiar to the effect created by a high float level.

LOW SPEED CIRCUIT OPERATION - Model 40,48

The idle and low speed circuit completely controls the supply of gasoline to the engine during idle and light load speeds up to 20 miles per hour and it partly controls the supply for light load speeds between 20 and 30 miles per hour.

The idle and low speed circuit consists of the low speed jet, (A) Figure 14, by pass (B), air bleed (C), port opening (D), idle adjusting screw (E), throttle valve (F), carburetor throat (0), anti percolator valve and economizer (H).

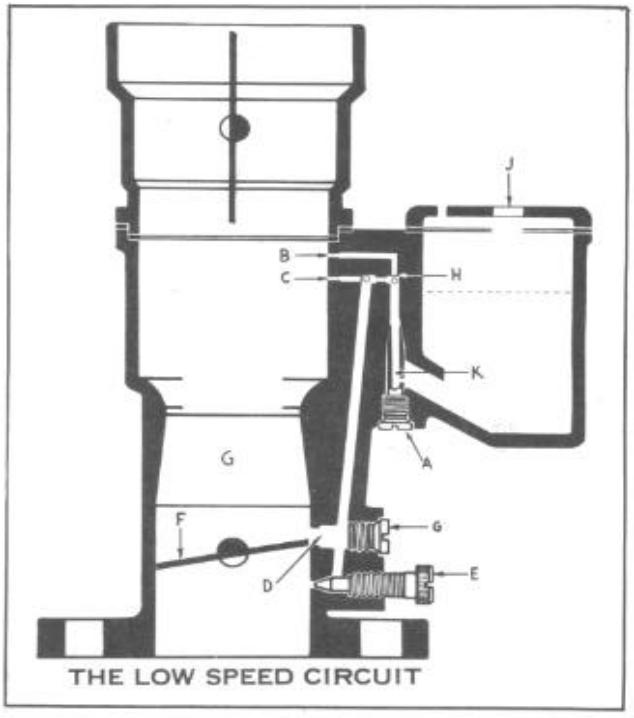


Figure 14--Low Speed Circuit
Model 40,48

During idling and low speed operation of the engine, gasoline flows from the float bowl through the low speed jet to the point where it is combined with a stream of air coming in from the carburetor air inlet through the by pass (B). The combining of the stream of air with the stream of gasoline tends to break up the gasoline into a vapor.

This mixture of air and gasoline continues on through the economizer (H) until it begins to pass the point where it is further combined with a stream of air coming in through the idle air bleed (C). This again tends to break the gasoline particles into a fine vapor.

The gasoline and air mixture that flows downward in the passage from the air bleed is still richer than the idle mixture needs to be but when it mixes with the air which has come past the throttle

valve (F) it forms a combustible mixture of the right proportions for idle speed.

The idle port (D) is made in a slotted shape so that as the throttle valve (F) is opened it will not only allow more air to come in past it but will also uncover more of the idle port allowing a greater quantity of the gasoline and air mixture to enter the carburetor throat from the idle mixture passage.

The idle position of the throttle is such that at an idle speed of 7 M.P.H. 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.

The idle adjusting screw (E) varies the quality of the idle mixture entering the carburetor throat (G). Backing out of the idle adjustment screw (E) makes the mixture richer.

The throttle lever adjusting screw regulates the idle speed by opening or closing the throttle valve and should be adjusted when the engine is warm to give the correct R.P.M. at curb idle.

All of the gasoline flowing from the float bowl during the idle period and at constant speeds up to 20 M.P.H. flows through the small metering hole in the low speed jet (A). This hole is held to a manufacturing tolerance of .00025" and is a very important factor in controlling the flow of gasoline into the engine during these speeds. It should never be cleaned out in any way other than with compressed air as a wire or drill tends to increase the size of the hole thereby changing the calibration of the carburetor.

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 vaporise. This develops a vapor pressure which would force the gasoline out of the nozzle into the carburetor throat and cause a flooded condition. The antiperculator valve relieves this vapor pressure by opening the well to the atmosphere when the throttle is closed.

LOW SPEED CIRCUIT ADJUSTMENT Models 41,43,44,45, 47, see Figure 15.

If the metering hole in the low speed jet is too large or too small (see Carburetor Specifications) or is clogged so that it cannot be cleaned with compressed air then the jet should be replaced.

In cases of an unsteady idle, low gasoline economy, poor low speed performance, and if there is any question regarding the condition or delivery of the low speed jet then it should be replaced.

When a low speed jet is removed from a carburetor its copper gasket generally remains in the carburetor body. If this should drop out of the recess in the carburetor during reassembly and the jet be installed without the gasket, the jet will be screwed in too far. This will cause a further rolling action of the taper on the jet.

If the jet is installed without this gasket a gasoline leak will likely result at the seat of

the jet and if the jet is then removed and replaced with a gasket there will be a space left between the up of the jet and the taper. This will allow gasoline to go into the idle passage past the outside tip of the jet without passing through the small metering hole in the side.

It is never advisable to remove the idle speed jet from one carburetor and install it in another as it is likely that the tip of the idle jet will not make a gasoline tight fit with the taper in the second carburetor.

If the metering hole in the side of the jet is too large because of improper cleaning or is clogged so that it cannot be cleaned with compressed air then the jet should be replaced.

AIR BLEED HOLES in the throat of the carburetor may become filled with a black carbon deposit which will restrict the air passage to the point that insufficient air will be supplied to mix with the gasoline before it reaches the idle port. These restricted air bleed holes will generally be indicated by having to screw the idle mixture adjusting screw closer in than the minimum limit.

If the condition is bad a loping idle may continue even after the idle mixture adjusting screw is turned entirely in against the seat. The air bleed holes can be cleaned with wires or proper sized drills (see Carburetor Specifications).

IDLE MIXTURE PASSAGE can become restricted, however, this is very unusual. Such a condition is indicated by an unsteady idle and should be checked after all other remedies have failed to correct the condition. The passage can be cleaned by removing the aluminum plugs from the carburetor body and using a wire and compressed air.

IDLE PORT must be clean and not restricted. Unsatisfactory engine performance at low speeds is an indication that the idle port is damaged and a new casting must be installed. See Carburetor Specifications for idle port size.

IDLE ADJUSTING SCREW must have a smooth point and be free of burrs. The spring must have enough tension to hold the screw in place.

THROTTLE VALVE must not be installed upside down. The letter "C" in a circle is stamped on the face of the valve. The letter "C" should be on the side of the valve toward the idle port and facing the manifold, when installed.

To center the valve in the carburetor throat, first back out the throttle lever adjusting screw so that it does not contact its seat, then start the valve screws into the shaft. Hold the carburetor with the air horn down and the valve seated tightly and tap the valve on the upper side. This will centralize the valve in the carburetor throat. Pressure should then be maintained until the screws are tightened.

A worn or bent valve should be replaced because of their effect on the port relation. The valves are made with the two opposite edges beveled so as to fit the carburetor throat when the valve is closed. Always make certain that the valve is not installed incorrectly as poor performance at low speeds will result.

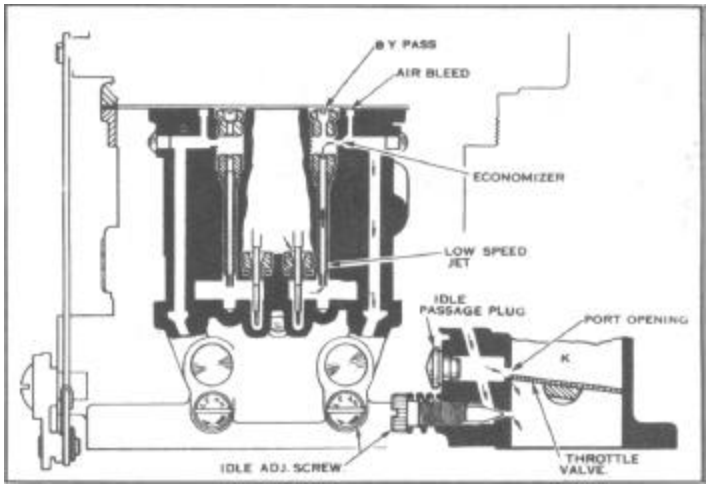


Figure 15--Low Speed Circuit
Models 41,43,44,45,47

THROTTLE SHAFT AND LEVER. A badly worn shaft will affect the port opening. A lever that is loose on the shaft will cause a slow idle at one time and fast at another. Replace the shaft and lever. Do not attempt tightening of a lever that is riveted to the shaft as damage to another part of the shaft usually results.

VALVE SCREWS are clinched over at the factory and it may be necessary to file the ends in order to remove them. Replace with new screws and it is not necessary to clinch them again.

CARBURETOR THROAT may become restricted with a carbon deposit which makes it necessary to open the throttle wider than the specified opening in order to obtain the proper idle speed. Opening of the throttle more than the specified amount in

order to obtain a proper idle will uncover more of the slotted idle port than was intended in the calibration of the carburetor. This will result in an insufficient amount of the idle port being left as a reserve to cover the period between idle and 20 M.P.H. at which time the high speed system begins to cut in. A flat spot will be the result. Clean the carburetor throat by scraping or use an emery cloth.

IDLE ADJUSTMENT - Models 40,48

Set idle adjustment screw 3/4 to 1 1/2 turns open. Richer mixture is obtained by turning the screw out.

Do not idle engine below 350 R.P.M.

The idle port is .165" long and .032" wide. The idle port opening is .122" above the valve with the valve closed tight.

The idle screw seat is Number 46 drill.

FAST IDLE OPERATION - All Models

During the warm up period it is desirable to run the engine at approximately 13 M.P.H. to keep it from stalling.

This is accomplished by having the fast idle cam come between the idle speed adjusting screw and its stop thus holding the throttle sufficiently open to give the necessary engine speed.

When the engine warms up sufficiently to run at the regular idle speed without stalling the operation of the choke moves the fast idle cam out from. between the idle speed adjusting screw and its

stop.

FAST IDLE ADJUSTMENT - Models 40,48

1. With fast idle cam (A), Figure 16, held in normal position, tighten throttle lever adjusting screw (B) until it justs seats against cam.
2. Hold throttle lever (C) closed and pull cam (A) back until first (or lower) step on cam is against (not on) set screw.
3. There should now be 5/8" clearance between the inside wall of the air horn and the lower edge of the choke valve.
4. Adjustment can be made by bending at the off set of the fast idle link (D).

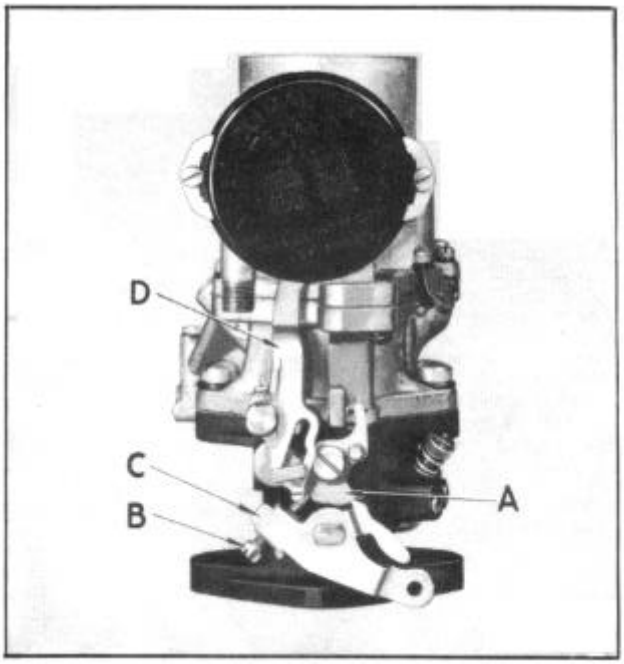


Figure 16--Fast Idle Adjustment
Models 40,48

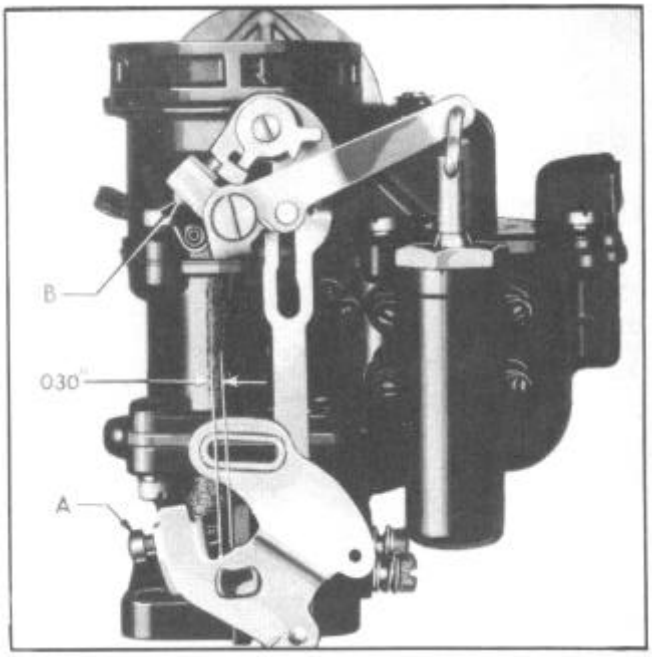


Figure 17--Fast Idle Adjustment
Models 41,43,44,45.47

FAST IDLE ADJUSTMENT - Models 41,43,44,45,47

1. Set throttle stop screw (A), Figure 17, for normal idle.
2. With choke valve closed, turn fast idle screw (B) with throttle stop screw held .030" from stop.

HIGH SPEED CIRCUIT OPERATION - All Models

The intermediate speed and high speed circuit consists of the metering rod, metering rod jet, nozzle, throttle valve, throttle shaft arm, connector rod, pump arm assembly, and metering rod spring, see Figures 18 and 19.

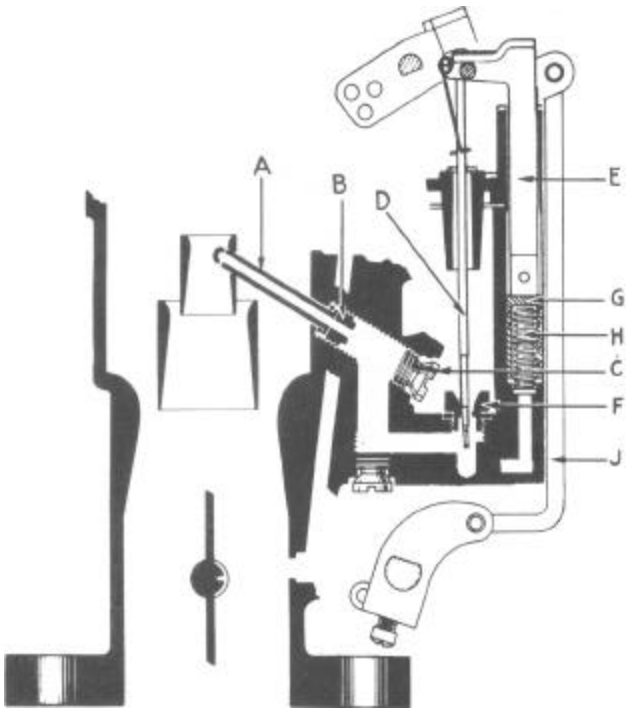


Figure 18--High Speed Circuit
Models 40,48

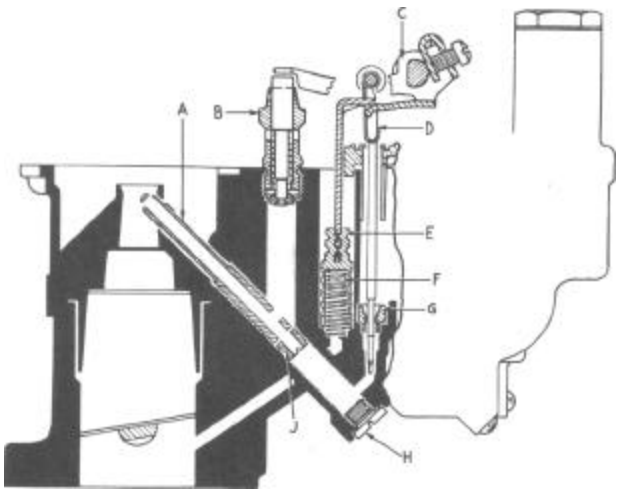


Figure 19--High Speed Circuit
Models 41,43,44,45,47

As the throttle is opened wide enough for a speed of a little more than 20 M.P.H. the velocity of the air flowing down through the carburetor throat creates a pressure slightly less than the atmospheric pressure at the tip of the main nozzle.

Since the gasoline in the float bowl is acted upon by atmospheric pressure, the difference in pressure between the two points causes gasoline to flow from the bowl through the metering jet and out the main nozzle into the throat of the carburetor.

As the speed increases from 20 M.P.H. the high speed system continues to cut in more &id more and the idle or low speed system to cut out until at 30 M.P.H. the high speed system is carrying the entire load and the idle system is inoperative.

At higher speeds the area of the opening between the jet and the metering rod governs the amount of gasoline going into the engine. At top speed the smallest section of the rod is in the jet.

Engines operated at part throttle on a level road use a mixture of maximum leanness. The mixture for greatest power and acceleration is somewhat richer. These mixture qualities are obtained by the various size steps on the metering rod.

Under part throttle acceleration, the power mixture is required for a short time. This requirement of the power mixture always coincides with a drop in the manifold vacuum. The vacumeter carburetor meets this demand by allowing the drop in manifold vacuum to permit a spring to move the metering rod to the proper step and give the required richer mixture the instant it is necessary, independent of the throttle opening. As soon as the demand is passed as shown by the rise of the manifold vacuum, the metering rod moves down against the tongue attached to the pump arm and it is then controlled mechanically until another such demand arises.

The vacumeter control consists of a small piston beneath which is a spring fitted into a cylinder bored into the carburetor casting. The lower end of the bore has a drilled passage opening into the carburetor throat below the throttle valve. The vacuum acting upon the piston through this passage holds the piston down and compresses the spring

as long as the vacuum is stronger than the spring. The spring under the piston is calibrated to force the piston up to a carefully determined point (not the top of the cylinder) when the manifold vacuum drops below 3" of mercury. This spring varies in length for different carburetors and the correct spring must be used and should never be altered. With the manifold vacuum above 3" of mercury the piston is pulled down until the arm on the piston link rests on the tongue attached to the pump arm. When the piston is down this tongue lifts the metering rod in direct ratio to the throttle opening without regard to the vacuum.

HIGH SPEED CIRCUIT CHECK - All Models

MAIN NOZZLE of the high speed circuit.

Poor engine performance above 20 M.P.H. can be caused by

1. Restricted main nozzle.
2. Main nozzle hole too large at the end.
3. Main nozzle leaking at the seat and the result will be increased gasoline consumption above 20 M.P.H. or a loping idle and poor performance at all speeds.

Clean a restricted main nozzle with compressed air. See carburetor specifications and check the size of the jet. Try a new gasket at the base of the jet. If the nozzle cannot be cleaned; is not up to specifications at the hole; or a new gasket does not stop the fuel leak replace the main nozzle.

A restricted hole in the main nozzle will change the mixture throughout the entire range and such a nozzle should be replaced. A nozzle cannot be bright dipped or buffed to remove carbon without very possibly damaging it.

METERING RODS that are too large will result in flat spots upon light acceleration at any speed. If the linkage is adjusted so that the metering rod is lower in the jet than it should be then the stops of the metering rod will not be "timed" properly as they are raised out of the jet.

If the metering rod is too rich (small) it will give poor gasoline economy at all speeds above 20 M.P.H.

If the metering rod linkage is adjusted too high it will affect the gasoline mileage at all speeds above 20 M.P.H. A change in the adjustment of a metering rod of 1/16" will definitely affect gasoline economy. If the metering rod is worn it will have the same effect upon gasoline economy as a metering rod that is too rich. A worn metering rod must be replaced. Measure the rod with a micrometer at different steps. Check with carburetor specifications. If it is worn the metering rod jet will also be worn and should be replaced.

METERING ROD SETTING - Models 40,48

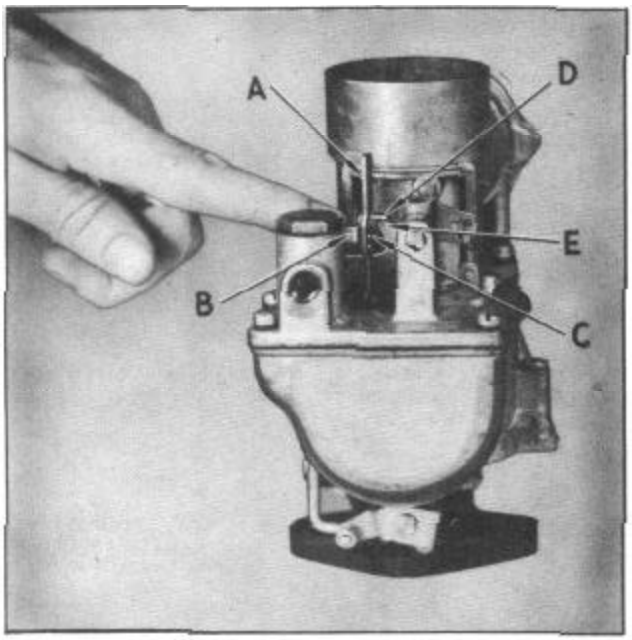


Figure 20--Metering Rod Setting
Models 40,48

1. Remove the metering rod and insert gauge J 1265 (2.468") (A) Figure 20, in its place.
2. Back out throttle screw, close throttle valve tight. Press lightly on piston link (B) until metering rod pin rests in shoulder (C) of gauge.
3. Bend lip (D) of piston link so that less than .005" clearance is obtained between lip and pump arm (E).

METERING ROD SETTING - Models 41,43,44,45,47

1. Remove one metering rod and insert gauge J 1305 (2.280") in its place, see Figure 21.
2. Back out throttle screw. Press lightly on piston link until piston rests on bottom of cylinder. There should now be less than .005" clearance between metering rod pin and shoulder of notch in gauge.
3. Adjust by. bending tongue on anti percolator arm.

ANTI PERCOLATING VALVE CLOSING - All Models

If the anti percolating valves do not close as soon as the throttle begins to open, the engine will receive a lean mixture and miss or stumble.

An open anti percolating valve when gas begins flowing through the main nozzle means that air

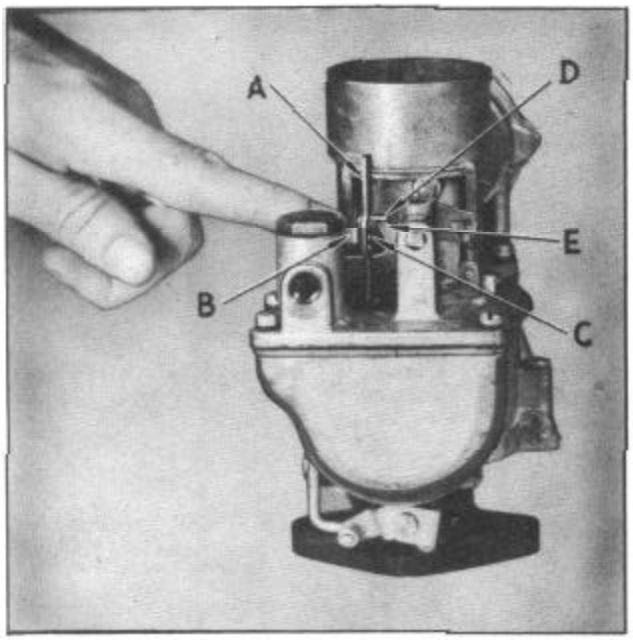


Figure 21 - Metering Rod Setting
Models 41,43,44,45,47

will be drawn in and mixed with the gasoline.

This mixture will be delivered through the main nozzle instead of liquid gasoline. This reduces the amount of gasoline entering the manifold and gives a lean mixture which appears to be a partial vapor lock.

ANTI PERCOLATOR VALVE - Models 40,48

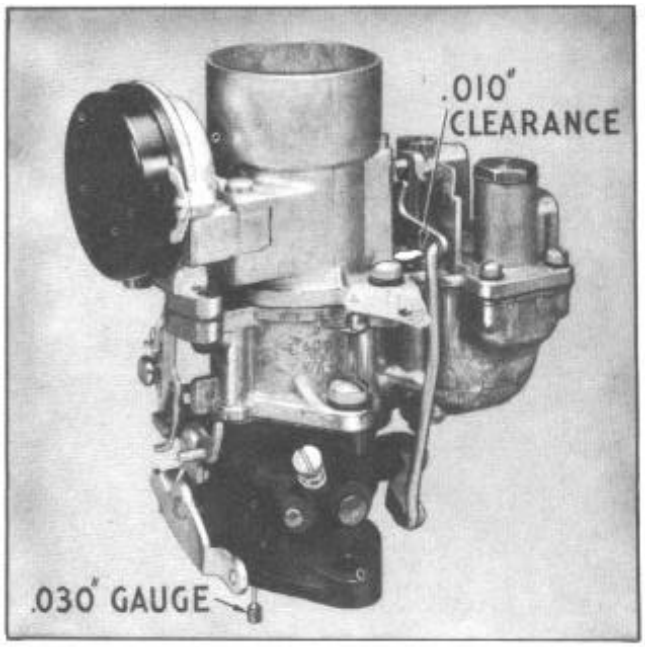


Figure 22 - Anti Percolator Valve Adjustment
Models 40,48

1. Insert a .030" diameter gauge between lower

edge of throttle valve and bore of carburetor (opposite port), see Figure 22.

2. Adjust lip of rocker arm so that .0101, clearance is obtained between lip and pump arm.

3. The anti percolator valve must close with only a slight throttle opening and seal the passage air tight. An air leak at the valve will cause faulty acceleration and high speed performance.

ANTI PERCOLATOR VALVES Models 41,43,44,45,47

1. Back out throttle screw and close throttle.

2. Bend lips of anti percolator arm until center of indicator lines on valves are just flush with top of plugs, see Figure 23.

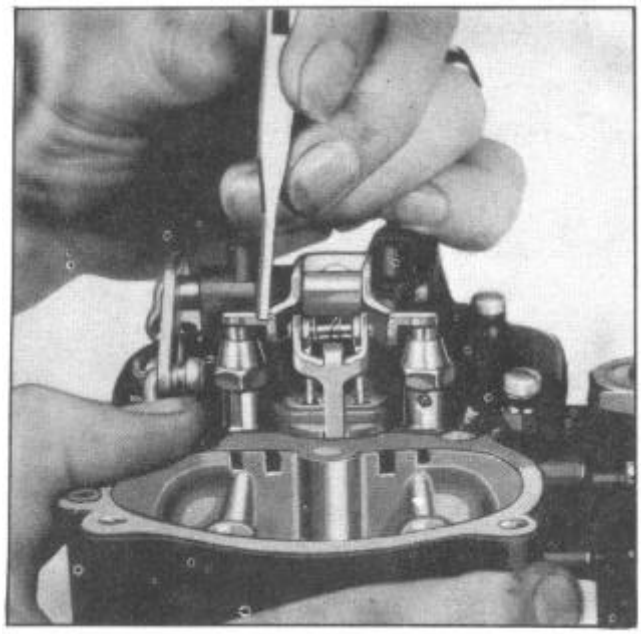


Figure 23 - Anti Percolator Valve Models 41,43,44,45,47

PUMP OR ACCELERATION CIRCUIT OPERATION - Models 41,43,44,45,47

The pump circuit consists of the pump cylinder (B), Figure 24, pump plunger (C), intake valve (F), discharge valve (L), strainer screen (E), pump jet (J) and plunger spring (D) and external air bleed to the pump jet (K).

When the pump plunger and leather are first installed in the pump cylinder, a small amount of air is trapped between the bottom of the piston and the top of the liquid gasoline. As the accelerator pedal is depressed, the pump plunger and leather are forced downward.

This compresses the air; forces the gasoline to leave the cylinder, closes the inlet valve, opens the outlet valve and discharges gasoline into the throat of the carburetor.

The discharge is prolonged since the hole in the tip of the accelerator jet is small enough to restrict the flow of fuel so long as it is being forced out by compressed air. The prolonging of the discharge gives the gasoline in the high speed system sufficient time to begin flowing fast enough to satisfy the demands of the engine.

As the accelerator pedal is allowed to return to its original position, the accelerating pump plunger is lifted upward by the link. This creates a partial vacuum in the cylinder which opens the inlet valve, closes the outlet valve, and draws in a charge of gasoline.

Since the outlet valve is below the liquid level of the carburetor, gasoline would be drawn into the throat of the carburetor through the pump jet from the accelerator system during fixed throttle intermediate speeds and high speeds, if it were not for the air bleed to the outside which breaks the vacuum on the pump jet.

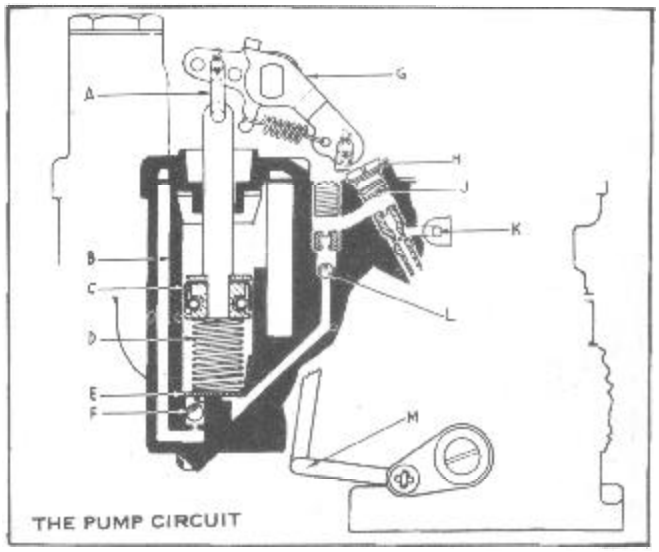


Figure 24--Pump Circuit Duplex Carburetor Models 41,43,44,45,47

A. Pump Connecting Link
B. Pump Cylinder
C. Pump Plunger and Rod Assembly
D. Plunger Spring
E. Strainer
F. Intake Valve
G. Pump Arm
H. Pump Jet Passage Plug
J. Pump Jet
K. Pump Jet Air Bleed
L. Discharge Valve
M. Throttle Connector Rod

SLOW CLOSING THROTTLE OPERATION (DUPLEX CARBURETOR ONLY)

When driving at high speeds with a wide open throttle, it is frequently necessary to release the throttle suddenly because of an emergency. Such a condition could cause an immediate flooding of the engine because the charge of fuel that was started on its way to deliver power for a previous second's requirement is suddenly left inert and since the amount of fuel to keep the engine running is but a fraction of that required when the throttle was wide open.

A device, known as the slow closing throttle, is used to prevent stalling at that critical moment when the engine after having been called on to do its utmost and is given the fuel to do it, is denied the burst of power and left with the unused fuel.

This extra charge of fuel can be used up without flooding the engine or stalling it and without uneven operation, if this excess fuel is given to the engine gradually. This is done by closing the throttle slowly and automatically for the last few degrees of its closing.

PUMP CHECK - All Models

THE PUMP PISTON AND SPRING may be worn or may stick or the spring may have lost its tension. If this condition exists

both the piston and the spring must be replaced, as the action of the pump will be affected.

PUMP INTAKE VALVE may be leaking. If the inlet valve leaks a part of the discharge of the accelerating pump will be forced out through the valve back into the gasoline well of the carburetor

causing an insufficient amount of gasoline to be discharged into the throat of the carburetor on acceleration. This valve cannot be cleaned, it must be replaced.

PUMP DISCHARGE VALVE may be leaking. If this valve leaks the air will be drawn into the pump cylinder on the upstroke of the pump plunger.

This gives an insufficient charge of gasoline into the throat of the carburetor upon acceleration causing a flat spot. The valve cannot be cleaned, it must be replaced.

PUMP PLUNGER AND ROD ASSEMBLY. If the plunger leather leaks the charge of air in the pump cylinder will be lost. The entire assembly must be replaced.

PUMP JET AIR BLEED may be clogged with dirt or carbon and gasoline will be drawn through the pump system during the high speed operation. The pump air bleed must be kept clean.

BALL CHECK STRAINER SCREEN may be restricted. A restriction of this screen will cause a small charge to be drawn into the pump cylinder and cause a flat spot. Replace the screen.

PUMP JET may be too large and cause the accelerating charge to pass out too fast giving too rich a mixture. This will cause a stumble on acceleration or sluggish action. Enlarged jets must be replaced. A loose jet on its seat will give the same effect.

PUMP LINKAGE improperly adjusted. If it is adjusted to give a heavy charge (long stroke) in hot weather then a flat spot will result because of too great a supply of gasoline. Worn pump linkage will cause the throttle valve to be opened by the accelerator pedal before the accelerating pump jet begins to discharge gasoline resulting in a flat spot. Replace all worn parts.

PUMP ADJUSTMENT - Models 40,48

Have throttle valve seated and connector link in place (short stroke which is the hole nearest the countershaft).

Pump plunger should travel 3/16" from the closed to the wide open position.

Adjustment should be made by bending the throttle connector rod at a lower angle.

The travel can be checked by marking a line across the pump plunger rod even with the top of the cover in the closed and another in the wide open throttle position and measuring between the two marks.

PUMP ADJUSTMENT - Models 41,42,44,45,47

With pump connector link in the long stroke and throttle adjustment screw backed out, the pump plunger should travel 9/32" from the closed to the wide open position.

Adjustment can be made by binding the throttle connector rod at a lower angle.

The travel can be checked by marking a line across the pump plunger rod even with the top of the cover in the closed and another in the wide open throttle position and measuring between the two marks.

CLIMATIC CONTROL - All Models

This device is used in place of the conventional choke control operated from the instrument panel, and will give the proper mixture ratios at all temperatures and at all speeds, relieving the driving of this important operation for the starting and driver of a cold motor.

CHOKE CIRCUIT OPERATION All Models

The choke circuit is used only in starting and warming an engine and its purpose is to supply a rich mixture for starting.

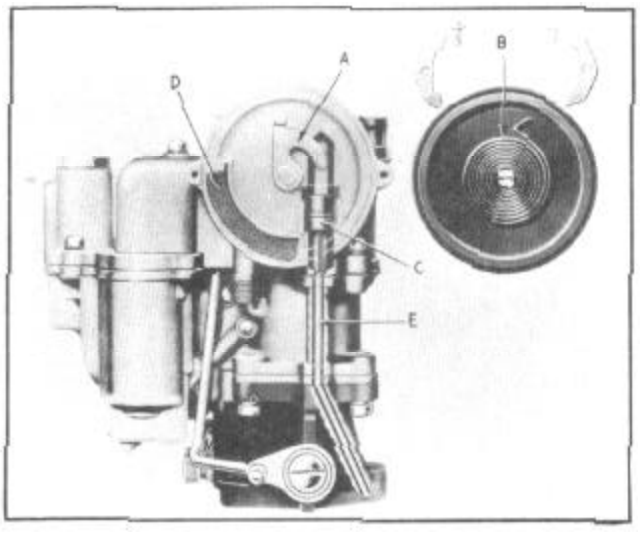


Figure 25--Choke Circuit
Models 41,43,44,45,47

The choker shaft and lever assembly (A) Figure 25, choker valve and screws, and the automatic climatic control comprise the choke circuit group.

Climatic control is controlled by a thermostatic coil (B) 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 of 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 through a tube; through the choke air cleaner screen (D); past the thermostatic coil (B) and into the intake manifold through 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 off 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 an arrangement is made in the choke linkage so that on all wide open throttle operations the choke is held partly open.

CHOKE CIRCUIT ADJUSTMENTS - All Models

THE CHOKE AIR CLEANER SCREEN (D) Figure 25, may be clogged and this will restrict the flow of warm

air from the manifold stove and will cause a slow opening of the choke. If badly clogged the choke will not fully open at the regular idling speed and temperature causing a loping idle. A clogged screen must be washed throughly in gasoline and blown out with compressed air. A damaged screen should be replaced. This screen should be cleaned every 5000 miles.

CHOKE COVER CORK GASKETS 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 section.

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 and affect all engine performance. Sticking parts should be freed and damaged parts replaced.

CHOKE LINKAGE may be sticking, bent or improperly adjusted all of which 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 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 properly or if they are worn they should be replaced.

THERMOSTATIC COIL (B) should never be removed from the cover. If damaged replace the entire cover.

CLIMATIC CONTROL TO DISASSEMBLE All Models

1. Remove two attaching screws and retainers holding thermostat coil and housing assembly.
2. Remove screw holding choker trip lever, washer and fast idle cam and collar assembly.
3. Remove two choke screws and choke valve.
4. Turn choke lever assembly until piston is free from cylinder and remove assembled parts. Do not lose piston pin.
5. Remove piston housing strainer.

CLIMATIC CONTROL TO REASSEMBLE - All Models

Before reassembling, 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 parts to allow all parts to work freely. Replace all worn or damaged parts with new. Then proceed as follows:

1. Install choke lever assembly and piston.
2. 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.
3. Install fast idle cam and collar assembly, washer and choker trip lever. Tighten screw.
4. Install piston housing strainer.
5. Install thermostatic coil and housing assembly with notch at bottom. Insert attaching screws and retainers part way and then turn housing counter clockwise until notch is in line with center mark on piston housing. Then tighten screws. Instruction for leaner or richer setting is stamped on housing. The position of choke valve will be governed by existing temperature. On a warm day choke valve might be open slightly. On a cold day choke valve is completely closed.

CLIMATIC CONTROL CAUTIONS: - All Models

Check choke valve to make certain it is in perfect alignment with air horn bore. If it is not, choke will stick in its closed position and will have a tendency to drag on air horn throughout its range.

When reassembling carburetor to motor, make certain flexible tubing is properly connected. An air leak at this point will prevent climatic control from functioning properly.

CLIMATIC CONTROL ADJUSTMENTS - All Models

For average driving and climatic conditions, the center index mark on coil housing should be set at index.

The climatic control is adjusted at the factory to close the choker valve lightly on its seat.

Action of climatic control during warm up period is affected by grade of fuel used.

Make no adjustment until motor is cold.

If a cold motor shows a tendency to run rich during the warm up period, revolve the choke housing clockwise one mark at a time to lean it out, until the desired results are secured.

These adjustments should be made with care, and between adjustments the engine must be thoroughly cooled off. At least four hours should be used to cool the engine.

UNLOADER OPERATION - All Models

There are occasions during the starting of the engine when it can and would become flooded with too much fuel if it were not for this unloader device.

To clean out an engine that has been flooded it is necessary to hold the choke open sufficiently to allow the engine to clear out the excessive fuel from the intake manifold.

The throttle lever and choke linkage are so arranged that the depressing of the accelerator pedal to the floor board forces the choke open sufficiently to allow the engine to clean out the intake manifold.

UNLOADER ADJUSTMENT - Model 40,48

There should be 7/16" clearance at (A) Figure 26, 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 at (C) on the throttle lever.

UNLOADER ADJUSTMENT - Models 41,43,44,45,47

With the 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", see Figure 27.

Adjustment can be made by bending the lip on the fast idle connector link (D). 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. The choker trip lever (E) is notched out for this setting.

LOCKOUT ADJUSTMENT - Model 40,48

The choke should lock in the wide open position with the throttle and choke valves wide open.

Adjustment can be made by bending the lip at the lower end of the fast idle link to give 1/32" clearance between the lip (B) Figure 26, and the throttle lever

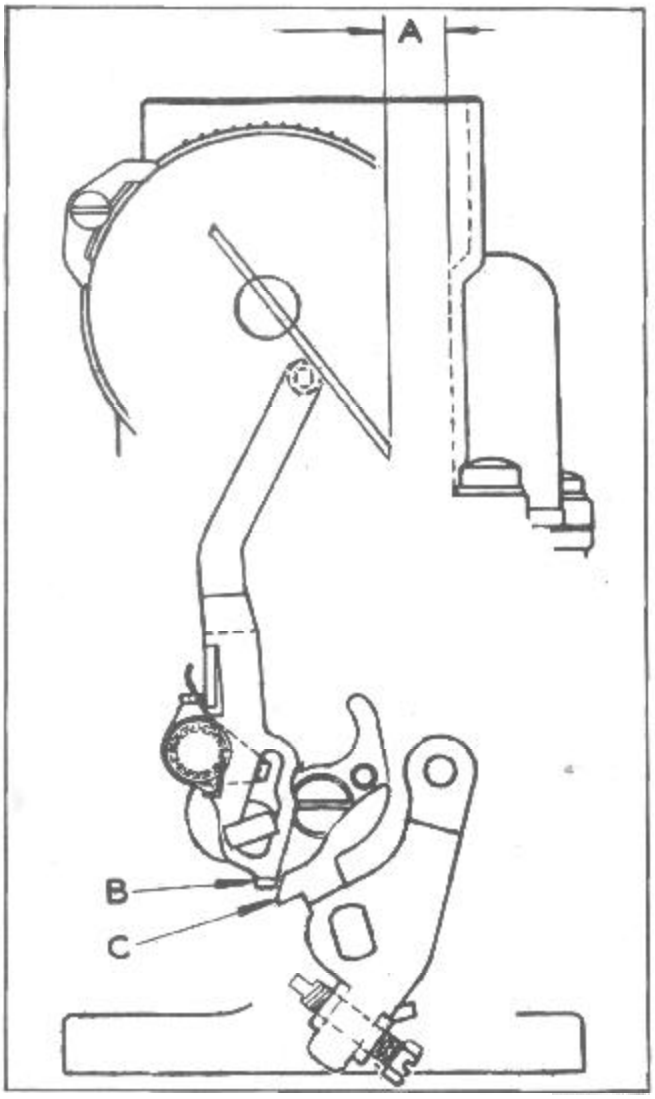


Figure 26--Unloader Setting
Models 40 and 48

lock (C). Throttle and choke valves wide open. Use tool J 787 for bending.

LOCKOUT OPERATION - Models 41,43,44,45,47

When the throttle is wide open the choker valve is held in a wide open position by the lockout to prevent the accidental closing of the choker valve which would flood the engine.

With the lip on the link (D) Figure 28, already bent for the correct unloader setting the same lip should lock the choker valve in a wide open position.

CARBURETOR LOADS UP

A carburetor may load up after considerable service and if it does the float level should be checked.

Wear on the lip of the float lever will raise the float level.

The float level may be reset by bending the lip of the float lever down so as to raise the float level or bending the lever up to lower the float level.

A very slight bend is all that is necessary.

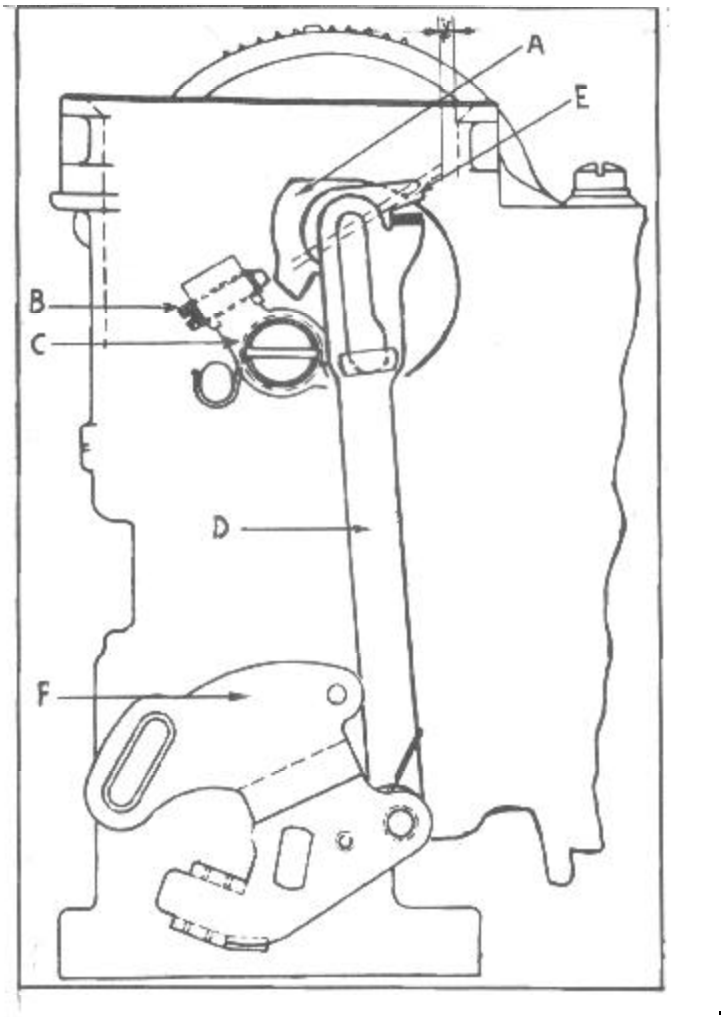


Figure 27--Unloader Setting
Models 41,43,44,45,47

A. Fast Idle Cam
B. Fast Idle Adjustment Screw
C. Dash Pot Arm
D. Fast Idle Connector Link
E. Choker Trip Lever
F. Throttle Shaft and Lever Assembly

ENGINE STALLS WHILE IDLING

There are cases where an engine may stall while idling and if it does the throttle adjusting screw and the idle adjustment screw must be reset according to instructions on page 12.

If these adjustments do not correct the stalling of the engine then remove the low speed jet and clean it thoroughly with compressed air.

See that the low speed jet seats gasoline tight at the shoulder. If not replace the jet with one of the same specifications.

A low speed jet should never be changed from one carburetor to another.

FOOT THROTTLE SHOWS INCREASING RESISTANCE

A clogged pump jet is the cause of an increasing resistance on the foot throttle.

The pump jet should be removed and cleaned with compressed air which usually will remove the dirt or lint. It is usually advisable to replace the pump jet.

All jets and ball checks should be inspected to see that they are gasoline tight when seated.

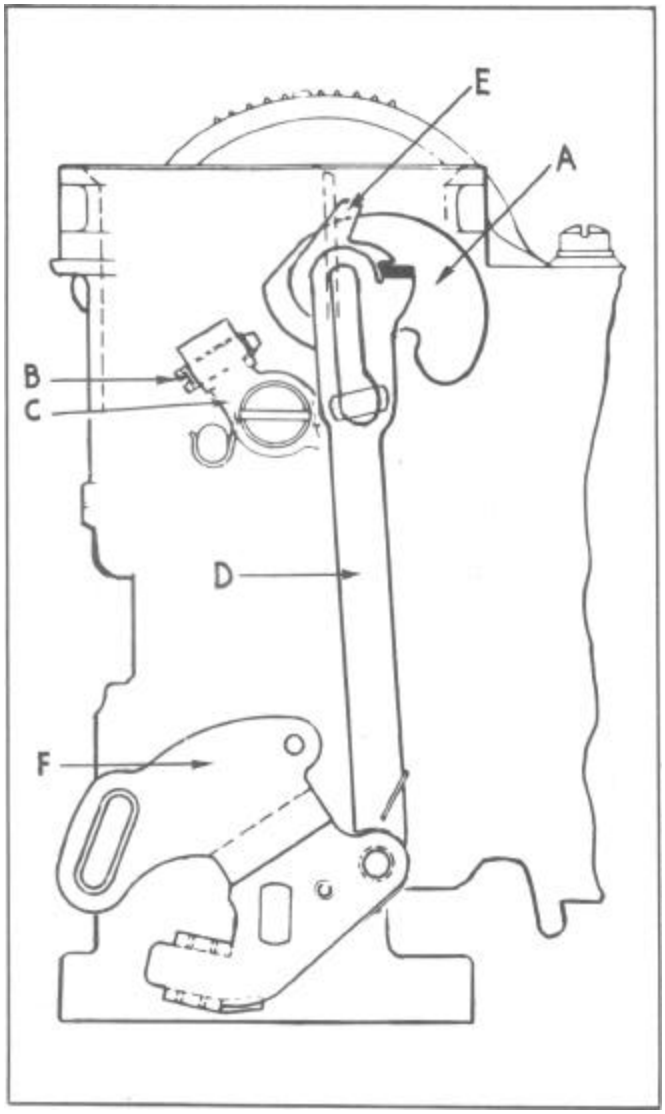


Figure 28 Lockout of Choker Valve
Models 41,43,44,45,47

A. Fast Idle Cam
B. Fast Idle Adjustment Screw
C. Dash Hot Arm
D. Fast Idle Connector Link
E. Choker Trip Lever
F. Throttle Shaft and Lever Assembly

POOR ACCELERATION

The following parts are usually the cause of poor acceleration

1. Accelerating pump plunger leather worn or damaged.
2. Accelerating pump plunger is loose.
3. Accelerating pump cylinder has corrosion or sediment in it.
4. Accelerating pump arm bent.
5. Pump arm has three holes for seasonal or altitude adjustment. Set to the longest stroke (upper hole) for cold weather; medium stroke •lower hole) for moderate weather; short stroke for hot weather driving.

ACCELERATION HAS "FLAT SPOT"

If a "flat spot" is encountered on acceleration the first place to check is the accelerating passages, valves and plunger and then the anti percolating device.

RICH MIXTURE AT IDLING

If a rich mixture is obtained at idling speed with the idle adjusting screw set according to instruction any one of the following conditions might cause the rich mixture:

1. Worn or damaged idle adjusting screw or seat.
2. Leak around the upper or lower seat of the idle jet.
3. Worn or damaged metering hole in the idle jet.
4. Leak at the main nozzle gasket.
S. High float level.
6. Float valve leaking.

IMPROVE GAS MILEAGE ABOVE 30 M.P.H.

All gasoline is supplied through the main nozzle for speeds above 30 M.P.H. and if poor gasoline mileage is obtained above this 30 M.P.H. the following points should be checked.

1. Main nozzle gasket for leak.
2. Metering pin for position and condition.
3. Main jet for wear.
4. Float level.
5. Float valve.
6. Accelerator pump stroke.

CARBURETOR JETS AND PASSAGE ACTION

The following jets and passages in the carburetor are used to supply gasoline during engine idling.

Main jet.
Idle jet.
Idle passage.
Idle ports.

The following jets and passages are used to supply gasoline during the moderate and high car speeds.

Main jet.
All passages connecting to the main nozzle and the main nozzle itself.
During acceleration the accelerating pump; passages and accelerating jets supply additional gasoline.

The following jets are used for a cold start

Main jet.
All passages connected to the main nozzle and the main nozzle itself.

And in addition the choke is closed thus preventing air under atmospheric pressure from entering the air horn so that the vacuum from the manifold extends up to the choke valve. This means that an equal pressure or vacuum exists both at the idle air intake ports and the idle delivery ports so no flow is caused through the idle passages. The vacuum existing at the main nozzle causes flow in the high speed system to supply gasoline for starting.

CARBURETOR GOVERNOR All Models

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.

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

the carburetor air intake noise.

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

STANDARD AIR CLEANER All Models

The standard air cleaner should be cleaned at least every 2000 miles and more often if the car has been operated in dusty territories.

1. Remove the wing nut and lift off the cover.
2. Wash the filter unit in gasoline and dry.
3. Re oil the filter unit by dipping in engine oil of the same grade as is being used in the engine. Allow all excess oil to drip off.

NOTE: The filter unit should be replaced after extensive use.

OIL BATH AIR CLEANER AND SILENCER

Optional Equipment all models.

In extremely dusty territories it is advisable to use the heavy duty Oil Bath Air Cleaner and Silencer.

This is a combination silencer and heavy duty, self washing type of air cleaner. Its efficiency in removing dust particles from the air passing into the carburetor is exceptionally high.

Dusty air enters the cleaner through passages at the top and passes down and over the surface of an oil reservoir so that the dust in the air is trapped by the oil before the air reaches the copper wool filter element.

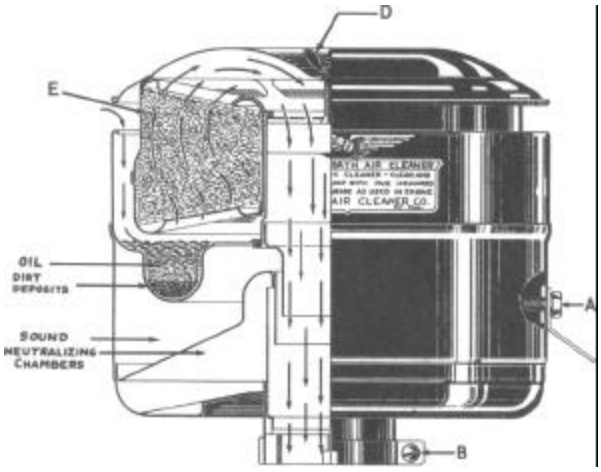


Figure 29 Air Cleaner Oil Bath Type

1. Clean this oil bath air cleaner according to the dust conditions under which the car is operated.
2. Remove the brace screw (A), Figure 29, and loosen the clamp screw (B). Remove the wing nut (D).
3. Lift the filter element (E) out of the body and wash in kerosene and dry it.
4. Remove the oil from the cleaner body and wash thoroughly both inside and outside with kerosene.
5. Refill reservoir with one pint of engine oil the same grade as used in the engine.
6. Reinstall the filter unit, cover and wing nut.
7. Reinstall air cleaner unit on the carburetor and tighten the clamp screw and install the brace.

NOTE: When installing the cleaning unit make certain the felt gasket is in place on the silencer as this seals against air leaks between the two units.

FUEL PUMP

FUEL PUMPS AND COMBINATION PUMPS

The fuel pumps and combination fuel and vacuum pumps used are manufactured by the A C Spark Plug Co., Flint, Michigan.

Models 40,48 Pass Fuel Pump is model AF with inverted bowl, see Figure 30.

Models 41,43,44,45,47,48 Com., Fuel Pump is model AP with appended bowl, see Figure 31.

Models 40,41,43,48 Combination Fuel and Vacuum Pump is model AJ, see Figure 36.

Models 44,45,47 Combination Fuel and Vacuum Pump is model AJ and is the same as Models 40,41,43,48 except for the position of the outlet.

The operation is described under "Combination Fuel and Vacuum Pump".

FUEL PUMP TYPE AF MODEL 40 AND 48 PASSENGER

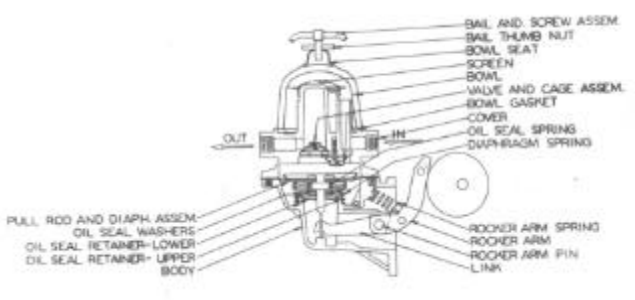


Figure 30 Fuel Pump Model 40,48 Passenger

This is an inverted bowl pump, see Figure 30, with an oil seal on the pull rod. The oil seal assembly consists of an upper retainer with a flange at its lower end (serving as a lower seat for the driving spring); two leather oil seal washers, and a lower retainer. The entire assembly is locked in place on the pull rod stem by the shoulder on the lower end of the pull rod and rests on the pump boss in the pump body.

NOTE: Always mark the position of the cover on the body before removing the cover.

TO REMOVE DIAPHRAGM ASSEMBLY FROM PUMP

NOTE: Mark position of the cover on the body before removing the cover. Remove rocker arm pin in order to free pull rod from rocker arm linkage. To remove diaphragm assembly (with pump cover or upper body removed), invert pump body, force edge of tool under edge or flange of upper oil seal retainer, pry on tool to move flange on retainer up onto top edge of pump boss. Hold pump link against upper stop by wedging a screwdriver between the link and the

the bottom of the pump body, push down on diaphragm and away from end of link. This will unhook the pull rod from the link and diaphragm assembly can then be removed. Diaphragm assembly should be replaced as a unit (see directions below for assembly of oil seal on pull rod).

TO ASSEMBLE OIL SEAL ON DIAPHRAGM ASSEMBLY

Place diaphragm driving spring in position on pull rod against lower diaphragm protector, place upper oil seal retainer in position on lower end of driving spring with cupped portion within spring, compress spring by pressing on oil seal retainer until retainer is below shoulder on pull rod, then rotate retainer 1/4 turn so that it is locked in place. Force two leather oil seal washers down on pull rod stem until they rest

against upper retainer, assemble lower retainer below washers and lock in place by rotating 1/4

turn. The complete assembly is then ready to be installed in the pump.

TO INSTALL DIAPHRAGM

Invert the pump body, hold link against upper stop by wedging screwdriver between link and bottom of pump body, insert diaphragm assembly in

pump body, tilting assembly so that flange on upper oil seal retainer rests on top edge of pump boss and pull rod clears end of link (see Figure 30). Press down on diaphragm assembly and hook pull rod over end of link, then push diaphragm back into vertical position and center in pump body so that oil seal retainer snaps into place around pump boss. The upper pump body can then be put in

place and the screws installed.

FUEL PUMP TYPE AP

Models 41,43,44,45,47, and 48 Commercial.

The rotation of the camshaft eccentric actuates the rocker arm which is pivoted and in turn pulls the pull rod and diaphragm assembly downward against the diaphragm spring, thus creating a vacuum in the pump chamber, see

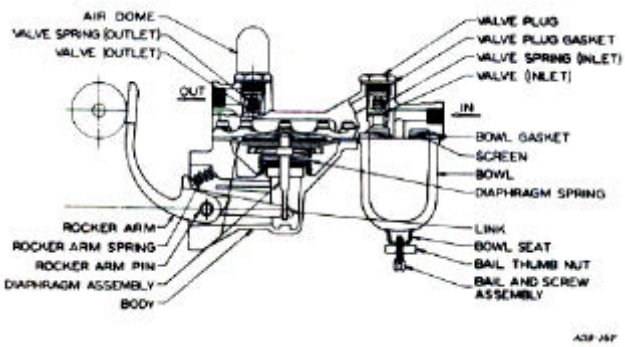


Figure 31.

Figure 31 Fuel Pump
Models 41,43,44,45,47,43 Commercial

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 pressure valve and outlet to the carburetor.

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.

Diaphragm and pull rod assembly requires placing the diaphragm (driving) spring in place in the pump body. Position diaphragm assembly on the driving spring so that the spring is centered in the lower diaphragm protector. Press downward on diaphragm and turn to the left at the same time so that the pull rod engages the end of the rocker link. Turn the diaphragm assembly a quarter turn to the left so that the holes in the diaphragm and pump body line up. Push in on the rocker arm until the diaphragm is flush with the pump body flange. Place the top assembly in exactly the same position as it was when removed (shown by the marks on the pump and cover made before disassembly). Install the cover screws and lockwashers turning the screws down loosely. Release the rocker arm which will flex the diaphragm in the extreme upper position. Tighten the cover screws alternately and securely.

VALVE AND COVER ASSEMBLY

To assemble valves and cover before installing on pump, place outlet valve spring retainer in cover, being careful not to distort legs of retainer, place valve plate gasket in position, install outlet valve spring in retainer, place outlet valve on spring. Place inlet valve on its seat, position valve spring on center of inlet

4 valve, install inlet valve retainer in valve

plate and see that shoulder of retainer fits flush in depression in plate. Install valve plate in position in cover and insert three mounting screws. See that inlet valve is centered in spring seat and outlet valve centered on valve seat in valve plate. Install strainer screen on top of cover, see that screen fits properly around inlet and at edges of cover. Place cork gasket in cover, install cover plate. Install fibre gasket on cover plate cap screw, tighten capscrew so that cover plate is secure and tight. See that gasket seats properly and that filter screen is not distorted. Cover assembly is then ready to install on pump body.

ROCKER ARM AND LINKAGE

If rocker arm has been removed, assemble link, rocker arm, and rocker arm spring in pump body in proper position (see illustration), insert rocker arm pin through hole in body so that it engages rocker arm and link. Stake pin in place by using punch to turn body metal over pin at each end.

See that rocker arm operates freely after assembly (if arm binds, drive pin back slightly). Rocker arm linkage will ordinarily not require disassembly when servicing pump.

FUEL PUMP DIAPHRAGM REPLACEMENT

Check first for minor defects as shown in Trouble Chart Page 23.

It is recommended that the fuel pump be given the operating test on Page 23 after it has been removed from the engine in order to determine without any doubt that the trouble is in the pump and not elsewhere.

1. Mount the pump in a vise or on a test stand.

2. nark the cover and body so that they can be put back exactly where they were originally and remove the cover.

3. Remove the nut on the end of the pull rod; remove lock washer, alignment washer, upper diaphragm protector cup and the diaphragm.

TO INSTALL A NEW DIAPHRAGM

1. Assemble pull rod gasket and lower diaphragm protector cup with cup portion down, on the pull rod. Gasket must be seated against the shoulder on the pull rod.
2. Place four layers of diaphragm material on the pull rod and carefully line up the holes. Use a special locating ring or several cover plate screws.
3. Install upper diaphragm protector cup on the pull rod with cup portion up. Place hexagon alignment washer on the diaphragm protector and assemble lock washer and pull rod nut.
4. Use a special wrench to hold the alignment washer from turning while the nut is being tightened and keep the diaphragm holes lined up with the locating ring or several of the cover screws until the nut is tight.

NOTE: The keeping of the diaphragm holes lined up is very important.

5. Install pump cover and insert the cover screws but do not tighten.
6. Insert alignment wrench in the hole in the pump body and force the pull rod and the diaphragm assembly to the extreme upper position and hold in this position while the cover screws are evenly and alternately tightened (to obtain correct alignment of the pump cover).
7. Test diaphragm assembly by installing a precision gauge in the outlet valve port so that the gauge rod rests on the upper diaphragm protector cup. If the diaphragm is correctly installed and in the extreme upper position the notch in the gauge rod should be visible at the top of the gauge.

NOTE: Before installing the pump repeat the operating test shown on Page 23 and after the pump is installed on the car check the priming action see Page 24.

FUEL PUMP INSTALLATION Models 40,48 Pass.

The fuel pump is installed as shown in Figure 32. The gasket is /16" in thickness.

FUEL PUMP INSTALLATION Models 41,43,44,45,47 and 48 Comm.

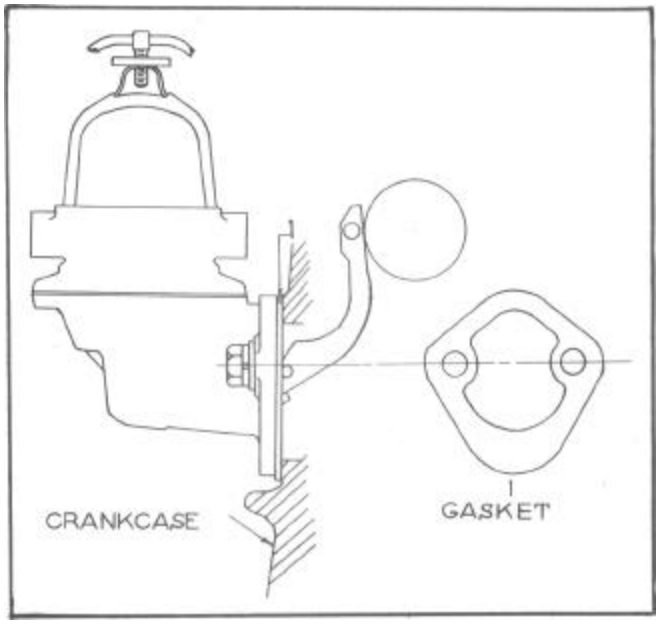


Figure 32 Installing Fuel Pump
Models 40,48 Pass.

The fuel pump is installed as shown in Figure 33. The Oil Baffle is of steel and is installed as shown. The gasket is of rubber and asbestos combination .015" thick. The spacer is of steel and asbestos and is .275" thick (compresses to .250" when installed). The spacer is the same as the one used on the combination fuel and vacuum pump used on Models 40,41,43,48 except for thickness. Do not use either one in the place of the other. The sleeve is of Bakelite and 25/32" long. The insulating washer is a 1/16" thick Bakelite washer.

FUEL PUMP TO MANIFOLD CONNECTIONS

Fuel pump to manifold connections should be made as shown in Figure 34. Be sure connections are tight, but avoid too much tension to prevent stripping threads.

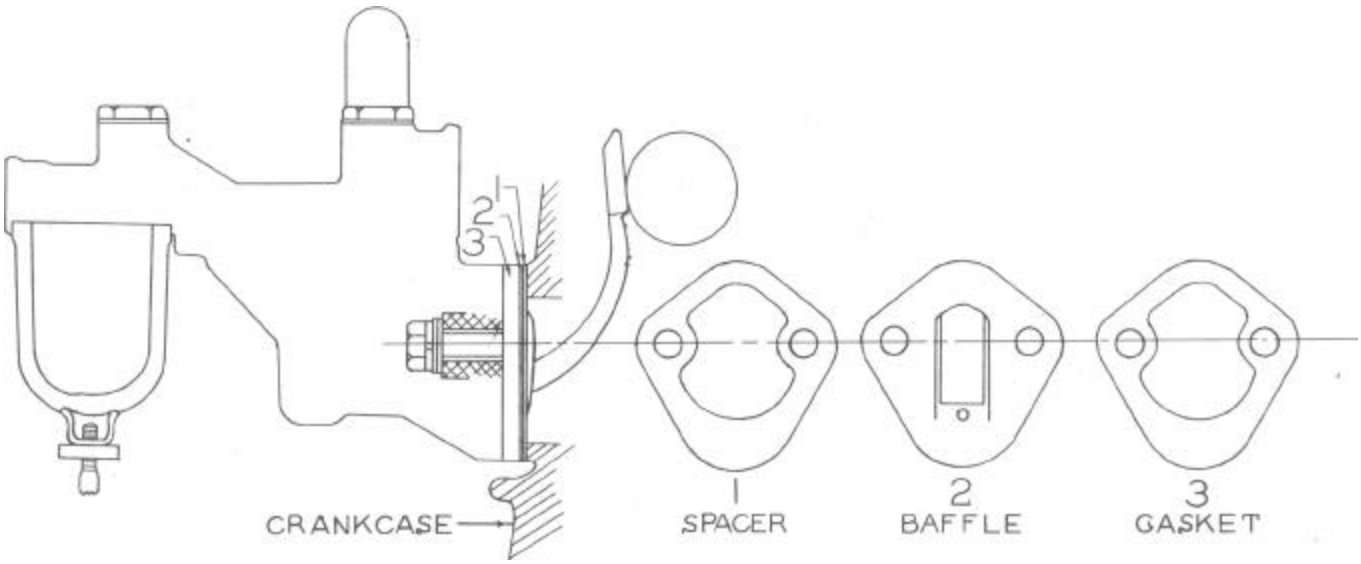


Figure 33 Installing Fuel Pump Models 41,43,44,45,47 and 48 Comm.

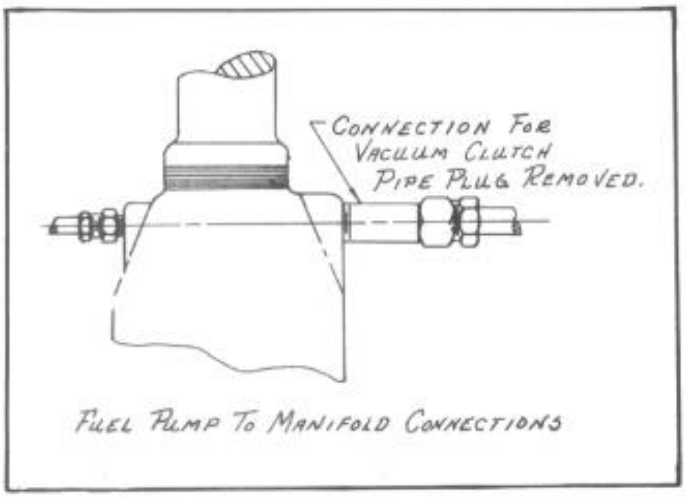


Figure 34 Fuel Pump to Manifold Connections
All Models

FUEL AND COMBINATION PUMP SPECIFICATIONS

MODELS 40,48 PASS. FUEL PUMP TYPE AF

Static pressure at 1800 R.P.M. 2 lbs. minimum to 3 1/2 lbs. maximum.
Minimum capacity 1 pint in 1 minute.

MODELS 41,43,44,45,47,48 COMM.

Static pressure 3 lbs. minimum to 4 1/2 lbs. maximum.
Pump should prime in 12 seconds at 120 R.P.M. Minimum capacity 18 gallons of gasoline per hour at 1950 R.P.M. thru standard restriction.

ALL MODELS COMBINATION FUEL AND VACUUM PUMP

Static pressure 3 lbs. minimum to 4 lbs. maximum Pump should prime in 22 seconds at 60 R.P.M. Vacuum requirements on mercury vacuum gauge are 8 1/2" of mercury at 120 R.P.M. and 12" of mercury at 1800 R.P.M.

FUEL PUMP TROUBLE CHART

No Fuel or Insufficient Fuel at Carburetor

1. Gasoline tank empty.
2. Bent, kinked, leaking, tubing or connections.
3. Dirty filter screen or loose sediment bowl. Take off glass sediment bowl, clean filter screen. Replace cork gasket if necessary. Tighten bowl thumbnut.
4. Loose valve plugs or caps.
   Replace valve plug gasket if necessary.
   Tighten plugs.
5. Warped or dirty valves. Loose valve seat. Remove valve plugs and take out valves. Wash valves in gasoline and if warped or gummed replace them. Valve seat must be smooth and tight in the pump body. Replace the valves and assemble valve springs and plugs.
6. Linkage worn. Driving spring weak.
   Check for excessive play in the linkage or a worn rocker arm pin which will shorten the pump stroke. Check diaphragm driving spring.

FUEL PUMP TESTING

There are various types of testing equipment some of which check the suction side for vacuum and some the delivery side for pressure. Some types of equipment check the output but usually require the running of the engine on the starter or from an outside fuel tank in the meantime catching the fuel delivered by the pump in a measure.

Vacuum testing alone is not reliable as it is possible to show vacuum on the inlet side without the pump actually being capable of delivering fuel, as would be the case with a pump inlet valve either blocked open or leaking badly.

Two things are necessary from a fuel pump

1. Quantity of fuel the pump can deliver.
2. Pressure under operating conditions.

The equipment shown in Figure 35 cakes it possible to take the above two readings without disturbing the funtioning of the fuel system and the engine may be operated in the shop or on the road at any speed using the fuel from the car gasoline tank. Readings can be taken from the drivers seat.

This testing equipment consists of a pressure gauge connected into the inlet line of the gas per mile gauge and can be used to test the fuel pump and at the same time obtain gasoline mileage tests.

Remove the fuel line from the fuel pump to the carburetor. Install the testing equipment as shown in Figure 35 and connect the hose from the rear to the fuel pump outlet and the hose from the front to the carburetor inlet.

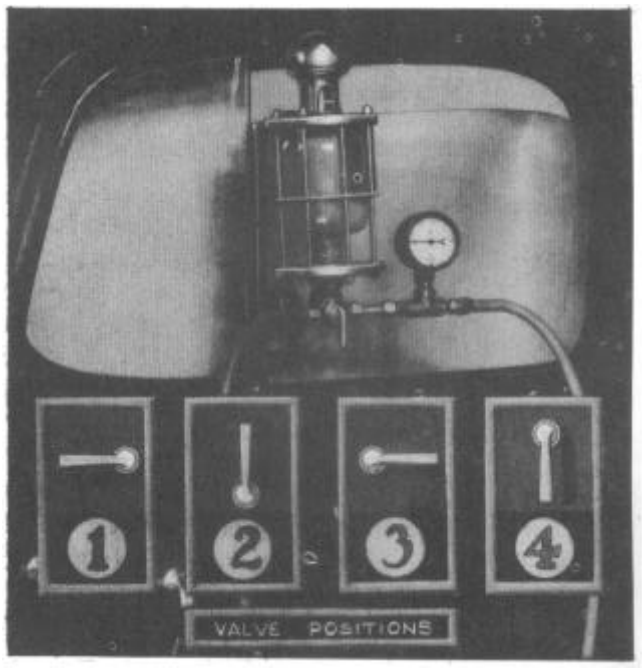


Figure 35 Fuel Pump Test

DELIVERY PRESSURE TEST

Turn the valve to position 3 in Figure 35 and start the engine. With the valve in this position the pump will deliver fuel directly to the carburetor and the delivery pressure will be shown on the gauge.

The pressure on the gauge to be taken only at the normal level of the gauge mounted on the body door.

Pressures on model 40 fuel pump should be from 2 to 3 1/2 lbs. and on all other pumps 3 to 4 1/2 lbs.

At the lower engine speeds the hand on the gauge will fluctuate when the carburetor needle valve opens to admit gasoline, while at the higher speeds the flow of fuel into the carburetor is more constant and the gauge readings will be constant.

The highest pressure will be obtained at idling speed and the lowest at top car speed.

Too much pressure will hold the carburetor float needle valve off its seat and cause a high gasoline level in the float chamber and thereby cause excessive gasoline consumption.

FUEL DELIVERY TEST

Turn the valve to position (1), Figure 35, and the gauge glass will fill with gasoline while fuel is still being supplied directly to the engine.

It should require 36 seconds to pump the gauge glass full (1/10 gallon between the top and bottom graduations). The rate of delivery can be determined from this time.

The fuel pumped directly to the carburetor with the engine idling can be disregarded because the quantity is very small.

If the time required to fill the gauge is more than 36 seconds a high speed test should be made on the road.

The road test should be at a speed of at least 60 miles per hour.

1. Valve in position 3 Figure 35 the pressure should show at least one pound pressure.
2. Valve in position 1, the gauge should be filled in at least one minute.
3. Fill the gauge and turn valve to position 4, and make a test at the same speed at which test 2 was made so as to be sure the engine is not taking on excessive amount of gasoline.

Excessive gasoline consumption will increase the time required to fill the gauge.

The time allowed in test 2 is based on the pump delivering ten gallons per hour and the engine using four gallons per hour or 15 miles per gallon at 60 miles per hour. If ten miles per gallon is obtained at 60 miles per hour it will require 90 seconds to fill the gauge if the pump is delivering 10 gallons per hour.

Timing is the accurate way of determining fuel flow, however, it is sufficient, in cases where the car can be driven with wide open throttle to see that the gauge can be filled which insures against any starvation of the engine when it needs its maximum fuel supply.

In case it is more convenient to check mileage instead of time, drive the car at a constant speed of 60 miles per hour. The gauge should be filled in test 2 in not more than one mile of driving.

FUEL PUMP LEAKAGE THRU VENT IN PUMP BODY

1. Worn or punctured diaphragm.
2. Loose diaphragm nut or defective gasket. See that the nut on the upper end of the pull rod is tight and that the gasket under the nut is in good condition.

FUEL PUMP LEAKING AT EDGE OF DIAPHRAGM

1. Loose cover screws.

Tighten cover screw alternately around the pump body.

CARBURETOR FLOODING

1. Carburetor needle valve not seating.

Check the valve or its seat for wear. Check for sediment or other obstruction that might prevent valve from seating. Check the float level.

FUEL PUMP PRESSURE TOO HIGH OR TOO LOW

A high fuel pump pressure tends to lift the needle valve off the seat or hold it off the seat and flood the carburetor giving poor gas mileage and poor performance.

A low fuel pump pressure tends to promote vapor lock.

CLEANING FUEL PUMP BOWL

1. Remove glass sediment bowl and clean.
2. Carefully remove screen and clean. If damaged replace. Check gasket.
3. Tighten fuel pump connections.
4. Check for diaphragm leaks tighten cover screws.

COMBINATION FUEL AND VACUUM PUMP

Used on all Models as optional equipment

The vacuum section is mounted on top of the pump body with the fuel pump below, see Figure 36.

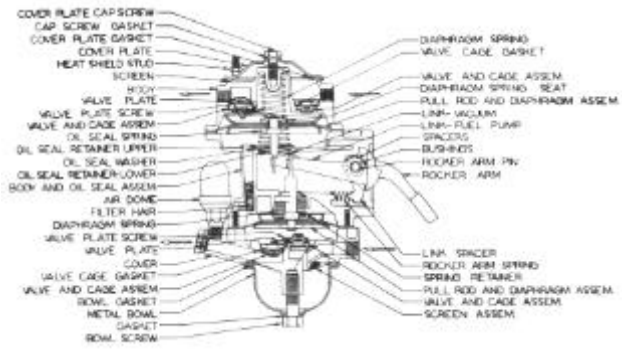


Figure 36 Combination Fuel and Vacuum Pump

The oil seal used on the fuel pump pull rod makes it necessary to remove the rocker arm pin to engage or disengage the pull rod when servicing the diaphragm.

OPERATION

There are two distinctly separate units, a fuel pump and a vacuum pump and they are entirely separate in their purpose but both have the same operating linkage.

The vacuum pump consists of a vacuum chamber which contains inlet and outlet valve:, and is closed at its upper and by the fuel pump diaphragm. A spring is assembled in the center of the vacuum pump under the diaphragm. The operating shaft on the upper surface of the diaphragm is connected to the fuel pump rocker arm thru the linkage.

In operation the fuel pump rocker arm (actuated by the eccentric on the camshaft) forces up the vacuum pump diaphragm forcing air out of the vacuum pump chamber thru the outlet valve into the intake manifold. When the fuel pump rocker arm moves back thus freeing the pump linkage, the driving spring under the vacuum pump diaphragm forces the diaphragm down creating a vacuum in the chamber, opening the inlet valve and causes the windshield wiper to operate.

If the windshield wiper is turned off the vacuum in the vacuum pump chamber will hold the diaphragm at its upper end of its stroke (driving spring compressed) and the vacuum pump will not operate. Whenever the intake manifold vacuum is higher than the pump vacuum the vacuum pump will likewise be inoperative and the windshield wiper will be operated by the intake manifold vacuum straight thru the pump with both valves open. At all other times the vacuum pump operates as a booster for permanent and stabilized operation of the windshield wiper (during acceleration or high speed operation).

The fuel pump suction stroke of the diaphragm is operated by linkage and the delivery stroke is operated by a driving spring under the diaphragm. The suction stroke is caused by the diaphragm being pulled up by

the rocker arm which is fastened to a link and the link to a diaphragm pull rod. This suction stroke draws fuel through an inlet into the sediment bowl and then through filter screens and the inlet valve into the fuel pump chamber. The rocker arm is held against an eccentric driving cam on the camshaft by a spring and, therefore, is pulling up on the diaphragm

part of the time and the balance of the time allows the compressed diaphragm spring to push down the diaphragm which causes the delivery stroke and forces the fuel out through the outlet valve to the carburetor. If the carburetor has enough fuel and the float valve has closed, the back pressure in the fuel line holds the diaphragm at the top of the stroke with its spring compressed and the rocker arm motion is taken up by the linkage. When the carburetor needs more fuel and the float valve opens the pumping action of the fuel pump is resumed.

COMBINATION FUEL AND VACUUM KIT

The combination fuel and vacuum kit 160515 for installation on Models 40,48 consists of:

Fuel and vacuum pump assembly
Fuel pump to cylinder spacer asbestos and steel
Fuel pump to cylinder spacer plate steel
Fuel pump to cylinder gasket
Fuel pump to carburetor pipe assembly
Fuel pump to manifold vacuum pipe assembly
Fuel pump to manifold vacuum pipe elbow (pump end)
Fuel pump to manifold vacuum pipe elbow manifold end)
Windshield cleaner tubing (rubber)
Windshield cleaner tubing connector (copper)
Fuel pump to cylinder bolt
Fuel pump to cylinder bolt insulating sleeve

The combination fuel and vacuum kit 160516 for installation on Models 41,43,48 consists of:

Fuel and Vacuum pump assembly
Fuel pump to cylinder spacer (asbestos and steel)
Fuel pump to cylinder spacer plate (steel)
Fuel pump to cylinder gasket
Fuel pump to carburetor pipe assembly
Fuel pump to manifold vacuum pipe elbow end)
Fuel pump to manifold vacuum pipe union (manifold end)
Windshield cleaner tube elbow (45 degree)
Windshield cleaner tubing (rubber)
Windshield cleaner tubing connector (copper)

The combination fuel and vacuum kit 160517 for installation on Models 44,45,47 consists of:

Fuel and vacuum pump assembly
Fuel pump to cylinder spacer (asbestos and steel)
Fuel pump to cylinder spacer plate (steel)
Fuel pump to cylinder gasket
Fuel pump flexible connection elbow (90 degree)
Fuel pump to carburetor pipe assembly
Fuel pump to manifold vacuum pipe assembly
Fuel pump to manifold vacuum pipe union (pump end)
Fuel pump to manifold vacuum pipe elbow (manifold end)
Windshield cleaner tube elbow (90 degree)
Windshield cleaner tubing (rubber)
Windshield cleaner tubing connector (copper)

COMBINATION FUEL AND VACUUM PUMP
Kit No. 160515 160516 160517
Installation Instructions

PROCEDURE:

1. Raise car and place on stand jacks.
2. Remove right front wheel and tire assembly
3. 3. Remove right fender dust shield.

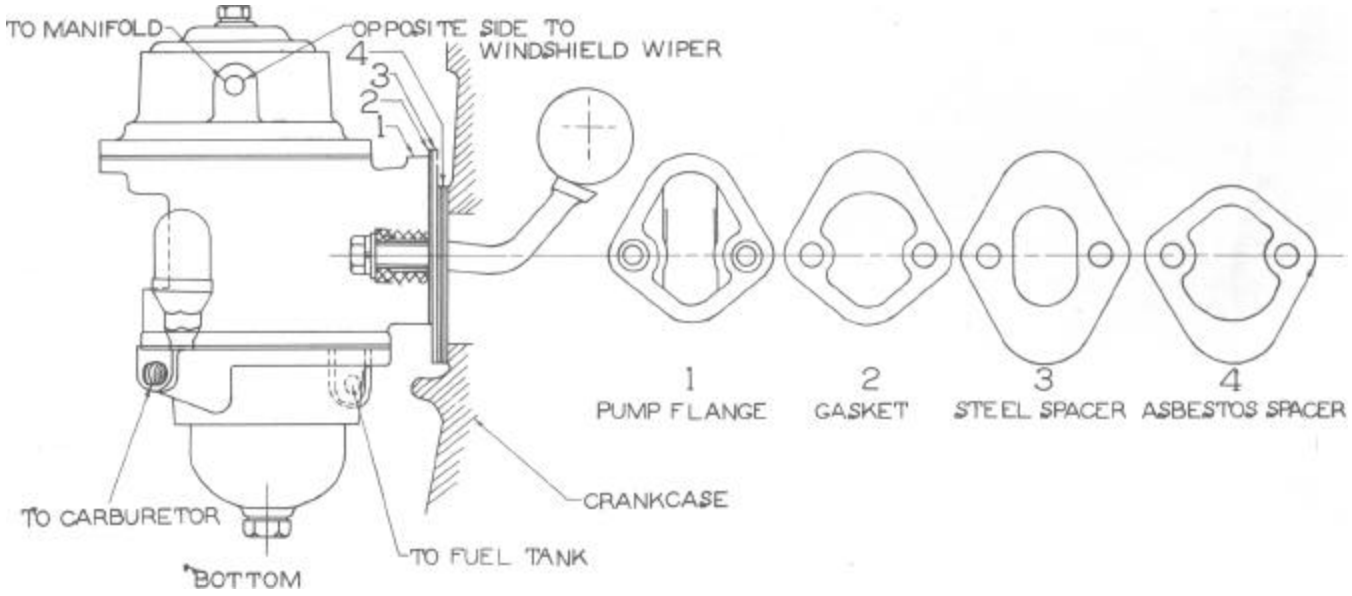


Figure 37 Installing Combination Fuel and Vacuum Pump All Models

4. Remove connector pipe from carburetor to fuel pump and discard.
5. Disconnect flexible gas line tube from fuel pump.
6. Remove fuel pump.
7. Clean fuel pump mounting flange on crankcase of old gasket.
8. Remove fittings from old fuel pump and install to holes in bottom of comb. fuel and vacuum pump.
9. Install fibre sleeves in bolt holes of comb. pump and install bolts with flat and lock washers in place in bolt holes.
10. Install gasket, plate and spacer over bolts as shown in Figure 37 and install comb. pump to crankcase bolting securely.

NOTE The spacer (4) is of steel and asbestos and is .165" thick compressing to .148" when installed. On models 40 and 48 it is necessary to install the two new fuel pump to cylinder bolts and insulating sleeves.

11. Install pipe included in kit from carburetor to lower fitting on front of comb. pump.
12. Connect flexible gas line tube to lower fitting on back of comb. pump.
13. Install 90° fitting supplied in kit in pump manifold opening or upper front hole of comb. pump.
14. Remove 45° windshield upper hose fitting and short pipe from manifold and install in windshield wiper opening or top rear hole of comb. pump.
15. Install 90° fitting supplied in kit to hole in manifold.
16. Install connector pipe supplied in kit from 90° manifold fitting on comb. pump to 900 fitting in manifold.
17. Connect short piece of windshield wiper hose supplied in kit to 45° fitting and short pipe in combination pump.
18. Connect this hose to the original windshield wiper hose with the short tube provided in the kit.
19. Replace right fender dust shield.
20. Replace right front wheel and tire assembly.
21. Lower car to floor.

NOTE It is very important that the correct gasket and spacer be used between the cylinder and the fuel pump to obtain the correct stroke.

DISASSEMBLY OF COMBINATION FUEL AND VACUUM PUMP USED ON ALL MODELS, SEE FIGURE 36

Clamp the pump in a vise and take out the two opposite flange screws and install special guide pins to act as pilots when the cover is removed. These guide pins can be made up of 3/16" cold rolled stock, 2" long with a fourth inch of No. 10 32 threads on one end.

Mark the cover and body flange to insure correct reassembly, take out the remaining flange screws and lift off cover assembly.

Press down on rocker arm and unhook diaphragm assembly from inner pump link. Lift diaphragm assembly out.

VACUUM PUMP BODY REASSEMBLY

Place the fibre inlet valve on the brass valve seat. The body is furnished with the valve seat installed.

Position inlet valve spring on valve.

Install spider shaped valve stop plate on the valve spring making sure that the top coil of the spring is seated in the recess in stop plate.

Install outlet valve spring and be certain that the spring is centered in the recess in the stop plate.

Install outlet valve spring and be sure that the spring is centered in the recess in the body.

Press down on inlet valve stop plate and install fibre outlet valve on valve spring. Make certain

that the legs on the stop plate fit into the recess in the body. Without releasing valve stop plate slide the retainer gasket into position and place retainer on top of the gasket. The countersunk holes must face up.

Insert the flat headed retainer screws and tighten them securely. The center screws should be tightened first and the end screw last.

Turn the pump body over and install the screen. The screen must be flat and fit snug around the screw holes in the body.

Install the gasket on the screen and place the bottom cover on the gasket and install the four cover screws.

CAUTION: Gasket must fit properly and the cover screws be tighte

COMBINATION FUEL AND VACUUM PUMP DIAPHRAGM REPLACEMENT

Diaphragm should be installed with the pull rod assembly out of the pump.

1. Clamp the flat end of the pull rod in a vise and assemble the pull rod gasket and lower diaphragm protector cup with the cup side down, on the pull rod.
2. Place five layers of diaphragm material on the pull rod, lining up the tabs on the layers and turning the diaphragm so that the tabs are 7/16" clockwise from the center line of the pull rod flat end.
3. Assemble the upper diaphragm protector with cup side up; the alignment washer; lock washer and nut. Hold the alignment washer with a wrench and tighten nut.
4. Test diaphragm position to be sure that the diaphragm layers have not been twisted or moved from their position.
5. Place leather oil seal and cap on the pull rod boss. Install driving spring.
6. Place pull rod assembly in the pump with the diaphragm tab pointing toward the center of the mounting flange on the pump body.
7. Invert the pump and attach flat end of the pull rod in the notch in the operating link. Turn pull rod one fourth turn until the tab points toward the projection on the diaphragm flange. This will lock the pull rod and operating link.

A test cannot be made on the bench due to the tension of the driving spring in the vacuum pump.

COMBINATION PUMP DIAPHRAGM AND PULL ROD ASSEMBLY

The diaphragm and pull rod are furnished riveted together.

Place the small lower oil seal retainer; leather oil seal washer; large upper oil seal retainer and oil seal retainer spring in their positions in the pump body.

These parts must fit snugly in the recess around the pull rod hole.

Install the diaphragm on top of the retainer spring thread the pull rod thru the oil seal and hook the hooked end of the long pump link in the pull rod slot.

VACUUM PUMP REASSEMBLY

Clamp the pump body, with fuel pump installed, in a vise with the vacuum diaphragm up.

Press down on the rocker arm until the diaphragm is flat on the flange. Install a small metal wedge between the body and shoulder on the arm to

hold it in this position while finishing the assembly.

Place the heavy driving spring on the diaphragm. Place vacuum pump body assembly in position on the spring.

Line up the flange marks made during disassembly and make sure that the spring is centered on the diaphragm also around the boss in the pump body.

Press down on the vacuum pump body and insert the flange screws with a lockwasher on each screw.

Turn down the screws loosely.

Remove the small metal wedge holding the rocker arm and tighten the screws evenly.

Check the vacuum pump operation after the unit has been reinstalled on the engine.

TEST ON THE ENGINE

Install on the engine with the rocker arm in the innermost position to avoid any possibility of distorting the pump mounting flange while the mounting nuts are being tightened.

The vacuum pump operation can be checked by noting the windshield wiper action during idling and accelerating of the engine. The action should be constant.

CAUTION: Do not operate the pump with the outlet closed or blocked.

VACUUM PUMP TROUBLE CHART

The windshield wiper action will indicate faulty vacuum pump operation.

1. Windshield wiper action slow at high speeds or when accelerating.

This will indicate that the vacuum pump is not operating. Check the windshield wiper lines and fittings. If no leaks are found then disassemble the vacuum pump and check the valves and diaphragm.

2. Oil smoke in engine exhaust.

Indicates a punctured diaphragm. To check before disassembling the pump, disconnect the line between the pump and the intake manifold and operate the pump. Hold a piece of paper over the pump outlet. Oil spray in the exhaust from the pump indicates a punctured diaphragm. If no oil spray is noted the oil smoke may be from worn piston rings, etc.

LEVEL GAUGE

The fuel level gauge Figures 38 and 39, is art electric type gauge using bi metal arms on which heating coils are wound in both the tank and the dash unit.

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 (one of which is mounted on the bi metal arm). The feed wire on the dash unit is connected to the accessory terminal of the ignition switch so that the gauge registers only with the ignition on.

The ground contact in the tank unit is mounted on a movable arm (arm mounted through diaphragm forming the lower cover of tank unit and flexes diaphragm as it is moved). The lower end of the ground contact arm is actuated by a cam on the upper end of the float rod pivot. 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 bi metal arm causes it to flex in the opposite direction and again close the contacts. In operation this cycle takes place very rapidly and a steady reading is obtained on the dash unit.

FUEL LEVEL GAUGE CHECKING

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 electric 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 units in the car until the tests have been completed that proves 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 this tank unit to the car frame. Turn on ignition switch and operate tank unit float by

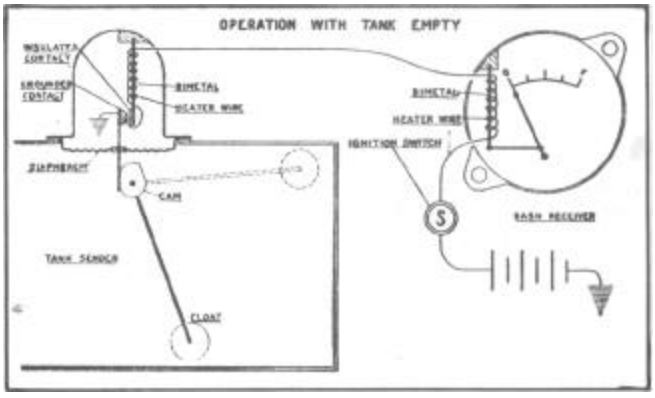


Figure 38 Fuel Gauge Operation With Tank Empty

hand. With the float of the tank unit at the bottom position the dash unit should register at the bottom mark on the dial, see Figure 38. Hove float rod up to top position and the dash unit being checked should move to top mark on the dial, as shown in Figure 39. Allow one minute for dash unit pointer to come to rest.

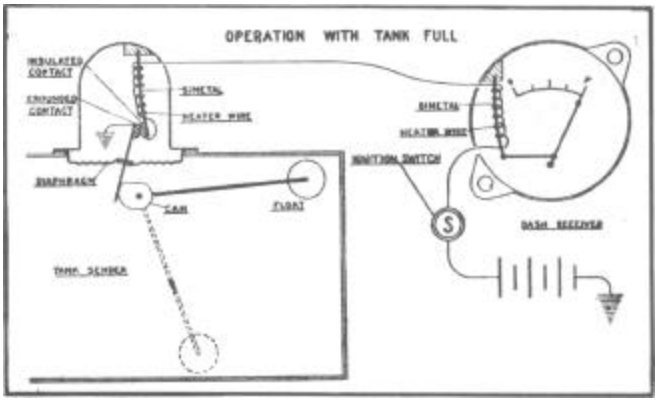


Figure 39 Fuel Gauge Operation With Tank Full

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

3. If the car is radio equipped, check the condenser on the tank unit. If the condenser is shorted it will

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.

4. If the ground (see paragraph 2) and condenser (see paragraph 3) are correct then replace the tank unit and see if this has corrected the difficulty.

5. If the 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. 6. If the wiring is satisfactory then replace the dash unit and check it with the tank unit on the car. If the dash unit fails to operate then replace the 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.

7. To install a new dash unit. Remove the wiring to the fuel and temperature instrument cluster. There are three wires, one is the hot lead from the ignition circuit and numbers two and three are the leads to the fuel gauge tank unit and to the water temperature gauge engine unit.

8. Remove cluster from the panel by removing three nuts top and sides.

9. Remove the lock nuts holding the bus bars and insulating shield from the dash unit and then remove the dash unit.

10. Install the new dash unit being careful to locate it properly so that the notches in the insulator are centered.

11. Replace insulator shield, locknuts and bus bars. Tighten securely.

12. Before replacing cluster. Test to make certain that no short exists. Check from each instrument terminal to the case. If there is a circuit the instruments are not properly located as stated in paragraph 11. Correct this condition before proceeding.

13. Replace the cluster in the panel.

14. Replace the three wires see paragraph 7.

CAUTION: When handling the instrument cluster be careful of the pointers and the dials.

INDEX

WATER PUMP

Circulation	Pressure Pump
Temperature Control	Thermostat
Capacity	
6 Cylinder	13 Quarts
8 Cylinder	18 Quarts
Water Pump Drive	V Belt
Fan Drive	Pump Shaft
Belt Adjustment	Generator Mounting
Pump Bearing	Bronze
Lubrication Fitting	Alemite (Metered)

COOLING SYSTEM

The efficient operation of the cooling system is one of the important factors in the satisfactory performance of an automobile engine.

The radiator is of cellular design. The water pump is a centrifugal 6 blade pressure pump circulating 30 gallons per minute at approximately 50 miles per hour.

THERMOSTAT

Thermostats located in the cylinder head water outlet of all models hold the water in the engine water jackets until it has reached the proper temperature for the most efficient engine operation.

Thermostats are of two types. Models 40, 41, 44, 45 and 48 use the choke type thermostat and Models 43 and 47 the by pass type. All thermostats are designed to begin opening at 150° to 155° and should be fully open at 185°.

COOLING CAPACITY

6 cylinder models 13 quarts.
8 cylinder models 18 quarts.

COOLING SYSTEM CHECK

Regular attention will eliminate cooling system difficulties and the most logical times for cleaning and conditioning a cooling system is:

1. When anti freeze is installed in the fall.
2. When anti freeze is removed in the spring.

Check thermostat for correct operation and use a new gasket on the cylinder water outlet when reinstalling.

Examine all hose both inside and outside. If the inside is rotted and mushy, replace.

Tighten all hose connections and check all water joints for leaks.

Examine the radiator for leaks and tighten the radiator mounting bolts.

CIRCULATION

Models 40, 41, 44, 45, 48.

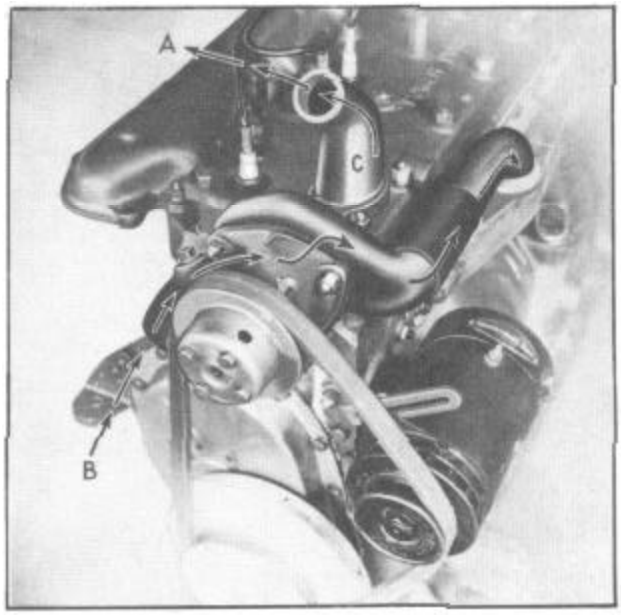


Figure 1--Water Circulation
Models 40, 41, 44, 45, 48

The thermostat is located in the water outlet (C), Figure 1, 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.

Models 43, 47.

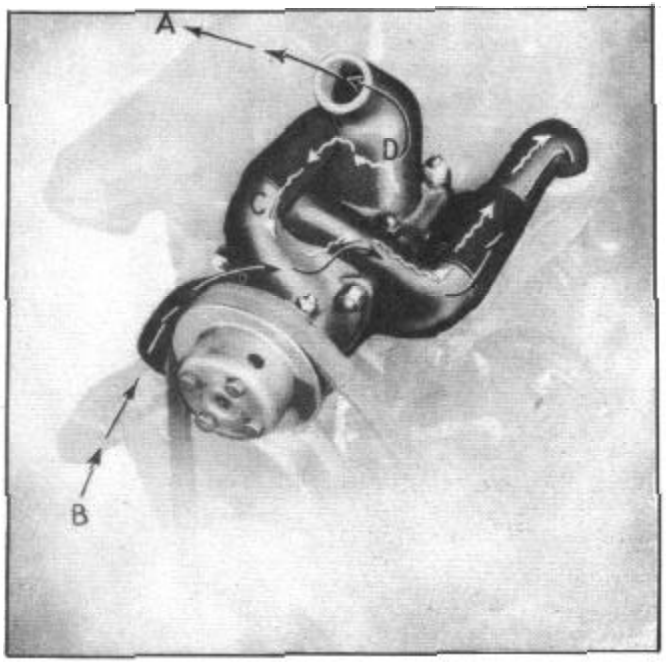


Figure 2--Water Circulation
Models 43, 47

The cylinder head water outlet (D) Figure 2 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. 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 to the engine maintaining a pressure of water in the engine at all times, The thermostat seated in the cylinder water outlet below the by pass and below the main water passage starts to open at 150° to 155° of water temperature and fully opens at 185° closing the by pass as it opens and forcing the water to take the main passage which leads to the radiator for cooling when fully opened. In the course of opening the thermostat allows some water to pass through the radiator and some to use the by pass.

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 draining of the cooling system.

RADIATOR CORE REMOVAL

1. Drain the radiator and remove the lower hose connection and the upper hose connection.
2. Disconnect the radiator stay rod bolts at the radiator.
3. Remove the two radiator mounting bolts.

RUST AND SCALE IN RADIATOR

The most common difficulty in the cooling system is rust clogging the water passages of the radiator core.

Rust is formed in the water jackets of the cylinder block and head and is carried into the radiator during the normal water circulation. This rust acts as a blanket and prevents the water from being properly cooled and also restricts the circulation of the water due to partially blocking the passages.

Rust deposits allowed to remain will eventually shut off the circulation entirely resulting in the engine overheating.

Rust deposits in the water jackets will build up and prevent the proper cooling of the cylinder block and head, acting as an insulator against the very condition that is desired. i.e. cooling water against cylinder bores.

Rust is formed by the oxygen in the water. Oxygen in the water cannot be controlled but we can control the amount of oxygen that enters the system in other ways and by this is meant the excess oxygen that is drawn into the system through leaks in the connections. This excess oxygen speeds up rust formation to a far greater extent than the rust formations caused by the normal oxygen content in the water.

Lime in the water causes a hard scale to form in the water passages this scale having the same form as the scale that forms in a tea kettle. This scale impairs the efficiency of the cooling system just the same as rust does.

A loose cylinder head or a damaged cylinder head gasket allows exhaust gases containing strong corrosive acids, to enter the cooling system and this also hastens rust formation.

Grease that may enter the cooling system acts as a binder for the particles of rust causing the rust formation to build up in the water passages. The heat is blanketed in and the water is prevented from circulating properly.

Rust and lime formations finally prevent dissipation of the engine heat and the engine becomes overheated and the water boils which causes it to be forced out the radiator overflow pipe causing loss of anti freeze and water.

The overheating caused by this rusting and lime deposits will lead to burned valves, cracked cylinder heads, scored cylinders and pistons and possibly burned out bearings.

Keep the cooling system clean.

Clean the cooling system twice a year.

RUST AND CORROSION INHIBITOR

A good cleaning solution should be used to loosen the rust and scale before reverse flushing the cooling system. Hudson Radiator Cleaner and Inhibitor is an engineering tested preparation to use for this purpose.

Care must be used in the selection of a 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 drained, flushed, refilled, and new inhibitor added.

REVERSE FLUSHING

The 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.

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

Remove the upper and lower radiator hose and replace the radiator cap if it has been removed.

Attach a lead away hose at the top radiator connection.

Attach a piece of new hose at the lower radiator connection and insert the flushing gun in this hose. Connect the water hose of the flushing gun to a water tap and the air hose to an air line. 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 flushing until the water from the lead away hose runs clear.

Flush the cylinder block and cylinder head as follows

Attach a lead away hose to the water pump inlet and a length of new hose to the water outlet on the cylinder head. Close the by pass outlet if car is equipped with by pass water pump.

Insert the flushing gun in the new hose and turn on the water and when the water jacket is full

turn on the air in short blasts. Continue this operation first filling with water then turning the air on until the water from the lead away hose runs clear. decrease the efficiency of the heater.

ANTI FREEZE

When installing anti freeze it is necessary that:

1. Drain radiator and flush cooling system thoroughly.
2. Tighten cylinder head stud nuts.
3. Fill cooling system with required amount of anti freeze, see chart and have the engine warmed up so that the thermostat is open thus allowing the system to be filled completely.
4. Tighten cylinder head stud nuts again after engine is warm.
5. Check all water connections for leaks with engine hot.

WATER PUMP

Packless, centrifugal six vane pressure water pumps, Figure 3, are used on all models. A shaft seal compression spring is incorporated which holds against the shaft at all times.

The pump used on models 40, 41, 44, 45 and 48 has a single outlet, while the pump used on models 43 and 47 is provided with a small by pass in addition to the main outlet.

ANTI FREEZE FILLING CHART

6 Cylinder Models

	Hudson Anti Freeze			Ethylene Glycol (Preston or Equivalent)			Methanol or Denatured Alcohol		
Temperature	Quarts		Liters	Quarts		Liters	Quarts		Liters
	U.S.	Imp.	Metric	U.S.	Imp.	Metric	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	6 1/3	6	7
20°	8	5 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	3	6 1/2	7 1/2	9 1/2	8	9

FLUSHING HOT WATER HEATER

Hot water heaters should be flushed out separately. Rust deposits build up in the heater core just the same as they do in the radiator core and will the seal snugly

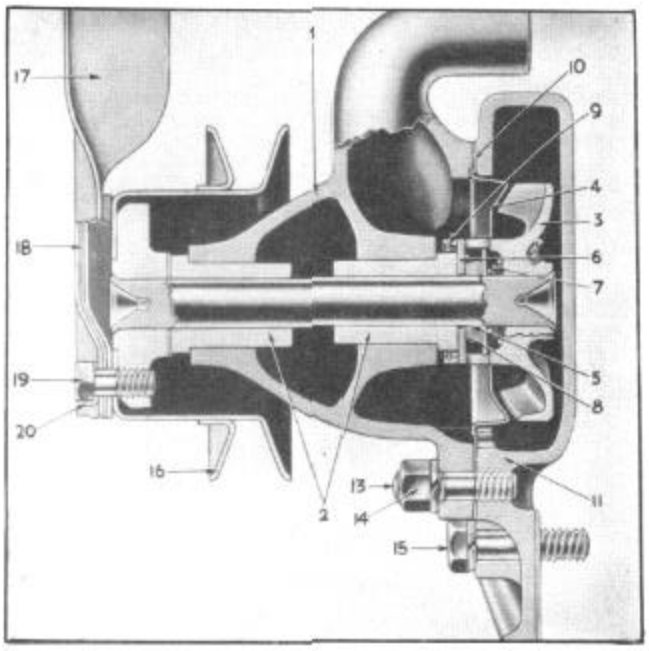


Figure 3--Water Pump

1. Water pump body assembly
2. Water pump body bushings
3. Water pump impeller
4. Water pump impeller cup
5. Water pump shaft seal
6. Water pump shaft seal thrust washer
7. Water pump shaft seal compression spring
8. Water pump shaft seal retainer
9. Water pump shaft seal retainer spring
10. Water pump body gasket
11. Water pump impeller housing assembly
12. Water pump impeller housing gasket
13. Water pump impeller housing stud
14. Water pump impeller housing stud nut
15. Water pump impeller housing to cylinder bolt
16. Pulley
17. Fan blade
18. Fan blade cushion
19. Fan blade bolt
20. Fan blade bolt lock

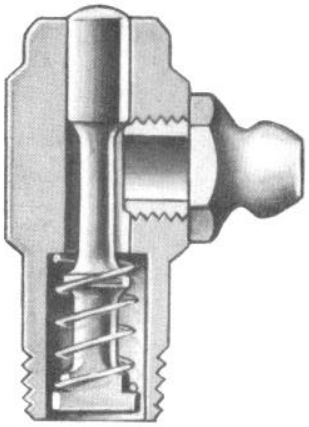


Figure 4--Water Pump Grease Fitting

The special grease fitting shown in Figure 4 is constructed to prevent the insertion of too much lubricant. When the reservoir in the water pump is filled with lubricant the plunger rises and cuts off the flow of grease from the gun thus preventing a grease pressure being set up in the water pump reservoir forcing grease past the bushings and into the water.

The front and the rear bearings of the water pump shaft are lubricated from this central reservoir and a grease must be used that does not dissolve in hot water.

The ordinary viscous greases suitable for chassis lubrication should not be used in the water pump. Wear and heat always make it possible for grease to get by the pump shaft bushings and into the water and therefore a grease that will not be dissolved by hot water must be used.

The only lubricant recommended is Aluminum Soap Base Grease. See Lubrication Section for specifications.

WATER HOSE LENGTHS RADIATOR AND WATER PUMP

Hose Dimensions are as follows:

		MODELS	I.D.	LENGTH
152555	Cylinder water outlet to radiator	40 41 42 43 48	1 1/2"	10"
159698	Cylinder water outlet to radiator	44 45 47	1 1/2"	7 3/4"
150243	Water pump outlet hose	all	1 1/2"	3 1/4"
150244	Water pump by pass hose	43 47	1"	2 5/16"
159699	Radiator to water pump hose	44 45 47	1 5/8"	10"
150550	Radiator to water pump hose	40 41 42 43 48	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 cutter tool K M 0 102.

WATER PUMP REMOVAL

1. Drain cooling system.
2. Loosen generator and swing toward the engine in order to relieve tension on the fan belt.
3. Remove hose leading to radiator.
4. Remove the two cap screws and washers that attach water pump to engine.
5. Remove water pump assembly.

WATER PUMP REPAIR KIT

The following parts have been made into a repair kit and sold under part number 159132 because it has been found that these parts are most frequently required when an overhaul of a water pump is necessary.

2 150288 Water pump bushing
1 158938 Water pump impeller
1 150226 Water pump shaft and pulley hub 1 155290 Water pump shaft seal
1 150232 Water pump shaft seal thrust washer 1 150233 Water pump shaft seal compression spring
1 158939 Water pump shaft seal compression spring washer
1 157895 Water pump shaft seal retainer
1 150235 Water pump shaft seal retainer spring 1 150219 Water pump body gasket
1 150222 Water pump impeller housing gasket

This list is provided for convenience and contains only parts necessary for replacement on frozen or worn water pumps.

WATER PUMP REPAIR KIT

The water pump repair kit J 733 A, Figure 5, should be used in making all water pump repairs.

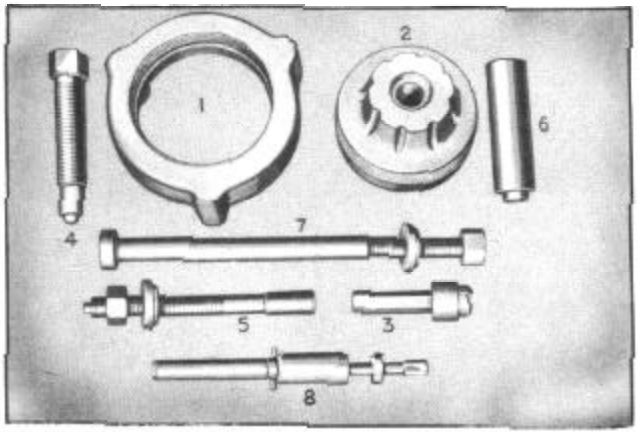


Figure 5--Tool Set

1. Body
2. Thumb screw
3. Cutter
4. Driver
5. Bushing puller
6. Driver
7. Bushing pilot
8. Burnishing tool

WATER PUMP DISASSEMBLY

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. Assemble the body (No.1) of the water pump reconditioning set (J 733 A Figure 5) to the water pump with the three attaching studs.
4. Clamp the pulley flange in a vise.
5. Insert the cutter (No.3) into the thumb screw (No.2) and then assemble them into the body (No.1) as illustrated in Figure 6.

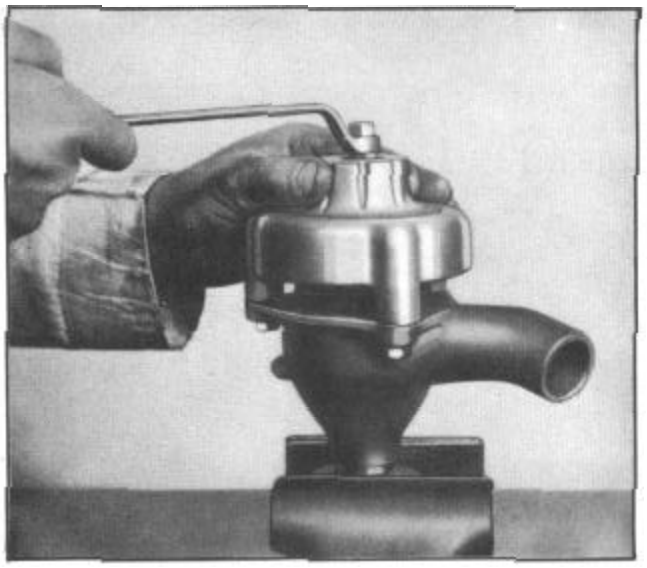


Figure 6--Cutting Burr from Shaft

6. Turn the cutter with an end wrench and apply a slight pressure with the thumb of the hand at the same time. This will cut the burr end of the impeller shaft.
7. After the burr has been removed the thumb screw and cutter are removed and the driver (No.4) is inserted into the thumb screw. Reassemble the thumb screw with its driver into the body (No.1) and turn the driver thereby pressing the shaft through the impeller as illustrated in Figure 7.

Figure 7--Removing water pump shaft

8. Remove thumb screw and driver from the body (No.1).

9. Assemble the bushing puller (No.5) in the thumb screw placing the washer and nut on top.

10. Screw the thumb screw (No.2) in place in the body and thread the bushing puller (No.5) into the rear bushing until the puller has taken a firm hold, as illustrated in Figure 8. Pull the rear bushing by turning the nut and holding the thumb screw in place at the same time.

Figure 8--Removing the Rear Bushing

11. Remove the thumb screw (No.2) and install the driver (No.4) in the thumb screw and place driver (No.6) against the front bushing.

12. Install thumb screw (No.2) with driver (No.6) in the body (No.1) and press out the front bushing as illustrated in Figure 9.

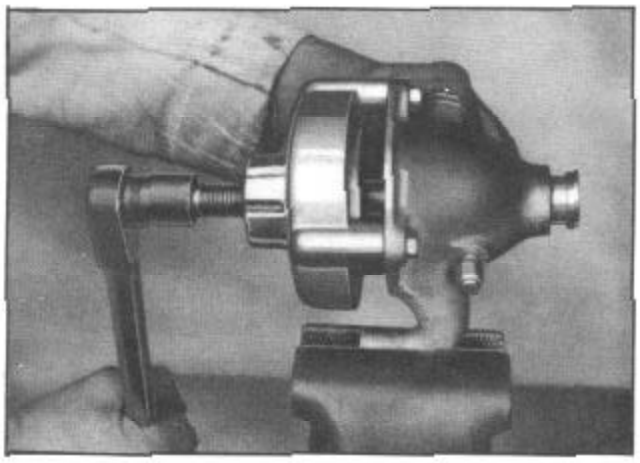


Figure 9--Removing Front Bushing

13. Disassemble the water pump impeller assembly by taking out the seal retaining spring. (No.9) Figure 2, seal thrust washer (No.6) shaft seal (No.5) seal retainer (No.8); and seal compression spring (No.7).

Replace any parts showing wear.

WATER PUMP SHAFT BUSHINGS

The inside diameter of water pump shaft bushings is .6205" to .6206" out of the water pump. The inside diameter of these bushings after being pressed into the water pump is .6185" to .6190".

The shaft clearance between it and the bushings is .0015" to .0025" and to obtain this clearance the bushing pilot (No.7) in the reconditioning set J 733 A (Figure 5) must be used.

NOTE: The bushings cannot be reamed or cut in any way because of their composition. Hammer blows will cause the bushings to collapse.

CAUTION: Too much clearance will allow the shaft to wobble which forces the thrust washer

(stainless steel) out of its line with the bushings thrust face and causes a water leak.

RE ASSEMBLING WATER PUMP

1. Install the front bushing so that it is just started into the water pump body and then insert the pilot (No.7) through the bushing and the water pump body as illustrated in Figure 10.

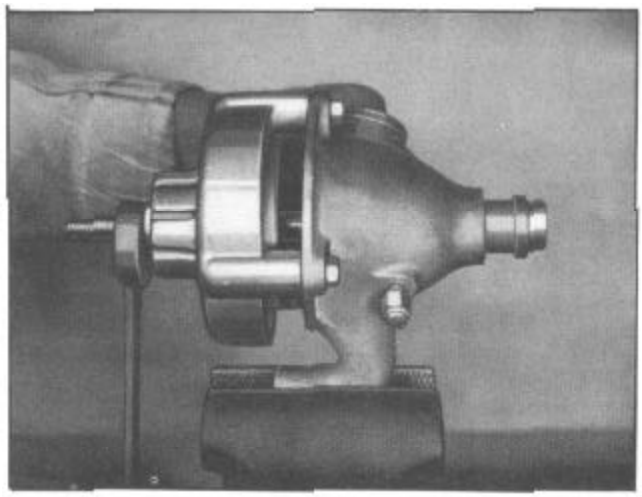


Figure 10--Installing Front Bushing

2. Place the washer and nut on the pilot and pull the bushing into place by turning the pilot.

3. Remove the pilot. Install the rear bushing so that it is just started into the water pump body.

4. Insert the pilot through both bushings and also through the thumb screw, as illustrated in Figure 11.

5. Place the washer and nut on the pilot and pull the rear bushing into place by turning the pilot.

6. Place the burnishing tool (8) supplied in repair kit in the rear bushing just installed. Install the thumb screw (No. 2) over the hex end of the burnishing tool and screw thumb screw into the body (No.1).

7. Hold the thumb screw finger tight and spin the burnishing tool (DO NOT stop the spinning motion) using a socket wrench.

CAUTION: If the turning of the burnishing tool is stopped while pressure is on it, a crease will be formed across the face of the bushing.

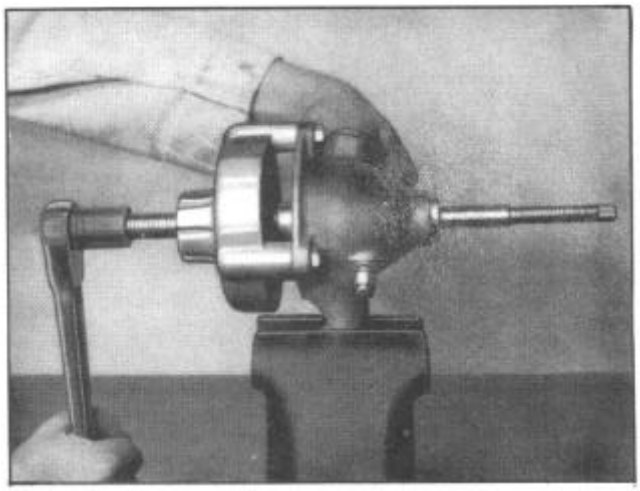


Figure 11--Installing Rear Bushing

8. Repeat the burnishing until a highly polished face is produced. The face must be free of dents, burrs or scratches.

INSTALLING WATER PUMP SHAFT AND IMPELLER

1. Install the shaft assembly with the impeller • assembly in the water pump body.
2. Place the pulley flange on a solid surface and peen the end of the pump shaft.

NOTE: Check the end play between the pulley flange and the front face of the bushing.
The end play should be from .010" to .014".

3. Assemble impeller housing to the body and install fan pulley and blades.

INSTALLING WATER PUMP

1. Always fill the water pump grease reservoir with an aluminum soap base lubricant.
2. Install the pump and fasten with the two cap screws and washers.
3. Install fan belt and adjust the tension to 3/4". (see Figure 12).
4. Tighten generator and adjustment bolts and nuts.
5. Fill cooling system.

FAN BELT ADJUSTMENT

The fan belt is adjusted by swinging the generator on its mounting. Since the fan belt is of the "V" type construction it does not require tension to prevent its slipping.
A slight amount of slack must be allowed to prevent an overload being placed on the water pump and generator bearings.
1. Loosen the two generator bracket bolt nuts D and E (Figure 12) adjusting the arm nut F and bolt holding adjusting arm to cylinder block.
2. 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), Figure 12.
3. Tighten adjusting arm bolt nut and generator mounting bracket nut.

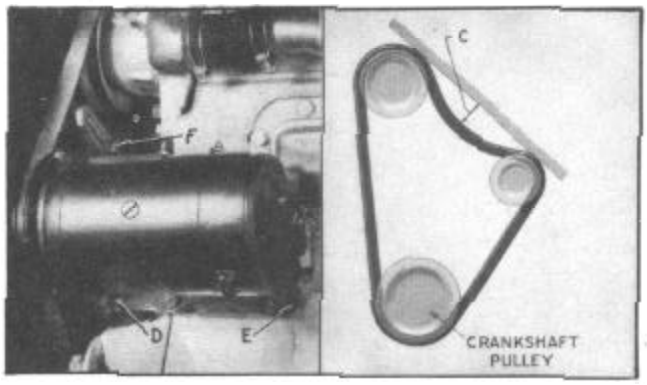


Figure 12--Adjusting Fan Belt

TESTING THERMOSTAT

The temperature at which the thermostat opens is very important and it should be checked whenever the complete cooling system is being checked.
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. Thermostats that:
Do not open completely
Open at too low a temperature
Open at too high a temperature
should be discarded. 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 the engine may overheat.

WATER TEMPERATURE GAUGE

The water temperature gauge is an electric type gauge using bi metal arms on which heating coils are wound in both the engine unit and the dash unit.

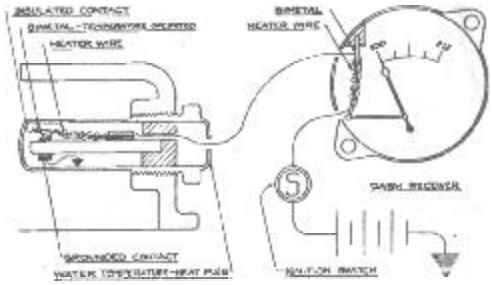


Figure 3--Temperature Gauge
Low Temperature Operation

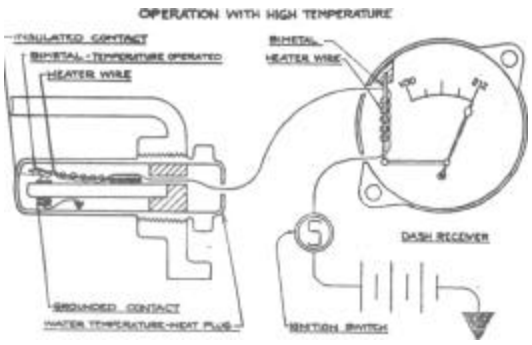


Figure 14--Temperature Gauge
High Temperature Operation

The engine unit consists of a fixed grounded contact so positioned that the bi metal against which it presses is bent mechanically.

At low temperatures, considerable heat is required to make this bi metal bend away from the grounded contact. With the temperature of the engine cooling water low, all of this heat must be made electrically and this same current flowing through the heater wire of the dash unit creates an equal amount of heat there and results in bending of the dash unit bi metal 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. This gives a higher temperature reading.

One wire connects the engine unit to the dash unit.

The same testing and replacing instructions apply as for the Fuel Level gauge.

WATER TEMPERATURE GAUGE

The Fuel and Temperature cluster assembly is attached by three screws.

The at rest position of the indicator hand is at the "H" or hot end of the dial.

A cylinder head temperature element is at the left side of the cylinder head at the rear and it is connected to the water temperature indicator on the instrument panel.

All wiring connections should be tight both at the cylinder head temperature element and at the indicator.

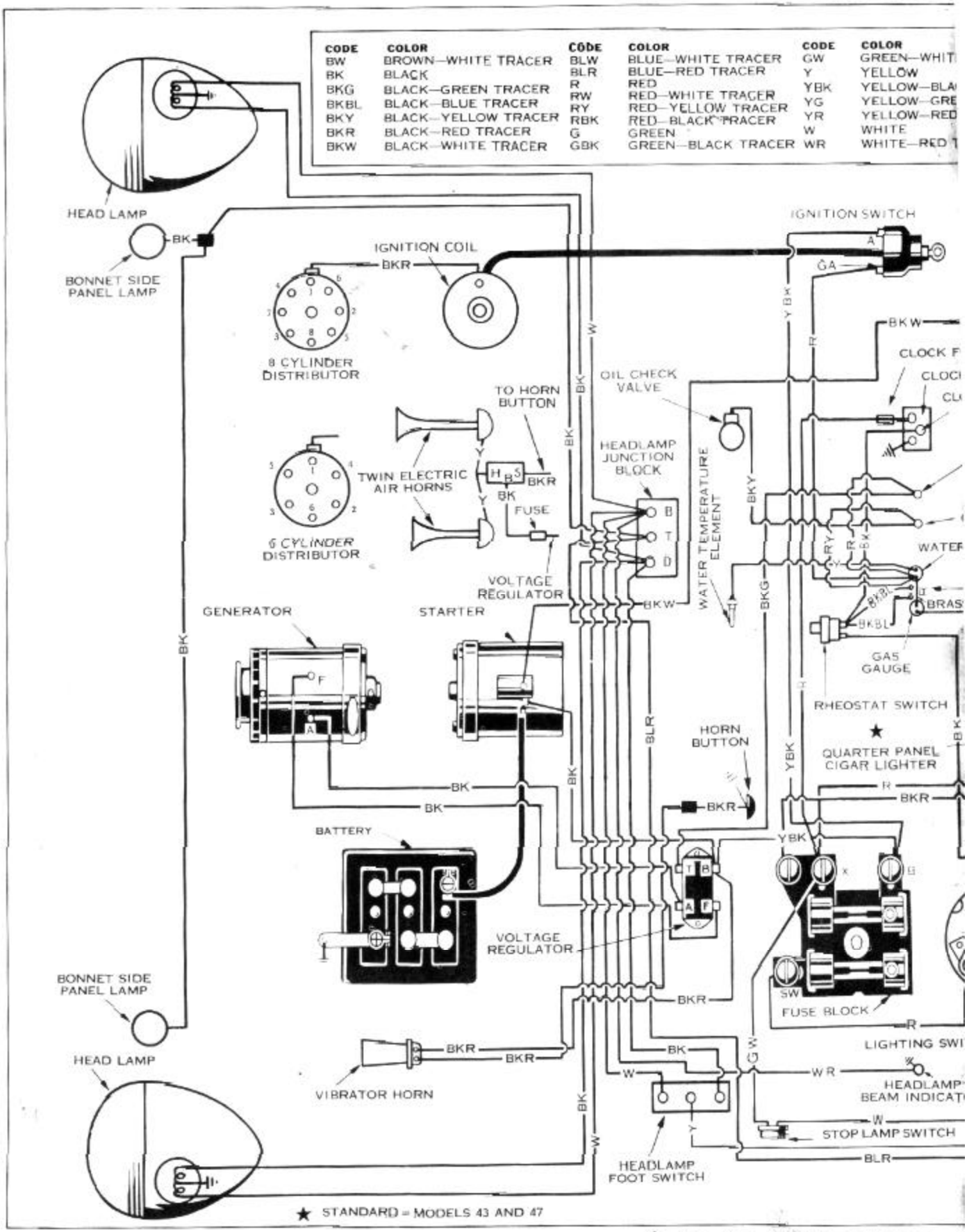
It is impossible to repair or adjust either the element or the indicator.

INDEX

AUTO LITE EQUIPMENT

Model	Generator	Voltage Regulator	Starting Motor	Starting Switch	Distributor	Ignition Coil
40	GDS 4801 A	VRR 4001 A	MZ 4079	RBM 2214	IGW 4203	IG 4662
41	GEC 4801 A	VRR 4001 A	MZ 4079	RBM 2214	IGW 4203	IG 4662
43	GEC 4801 A	VRR 4001 A	MZ 4079	RBM 2214	IGW 4203	IG 4662
44	GEC 4801 A	VRR 4001 A	MAB 4103	RBM 2214	IGP 4008 A	IG 4641
45	GEC 4801 A	VRR 4001 A	MAB 4103	RBM 2214	IGP 4008 A	IG 4641
47	GEC 4801 A	VRR 4001 A	MAB 4103	RBM 2214	IGP 4008 A	IG 4641
48	GDS 4801 A	VRR 4001 A	MZ 4079	RBM 2214	IGW 4203	IG 4662

HUD



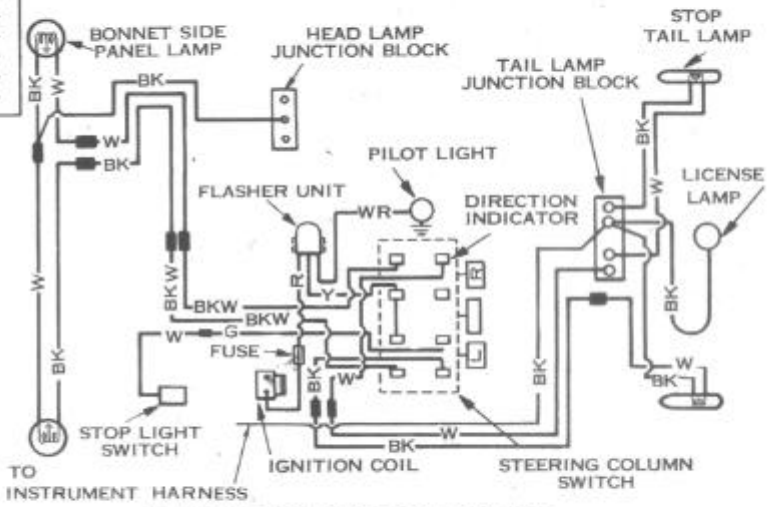
1940 - WIRING

ON

RACER	FUSE DATA		
	Circuit	No. Used	Capacity
TRACER	LIGHTING	1	20 AMP.
TRACER	ACCESSORY	1	20 AMP.
RACER	OVERDRIVE	1	20 AMP.
	HORNS	1	30 AMP.
CER	CLOCK	1	2 AMP.
	DIRECTION INDICATOR	1	10 AMP.

INDICATING FUSE

INDICATING WIRE CONNECTOR

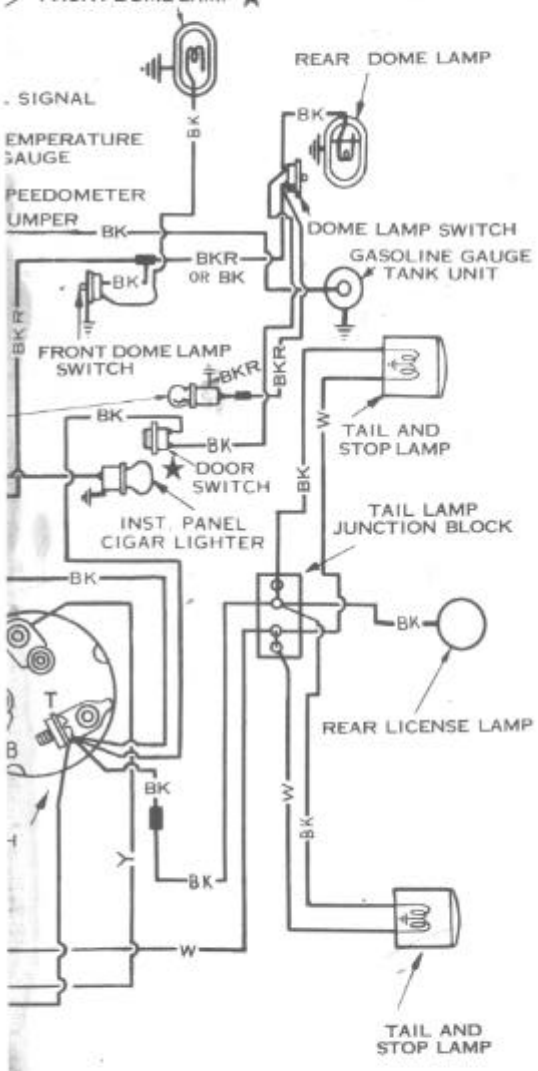


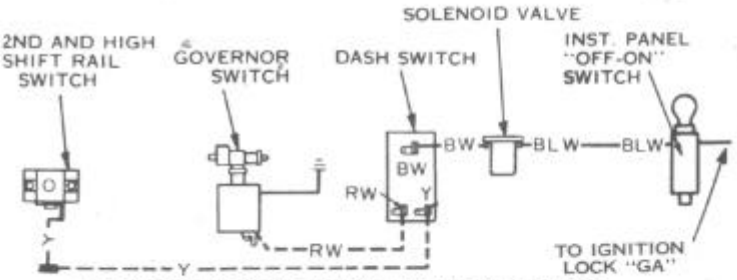
★ WIRING FOR DIRECTION INDICATOR

STARTER BUTTON

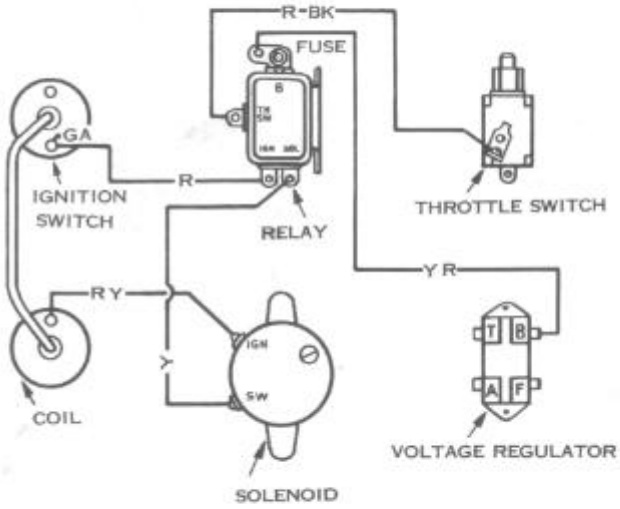
GENERATOR SIGNAL

K LIGHT





WIRING FOR AUTOMATIC VACUUM CLUTCH CONTROL
(OPTIONAL EQUIPMENT)



WIRING FOR OVERDRIVE (OPTIONAL EQUIPMENT)

IAGRAM - 1940

Position	C. P.	Base	Voltage	Mazda No.
Headlamp-domestic	Sealed Beam Type		6-8	
Bonnet side panel	1-1/2	S.C.	6-8	55
Bonnet side panel- with direction indicator	21-3	D.C.	6-8	1154
Instrument	1-1/2	S.C.	6-8	55
Stop and tail	21-3	D.C.	6-8	1154
License lamp	3	S.C.	6-8	63
Dome	15	S.C.	6-8	87
Beam indicator	1	S.C.	6-8	51
Speedometer - Models 40, 41, 44, 45, 48	1	S.C.	6-8	51
Speedometer - Models 43, 47	1-1/2	S.C.	6-8	55
Radio	1-1/2	S.C.	6-8	55
Gen. and oil indicator	1	S.C.	6-8	51
Direction indicator	1	S.C.	6-8	51
Mechanical clock	1-1/2	S.C.	6-8	55
Electric clock	1-1/2	S.C.	6-8	55

GENERATOR SPECIFICATIONS (GDS 4801 A) -
Models 40, 48

Rotation	C.W.D.E.
Charging rate	8 volt
Control	3rd brush and vibrating voltage regulator
Fuse	None
Brush spring tension	53 ounces maximum with new brushes
Bearings--commutator end	Bronze
Bearings--clearance	.001" to .0025"
Bearings--Drive end	Ball

Field Current Draw

Volts	Amps. Max.	Amps. Min.
6.0	1.82	1.65
6.8	2.07	1.87
7.2	2.19	1.98
7.6	2.31	2.09

Motorizing Draw

6.0	5.45	5.10
6.8	5.65	5.38
7.2	5.80	5.50
7.6	6.00	5.65

Maximum output--cold

6.6	28.0	25.0	
7.0	29.7	27.0	
7.6	32.3	30.0	
8.0	34.0	32.0	
7.2		5.7	5.12
7.6		5.8	5.2

Maximum output--cold

6.6	35.0	30.2
7.0	36.6	31.9
7.6	40.3	35.7
8.0	43.0	39.0

Charging rate--hot (maximum)

Amperes	29
Voltage	8
R.P.M. (generator)	3400
Car speed Approx.	35 M.P.H.

Charging rate--hot (maximum)

Amperes	35
Voltage	8
R.P.M. (generator)	3800
Car speed	Approx. 43 M.P.H.

GENERATOR SPECIFICATIONS (GEC 4801 A)
Models 41, 43, 44, 45, 47

Rotation	C.W.D.E.
Charging rate	8 volt
Control	3rd brush and vibrating voltage regulator
Fuse	None
Brush spring tension	53 ounces maximum with new brushes
Bearings--commutator end clearance	Bronze .001" to .0025"
Bearing--Drive end	Ball

Field Current Draw

Volts	Amps. Max.	Amps. Min.
6.0	1.78	1.60
6.8	2.01	1.81
7.2	2.12	2.03

Motorizing Draw

6.0	5.4	4.85
6.8	5.6	5.03

VOLTAGE REGULATOR DATA (VRR 4001 A)
Used on All Models

Ground polarity	Positive
Volts	6

Carbon resistor marked 30, resistance 28 to 32 ohms
Circuit breaker (cutout relay)
Points closed 6.4 to 7.0 volts
Points open 6.0 amperes at 6.3 volts minimum to 6.4 volts maximum
Open circuit voltage at battery 6.3 min. to 6.4 max.

Armature speed at closing	825 R.P.M.
Amperes to open	6 amperes maximum discharge
Car speed at closing	9.4 M.P.H.
Operating voltage	7.1 to 7.4 volts at 70° F.

VOLT-AMMETER TESTER

The volt-ammeter tester KMO-330 is recommended for electrical tests.

Always connect a voltmeter in parallel (to the two points between which the difference in pressure is to be measured).

A voltmeter measures the electrical pressure available to cause current to flow and by connecting the voltmeter at a point of high electrical pressure and at a point of low electrical pressure the difference in pressure is measured between the two points.

AMMETER TEST

Always connect an ammeter in series in the circuit in which the current flow is to measured because it is a measure of the quantity of current that is flowing and therefore, must be connected so that the current flows through it.

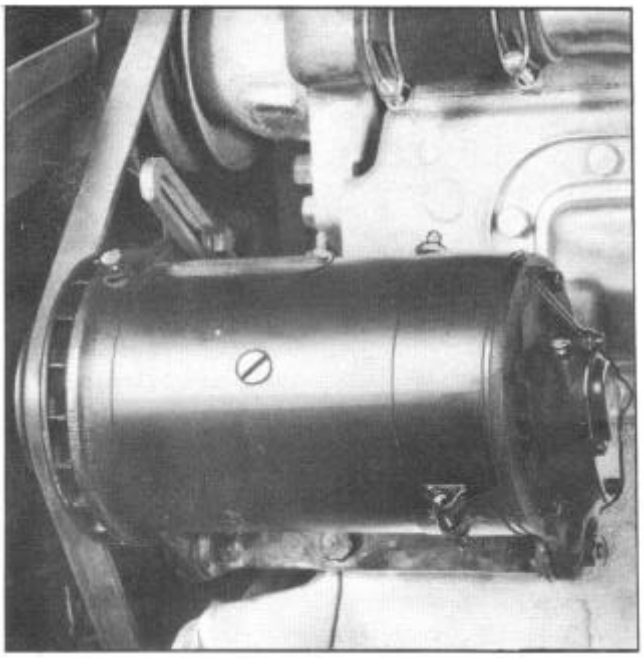


Figure 2--Generator

GENERATORS

All generators, Figure 2, 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.

VOLTAGE REGULATOR

The voltage regulator includes two individual units in the one housing. These are 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 and the voltage regulator which holds the voltage of the system constant within very close limits. The maximum current of the generator is controlled by the conventional third brush action.

The voltage regulator unit is temperature compensated by means of a nickel iron magnetic by-pass across the top of the regulator unit. The by-pass allows more of the magnetic flux to pass through it when cold than when it is hot. This affects the amount of flux needed to operate the contact points and causes the points to operate at a higher voltage under cold conditions than when operating under hot conditions. This compensation is needed to offset the variations in battery characteristics due to temperature changes.

By selecting this pre-determined voltage point at which the regulator is set a high voltage condition which may cause burned ignition points, burned out bulbs, damage to radio and other electrical devices is prevented.

The voltage regulator has a single winding which is connected directly across the generator brushes, see Figure 3. As the generator voltage reaches the value for which the regulator is set 7.1 to 7.4 volts at 700 F., the regulator armature vibrates,

opening and closing the regulator contact points.

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

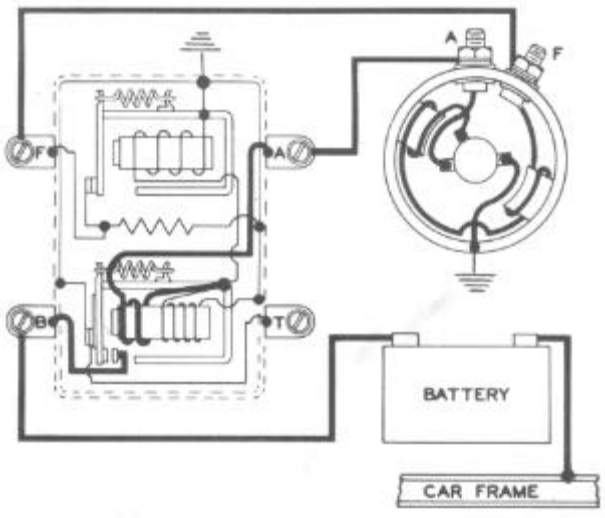


Figure 3--Voltage Regulator to Generator Wiring Diagram

CHECKING GENERATOR CHARGING RATE

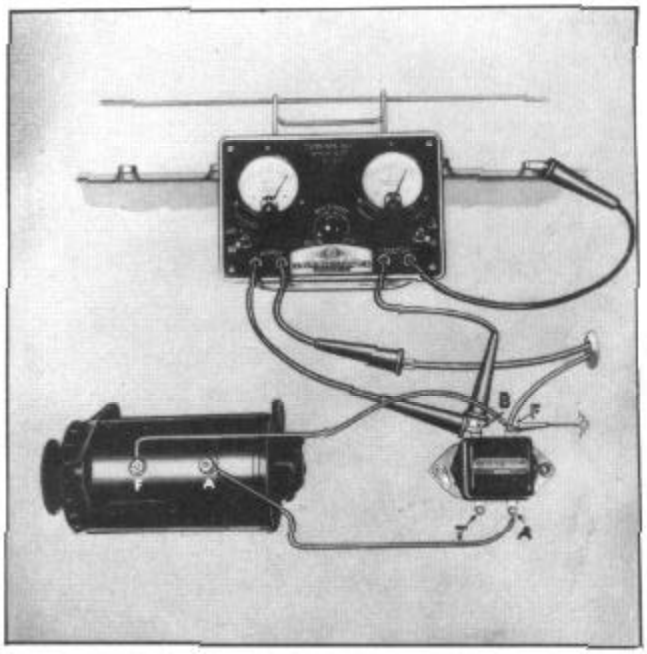


Figure 4--Checking Generator Charging Rate

1. Disconnect "BAT" lead at "B" terminal on voltage regulator, see Figure 4.

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

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 m.p.h. for 15 minutes to warm up.

6. With resistance turned "out" and engine running at speed corresponding to 35 m.p.h., at 8 volts, generator charging rate should be not less than 27 amperes on Models 40 and 48, see Figure 5. On all other models charging rate should be not less than 34 amperes, see Figure 6. Adjust third brush in a counter-clockwise rotation to increase output.

GENERATORS FOR SPECIAL DUTY

The generators used on all models are adequate to provide the necessary output under normal operation, this including radios, heaters and other electrical accessories.

When a car is to be used for special types of operation such as police prowl cars, highway patrol duty, or taxicab use special consideration should be given to the current output required. Special batteries may also be necessary in some instances.

In the case of police work most cars are operated with one or two-way radio. Prowl cars or cruisers are frequently driven at very low speeds at a point lower than the standard generator cut-in speed. On highway patrol cars where frequently high speeds

are maintained, still another operating condition will have to be considered and other types of equipment will be required.

Taxicab operation is in still another field of operation as quite frequently the engines are operating at idle speed when parked and also a portion of the operation is at low cruising speeds, lower than the standard generator cut-in point.

Special heavy duty generators with voltage regulators and batteries are available through the factory.

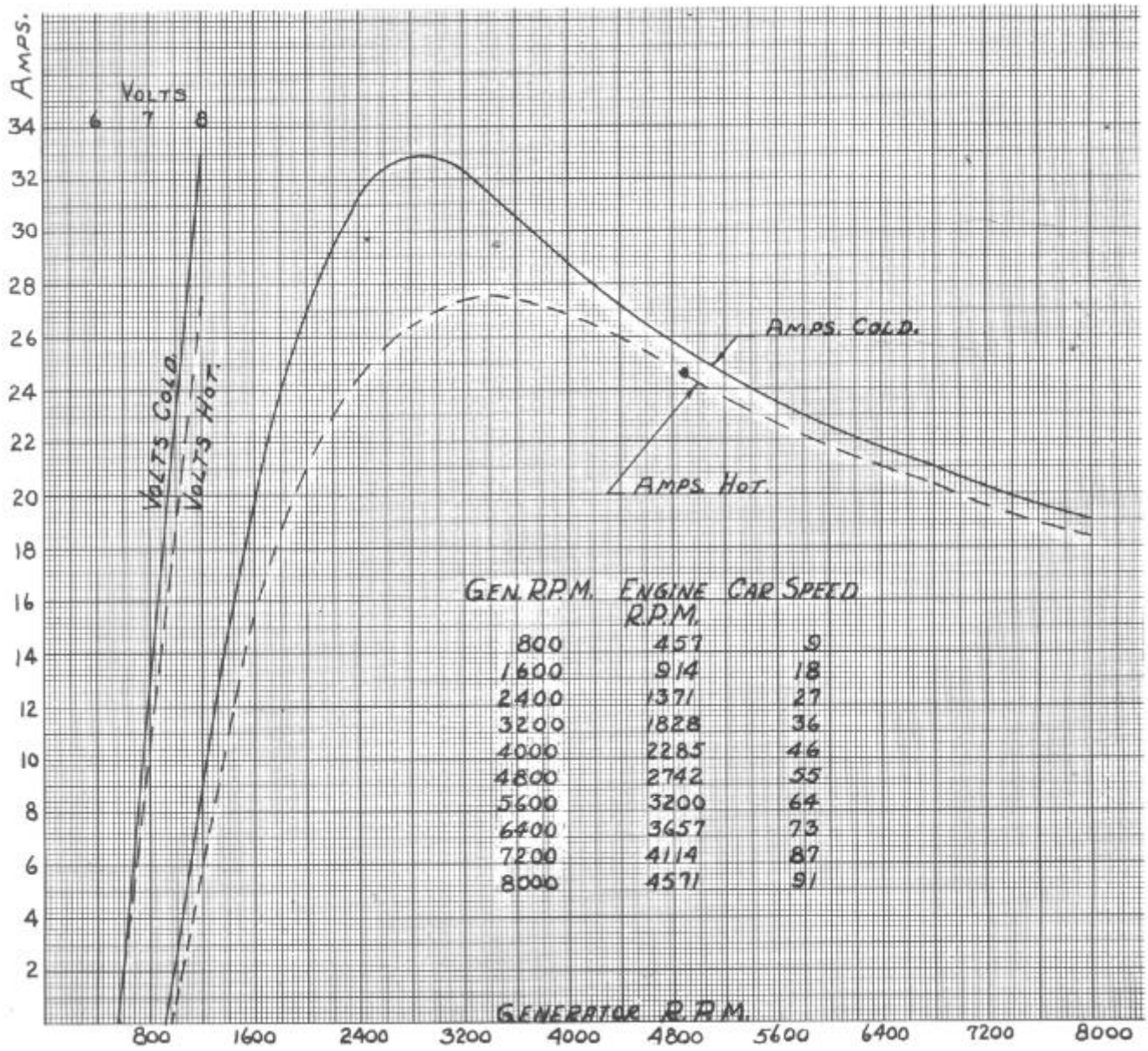


Figure 5--Generator Charging Curve - Models 40, 43

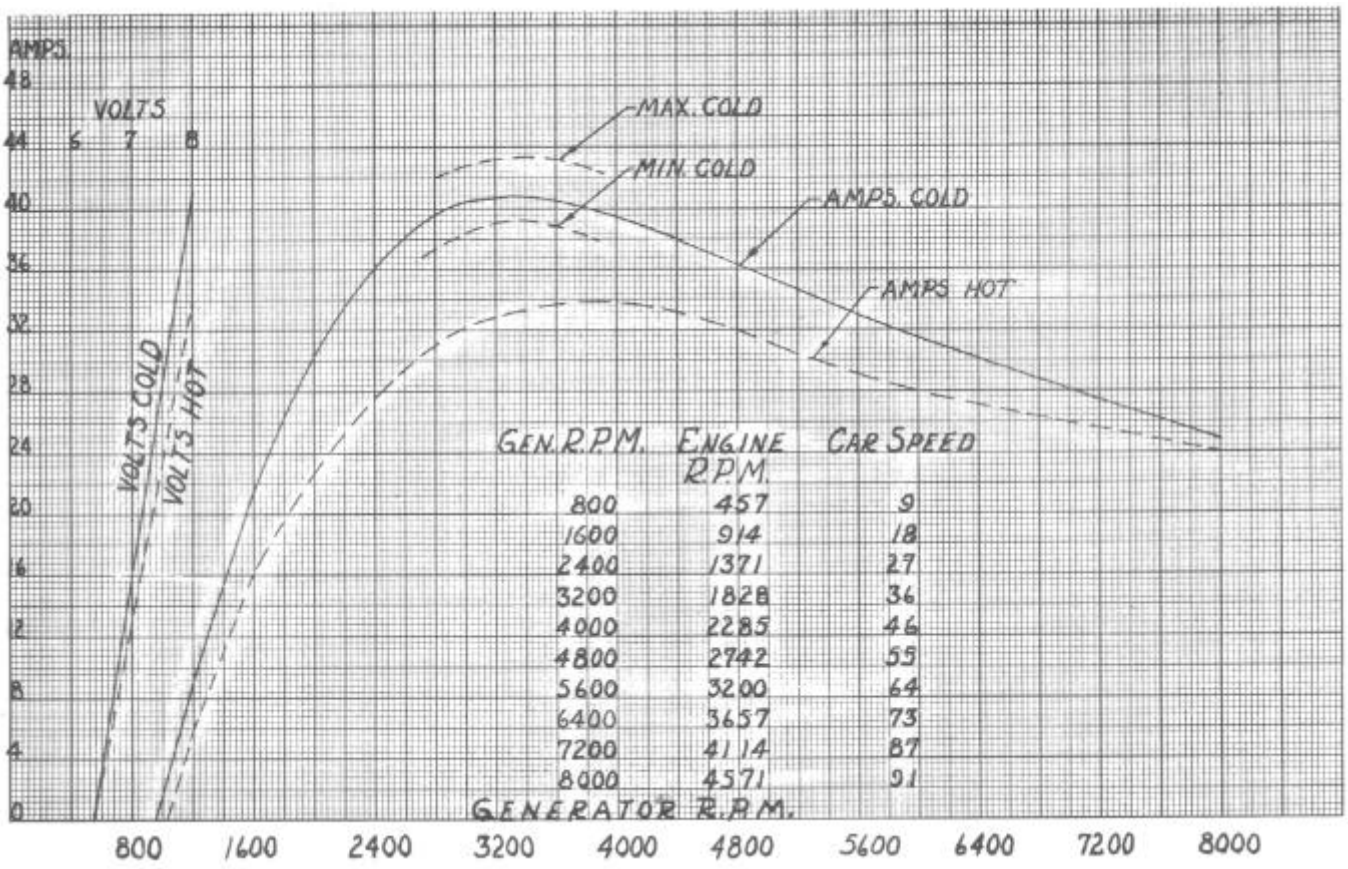


Figure 6--Generator Charging Curve
Models 41, 43, 44, 45 and 47

CHECKING VOLTAGE REGULATOR

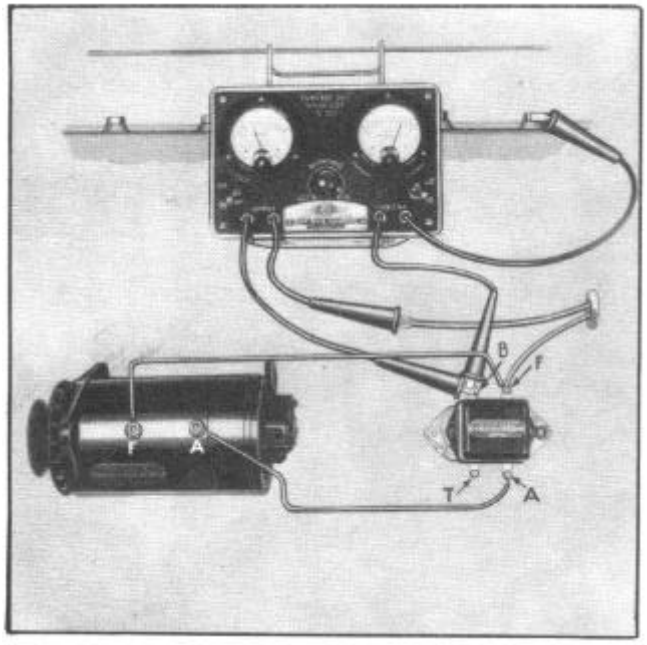


Figure 7--Checking Voltage Regulator

1. Disconnect "BAT" lead at "B" terminal on voltage regulator, see Figure 7.

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

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

4. Run engine at speed corresponding to 20, m.p.h. for 15 minutes to warm up.

5. Run engine at speed corresponding to 35 m.p.h. Turn "in" resistance until ammeter reads 10 amperes.

6. With regulator at temperature of 700 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.

GENERATOR TUNE-UP

The tune-up inspection includes an inspection of--

1. Commutator condition.
2. Brush condition.
3. Bearings for wear.
4. Connections throughout charging circuit.
5. Generator output.
6. Generator and line voltage.

Commutator that is dirty or discolored can be polished with No. 00 sandpaper. If worn or rough so that the mica and copper bars are nearly even or if the brushes are badly worn, it is best to remove the generator for repairing on the bench.

The bearing at the commutator end is an absorbent bronze plain bearing and can be checked for wear by lifting on the armature for noticeable play.

Clearance should be .001" to .0025".

The bearing at the drive end is a ball bearing and should be replaced if loose.

Lubrication is by means of hinged top oilers over the bearings at each end. Use light engine oil and a few drops is sufficient every 2000 miles.

GENERATOR DISASSEMBLY

Remove generator from the car and perform all work on the bench.

Place the generator in a bench vise and use the vise as a holding fixture. Do not pinch the generator frame.

Remove the generator pulley using puller J 354. It is held by the armature shaft nut and woodruff key. See Figures 8 and 9. Remove the commutator cover band; brush lead screws; two through bolts and commutator end plate assembly.

The commutator end bearing should be thoroughly checked for wear. The drive end bearing should be thoroughly cleaned and should be packed not over one-half full with high temperature grease before reassembly in the drive end head.

When new brushes are installed, they should be carefully sanded in so as to have at least a 75% bearing on the commutator and then run in long enough to have a perfect fit before any attempt is made to set the generator output.

Check to determine that the brush holder springs have enough tension to hold the brushes snugly against the commutator. This should be 53 ounces maximum with new brushes measured by J 544 checking scale.

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 specifications on page 2 for the generator that is being tested.

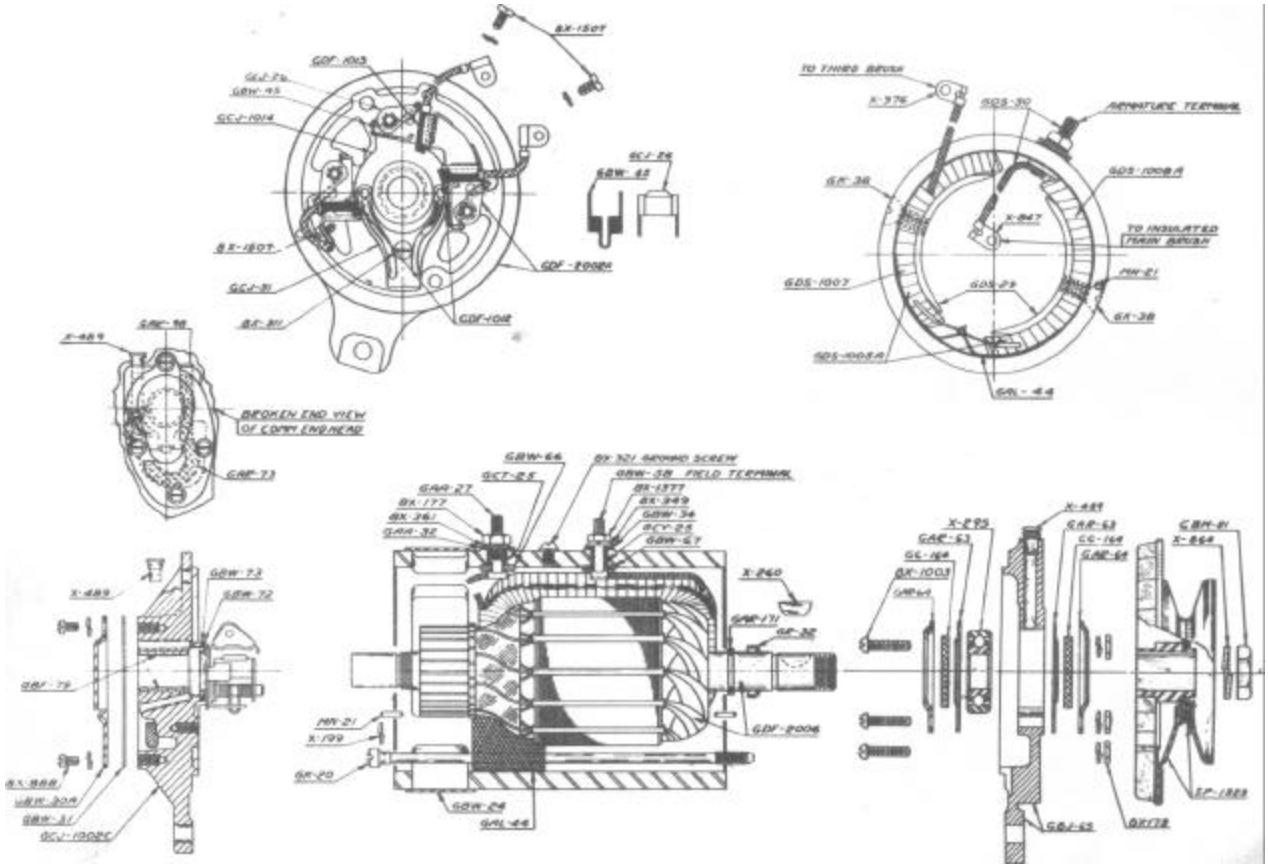


Figure 8--Generator - GDS-4801 A - Models 40, 48

Remove the drive end head with armature.

Remove the screw nuts holding the drive end head bearing retainer; drive end head bearing felt washer and felt guard.

The drive end ball bearing should be removed with puller J 354.

NOTE: The use of this tool will prevent damage to the bearing and armature.

GENERATOR OVERHAUL

At the time the generator is disassembled the commutator will probably need turning and undercutting. When undercutting be sure to undercut the mica square, the full width of the slot and 1/32 inch deep.

GENERATOR REASSEMBLY

Assemble the drive end bearing; the retainer; felt washer and felt guard to the head. Place drive pulley on armature shaft and place the lock-washer and nut on the end.

Turning the armature shaft end nut will force the bearing and pulley onto the shaft without any necessity of pounding on the shaft which might prove very injurious.

Assemble the armature and drive end assembly to the generator frame. Assemble the commutator end frame assembly, the through bolts and connect up the brush leads.

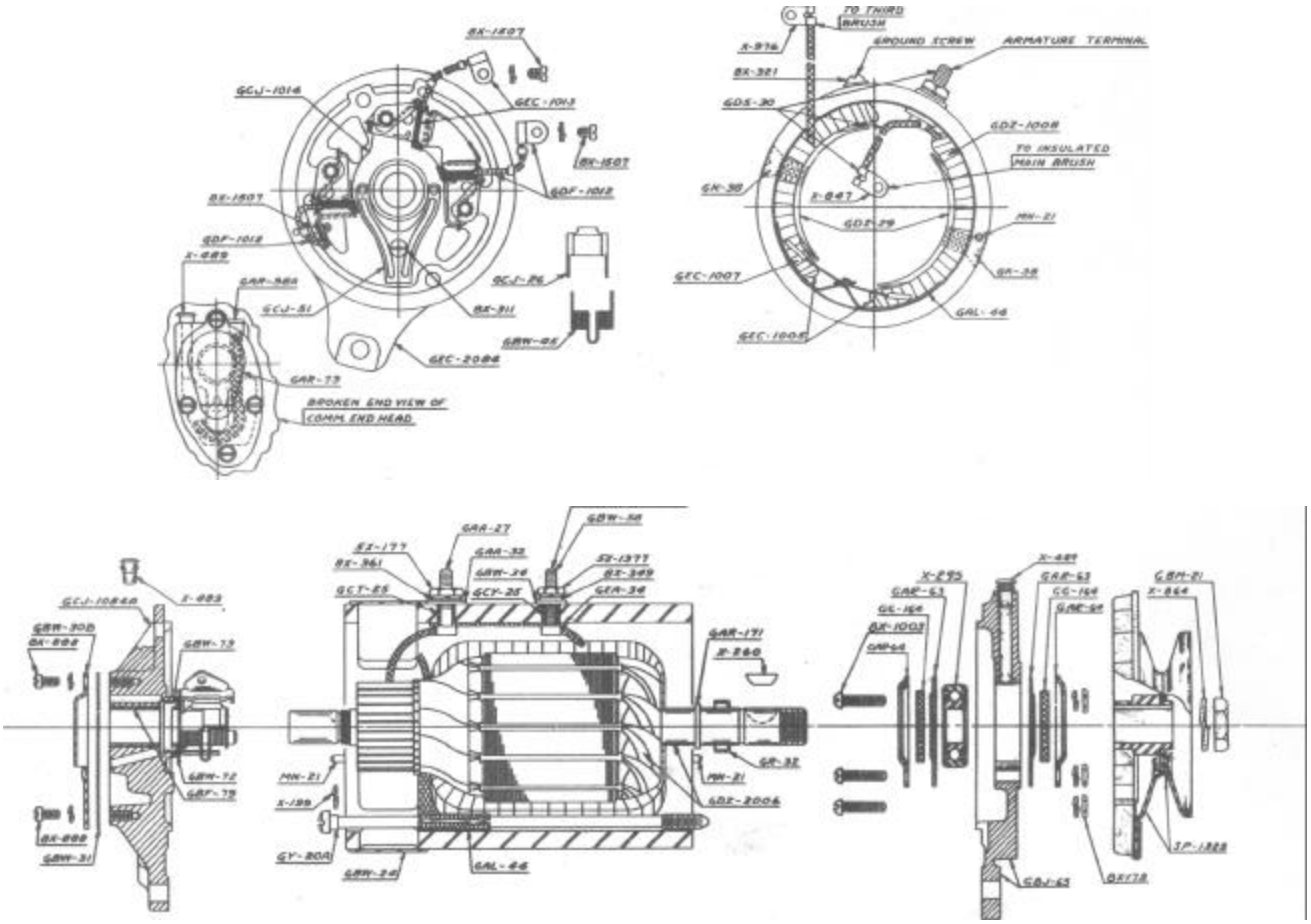


Figure 9--Generator - GEC-4801 A -
Models 41, 43, 44, 45 and 47

GENERATOR LUBRICATION

The generator front and rear bearing oilers (A and B), Figure 10, should be lubricated with a few drops of light engine oil every 2,000 miles. Be careful not to over-oil as too much lubricant nay damage the field coils and brushes.

FAN BELT ADJUSTMENT

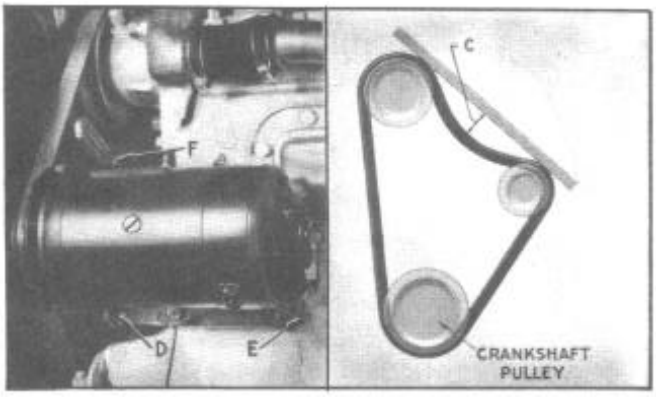


Figure 10--Generator Lubrication and
Fan Belt Adjustment

The generator pulley is driven by the "V" type fan belt. To prevent slippage and overloading the generator bearings and water pump bushings it is essential that the fan belt be adjusted to provide 3/4" slack in the belt, measured between the fan pulley and generator pulley as shown at "C", Figure 10.

To adjust, if necessary, loosen mounting bracket nuts (D, E and F) and swing generator to the right (toward the engine) to decrease tension, or to the left (away from engine) to increase tension.

GENERATOR RUNNING AS A MOTOR

Using a storage battery, an ammeter and the generator to be tested connect the field terminal to ground using a jumper lead. Place negative lead of battery on the generator armature "A" terminal and the positive to ground. This will operate the generator as a motor.

See specifications on page 2 for motorizing draw on type of generator 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

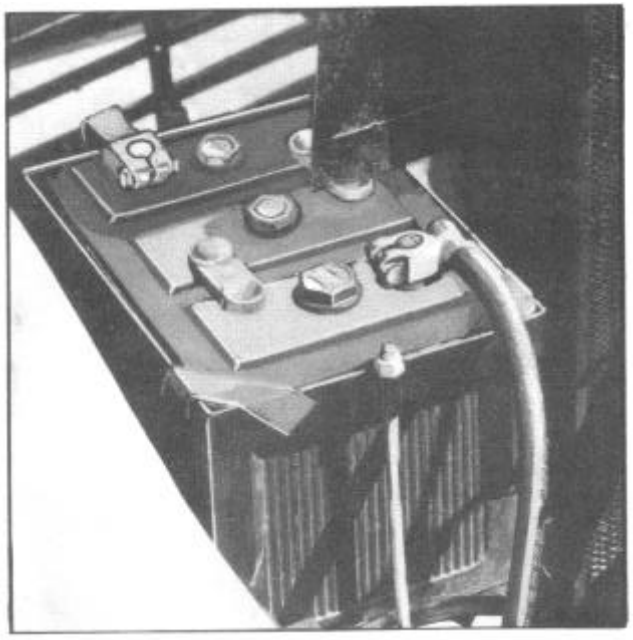
engine and speed it up. The generator charge indicator light should go out and stay out as long as the engine is running above idle speed. Turn off the ignition until the engine stops, then turn it on again. The generator charge indicator light should turn on, indicating that the circuit breaker points are not stuck.

BATTERY

6 cylinder models	17 plate National
8 cylinder models	19 plate National

Dimensions
6 cylinder 10 9/16" long 7 1/4" wide 7 13/16" high 8 cylinder 11 3/4" long 7 1/4" wide 7 13/16" high
Terminal grounded Positive

The battery on all models is located in the engine



compartment just back of the radiator core on the left side and is accessible for servicing by raising the hood.

Figure 11--Battery Position

To preserve the battery life it should be kept in a fully charged state at all times. Periodic checking with a hydrometer will disclose the specific gravity which should be maintained between 1250 to 1290 at 700 F. If the battery is permitted to remain in a low state of charge the plates will become sulphated, shortening its potential life.

The only service required by the battery other than periodic hydrometer reading is to keep the water level at least 3/8" above the plates. During cold weather distilled water should be added at least once a month. Be sure to add water just before driving the car to prevent it from freezing before it mixes with the electrolyte. In warm weather add water at least every two weeks.

Keep battery hold-down bolts and battery connections tight at all times.

CHECKING BATTERY CAPACITY

1. Take hydrometer gravity reading. Gravity should be 1250 to 1290 at 700 F.
2. Connect positive voltmeter lead to positive battery terminal - negative voltmeter lead to negative battery terminal, see Figure 12.

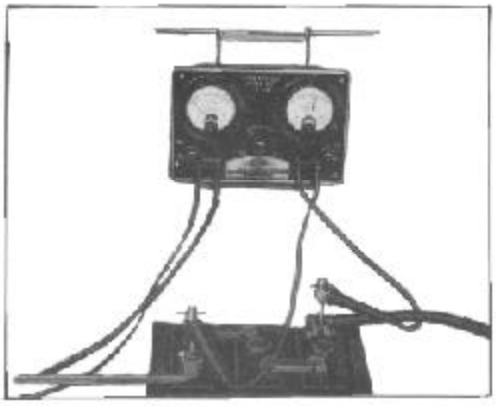


Figure 12--Checking Battery Capacity

3. Without current draw voltmeter reading should be 6 to 6 1/2 volts.
4. If gravity or voltage is low recharge battery.

STARTING MOTOR DATA (MZ-4079) -
Models 40, 41, 43, 48 (6 cylinder)

Rotation	C.W.D.E.
Volts	6
Brush spring tension	42 to 53 ounces with new brushes
Bearings	Bronze (two)
End play	1/16" maximum
Drive	Left hand inboard bendix

Tests	Ampere draw	Volts	R.P.M.
Without load and with bendix	70	5.5	4300

	Amps.	Volts	Load in foot pounds	R.P.M.
With load	100	5.5	.65	2500
	200	5.0	2.55	1325
	300	4.5	4.95	750
	400	4.0	7.65	220
Stall torque test	260	2.0	4.3	
	380	3.0	7.75	
	540	4.0	12.20	

See Torque Chart, Figure 13

STARTING MOTOR DATA (M.A.B. 4103) -
Models 44, 45, 47 (8 cylinder)

Rotation	C.W.D.E.
Volts	6
Brush spring tension	42 to 53 ounces with new brushes
Bearings	Bronze (two)
End play	1/16" maximum
Drive	Left hand inboard bendix

Tests	Amps.	Volts	Load In foot pounds	R.P.M.
Without load and with bendix	100	5.5	0.7	2200
	200	5.0	3.4	1240
With Load	300	4.5	6.4	795
	400	4.0	9.65	450

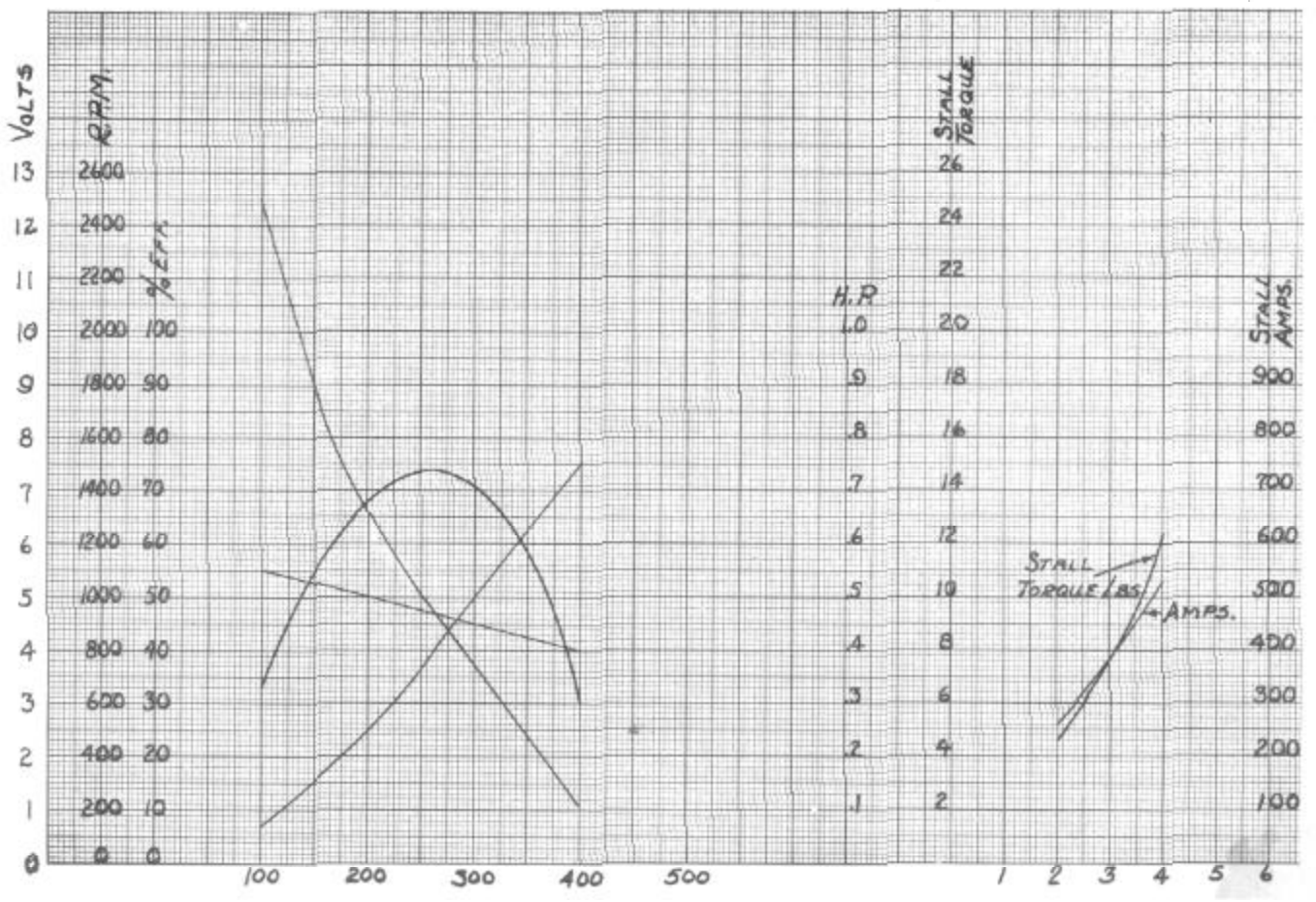


Figure 13--Starting Motor Torque
Models 40, 41, 43 and 47

Stall torque without switch	388	2.0	9.2
	582	3.0	15.8
	775	4.0	22.5
Stall torque with switch	375	2.0	8.7
	575	3.0	15.2
	750	4.0	21.5

See Torque Chart, Figure 14.

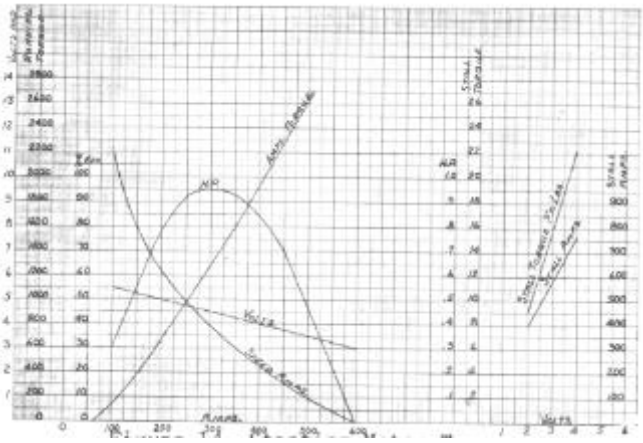


Figure 14--Starting Motor Torque
Models 44, 45 and 47

STARTING MOTOR

Starting motors on all models are operated by a solenoid switch mounted on top of the starting motor case, controlled by a push button located on the instrument panel.

An inboard Bendix drive is assembled on the end of the starting motor armature shaft which operates in two absorbent bronze bearings. Each bearing is provided with a separate oiler - the front oiler being of the swinging cover type and the rear of the hinged top design.

The starting motor used on Models 40, 41, 43 and 1 48, illustrated in Figure 15, is of 4 inch diameter and the unit used on Models 44, 45 and 47, shown in Figure 16, is 4 1/2 inches in diameter.

STARTING MOTOR TUNE-UP

The tune-up of a starting motor should include a check of the brushes and commutator, cleaning of the commutator, a check of the bearings for wear and lubrication of the bearings.

The starting switch should be given a voltage drop test for possible burnt contacts.

The starting circuit should also be given a voltage test to be sure there is no loss of starting motor efficiency due to poor or corroded connections or improperly soldered terminals. In making this check particular attention should be given the ground connection.

STARTING MOTOR LUBRICATION

All starting motor commutator end bearings are provided with an oil hole accessible by swinging the oil hole cover to one side. This oil hole is located on the end of the bearing housing. A hinged top oiler is located at the drive end for cranking read voltage.

3. Difference between first and second readings should not be greater than .25 volt. If greater than this, check battery cables and cable connections.

4. Check and tighten screws at "B" terminals of fuse

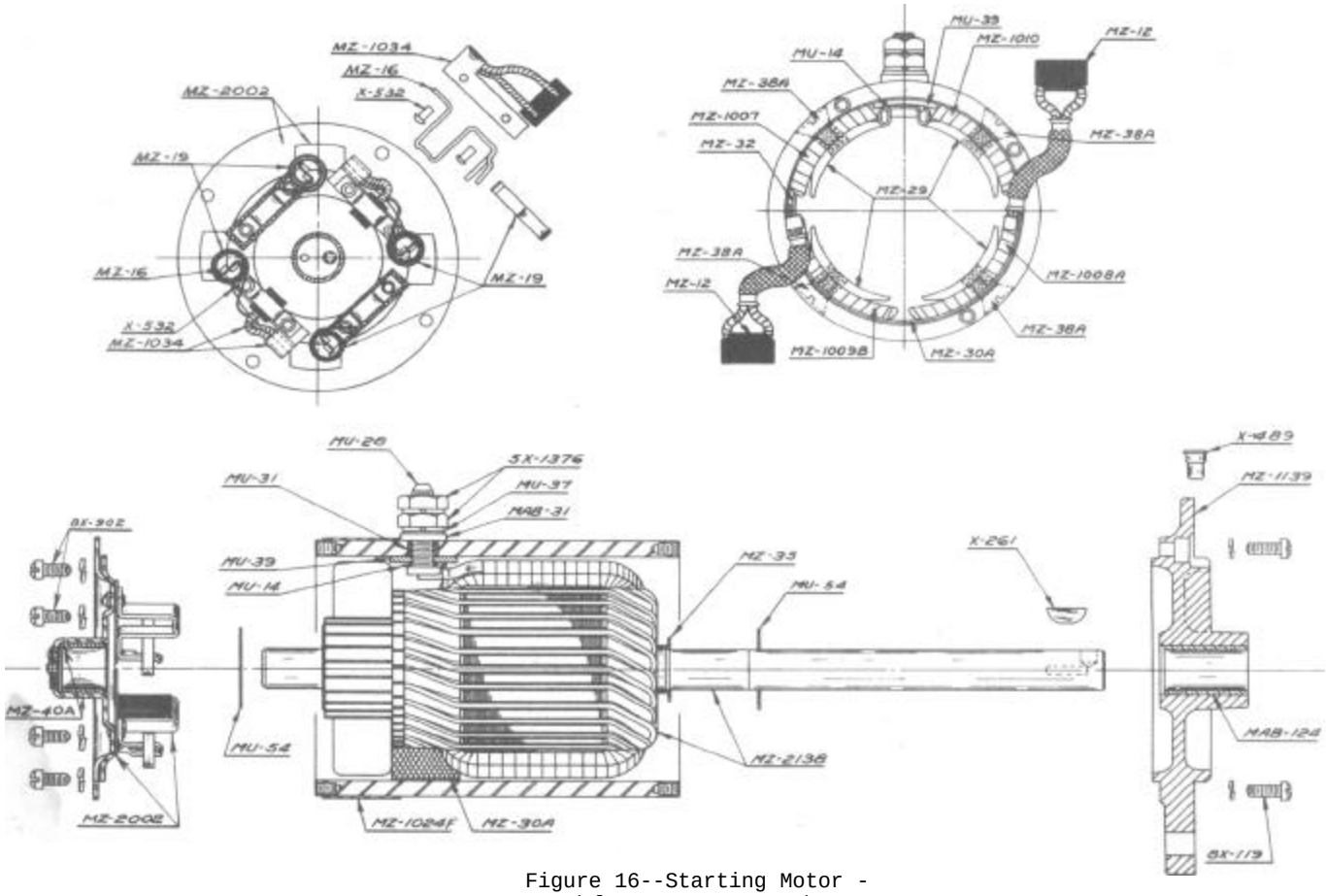


Figure 16--Starting Motor - Models 40, 41, 43 and 48

lubrication of the drive end bearing. Add a few drops of light engine oil in each oiler every

2,000 miles. Avoid over-oiling so as not to damage brushes and field coils.

STARTING MOTOR COMPLETE INSPECTION

The complete inspection should include:

1. Removal of starting motor.
2. Disassembly of starting motor.
3. Truing up commutator.
4. Installing of new brushes if needed.
5. Check for worn bearings.
6. Inspection of the Bendix drive for worn parts or distorted spring.
7. Check of starting switch and starting circuit.

CHECKING BATTERY VOLTAGE DROP - STARTER SYSTEM

1. Connect positive voltmeter lead to positive battery terminal - negative voltmeter lead to negative battery terminal, see Figure 17. Ignition "off", engine cranking read voltage.

2. Connect positive voltmeter lead to ground on engine - negative voltmeter lead to starting motor switch "BAT" terminal. Ignition "off", engine block, voltage regulator and "BAT" terminal of starter switch.

CHECKING BATTERY CABLE AND CABLE CONNECTIONS

1. Connect positive voltmeter lead to positive battery terminal - negative voltmeter lead to ground on engine, see Figure 18.

2. With engine cranking voltage reading should not be more than .1 volt. If higher than this, check positive battery cable connection at battery terminal, ground strap tightness and engine to frame ground connections.

3. Connect positive voltmeter lead to "BAT" terminal of starting motor switch - negative voltmeter lead to negative battery terminal.

4. With engine cranking voltage reading should not be higher than .1 volt. If higher than this, check negative battery cable connection at battery terminal and cable connection at "BAT" terminal of starting motor switch.

5. If cranking speed is slow it indicates starting motor switch trouble. Check starting motor switch, see page 12.

STARTING MOTOR SOLENOID SWITCH

The starting switch is operated by the push button

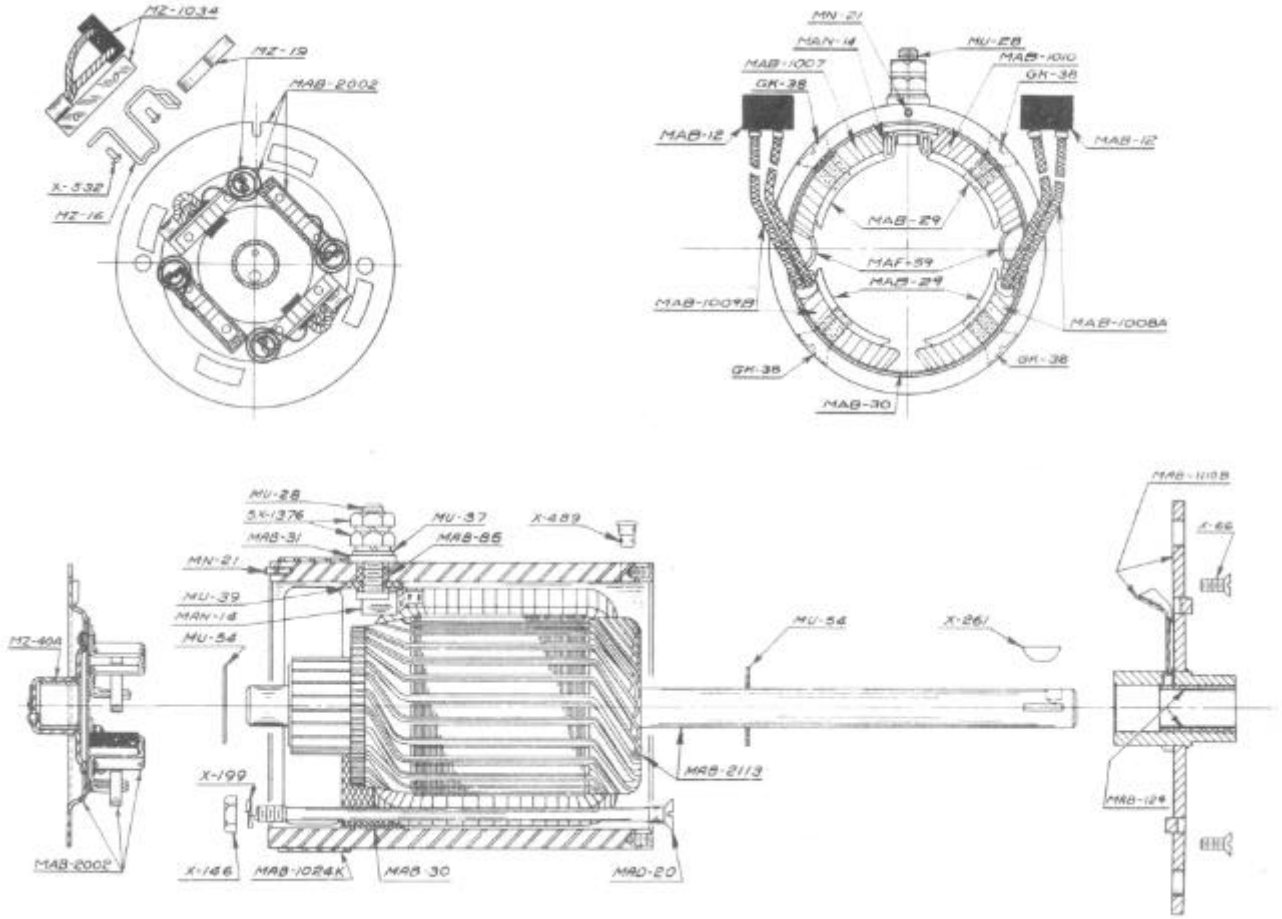


Figure 16--Starting Motor - Models 44, 45 and 47

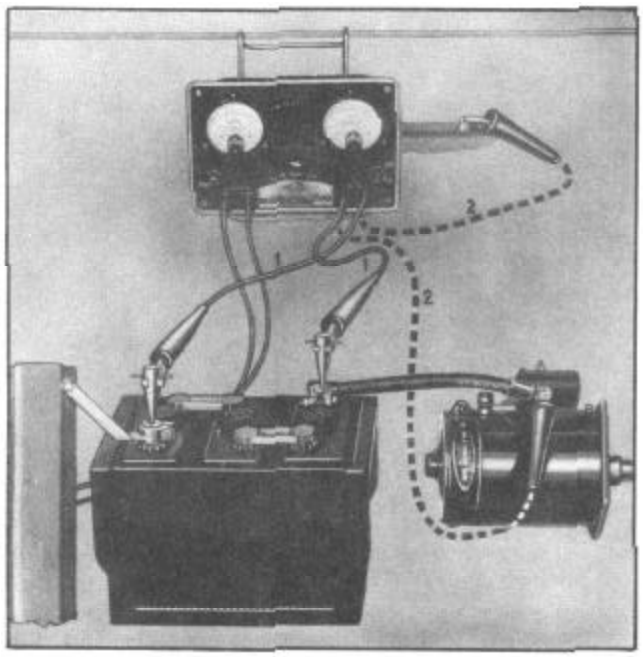


Figure 17--Checking Battery
Voltage Drop - Starter System

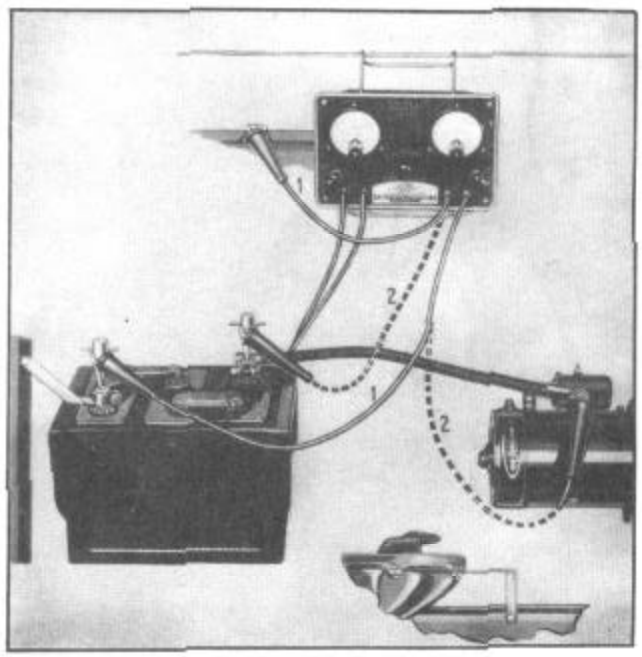


Figure 18--Checking Battery
Cable and Cable Connection

button on the instrument panel and also has a small button located on the front end of the solenoid switch to permit turning the engine over when checking timing or replacing the Hudsonite clutch compound.

CHECKING STARTING MOTOR SWITCH

1. Connect positive voltmeter lead to starting motor terminal of solenoid switch - negative voltmeter lead to "BAT" terminal of solenoid switch, see Figure 19.
2. Crank engine with starter. Voltmeter reading should not be more than .2 volt. If more than this check connections or replace switch.

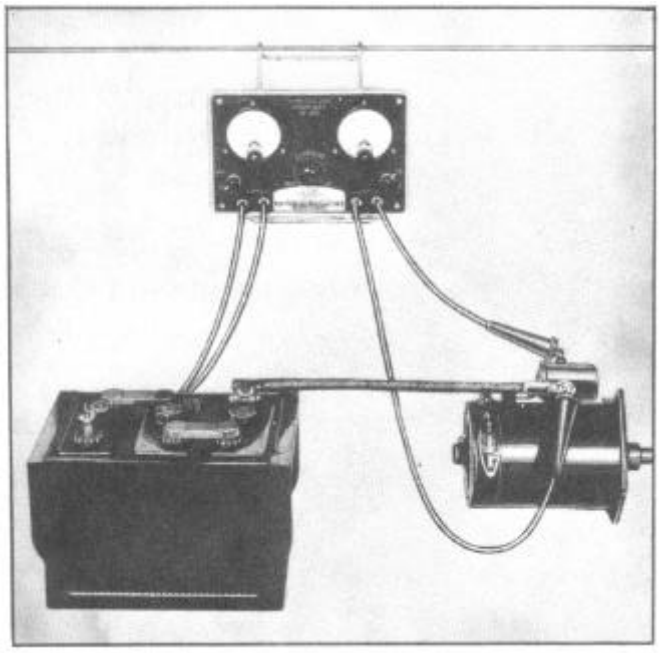


Figure 19--Checking Starting Motor Switch

STARTING MOTOR REMOVAL

Remove the battery cable and battery wire from the solenoid starting switch.

Tape the end of the cable to prevent shorting and possible fire.

Remove starting motor mounting stud nuts.

STARTING MOTOR DISASSEMBLY

Remove the starting motor solenoid switch; commutator cover band; through bolts; and rear drive end head.

Remove the field coil to brush lead screws and remove the commutator and plate assembly and armature.

STARTING MOTOR INSULATED AND BRUSH HOLDER TEST FOR GROUND

Place one test prod lead to the cover and the other on the brush holder. If the test lamp lights the brush holder is grounded and must be replaced. If the test lamp does not light the brush is satisfactory.

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.

STARTING MOTOR GROUNDED BRUSHES

Check the rivets holding the brush holders and brush ground strip to the commutator end plate. The rivets must fit the holes snug and tight so as to hold the brush holder firmly in place and make a positive ground connection for the brushes.

REASSEMBLING STARTING MOTOR

To reassemble reverse procedure of disassembly.

BENDIX DRIVE CONSTRUCTION

All parts of the drive mechanism except the drive spring are located within the pinion barrel, see Figure 20.

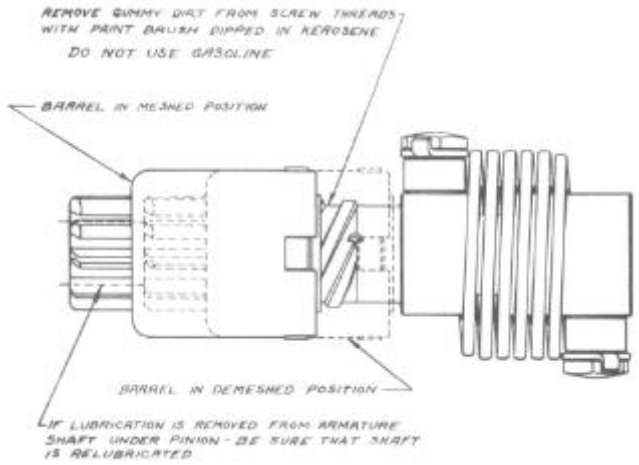


Figure 20--Bendix Drive

The threaded sleeve is mounted loosely on an extension of the drive head and is retained by the stop nut which is screwed and staked in place on the outer end of the head.

The pinion is integral with the barrel or drive sleeve and is mounted loosely on the starter shaft.

The starter drive is through lugs on the control nut or driving ring on the screw shaft which engage slots in the end of the pinion barrel.

The pinion barrel is held in place on the control nut by a locking ring within the end of the barrel directly behind the driving lugs.

A coil type anti--drift spring is mounted on the threaded sleeve ahead of the control nut and a meshing spring is located within the head of the barrel ahead of the drive head stop nut.

BENDIX DRIVE OPERATION

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 pinion with damage to the drive and flywheel teeth.

BENDIX DRIVE ADJUSTMENTS

If the pinion jams or does not mesh properly with the flywheel gear teeth check the following--

1. Armature shaft rough or burred, dirty or rusty under the threaded sleeve.

Remove Bendix and clean and smooth shaft. Lubricate lightly with S.A.E. 10 engine oil before replacing.

2. Armature shaft rough, burred or dirty under Bendix pinion.

Thread pinion back on threaded sleeve (demeshed position) smooth the shaft with emery cloth or clean with kerosene (do not use gasoline). Lubricate shaft lightly with S.A.E. 10 engine oil.

3. Armature shaft bent.

Remove Bendix drive and check shaft- straightening if possible otherwise replace.

4. Drive spring screw at threaded sleeve end is too long.

See that spring does not project through the sleeve and bind on drive head extension or armature shaft.

5. Cocked or deformed drive spring.

This will cause threaded sleeve to drag on armature shaft or on drive head extension.

Remove spring by taking out spring screws, examine spring, replace if necessary. Spring eye centers should be at right angles to spring axis. Use new lockwashers under spring screw heads when replacing screws and see that one lip of washer is turned down in spring eye gap and other lip is turned up against screw head, flat.

BENDIX STARTER DRIVE CLEANING

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--

1. Press the starter button and release quickly repeating until the Bendix pinion is fully meshed with the flywheel gear.

2. Use a paint brush dipped in kerosene and brush the screw threads back of the pinion rotating the pinion while brushing.

CAUTION: Use a very little kerosene and do not use gasoline because it removes all lubrication.

3. Start the engine several times so as to work the kerosene into the gum on the screw threads.

4. Remove excess kerosene after cleaning by brushing with a dry brush or wiping with a clean cloth.

5. With pinion rotated to demeshed position clean exposed portion of armature shaft with kerosene and then lubricate with S.A.E. 10 engine oil.

Do not apply any lubricant to the screw threads.

DISTRIBUTOR DATA (IGW 4203)
Models 40,41,43,48 (6 cylinder)

Rotation	Left hand (viewed from top)
Cylinders	6
Control	Vacuum advance--automatic
Timing	Adjustable through range of 360° by loosening hold down clamp screw
Automatic advance	14° maximum
Manual	Advance 30° retard 30°
End play	In drive shaft after coupling Is pinned .003" to .010"
Side play	In bearings .005". New bearings fitted .0005" minimum to .001" maximum
Condenser	Located on outside of housing. Capacity .20 to .25 Mfd.
Breaker point gap	.020"-check with wire feeler gauge
Cam dwell or angle	35°
Breaker arm spring tension	17 to 20 ounces
Vacuum advance	15°

Automatic advance (Distributor R.P.M. and distributor degrees) (Engine R.P.M. and degrees are double these figures)

	Advance	RPM
Start advance	0°	300
Intermediate advance	3°	400
Intermediate advance	7°	825
Intermediate advance	11°	1225
Full advance	14°	1580

See Curve, Figure 21

Vacuum advance (Distributor degrees and inches of mercury)

	Advance	Inches Hg.
Start advance	0°	7"
Intermediate advance	2°	7-3/4"
Intermediate advance	4°	8-5/8"
Intermediate advance	6°	9-3/8"
Full advance	7.5°	10"

See Curve, Figure 22

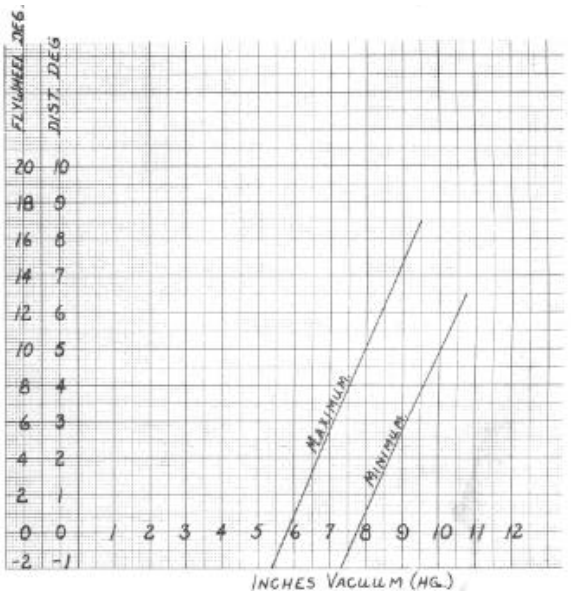


Figure 22--Distributor Vacuum Advance Curve - 6 Cylinder Models

Breakers points open T.D.C.
Firing order 1-5-3-6-2-4

DISTRIBUTOR DATA (IGP 4008 A)
Models 44,45,47 (8 cylinder)

Rotation	8
Cylinders	Automatic
Control	Adjustable through range
Timing	of 360° by loosening hold down clamp screw
Automatic advance (engine)	17-1/2° maximum
End play	In the drive shaft after coupling is pinned-.003" to .010"
Side play	In bearings .005". New bearings fitted .0005" minimum to .001" maximum
Condenser	Located on breaker point plate. Capacity 20 to 25 Mfds.
Breaker point gap	.017"--check with wire feeler gauge

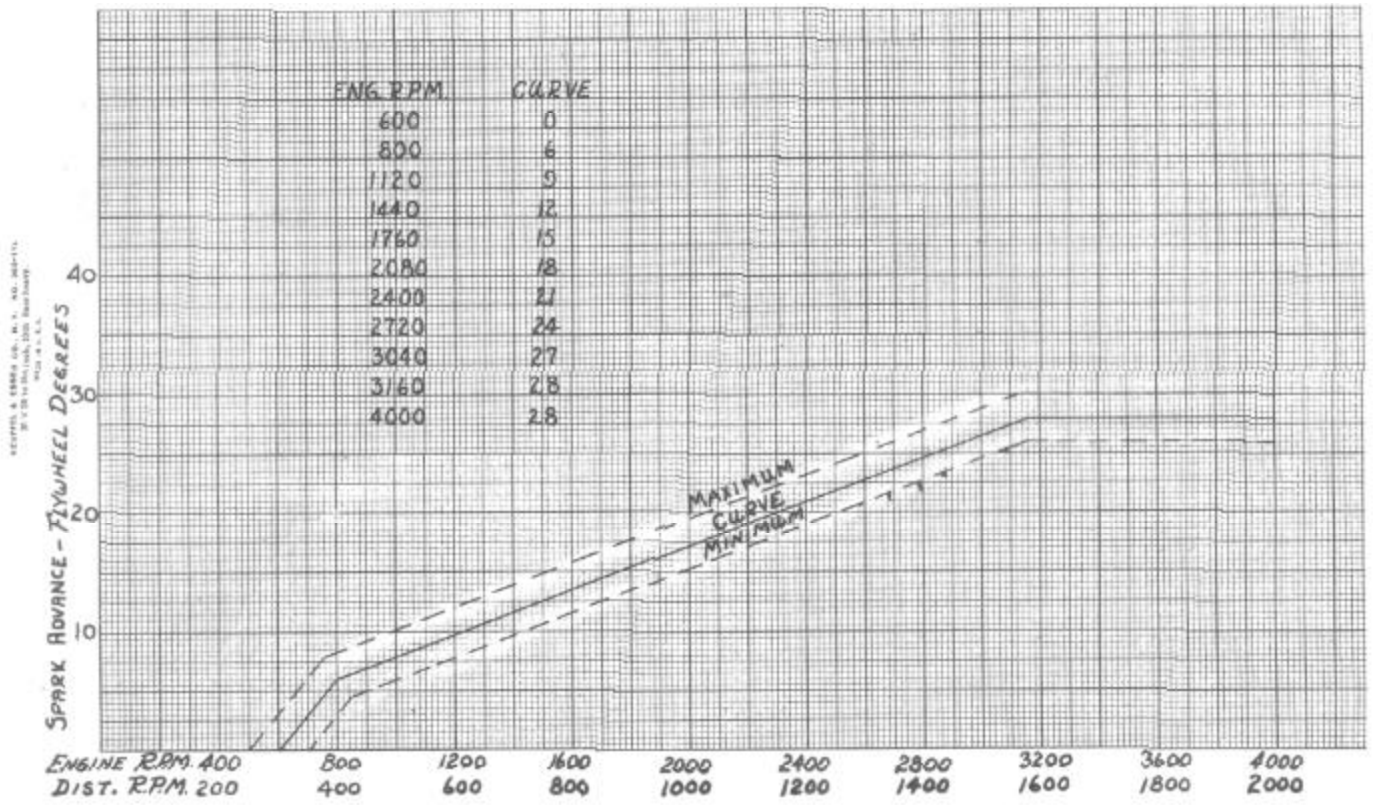


Figure 21--Automatic Spark Advance Curve - 6 Cylinder Models

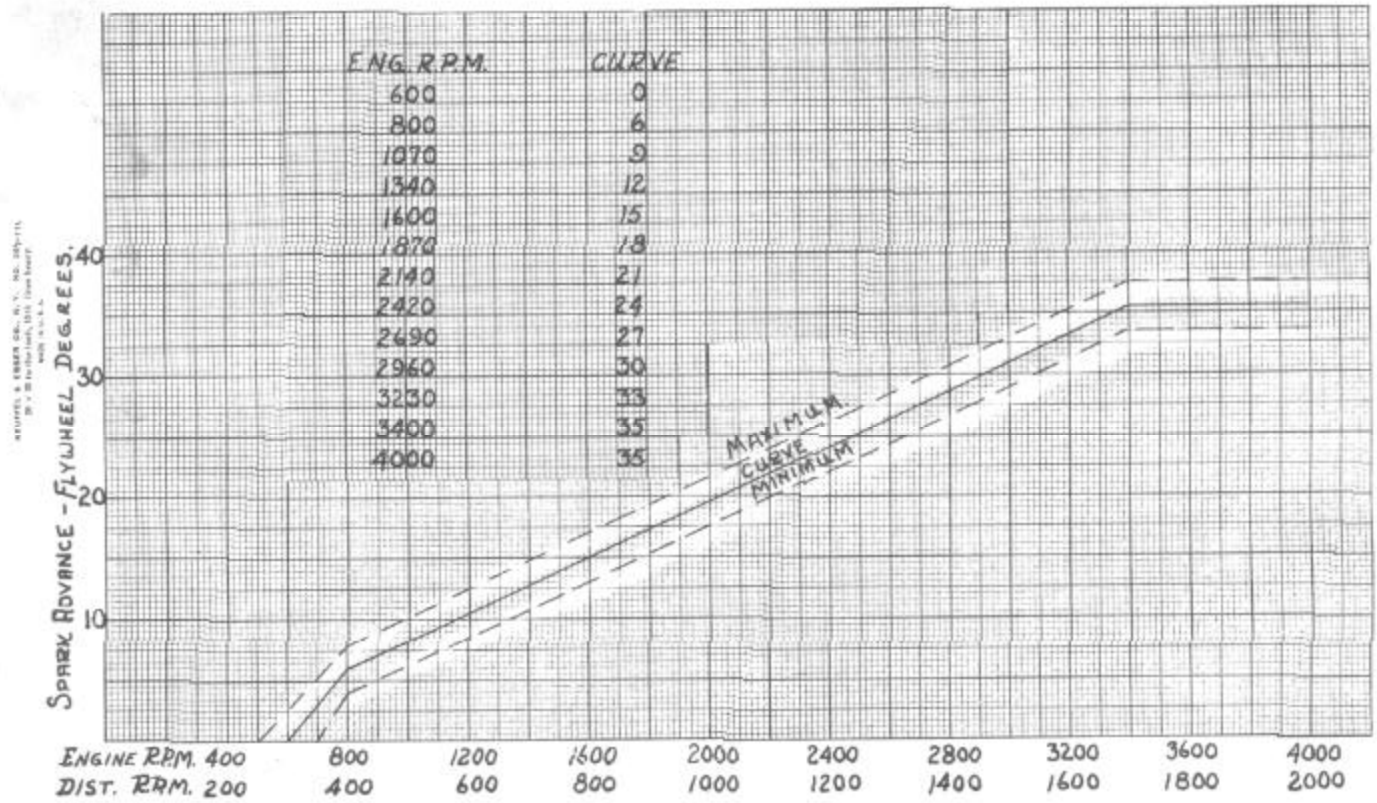


Figure 23--Automatic Spark Advance Curve - 8 Cylinder Models

Breaker point spring tension 18 to 20 ounces

Automatic advance (Engine R.P.M. and degrees are double these figures)

R.P.M. of distributor	Advance
300	0.0
400	3.0
535	4.5
670	6.0
800	7.5
935	9.0
1070	11.5
1210	12.0
1345	13.5
1480	15.0
1615	16.5
1700	17.5
2000	17.5

See Curve, Figure 23

Cam dwell or angle 31° closed 14° open
Breaker points open T.D.C.
Firing order 1-6-2-5-8-3-7-4

DISTRIBUTOR - 6 CYLINDER MODELS

The distributor on six cylinder models is mounted in the top of the cylinder block at the rear of the engine, see Figure 24.

The distributor support, in which the distributor is mounted, is anchored in the cylinder block by a special dowel bolt. The distributor support is further supported by a plate held in place by two cylinder head stud nuts.

The distributor is of six lobe type, with automatic as well as vacuum advance. Rotation is counter-clockwise (viewed from above). Firing order is 1-5-3-6-2-4.

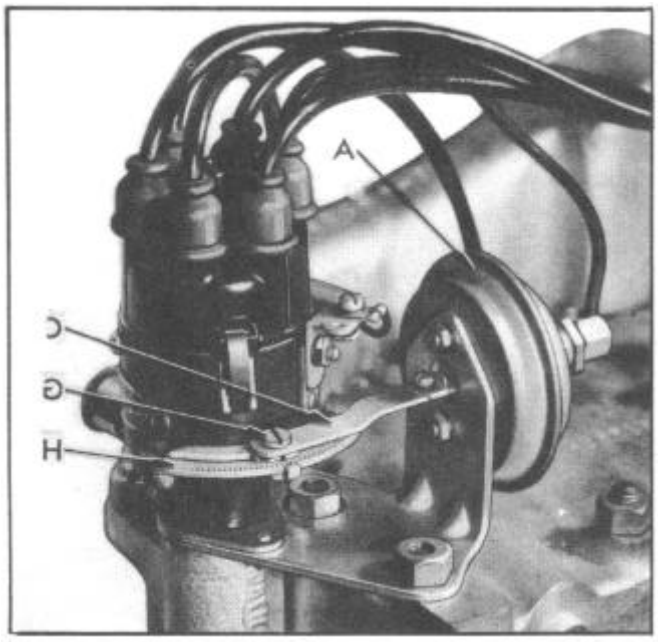


Figure 24--6 Cylinder Distributor Mounting

The vacuum chamber (A) contains a spring loaded diaphragm, which is connected to a graduated quadrant (H), through arm (C). The diaphragm is actuated by intake manifold vacuum through a copper tube connected to the carburetor body with an opening in the port, near the throttle valve. Under light operating conditions, when maximum manifold vacuum is available the diaphragm is drawn forward against the diaphragm spring advancing the ignition timing. 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 and providing maximum efficiency.

Fifteen degrees additional advance is provided over the automatic centrifugal advance. Since the extra 150 advance would result in poor idling, the vacuum is taken from the close proximity of the throttle valve and permits the vacuum to be shut off when the throttle is closed, thus retarding the ignition.

LUBRICATION

Every 2,000 miles a few drops of light engine oil should be applied to shaft wick (E), Figure 25. Also apply one drop of light engine oil to the breaker arm pivot (F). Apply a light coating of high temperature grease to the cam lobe (A). Turn grease cup (D) one turn.

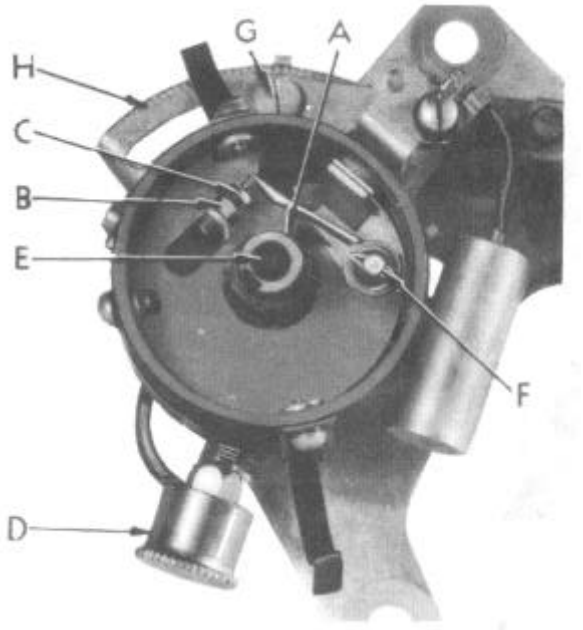


Figure 25--6 Cylinder Distributor

Every 5,000 miles refill the grease cup with high temperature grease.

Whenever the distributor is removed from its support, a generous coating of water pump lubricant should be applied to the distributor shaft housing before it is reassembled in the support.

BREAKER POINT ADJUSTMENT - 6 CYLINDER MODELS

Remove distributor cap. Turn engine over until breaker arm fibre block (A), Figure 25, is on the highest point of the cam. Points should be clean and smooth and make full contact. Loosen lock nut (B) and turn adjusting screw (C) until .020" gap is obtained. After tightening lock nut, recheck gap.

IGNITION TIMING SETTING - 6 CYLINDER MODELS

Ignition timing is on top dead center.

1. Loosen the distributor advance diaphragm arm screw (G), Figure 25, at the extreme rear end and turn the distributor housing counter clockwise to the limit of the slot in the quadrant.

2. Remove the central terminal from the distributor cap and place the bare end 1/8" from the cylinder head.

3. Turn ignition off and turn over the engine until the U.D.C. 1-6 mark on the flywheel is in line with the pointer on the engine rear support plate.

4. Rotate the distributor body clockwise slowly just to the point where a spark jumps from the high tension wire to the cylinder block or if a timing light is being used turn the body until the light flashes.

5. Tighten the distributor advance arm screw (G), replace cable in distributor cap and replace the cap on the distributor.

6. When the distributor cap is in place, the metal strip on the rotor arm should be directly under number one spark plug terminal. The other cables should be in the cap terminals in the order 1-5-3-6-2-4 following in a counter clockwise rotation.

The cable in the center terminal of the distributor cap should go to the center (high tension) terminal of the ignition coil.

DISTRIBUTOR - 8 CYLINDER MODELS

The distributor, Figure 26, is located on the right side of the engine.

The distributor is of eight lobe type, with automatic advance. Rotation is clockwise (viewed from above). Firing order is 1-6-2-5-8-3-7-4.

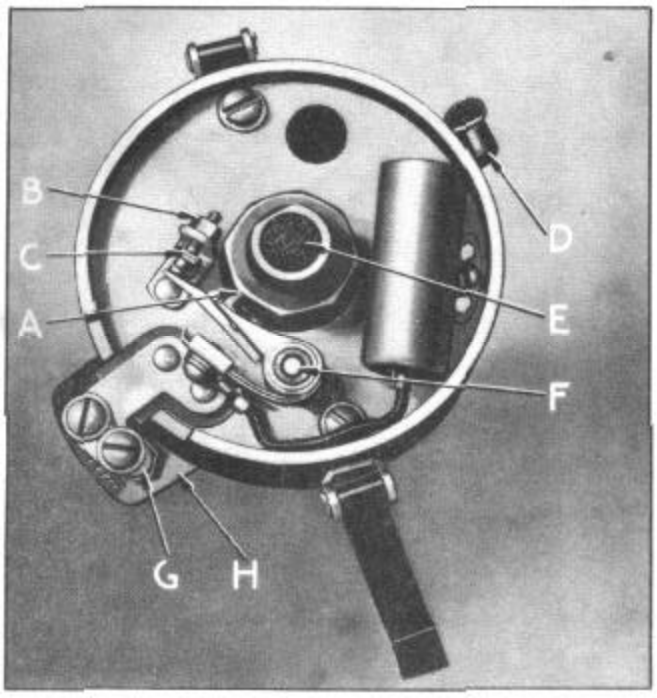


Figure 26--Distributor - 8 Cylinder Models

LUBRICATION - 8 CYLINDER MODELS

Every 2,000 miles insert a few drops of light engine oil in oiler (D), Figure 26, and shaft wick (E). Also apply one drop of oil to contact arm pivot (F). Apply a light coating of high temperature grease to cam lobe (A). Avoid over-oiling.

BREAKER POINT ADJUSTMENT - 8 CYLINDER MODELS

Remove distributor cap. Turn engine over until breaker arm fibre block (A), Figure 26, is on highest point of cam. Points should be clean and smooth and make full contact. Loosen lock nut (B) and turn adjusting screw (C) until .017" gap is obtained. After tightening lock nut, recheck gap.

IGNITION TIMING SETTING - 8 CYLINDER MODELS

Ignition timing is on top dead center.

1. Loosen the distributor clamp screw (G), Figure 26, and rotate the distributor housing clockwise to the limit of the slot in the clamping plate (H).

2. Remove the center cable from the distributor cap and place the bar end 1/8" from the intake manifold.

3. Turn ignition off and turn over the engine until the U.D.C. 1-8 mark on the flywheel is in line with the pointer on the engine rear support plate.

4. Rotate the distributor body counter clockwise slowly until a spark jumps from the high tension wire to the manifold, or if a timing light is being used turn the body until the light flashes.

5. Tighten the distributor advance arm screw (G). Replace the cable in the distributor cap and replace the cap on the distributor.

6. When the distributor cap is in place the metal strip on the rotor arm should be directly under the terminal to which number one spark plug is attached. The other cables should be in the cap terminals in the order 1-6-2-5-8-3-7-4 following in a clockwise rotation.

The cable in the center terminal of the distributor cap should go to the center (high tension) terminal of the ignition coil.

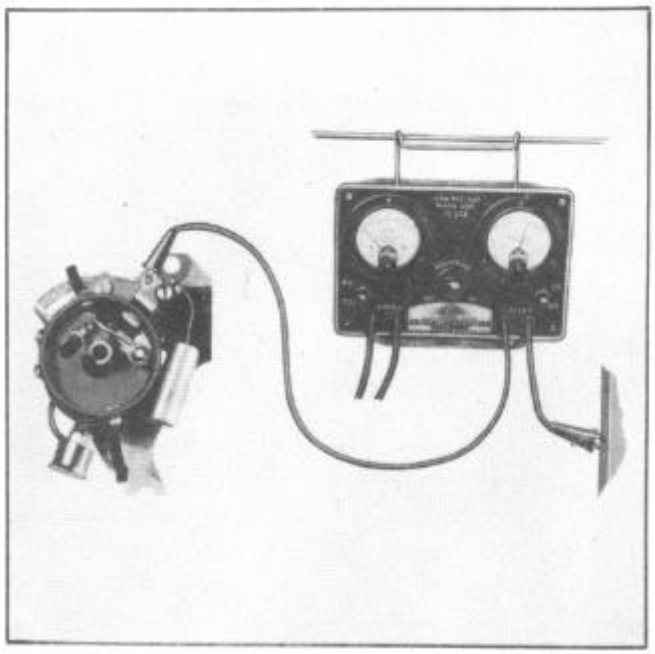


Figure 27--Distributor Ground Test

DISTRIBUTOR GROUND TEST

1. Connect positive voltmeter lead to ground on engine - negative voltmeter lead to terminal of distributor, as shown in Figure 27 .

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 1/10 volt.

6. A reading of more than 1/10 volt indicates poor

breaker point contact, poor distributor point plate contact or poor distributor housing contact to engine.

7. Turn distributor shaft until points are open.

8. Turn ignition switch on.

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

10. If lower, condenser is leaky or grounded.

DISTRIBUTOR TUNE-UP

The tune-up inspection of the distributor should include the following:

1. Removal and cleaning of the inside of the distributor cap.

2. Removal of the rotor.

3. Inspection of the breaker points for necessary refacing and respacing or replacement.

4. Check the automatic governor to see that it is working freely.

5. Test the condenser.

6. Lubrication.

7. Check and re-set the timing of the distributor to the engine.

8. Check the ignition coil.

Breaker points that show a grayish color and are only slightly rough with no pit or crater showing and which have within .002" of the proper maximum gap, require no adjustment or refacing. Breaker points that require adjustment should always be refaced first so that they have a smooth, flat contact with each other. They should be properly aligned so as to have full face contact.

Check governor for free operation by turning the breaker cam in the direction of rotation as far as it will go and then releasing. When released it should immediately return to its original position without any drag or hesitancy.

A test of the condenser should include both capacity and leakage.

DISTRIBUTOR COMPLETE INSPECTION

The complete inspection should include the removal of the distributor from the engine, complete dismantling and cleaning, an inspection of the bearings and breaker cams for wear. A check of all points mentioned in the tune-up inspection. The bearings in the distributor housing should be thoroughly cleaned and then lubricated before assembling the drive shaft in the housing, see Figures 28 and 29.

The distributor should have a complete resetting of the timing to the engine after reassembling and final reinstallation.

No attempt should be made to check or adjust the automatic governor except with an oscillograph because with this instrument only, can the occurrence of the spark in degrees be checked against the speed in R.P.M.

In order to obtain the correct dog-leg 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.

The tension of the flat auxiliary spring is 5 to 6 ounces.

SPARK PLUG DATA - All Models

Make	Champion
Type	J -8
Thread	14 M.M.
Gap	.032"

SPARK PLUG INSPECTION

1. Inspect spark plugs to be sure they correspond to factory specifications. Clean, regap to .032" and test. If electrodes are burned, porcelain is chipped or cracked,

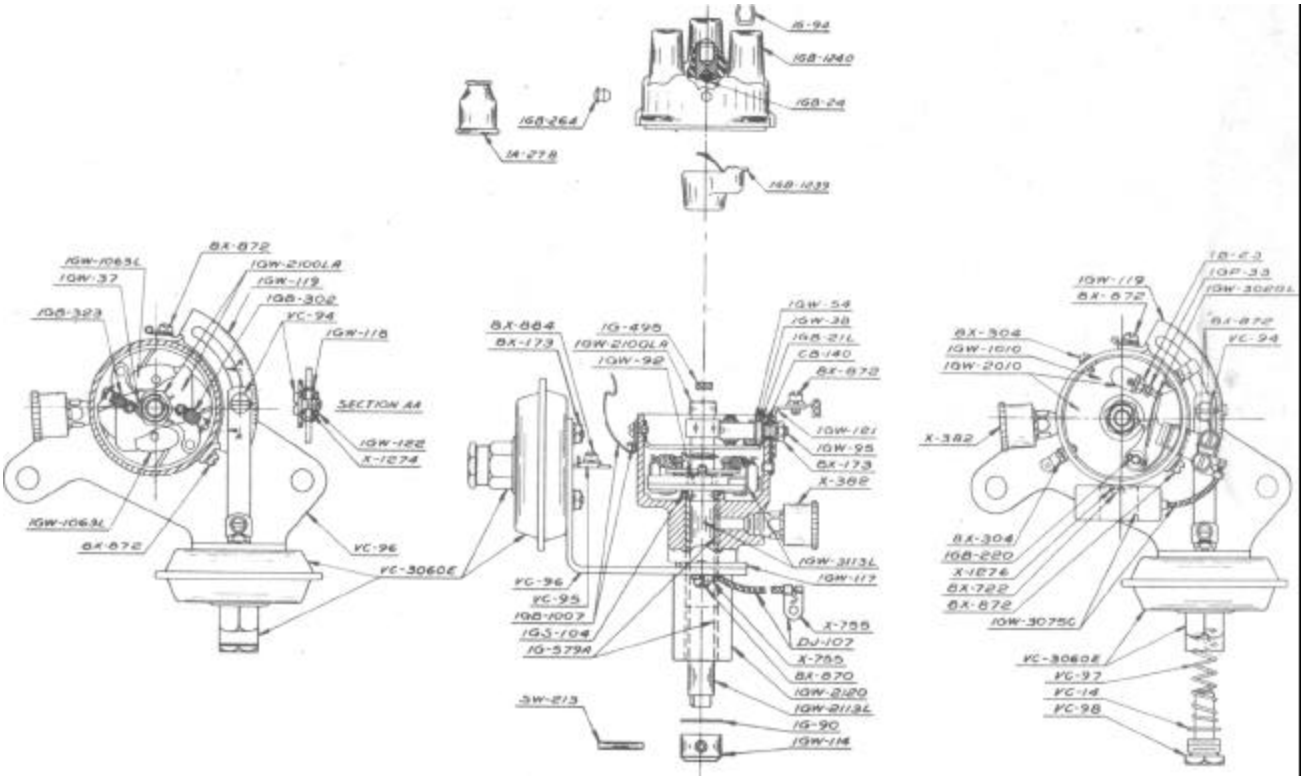


Figure 28--Distributor IGW 4203 - Models 40, 41, 43

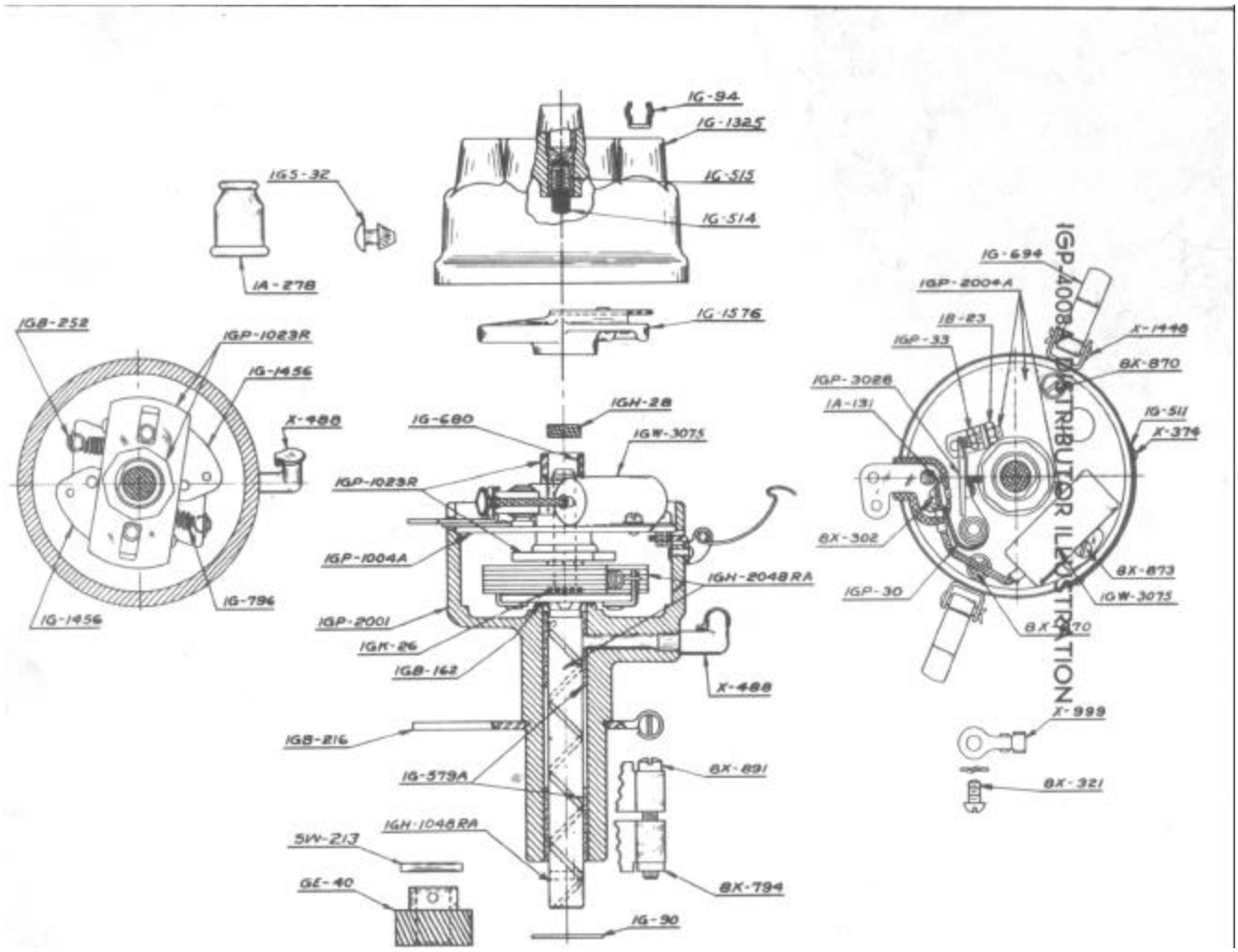


Figure 29--Distributor IGP 4008 A - Models 44, 47

or if spark plugs have been in service more than 10,000 miles replace with new ones of proper specifications.

HIGH TENSION CABLE TEST

1. Connect tester to No. 1 spark plug cable and ground as shown in Figure 30. Run engine at idle and set tester at 7 M.M.
2. If spark is weak or irregular connect tester to No. 1 socket of distributor. A regular spark across 7 M.M. gap indicates poor No. 1 cable. Repeat test on all plug wires.
3. If regular spark is obtained on some but not all tests, check distributor cap for crack or burned sectors.
4. If regular spark is not obtained on any tests, check rotor for short to shaft and wide gap.

COIL DATA

Six cylinder models IG - 4662
Eight cylinder models CE - 4641
Amperage draw of coil -
Engine stopped 4.5 amperes
Engine idling 2.5 amperes

COIL TEST

1. If regular spark is not obtained in high tension cable test, remove cable from distributor

Figure 30--High Tension Cable Test

central terminal and connect tester to cable and distributor as shown in Figure 31. Close tester gap and run engine at idle speed. Open gap to 7 M.M. and not spark.

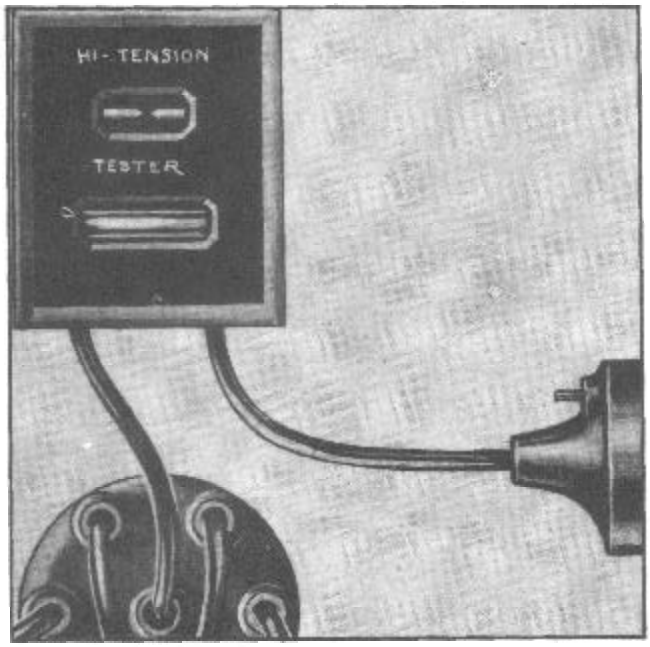


Figure 31--Coil Test

2. Remove cable from coil and connect tester direct to coil and distributor. Repeat test. If spark is more regular than before, install new cable.

3. If regular spark is not obtained with 7 M.M. gap, replace coil.

IGNITION SWITCH AND LOCK

The lock is placed on the primary circuit as shown on the wiring diagram Figure 1.

The cylinder lock is installed on the instrument panel and is held in the switch case (on the end of the ignition coil cable) by a retaining ring. To remove the lock cylinder insert the key in the switch and turn the key to extreme right or "ON" and with a pointed tool or wire, (1/16" diameter) or a paper clip, inserted in the small hole in the face of the cylinder (the hole is just back of the bracket legs bolted to the instrument panel ledge).

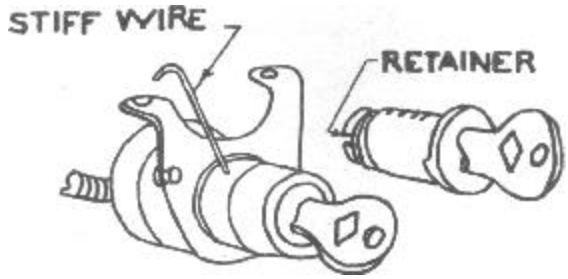


Figure 32--Removing Ignition Lock Cylinder

Press in on the tool or wire, see Figure 32, depressing the lock cylinder spring retainer and turn the key clockwise which will release the cylinder. Remove cylinder from the lock body. Replace cylinder in case with key in "ON" position and then snap key to "OFF" position.

The ignition lock key series is H 601--H1100.

Blank lock cylinders can be purchased from the Factory Parts Department and by blank lock cylinders is meant cylinders that have not had the tumblers cut to match a certain key (uncoded). See "Blank Lock Cylinders for Coding," "Body Section."

To disassemble the ignition switch:

1. Remove the ignition switch by taking off the two mounting bolts fastening it to the instrument panel ledge and disconnect all leads.

2. Remove ignition coil at dash and remove coil and switch assembly as a unit.

3. Remove the stakings on the lock case retaining lock case 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.

To reassemble the ignition switch:

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 securely.

To test ignition lock use a test lamp and leads. With the switch "ON" test switch circuits. If circuits are completed and switch is still unsatisfactory remove ignition coil base (cable connection) by taking out three screws. This will expose the coil terminal in the base. Check the circuit through switch and coil lead to this terminal. If the circuit tests O.K. disconnect coil, test coil, and replace if necessary. If tests indicate switch is faulty disassemble as shown above.

LIGHTING SWITCH

The lighting switch is located slightly to the right of the center of the instrument panel and is of the rotary type. The "OFF" position is to the extreme left. First turn to the right or clockwise is parking (bonnet lamps) and tail lamps. Second position is headlights, bonnet lights and tail lamps.

When headlights are turned on their beam is controlled by a foot switch located on the left side of the toe board. A small red light in the speedometer dial indicates whether the beam is on highway (high) or city driving (low) beam. If the

light is red it indicates highway or high beam. Pressing the foot switch turns out the light and places the beam in the city driving or lower beam for safe passing. Always impress owners with the necessity of driving on the low beam when meeting cars on the highway at night. It denotes road courtesy and results in safer night driving.

The terminal surfaces are silver plated to preclude the possibility of corrosion which produces many electrical difficulties.

Terminals are marked "R" or "T" for tail lamps, "H" for headlights and "B" for battery.

HEADLAMPS

A new headlighting system "Sealed Beam" is used on all models. The lamps are designed so that the bulb, the reflector, the lens, and the gasket are all assembled in one securely sealed unit making them dust and moisture free.

When the filament burns out or the lens breaks the entire unit is discarded and a new one installed thereby assuring maximum lighting efficiency throughout the entire life of the car.

The cost of this unit is very low and is balanced by giving a longer life of the filament than has been possible in previous headlamp bulbs. In general the cost

of maintenance will be no higher than any past equipment properly maintained and the satisfaction derived from the lighting supplied by this sealed unit will be greater than any previously experienced.

This lighting system represents the coordinated effort of the automobile and headlamp manufacturers and has the endorsement and approval of the American Association of Motor Vehicle Administrators, Automobile Manufacturers Association, and organizations interested in National safety. The beam patterns conform to the Society of Automotive Engineers specifications.

HEADLAMP BEAMS

Sealed Beam headlamps provide two separate and distinct beams as follows, each giving considerably more light than has been produced in the past.

1. The upper beam is the bright light for country driving and is designed for illuminating the road evenly for a considerable distance ahead of the car. This beam is for use on the open highway when no other vehicles are approaching.

2. The lower beam is the traffic light and is low enough on the left side to avoid glare in the eyes of the oncoming drivers. It is intended for use on heavily traveled highways and should ALWAYS BE USED WHEN MEETING OTHER VEHICLES.

NOTE: This beam is so designed so that it does not throw any dazzling light into the eyes of the approaching driver regardless of the load in the car. Yet the light is such that the right side of the road is illuminated as far ahead as is practicable without causing glare on the curves.

HEADLAMP OPERATION

The operation of the headlamp country beam or traffic beam is by means of a foot switch conveniently located on the left side of the toe board.

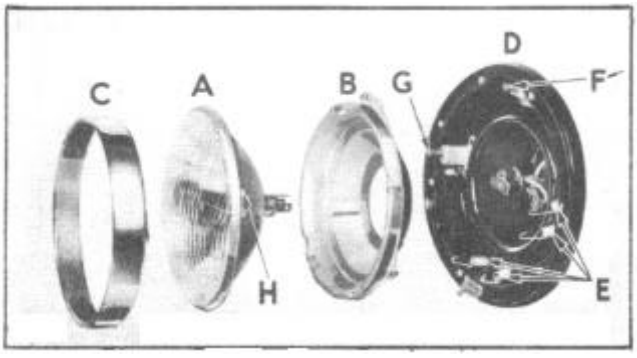
The light switch button on the instrument panel has two positions. The first stop is for the bonnet lights, tail lamps and license plate, and the second and last stop is for the headlamps, bonnet lamps and tail lamps.

When the country or upper beam is lighted a red pilot bulb under the 50 mile mark on the speedometer dial is illuminated.

HEADLAMP CONSTRUCTION

The Sealed Beam reflector unit (A) Figure 33 is held to a sub-body (B) by the retainer (C) and three screws which may be loosened for removal of

Figure 33—Headlamp Construction



the unit. 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).

NOTE: The horizontal light beam adjustment can be made without disturbing the vertical light beam setting.

The reflector unit is provided with three locating lugs (H) which fit into corresponding slots in the sub-body. These lugs are located so that the reflector unit can only be mounted in one position.

The Sealed Beam unit is interchangeable right and left.

REMOVING SEALED BEAM UNIT

1. Remove headlamp lens rim by taking out the three screws.

2. Loosen, but do not remove, the three screws (C), Figure 34, holding the retainer. (Do not disturb the aiming screws A and B at the top and left side of the unit.)

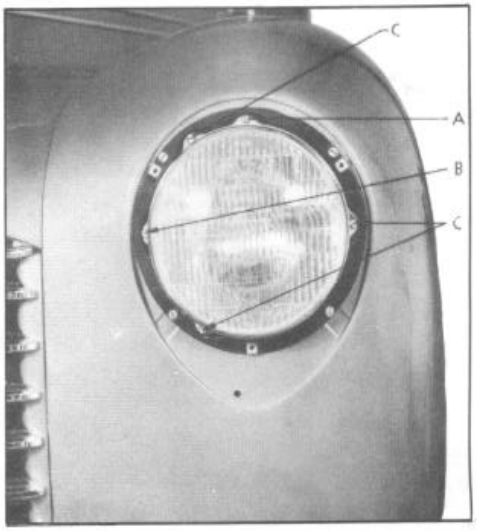


Figure 34--Headlamp Beam Adjustment

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

4. Remove the reflector plug from the unit as shown in Figure 35.

5. Install new unit by reversing above operations.

REMOVING HEADLAMP

1. Remove three screws holding rim to headlamp body.

2. Loosen three screws (C), Figure 34, holding the retainer.

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

4. Remove the reflector plug from the reflector unit as shown in Figure 35.

5. Remove four screws attaching headlamp body to fender.

6. Remove sheet metal ground screw in back of lamp body.

7. Remove three sheet metal screws attaching wire harness to lamp housing.

8. Remove harness from junction block and pull harness through lamp housing.

To reassemble reverse procedure of disassembly. Re-aim lamps after installation.

Figure 35--Sealed Beam Headlamp

SEALED BEAM HEADLAMP - AIMING

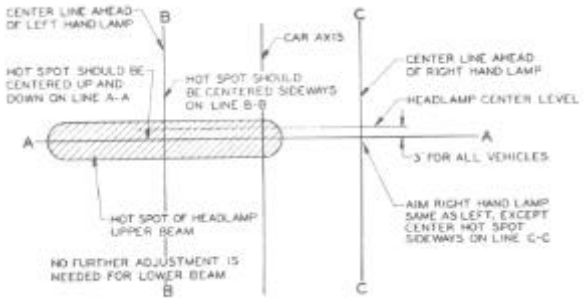


Figure 36--Headlamp Adjusting Chart

1. Place the car on a level stretch with a light colored vertical screen 25 feet ahead of headlamp lens.

2. Draw a horizontal line on this surface at the level of a point 3" below the headlamp center, as shown in Figure 36. 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.

3. Sight through the center of the rear window to the right and left of the windshield center bar and mark two points on the horizontal line.

4. Draw vertical lines (B-B) and (C-C), Figure 36, 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

5. Place lighting switch in position which produces highway (upper) beam on screen. When the highway (upper) beam is lighted the lower filaments on both lamps are illuminated.

6. Remove headlamp lens rim.

7. Independent adjustment of both horizontal and vertical aim is provided in "Sealed Beam" headlamps with the adjustment screw as shown at (A), Figure 34, and the horizontal adjustment screw at (B).

The light beam is moved to the right or left by tightening or loosening this horizontal adjustment screw (B). The beam may be raised or lowered by turning the vertical adjustment screw (A).

8. Cover one lamp to obscure the beam of light and then adjust the beam from the other lamp so that the center of the zone of highest intensity falls on the intersection of the horizontal line (A-A), Figure 36, 3" below the headlamp center and the vertical line directly ahead of the lamp.

9. Repeat the operation for the other lamp. No further adjustment is needed for the traffic (lower) beam.

DIRECTION INDICATOR

The direction indicator is manually operated from a switch located directly below the steering wheel on the steering column, see Figure 37.

This direction indicator is standard equipment on models 43 and 47 and is optional on all other models.

Figure 37--Direction Indicator

OPERATION

When the direction indicator switch button "R" is depressed an electric circuit is made that lights the 21 candle power bulb in the right bonnet lamp and right stop lamp on the fender.

The electric current passes through a flasher switch which interrupts the circuit and gives an intermittent flashing of the lamps which continues until the release (center) button is depressed.

Depressing the button "L" flashes the left bonnet lamp and left stop lamp on the fender and the flashing continues until the release (center) button is depressed.

Simultaneously with the flashing of the bonnet lamp and stop lamp a bulb flashes in a small jewel in the switch cover. This draws the driver's attention to the fact that the bonnet and tail lamps are flashing.

If the bonnet lamp bulb or tail lamp bulb is burned out or is failing to operate this jewel will not flash.

When the switch button "R" is depressed and the brake pedal is depressed at the same time the right bonnet lamp and right tail lamp will flash and the left stop lamp will light as usual without flashing. The same condition is true when the left ("L") button is depressed and the brake is applied.

When neither the "R" or "L" button has been depressed

pressed the usual operation of all lights applies and no lamps are flashing.

The flashing operation only takes place with the ignition switch on.

DIRECTION INDICATOR INSTALLATION ON CARS NOT SO EQUIPPED

The direction indicator kit contains all of the wiring connectors, etc., that are needed to make an installation in the field.

No special tools are necessary and the direction indicator kit can be installed in one hour. Wire terminal end pliers, steering wheel puller and a Phillips screw driver will be needed.

DIRECTION INDICATOR KIT

The kit for installation of a direction signal indicator on cars not previously equipped with this device consists of--

Direction indicator switch and flasher complete Wire assembly (lead to bonnet)

Wire loom (for above wire)

Wire assembly to trunk compartment (195" long) Conduit for steering column

* Conduit clips for trunk compartment wire
* Conduit clips bolt
* Conduit clips bolt nut
* Conduit clips bolt lockwasher
* Conduit clips bolt plain washer

(* above 5 items for attaching trunk compartment wire conduit to frame)

Handy shift lever tube bracket--upper

Jacket tube bracket cap

Bonnet light wire and socket assembly--Right Bonnet light wire and socket assembly--Left Connector--single (2)

Connector--double (1)

Bonnet lamp bulb (6 V--21--3 C.P.)

INSTALLING DIRECTION INDICATOR

The models 43 and 47 have the wire leading from the indicator switch to junction in trunk compartment. On all other models when indicator is installed in field it is advisable to install wire and conduit included in kit by running along inside of frame side member securing with clips provided and carry up into trunk compartment through hole provided for dome light wire.

On Models 43 and 47 this wire runs along the left side of the body under the headlining and just above the doors.

1. Disconnect horn wire at the bottom of steering column.
2. Remove horn button, spring and retainer by pressing down on the horn button and turning slightly counter clockwise.
3. Remove steering wheel nut.
4. Pull wheel with tool J 739 and adapter J 739-7.
5. Using Phillips screw driver remove Phillips screw holding handy shift upper bracket and cap to steering column. Discard screw.
6. Remove this Handy Shift upper bracket cap and discard.
7. Place conduit with wires also conduit cover in place in the direction indicator switch head and install the switch head; conduit and conduit cover all at one time using screws included in kit.
8. Remove lower steering column support cap Phillip screws. Remove cap and discard.
9. Install lower steering column support cap included in kit. This also serves as a holder for the direction indicator conduit cover. Use screws that were removed.

NOTE: The wiring conduit must be placed on the left side of the new lower steering column support cap (there is a place provided for it).

10. Install steering wheel; horn button wire spring and retainer and horn button.
11. Connect horn button wire at lower end of steering column tube.
12. Remove two screws under instrument panel that attach instrument cluster to dash and attach the flasher switch at this point using the screws just removed.
13. Remove screw at the top terminal of heat indicator (under instrument panel) and attach red fuse wire of flasher switch.
14. Disconnect the white and black tail and stop light wires (under instrument panel) from the white and black

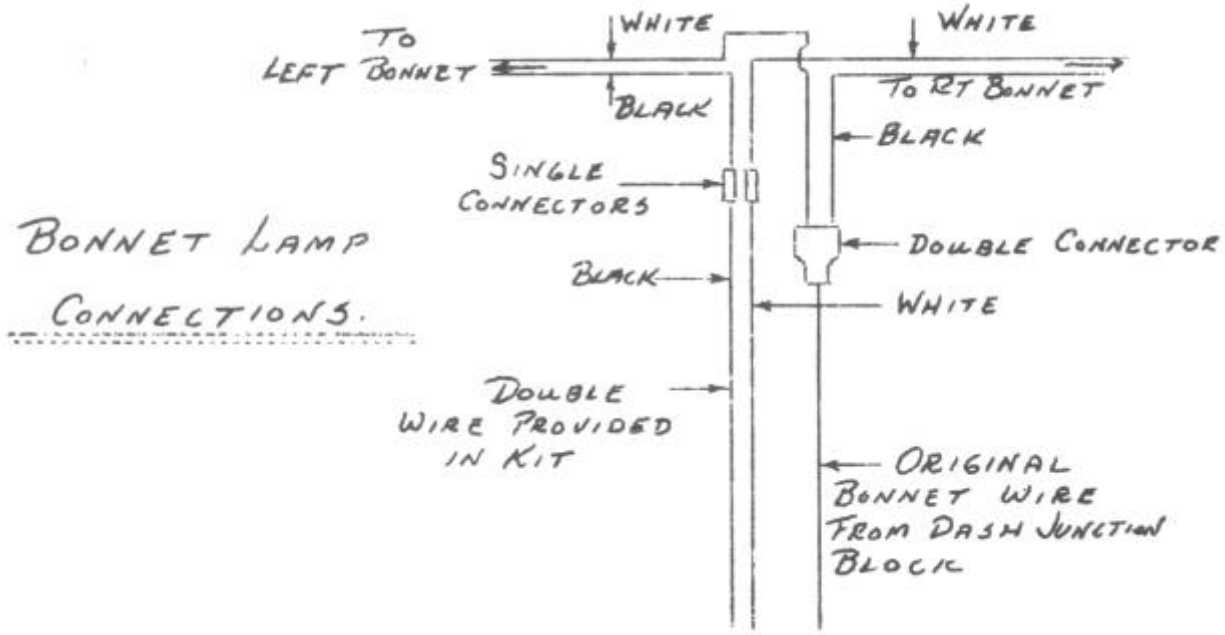


Figure 38--Direction Indicator
Wiring Diagram - Front End

wires that are in the wire harness. Fastened together by connectors.

15. Connect the white wire just disconnected to the white wire from the flasher switch, Figure 38.

16. Connect the black wire just disconnected to the black wire from the flasher switch.

NOTE: This leaves one black wire and one white wire (under the instrument panel) that come from the wiring harness still unconnected.

17. See note above and connect the green wire from flasher switch to the white wire on Figure 38.

18. See note above and connect the remaining black wire to the long black wire in the kit. (This long black wire leads to the trunk compartment.) Lay this wire aside for time being.

19. Remove bonnet lights, connectors, and wires from bonnet and remove bonnet light wires at the double terminal and discard old wires and connectors.

20. Install short and long bonnet wire assembly provided in the kit and 21-3 C.P. bulbs provided in the kit. Discard old bulbs. Use wire terminal end pliers J 875.

21. Under the instrument panel take the black also the white cable assembly that runs from the flasher switch and push it through the hole in the dash that the wire harness runs through.

22. Connect the double wire provided in the kit to the double wires that were just pushed through the dash, connecting white to white and black to black.

23. Spread the dash and fender clips and thread the wire through.

24. Thread double wires coming from flasher switch and single wire coming from junction block thru the loom provided in the kit and attach the loom to clip on the bonnet hinge.

25. Connect wires as shown on Figure 38.

26. Refer to instruction 16 with reference to the black wire.

27. Remove cowl kick pad center screw and the three screws holding pad that are on the body pillar (not necessary to remove pad from car).

28. Push this black wire referred to in item 16 (the long wire to go back to trunk compartment) over the top of cowl kick pad and down in behind it and through the hole in the bottom of the cowl.

29. Place wire inside the frame channel (working from underneath the car) and push the front end of the wire through the hole in cowl so as to protect the wire.

30. Replace cowl kick panel.

31. Place wire inside the frame channel and fasten with clips and clip screws provided in kit. 32. Push wire up through the hole in the trunk floor where the fuel gauge wire comes through. Thread the wire through the hole in the rear seat back support. Place wire back through the rear compartment channel top wire clip. Follow around the channel with the other wires) to the junction block and connect according to wiring diagram shown in Figure 39.

REPAIRING OF DIRECTION SIGNAL INDICATOR

The buttons of the direction signal indicator switch slip over flat terminals in the switch. The interior of the switch is accessible for checking connections or changing jewel bulb by pulling the buttons off and underneath the button are screws which permit the removal of switch cover. The switch can be removed after the cover has been taken off by removing screws under the cover. Jewel bulb is 1 C.P.--6 V.--G 3-1/2 Bulb--Miniature Bayonet base.

CAUTION: When checking tail or bonnet lights for flashing be sure that ignition switch is "ON".

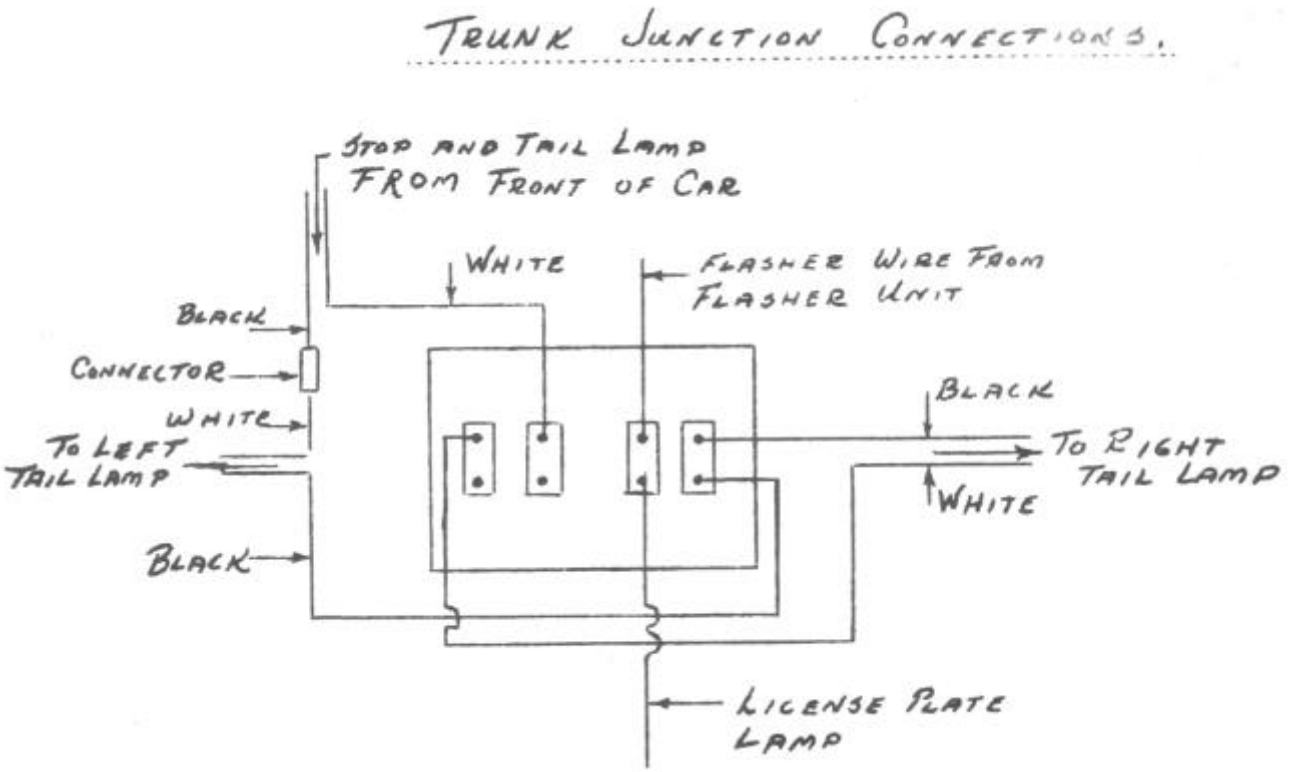


Figure 39--Direction Indicator
Wiring Diagram - Rear End

NOTE: If direction signal indicator is already installed on the car and it is necessary to pull the steering wheel it will be necessary to remove the direction indicator switch to use Tool J 739 and adaptor J 739-7 puller.

STOP LIGHT SWITCH

The stop light switch is "ON" in its normal position with one end of the switch plunger resting against the brake pedal in order to hold the switch in the "OFF" position so that when the brake pedal is released the spring inside the switch returns it to its normal "ON" position.

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.

NOTE: When replacing a stop light switch use a Hudson switch with silver plated terminal contacts. Voltage drop across the stop light switch terminals should not exceed SO M.V. at 10 ampere load.

FUSES

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. These two fuses are of 20 ampere capacity and have silver plated caps.

Silver maintains a clean contact indefinitely and the use of silver plated fuses will maintain light efficiency and accessory life. Corrosion at this point which shortens the good headlamp lighting is eliminated. The Sealed Beam headlamp will operate at its best continually because of this silver plating of fuses.

The fuse clips of the fuse block are also silver plated.

Replacement silver plated fuses should always be used and are available through the Hudson Factory Parts. Department.

The lower fuse in the fuse block protects the lighting circuit and the upper fuse protects the accessory circuit.

There are two extra terminals on the fuse block for extra electrical accessories that may be installed.

Other fuses used (not silver plated) are as follows:

Twin electric air horn fuse is of 30 amperes and is located in a fuse case attached to the engine side of the dash on the left side.

Overdrive electrical circuit fuse is of 20 amperes and is located in the relay attached to the engine side of the dash on the left side. To replace the fuse remove the cap. On later models remove fuse from spring clips.

Direction indicator circuit fuse is of 10 amperes and is located behind the instrument panel near the speedometer head.

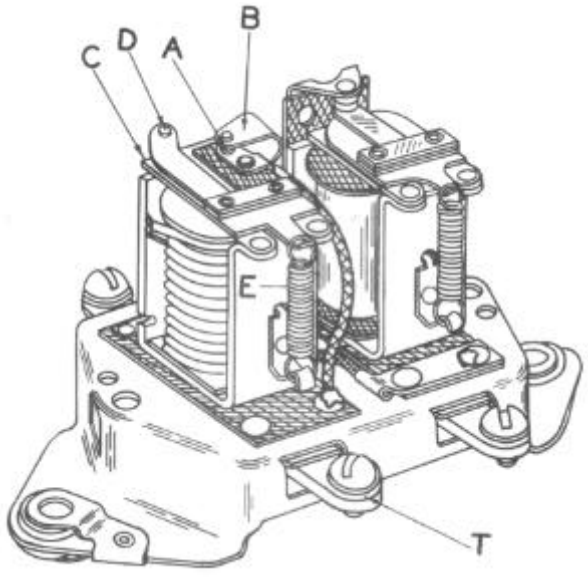
Electric clock circuit fuse is of 2 amperes and is located in a case behind the clock.

GENERATOR CHARGING INDICATOR

This is an instrument mounted on the instrument panel instead of an ammeter to indicate to the driver when the generator is charging the battery.

A small lamp bulb is incorporated in the case behind a red window and is connected to the "GA" terminal of the ignition switch and is operative only when the ignition is turned on.

When the ignition switch is turned on the circuit is completed from the ignition switch, through the bulb, to the "T" terminal of the voltage regulator, Figure 40, to the insulated contact points (A), to the grounded strap



(B) of the cut-out relay. As

Figure 40--Checking Generator Charging Indicator

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.

OIL PRESSURE INDICATOR

See "Engine Group."

WATER TEMPERATURE GAUGE

See "Cooling System Group." RHEOSTAT SWITCH

The rheostat switch is standard equipment on Models 43 and 47. This is located on the lower ledge of the instrument panel just to the left of the center. Its purpose is to dim or entirely turn out the instrument panel lights.

The switch is connected to the "T" terminal of lighting switch and is operative only when the car lights are turned on. Turning the knob to the right or clockwise rotation decreases and turning to the left or counter-clockwise increases the brilliancy of the instrument panel lights. Turning the knob to the extreme left turns lights out.

HORN ADJUSTMENT - 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, self-locking, fillister head screw is provided, located at some distance from the center, near the outer row of six cover screws.

Before attempting an adjustment to improve an unsatisfactory tone, however, the following possible causes 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 fillister head adjusting screw clockwise or counterclockwise, 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 miles per hour with all lights off and again with the engine shut off and all lights on.

DO NOT DISTURB ANY OTHER SCREWS OR POINTS OR ADJUSTMENT.

ELECTRIC AIR HORNS

The twin electric air horns are standard on Models 40 Passenger, 41, 43, 44, 45 and 47 and are optional equipment on the Model 40 Traveler, 48 and Commercial cars. The snorter horn is the high ditch and the longer the low ditch.

The power is derived from a magnetic type motor consisting of a field, armature, coil and a set of break points 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.

These are the major items that govern the frequency; the form of the diaphragm; the thickness of the diaphragm; the length of the air column and the air gap setting between the field and the armature.

The high pitched horn has a diaphragm .0195" thick and a short air column. The low pitched horn has a diaphragm .015" thick and a long air column.

Adjustment is by means of an adjusting nut under the motor cover and it is advisable to have only one horn operating when the above 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), Figure 41, and 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 in the position with its lock nut.

If satisfactory results are not obtained after the above adjustment proceed as follows:

1. Check the air gap between the field (A) and the armature (B) with a feeler gauge. This should be .026" to .030" on the high pitch horn and .032" to .035" on the low pitch horn.

2. 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

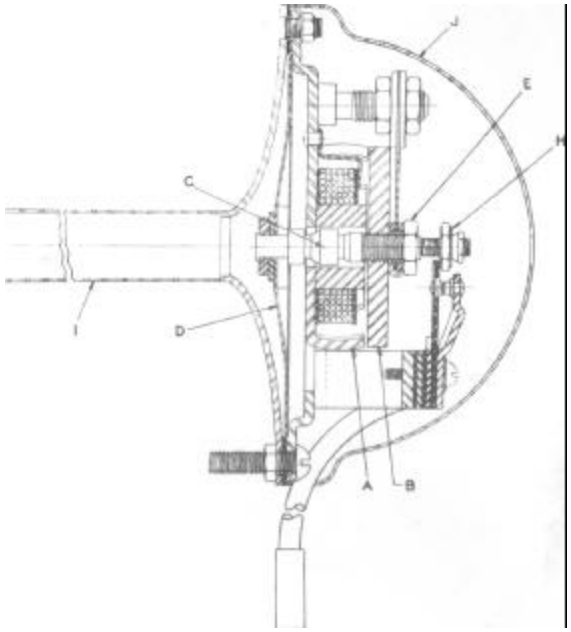


Figure 41--Electric Air Horn

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 counterclockwise to increase the air gap.

3. Tighten the lock nut (E) securely before and after checking the air gap.

4. 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.

5. 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 quality of the tone 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.

HORN RELAY

A horn relay is used with the twin electric air horns.

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.

The coil resistance is 7.3--8.9 ohms at 700 F.

HORN FUSE - TWIN ELECTRIC AIR HORNS

The horn circuit is protected with a 30 ampere fuse located in a fuse connector attached to the dash in the engine compartment.

HORN ASSEMBLY - REMOVE AND REPLACE

1. Unlock and raise bonnet.
2. Disconnect red ground wire to horn relay.
3. Disconnect yellow battery wire to horn relay.
4. Remove the bottom screw of the bonnet spring support rod which holds the horn.
5. Remove screws holding horn support bracket to frame.
6. Remove radiator core baffle through which horn protrudes by removing machine screws and clips holding it to fender
7. Remove horn.

INDEX

ENGINE SPECIFICATIONS

ENGINE MOUNTING	
Rubber	
3 Points	
CAMSHAFT	
Drive	Laminated Gear
Time indication marks on	Gears
CAMSHAFT BEARINGS	
Diameter and length	
6 cylinder	
No. 1	2" x 1-1/4"
No. 2	1-31/32" x 1-1/16"
No. 3	1-9/16" x 1-3/4"
8 cylinder	
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	1.935" x 1-1/16"
No. 5	1.498" x 1-1/2"
Radial clearance	.0025"
CONNECTING RODS	
Material D.F. Steel	
Weight	
Model 40	30-3/4 oz.
All other models	30 oz.
Length - Center to center	
Models 40,48 5 Pass Sedan-48 Pass Chassis--	8-5/8"
All other models--	8-3/16"
Lower end bearing	
Diameter	1-15/16"
Length	1-3/8"
Radial Clearance	.001
End Play	.007 to .013
Material	Bearing alloy
Upper end bearing	
Diameter	3/4"
Length	15/16"
Radial Clearance	.0003
Material	Bronze
CRANKSHAFT	
Type	Fully Compensated
Bearings	
6 cylinder	3
8 cylinder	5
Bearing material	Bearing alloy
Bearing- Diameter and length	
6 cylinder	
No. 1	2-11/32" x 1-5/8"
No. 2	2-3/8" x 1-3/4"
No. 3	2-13/32" x 2-3/8"
8 cylinder	
No. 1	2-9/32" x 1-5/8"
No. 2	2-5/16" x 1-3/8"
No. 3	2-11/32" x 1-7/8"
No. 4	2-3/8" x 1-3/8"
No. 5	2-13/32" x 2"
End Play taken up by bearing Number	
6 cylinder	2
8 cylinder	3
Bearing end play	.006"-.012"
Bearing radial clearance	.001"
Adjustment type	Shim
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	3/4"
PISTON PIN	
Type	Floating
Method of locking	Snap rings
Diameter	3/4"
Length	2-7/16"
Fit in Piston (at 200° F.)	.0003"
Fit in Rod	.0003"
PISTON RINGS	
Material	Cast Iron
Joint type	Straight cut-Pinned
Compression rings	
Number used	2
Width	3/32"
Gap	.009" to .011"
Oil Rings	
Number Used	2
Width-upper	3/16"

Width-lower	5/32"

INLET VALVE AND TAPPET

Inlet valve material	Silicon Steel
Inlet Valve head outside diameter	
6 cylinder	1-3/8"
8 cylinder	1-1/2"
Inlet valve opening	
6 cylinder	1-1/4"
8 cylinder	1-3/8"
Inlet valve lift	11/32"
Inlet valve stem length	
6 cylinder	5-11/32"
8 cylinder	5-3/32"
Inlet valve stem diameter	11/32"
Inlet valve stem clearance	.0025"
Inlet valve tappet clearance	.006 Hot

EXHAUST VALVE AND TAPPET

Exhaust valve material	Silichrome Steel
Exhaust valve head outside diameter	1-3/8"
Exhaust valve opening	1-1/4"
Exhaust valve lift	11/32"
Exhaust valve stem length	
6 cylinder	5-11/32"
8 cylinder	5-3/32"
Exhaust valve stem diameter	11/32"
Exhaust valve stem clearance in guide	.004"
Exhaust valve tappet clearance	.008" Hot

VALVE STEM GUIDES	Removable
VALVE GUIDE LENGTH	2-9/16"

VALVE GUIDE TO CYLINDER BLOCK DISTANCE

(top of guide to top of block)	
6 cylinder	1-1/16"
8 cylinder	15/16"
VALVE SPRING PRESSURE-CLOSED	40 lbs at 2"

LUBRICATION SYSTEM

Type	
Pump type	
Pump drive	
Oil cooling by	
Oil filter screen mesh	40
Capacity-Total	
6 cylinder	5-1/2 Qts.
8 cylinder	9 Qts.
Capacity-Refill	
6 cylinder	4-1/2 Qts.
8 cylinder	7 Qts.

ENGINE NUMBERS

Engine numbers are stamped on top of the cylinder block between number one and two exhaust manifold flanges. The engine number is also the car serial number. The first two figures of the engine and car number are the year and model of the car. The succeeding figures are the actual serial number and these figures run in a single series regardless of model.
Example--40101 - 41102 - 47103
First number is a model 40 Serial No. 101 Second number is a model 41 Serial No. 102 Third number is a model 47 Serial No. 103

ENGINE

LUBRICATION

The Hudson Duo-Flo lubrication system is by means of a large double acting pump that delivers its entire output to the two ends of the engine. No oil is side tracked back into the pan, all of it being used for lubrication. Once in the engine, the entire quantity must pass each bearing in succession until the two streams unite at the center and flow back into the pan. This assures every bearing getting all of the oil from the pump because the bearings act as their own pumps (operating at pressures far greater than any force feed pump pressure). Oil cannot be forced into bearings but

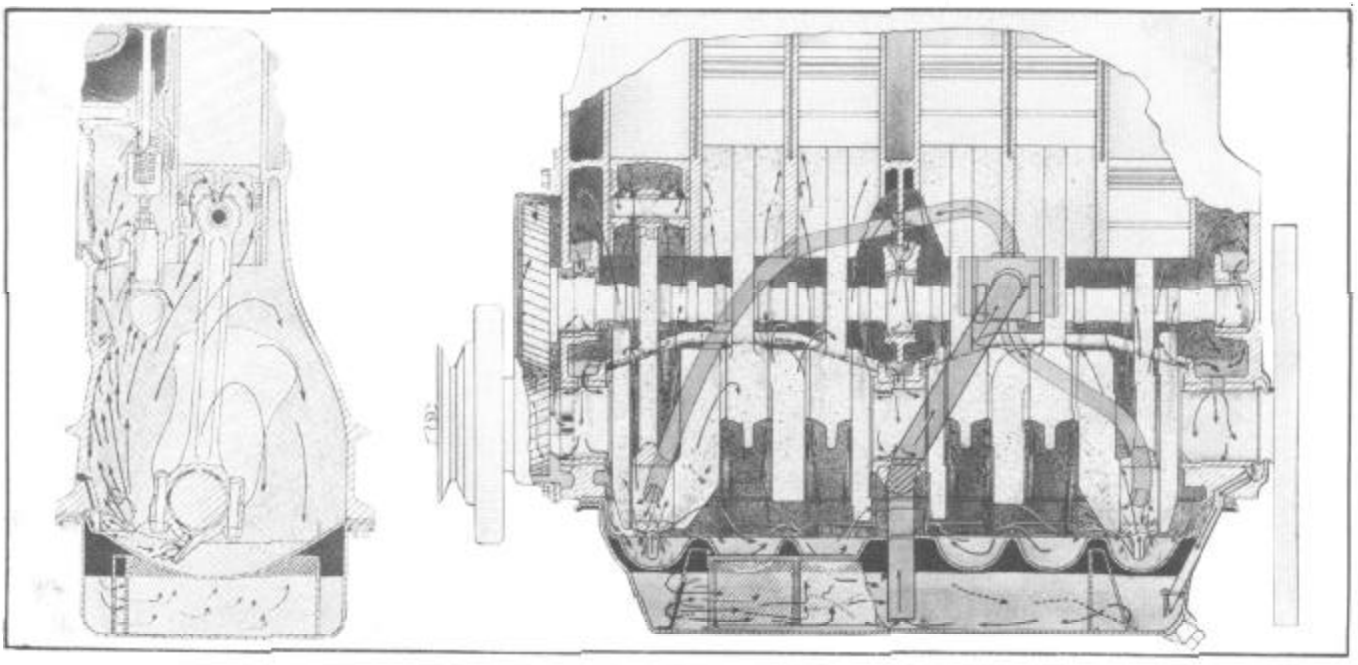


Figure 1--Engine Lubrication

but if they are assured plenty of oil they will accept as much of it as their running condition requires.

The oil is cool because the two large streams of oil can absorb the heat of the bearings, whereas a small stream entering a bearing neither cools the bearing nor stays cool itself.

The double acting Hudson Duo-Flo oil pump is valveless with no adjustments or by-passes, assuring a never failing supply of oil. The oil inside the engine is controlled by gravity, a force that does not change or fail and is independent of workmanship, bearing fits, dirt or wear and will work exactly the same after thousands of miles of car usage as it did at the first mile of use.

OIL PUMP (Figure 3)

The pump is of the oscillating plunger type and the drive is by gear from the camshaft. The rotary oscillating motion imparted to the plunger by the eccentric on the drive 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 - so that the plunger is in reality a combination of a double acting piston and sleeve valve.

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

OIL PUMP REMOVAL

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

OIL PUMP DISASSEMBLY

To disassemble the pump--

1. Remove end hex caps and gaskets.
2. Remove dowel screw from pump mounting. sleeve.
3. Withdraw shaft and plunger.

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

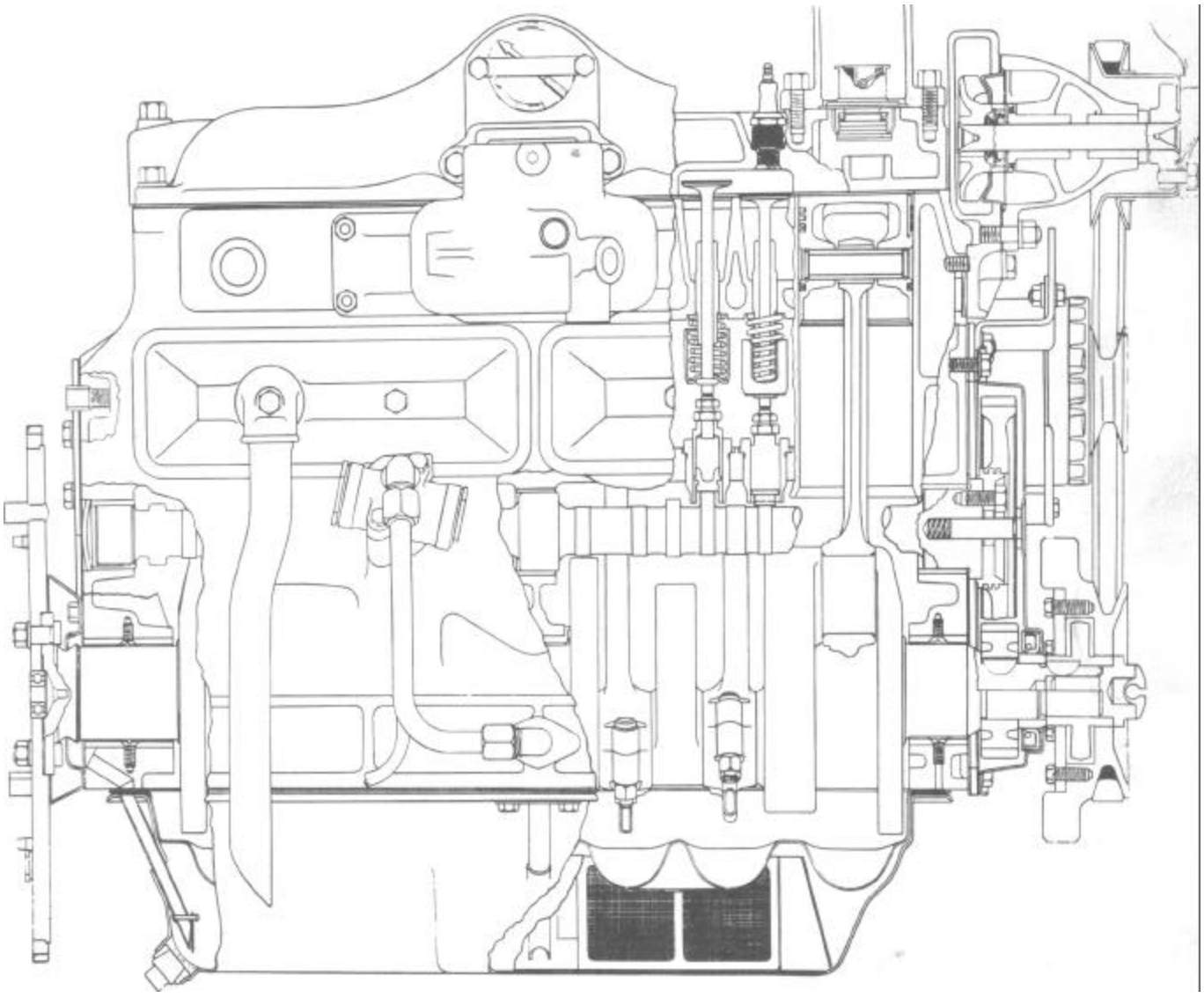


Figure 2--Engine-Cross Section

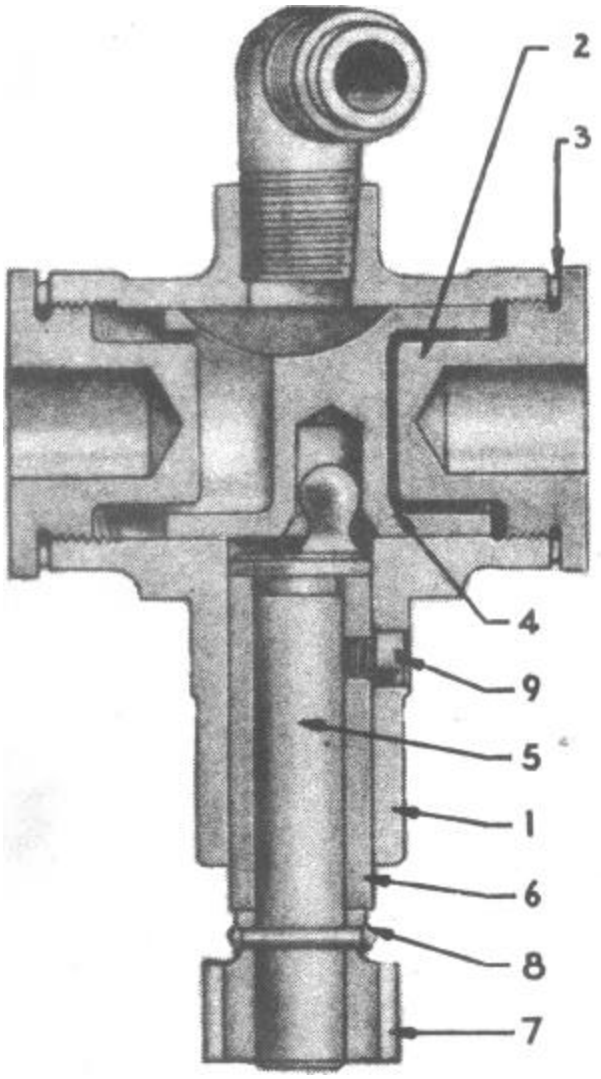


Figure 3--Oil Pump

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.

OIL PUMP INSPECTION

The inlet to the pump consists of two 5/8" tubes. First--Reservoir to crankcase side wall. Second--Crankcase side wall to pump.

In checking the oiling system see that the lower suction line extends to within 15/32" of the bottom of the reservoir and that both the oil pan and oil pan tray gaskets are in good condition.

Check the connections at the cylinder block and the one at the oil pump. They should be 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 DELIVERY LINES

There are two 5/16" oil lines leading from the pump.

One leads directly into number one oil trough and the other to the oil check valve at the rear of the engine where the oil enters directly into number 6 trough.

OIL CHECK VALVE AND SIGNAL

The oil check valve builds up enough pressure to operate the dash signal to indicate oil flow. With hot oil this pressure ranges from 4 to 12 lbs.

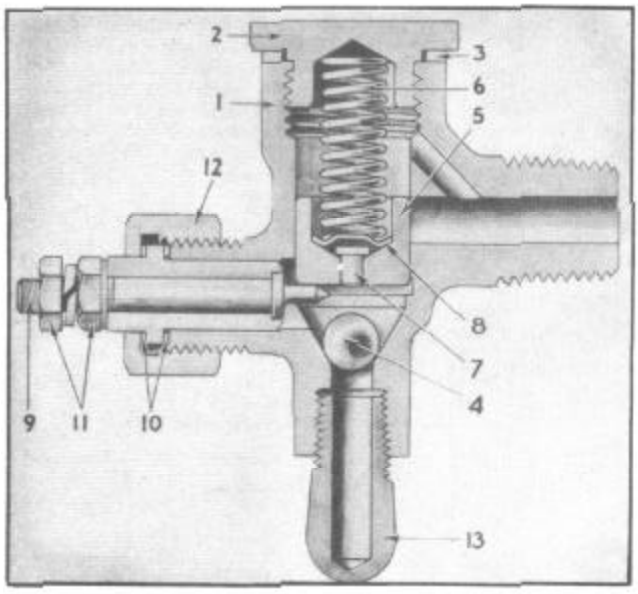


Figure 4--Oil Check Valve

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

The valve consists of a housing in which a piston operates against the pressure of a spring.

When there is no oil flowing and therefore no pressure the piston is pushed by the spring down and against an insulated pin which is the ground for the dash oil signal switch. The light will burn until sufficient oil pressure is developed to raise the piston.

A bleed hole is provided in the piston 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.

LUBRICATION CHECKS

All lines should be tight and not bent nor damaged.

The oil pan should be washed thoroughly with the change of seasons so as to remove any foreign matter on the filter screens that was not removed when the regular oil change was made.

OIL LEVEL GAUGE

Oil level gauges are of the bayonet type attached to the oil filler cap. When the bayonet gauge is in place the bottom of the gauge is in line with the bottom of the suction line. The top mark on the gauge is the normal level of oil with the recommended quantity. The middle mark (bottom

of oil level range) is reached when there is 2-1/2 quarts less than the recommended quantity in the reservoir. When the level reaches this point a complete oil change is in order or 2-1/2 quarts should be added to bring the level up to the top line.

ENGINE OIL FILTER

Special Equipment

The engine oil filter used is of special construction designed for use with the low pressure oil system used in Hudson engines.

In dust areas this engine oil filter and the oil bath air cleaner should be used.

The oil filter kit consists of--

1 oil filter assembly including the mounting bracket 4

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 3 way elbow

TO INSTALL

1. Remove fuel pump bowl if being installed on the 8 cylinder engine.

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.

5. Install oil check valve body extension to the oil check valve. Install one of the three elbows in the kit in the extension.

NOTE: Locate this elbow so that it is horizontal and toward the front of the car. The elbow pointing toward the side of the car and away from the engine (See 9 Figure 5)

6. Remove the elbow from the bottom of the check valve and discard it. Replace with the 3 way tee (3, Figure 5) in the kit. Locate this tee with the 5/1o" outlet toward the front of the car.

7. Install this oil check valve assembly on the engine using Tool J-1454.

8. Attach the oil line (4, Figure 5) from the oil pump to the 5/16" outlet of the 3 way tee.

9. Attach the tell-tale wire to the check valve (7, Figure 5).

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.

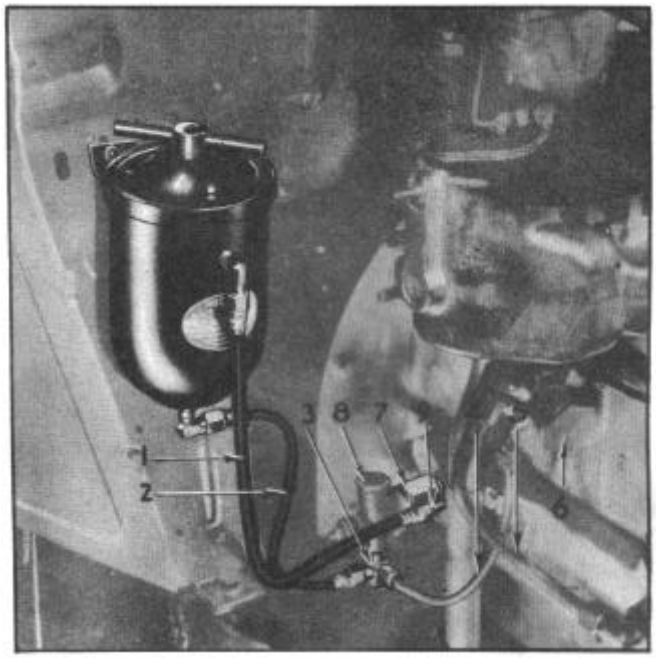


Figure 5--Engine Oil Filter Installation

1. Outlet hose
2. Inlet hose
3. 3 Way tee
4. Oil pipe from oil pump
5. Oil pump to cylinder pipe
6. Oil pump
7. Oil check valve
8. Oil check valve body plug
9. Oil filter pipe elbow

The outlet elbow at the top must be set at approximately 450 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. Keep the hose clear of any obstructions and connect the short or inlet hose from the 3 way tee to the elbow at the bottom of the filter (2, Figure 5).

15. Keep the hose clear of any obstructions and connect the long or outlet hose from the elbow in the oil check valve body extension to the elbow at the top of the filter (1, Figure 5).

16. Use two wrenches and tighten the hose. This is to prevent strain on the hose.

17. Run the engine for about ten minutes and inspect all connections for leaks.

NOTE: The oil filter cartridge is under the cover and can be removed by turning the handle and removing the cover.

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.

The engine oil should be changed every 2000 miles as shown on the Lubrication chart.

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.

OIL PRESSURE INDICATOR

This signal light consists of an oil pressure tell-tale on the instrument panel to indicate whether the oil pressure is satisfactory.

A regular lamp bulb is connected to the accessory terminal of the ignition switch (operating only with the ignition switch turned on) and is controlled by the oil line check valve.

The oil line check valve on the right side of the crankcase is provided with an insulated terminal pin which is grounded by the check valve plunger when no pressure exists in the oil line.

The oil pressure tell-tale lamp lead is connected to this terminal. A small hole in the check valve plunger and a by-pass in the body allows passage of sufficient oil so that the plunger alternately opens and closes the circuit at idling speeds, causing the tell-tale lamp to flash.

The plunger rests normally against the pin when no pressure exists in the oil line so that the tell-tale lamp will light when the ignition is turned on. At speeds above idling (approximately 7 M.P.H.) the oil pressure holds the check valve plunger off its seat so that the tell-tale lamp does not burn or flash.

If the tell-tale 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. If the tell-tale lamp does not flash at idling speeds see that the small hole in the plunger is clean and open.

ENGINE FRONT SUPPORT REMOVAL

1. Drain cooling system (Petcock at bottom of radiator and 1/8" pipe plug near lower rear corner of water jacket cover).
2. Remove generator; fan belt; and radiator outlet hose.
3. Raise the front end of the car and remove radiator lower tank shield.
4. Remove starting crank jaw and vibration dampener using tool J-676-B.
5. Remove timing gear cover and gasket (See Page 15).
6. Turn engine over until timing marks on gears coincide.
7. Remove camshaft gear and thrust plunger. (See Page 16).
8. Remove crankshaft gear (See Page 16) using tool J-471.
9. Block up the front end of the engine. Remove front engine mounting bolts and nuts.
10. Remove engine support bolts and locks. Remove plate.

ENGINE FRONT SUPPORT INSTALLING

Clean the front face of the cylinder of all traces of the old gasket. Use new gaskets.

1. Replace engine support plate using new gasket.
2. Replace front engine mounting bolts and nuts. Draw them up tight until the upper and lower plates are against the bolt spacer.
3. Replace crankshaft gear with tool J-483.
4. Replace camshaft thrust plate and gear. The punch marked tooth of crankshaft gear must be between the punch marked teeth on the camshaft gear.
5. Replace timing gear cover.
6. Replace vibration dampener and replace starting crank jaw.
7. Lower front end of car.
8. Replace radiator outlet hose, fan belt and generator.
9. Adjust fan belt and refill cooling system.

ENGINE 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.

New mounting bolts without cotter pin holes and self locking slotted hex nuts are used which eliminate the need for cotter pins. The nut has a slight chamfer at the contact face and as it is tightened the slots in the hex close up thus automatically closing the threads on the nut tighter in 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.

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 cover
Clutch housing to engine bolts
Engine ground strap
3. Drain cooling system (Petcock at bottom of radiator and 1/8" 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.

ENGINE INSTALLING

Reverse procedure of removal.

NOTE: Install starting motor after engine is in place.

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.

Always use new genuine Hudson gaskets throughout as the cost of the new gaskets, made to fit, is small and any possibility of leaks due to torn; worn or buckled gaskets is almost eliminated.

EXHAUST MANIFOLD

The exhaust manifold is designed to make use of the heat it contains to preheat the gasoline vapor before entering the combustion chamber.

The automatic heat control; manual and automatic exhaust damper control are as follows--

All models Automatic choke control
Models 40,48 Manual exhaust damper
Models 41,43,44,45,47....Automatic exhaust damper

MANUAL EXHAUST DAMPER

The models 40, 48 are fitted with a manual heat control valve mounted at the center of the exhaust manifold. This valve should be set so that the arrow on its cover points straight up to the "W" cast on top of manifold for summer and winter.

All other models are fitted with an automatic heat control valve which is controlled according to the under hood temperature by a thermostatic coil.

CRANKSHAFT REMOVAL

1. Remove engine from chassis (See Page 6).
2. Remove vibration dampener (Page 14).
3. Remove timing gear cover (Page 15).
4. Remove oil pan.
5. Disconnect connecting rods.
6. Remove crankshaft caps using remover Tool J-377 for front and rear caps.

Lift out crankshaft with flywheel and crank-shaft gear.

CRANKSHAFT PIN SIZE CODE

Some engines are built with .010" undersize crank pins only or .010" undersize crankshaft bearing journals only or with .010" undersize crank pins and bearing journals.

To identify each of these three conditions in an engine the following markings are used:

PU means crankshaft has .010" undersize crank pins.

MU means crankshaft has .010" undersize crankshaft bearing journals.

PMU means crankshaft has .010" undersize crank pins and also .010" undersize crankshaft 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 surface covered by the oil pan gasket. The letters can be seen without removing the oil pan.

CRANKSHAFT BEARINGS

The crankshaft bearings are bronze backed and the radial clearance is .001" and the end play from .006" to .012".

CRANKSHAFT BEARING CAPS

The upper and lower halves of the crankshaft bearings 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.

Vertical and horizontal packing holes are used in the front bearing caps (See Figure 6 showing packing holes). No horizontal holes are used in the rear cap.

Front and rear bearing caps have to be removed with a puller because sufficient force has to be

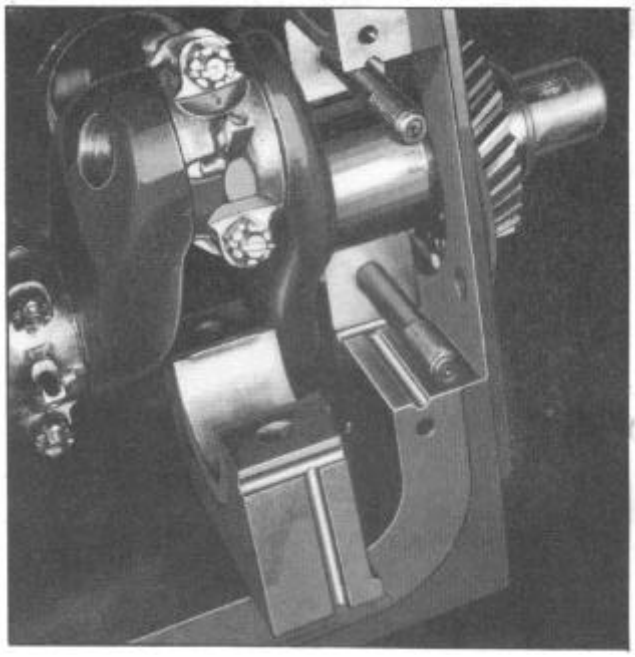


Figure 6--Crankshaft Front Bearing Cap

used to shear off the packing in the grooves. The packing should be thoroughly cleaned from the grooves in the case and the cap.

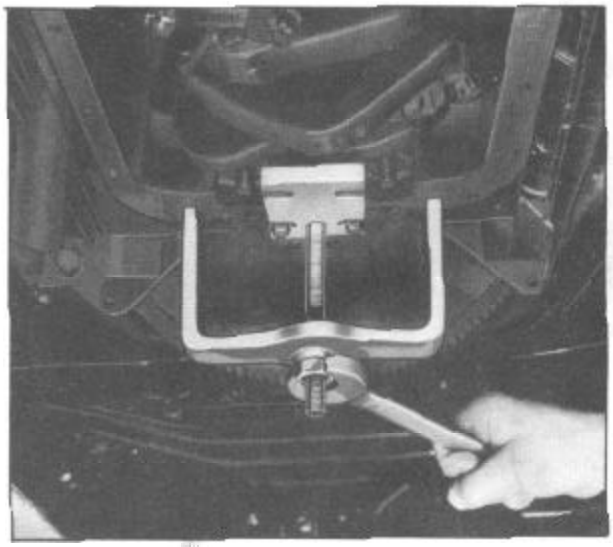


Figure 7--Crankshaft Bearing Cap Remover Tool J-377.

CAUTION: None of the packing should be allowed to remain in the case as it might clog the oil passages.

After the bearing caps have been replaced and the stud nuts tightened and keyed the packing should be replaced. Tighten the nuts to 1100 inch pounds torque tension.

Drive cotton wicking into the front bearing cap horizontal hole first, then drive the cotton wicking into the vertical holes of the front and rear bearing cap. Use crankshaft bearing cap packing inserter tool J-392.

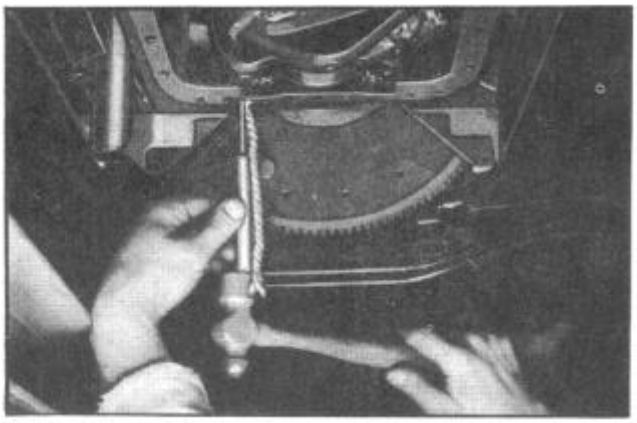


Figure 8--Crankshaft Bearing Packing Inserter Tool J-392.

CRANKSHAFT BEARINGS

The lower halves of the bearings are held in the caps with machine screws while the upper halves in the case are also held with machine screws.

Bearing adjustments can be made by removing the bearing caps and removing shims from the pack on top of the bearing cap.

The crankshaft bearings should have a .001" clearance and not over .006" to .012" end play.

End thrust is taken at the center main bearing flange in the 6 cylinder engine and at the No. 3 main bearing flange in the 8 cylinder engine.

Bearings can be supplied in individual sets (upper and lower) finished to standard size or .010" undersize, or in a semi-finished state to permit line reaming.

Finished standard size bearings can be put in place in the case; fastened with the retaining screw and adjusted to the proper clearance by selection of shims without the necessity of scraping or reaming.

.010" undersize finished bearings may be installed where the crankshaft is worn or has been reground.

REAR CRANKSHAFT BEARING OIL RETAINER

After the rear crankshaft bearing cap has been removed and reinstalled the lower half of the oil retainer should be checked to see that it fits tightly against the upper half and also to see that the gaskets are in good condition.

CAUTION: A gap between the two halves of the retainer will permit loss of oil.

CYLINDER HEAD

Remove all cylinder head nuts.

The cylinder head has lugs cast along the left side to allow a pinch bar to be used to pry it loose from the gasket.

The seal between the head and the gasket can usually be broken by cranking the engine with the starter after the spark plug wires have been removed and the ignition off.

CAUTION: One stud nut should be left on loosely both at the front and rear to prevent the head being lifted completely off.

In rare cases it may be necessary to lift the head off with a chain hoist and two eye bolts screwed into the spark plug holes (use service tool J-917).

CAUTION: If necessary to hit the cylinder head with a hammer in order to ease it off the studs use a rawhide hammer only.

Check the surface of the cylinder head and cylinder block for particles of dirt or carbon. Clean thoroughly.

If there is reason to suspect a badly overheated engine check each surface with a long straight edge. Long service with many miles of hard driving will sometimes cause a condition as illustrated below. The stud has thrown up a burr around the

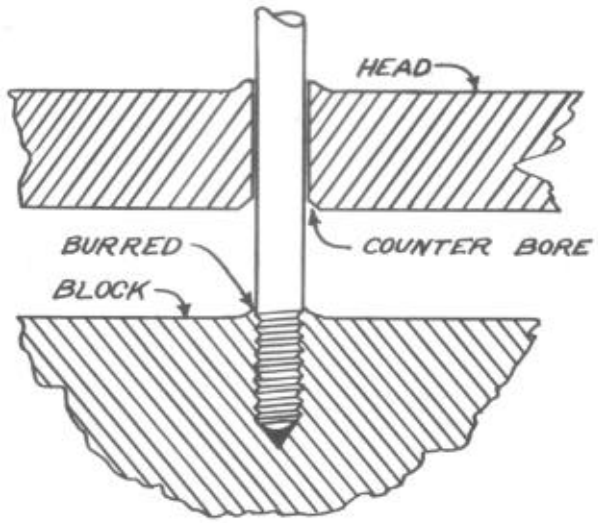


Figure 9--Burr On Cylinder Block

top of the threaded portion. It is evident that the head gasket will be pinched tightly at this point, and these high spots will not allow the gasket to be tightly pressed down at all points.

Counterbore the stud holes in such cases as shown in Figure 9.

CYLINDER HEAD GASKET

A light coating of Perfect Seal Gasket Paste should be applied to both faces of the gasket.

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 so that the letters on the gasket are on top.

CYLINDER HEAD STUD NUTS

Install head on the gasket and put on all the stud nuts and turn them down as far as possible with the fingers.

The nuts should be tightened to 45 foot pounds (540 inch pounds) on the 6 cylinder and 55 foot pounds (650 inch pounds) on the 8 cylinder with a torsional wrench. Tighten nut very carefully each one a little at a time so that no one particular nut gets excessive tension.

The following plan has proven most satisfactory whether used for the 21 nuts of the 6 cylinder engine or the 30 nuts of the eight cylinder engine.

Removing and Replacing Cylinder Heads

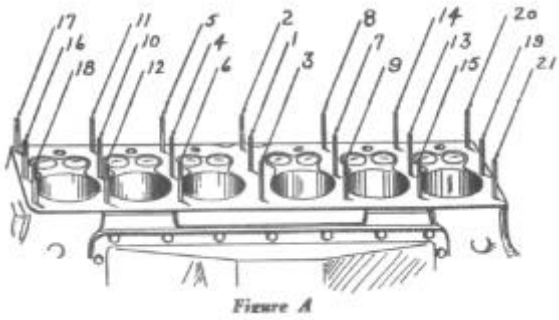


Figure 10--Sequence of Tightening Cylinder Head Stud Nuts

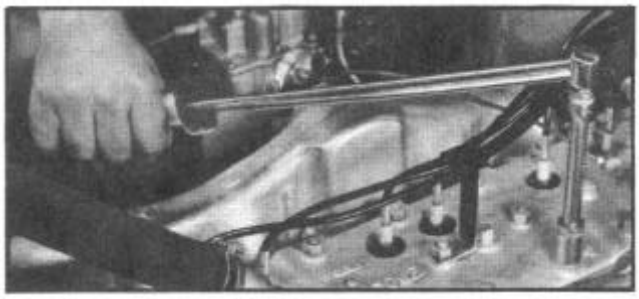


Figure 11--Tightening Cylinder Head Stud Nuts with Tension Wrench J-1313

Start with middle nut No. 1. Pull down the nut until it is just snug or just starts to take hold. Pull down in the following order.

1 - 4 - 10 - 16 - 7 - 13 - 19

just snugly.

Go back to No. 1 and pull down fairly tight, then

1 - 2 - 3 - 4 - 5 6 - 7 - 8 - 9 - 10

11 - 12 - 13 - 14 - 15 - 16 - 17 - 18 - 19 - 20 - 21

Go back to No. 1 and pull down very tight, then

1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

11 - 12 - 13 - 14 - 15 - 16 - 17 - 18 - 19 - 20 - 21

Run the engine and warm it thoroughly, then while still warm tighten

1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

11 - 12 - 13 - 14 - 15 - 16 - 17 - 18 - 19 - 20 - 21

PISTON CONSTRUCTION

The cylinder bores are fitted with T slot low expansion silicon aluminum alloy cam ground pistons.

The pistons are fitted with four rings, two of which are 3/32" wide compression rings, pinned in place above the piston pin, and two 3/16" wide oil control rings. One of the oil rings is located above the piston pin and the other below the piston pin. The oil control rings are also pinned in place to prevent rotation in the ring grooves.

CAUTION: The piston pin bosses in the pistons are diamond bored giving a highly finished accurate piston pin bearing. Do not ream the piston pin bosses; use oversize pins and ream the bronze bushing for the piston pin in the connecting rod.

PISTON SIZES

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

A code letter and the piston weight (in ounces and quarter ounces) is stamped on the heads 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--See Figure 12 remove the piston from No. 2 cylinder and find marks like these--547--(for production information only and used 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) B is the code letter on both the piston and the lower face of the valve chamber. 10 over 3 is the weight and means 10-3/4 ounces. 3 (if marked 10 over 1 is 10-1/4 ounces 10 over 2 is 10-1/2 ounces.) 2 is the number of the cylinder the piston is used in.

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 SIZES

Cylinder Size	Piston Code	Piston Code	Piston Size	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
3.004		J	3.0025	3.003
3.005		L	3.0035	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
3.015		LO	3,0135	3.015
3.020		BB	3.0185	3.020
3.021		DD	3.0195	3.020
3.022		FF	3.0205	3.020

The cylinder code is stamped on the lower face of the valve chamber (see Figure 12) and the piston code on the head of the piston.

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 .020" oversize are given in this chart and the two recommended piston size 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. This gives a minimum piston ring gap (gap of not less than .005").

PISTON FITTING

The piston skirt is cam ground and tapered when machined so that it takes a true cylindrical shape when heated. This gives the maximum bearing area at operating temperatures.

The cam grinding of the skirt makes it necessary that a .0015 feeler gauge blade be used when directly opposite the skirt slot (see Figure 13 point "A").

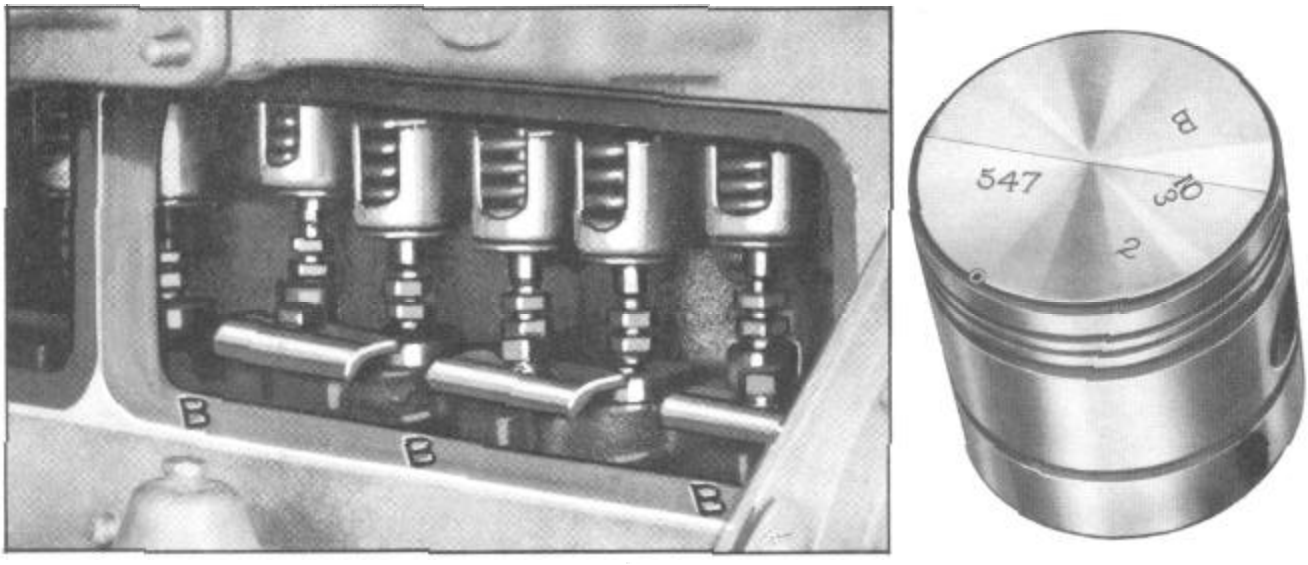


Figure 12--Cylinder Bore Markings

NOTE: Before fitting pistons remove the ridge from the top of the cylinder with cylinder ridge reamer tool J 592.

Figure 13--Piston Clearance

After inserting piston in the cylinder with the .0015" feeler gauge in the position described above the feeler should be movable under a 3 to 4 pound pull. Use tool J 888-A Piston feeler scale to measure this pull.

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

PISTON PIN

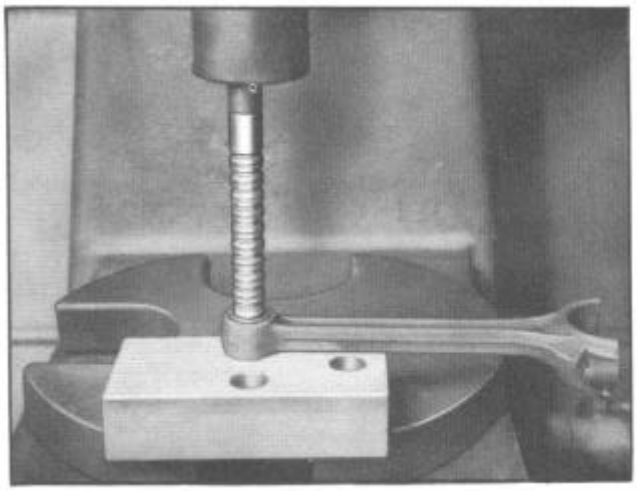


Figure 14--Piston Pin Bushing Burnisher and Support Block Tools J 410 (Burnisher) and J 400-2 (Support Block)

The piston pins are of full-floating design. The pin can rotate in the piston and has sufficient movement 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 and a clearance of .0003" is possible between the pin and the bushing because of the accurate grinding and diamond boring.

NOTE: We recommend using oversize piston pins to fit the piston boss and new piston pin bushings in the connecting rod, 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 attempt to ream the piston.

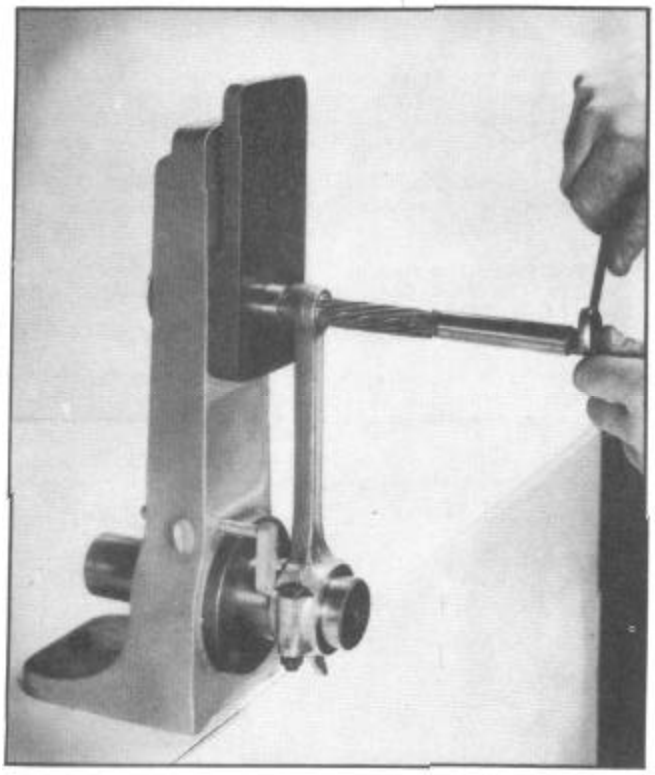


Figure 15--Piston Pin Bushing Expansion Reamer as Used on the Connecting Rod Aligning Fixture J 874 H

The piston pin and piston pin bushing should be replaced when necessary by selecting the proper size pin and then reaming the bushing to size. See Figure 15.

Piston pins are furnished in standard (3/4" or .750") and in .002", .005" or .010" oversizes.

When replacing piston pins select parts which can be pushed into the piston bosses with the heel of the hand when the piston is heated to 2000 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 (see Figure 15) to .0003" larger than the pin diameter.

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

PISTON PIN 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 by a pointed instrument.

PISTON RINGS

The piston ring as used in Hudson cars is of the square end type and is pinned to prevent rotation on the piston.

The rings are cut and notched to fit the pin so that the clearance on the pin is equal to the gap between the ends of the ring (Figure 16). In other words, if the ring is compressed so the ends come ,together there will be no clearance on the pin.

If the ends of the ring are filed in fitting, it is necessary to file an equal amount in the pin notch to maintain the pin clearance. Filing, however, should not be necessary.

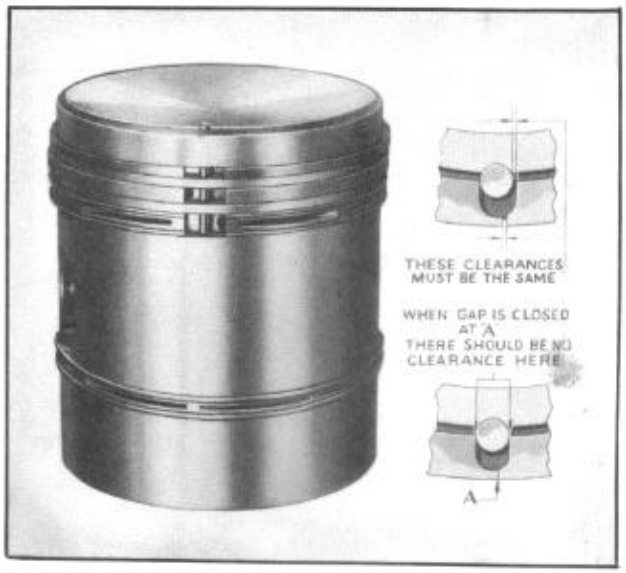


Figure 16--Piston Ring Clearances

The granoseal is a form of etching by means of which certain undesirable particles that have no wear resisting qualities are eliminated from the finished surface leaving a black and seemingly

rough surface on the entire ring. The surface, however, acts as a series of minute oil reservoirs and tends to improve lubrication.

Piston rings of the pinned type are supplied in exact sizes to give a minimum gap of .005" when

ring is compressed. Since it is generally necessary to hone or otherwise recondition a cylinder bore when oversized pistons are being fitted, they

should be brought to an exact size for which piston rings are available.

Example--A cylinder may clean up at .009" oversize. Since no ring is available in this size it is advisable to hone the cylinder to .010" oversize rather than to file the gap of a set of .010" oversize rings to permit their use in a .009" oversize cylinder.

Piston rings are available in the sizes shown in the table on page 9.

CONNECTING RODS - CONSTRUCTION

The connecting rods are of drop forged steel. The connecting rod bolts are of centerless ground type fitted in reamed holes. The connecting rod

bolt nuts are locked by a special spring steel companion nut.

The connecting rods have steel side thrust faces. A lead alloy bearing metal is used to line the connecting rods and the lining thickness is .015". This thickness of the lining plus the elimination of babbitt thrust flanges (by carrying out the steel forging to the full width at the bottom end) permits quick heat dissipation and reduces the tendency of the bearing to flake or pound out under severe driving conditions.

The radial at the connecting rod big end is .001" and the end clearance is .006" to .010".

CONNECTING ROD OFFSET

Connecting rods are right and left hand; the big 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.

HUDSON REPLACEMENT CONNECTING RODS

The use of Genuine Hudson Connecting Rods for replacement in an engine overhaul insures the very careful Hudson process of babbitting.

A continuous babbitting procedure is used and the rod is protected between operations so as to avoid oxidizing before babbitting. A special process of bonding the bearing metal to the forged rod is used to prevent separation and consequent disintegration of the bearing metal.

Genuine Hudson Connecting Rods will extend the life of an engine overhaul by many thousands of miles.

CONNECTING ROD BEARINGS

The connecting rod bearing does not lend itself to adjustment.

Never file the connecting rod or its cap to reduce clearance.

Replace connecting rods having improper clearance.

Radial bearing clearance should be .001". Bearing end play should be from .006" to .010".

CONNECTING ROD BOLT NUT LOCK

A light weight companion nut is used in place of a cotter pin in locking the connecting rod bolt nut. This nut is known as a "Palnut", and is a small single thread nut stamped from light gauge steel and tempered.

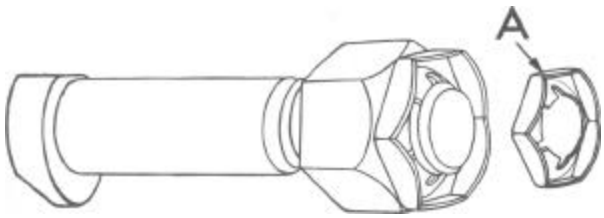


Figure 17--Connecting Rod Bolt Palnut

The Palnut tightens down against a plain hexagon nut and locks itself in the bottom of the bolt thread by the compression of the single conical- shaped thread.

USING THE PALNUT

Tighten the regular connecting rod bolt nut to 630 inch pounds torque tension with a torque tension wrench.

Place palnut 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.

CONNECTING ROD ALIGNING AND REAMING FIXTURE

The Hudson Connecting Rod Aligning and Reaming Fixture J 874-H 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. See Figure 00.

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 .010" undersize rods.

The piston pin expansion reamer is .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 Figure 18.

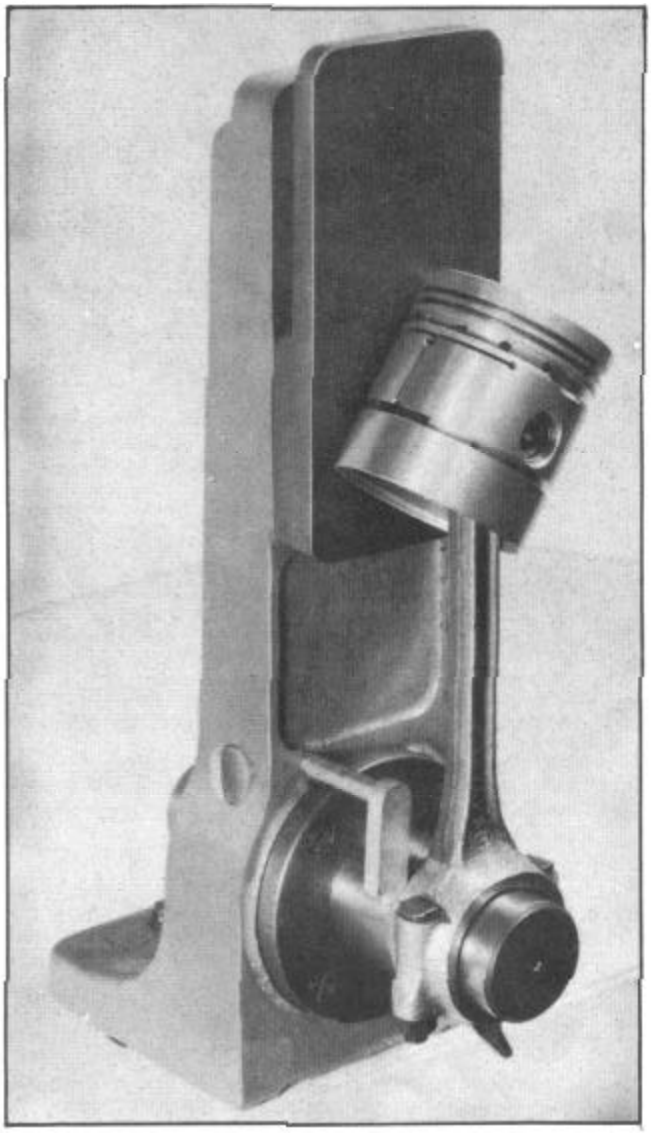


Figure 18--Setting Piston in line with the Connecting Rod on Fixture J 874-H

CONNECTING ROD ALIGNMENT

The Connecting Rod Aligning and Reaming Fixture J 874-H is used to accurately check the alignment of the piston and the pin with the connecting rod bearing.

The connecting rod is clamped on the arbor (Figure 19) 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 on the fixture.

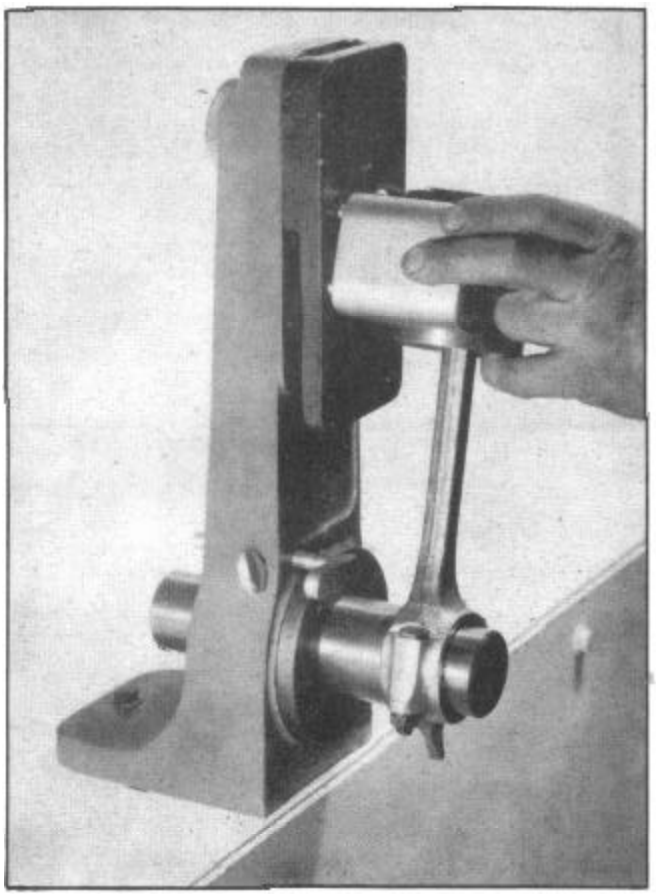


Figure 19--Connecting Rod Alignment with V Blocks on Fixture J 874-H

CONNECTING ROD COCKED OR BENT

To check the rod on this fixture, 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 fact 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.

CONNECTING ROD TWISTED

Proceed as under "Connecting Rod 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.

CONNECTING 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.

CAUTION: 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.

All four pins of the "V" block will touch the face plate when the rod is straight.

CONNECTING 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 large end of 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 .025" the rod should be straightened until both the pins touch the face plate and the index touches the rod bearing within .025".

NOTE: Use two bending bars H M 3-R 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 .025" the rod should be straightened until the pins on the "V" block, touch the face plate and the index touches the rod bearing within .025".

CONNECTING ROD WITH PISTON-ALIGNING

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.

CONNECTING ROD ALIGNMENT - QUICK CHECK

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. (Figure 19)

With the "V" block on the piston skirt and the pins against the face plate, tip the piston first in one

PISTON PIN BUSHING REAMER - Figure 15

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.
1. Place the connecting rod on the arbor and tighten it.
2. 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.
3. Insert reamer pilot bushing in upper hole in fixture.
4. Insert reamer thru connecting rod bushing and into pilot bushing.
5. Perform reaming operation.

CONNECTING ROD AND PISTON REMOVAL

The 6 or 8 cylinder connecting rods and pistons can be removed from the top and the 8 cylinder connecting rods and pistons can be removed from either the bottom or top.
Remove oil pan and connecting rod caps and also remove cylinder head on 6 cylinder engines.

CAMSHAFT

The camshaft is of iron alloy and electric furnace hardened.
The granoseal process of treating is used which 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 sand provides a cushion of oil for the tappets; bearings and gears during operation. The life of all these parts is greatly prolonged.
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

1. Drain cooling system (Petcock at bottom of radiator and 1/8" pipe plug near lower rear corner of water jacket cover.
2. Remove bonnet.
3. Remove radiator.
4. Remove louvre panel assembly.
5. Remove starting crank jaw and vibration dampener--see page 14.
6. Remove fan blades. Loosen generator and remove fan belt.
7. Remove timing gear cover.
8. Remove camshaft gear (3 bolts).
9. Remove valve chamber cover.
10. Remove cylinder head, valves and tappets.
11. Remove oil pump, fuel pump and distributor.
12. Loosen front engine support and raise the front end of the engine so that the camshaft can be pulled out over the radiator lower tank shield. 13. Remove camshaft with the thrust button and spring.

CAMSHAFT BEARINGS REMOVAL

1. Remove camshaft as described.
2. Remove oil reservoir.
3. Remove old camshaft bearings.
See camshaft rear bearing replacement.

CAMSHAFT REAR BEARING REPLACEMENT - 6 CYLINDER

The distributor shaft gear is driven by the cam shaft at a point near the rear camshaft bearing and requires a cut in the rear camshaft bearing for clearance.
This cut can be made after bearing installation with a standard 1-1/8" hole saw which should be mounted to apiece of 1/2" cold rolled stock of sufficient length to extend through the distributor support in place of the standard distributor shaft. A hex nut fastened at the top end will enable application of a ratchet wrench for cutting the bearing.
1. Remove distributor drive shaft and support assembly.
2. Remove drive shaft and insert hole saw in its place.
3. Replace Support assembly.
4. Attach ratchet to top of hole saw tool and cut bearing, applying light pressure to produce a clean cut.
5. Remove support assembly and clean out cuttings.
6. Disassemble distributor shaft to support and install.

NOTE: Place a rag soaked in oil or cup grease under bearing to catch chips, thus eliminating necessity of removing the crankshaft.

CAMSHAFT INSTALLING

To install the camshaft reverse the order of removal.
Use new gaskets and a new camshaft thrust washer.
Apply a light coating of engine oil to all of the camshaft bearings before putting camshaft in place.
Tighten valve tappet guide clamps. Recheck to see that they are secure.
Tune up engine (see Engine Tune-Up Section).

CAMSHAFT BEARINGS

When replacing camshaft bearings it is advisable to use factory reamed bearings available from the Factory Parts Department. These bearings are reamed at the factory sufficiently oversize so that when pressed into place they will be compressed to 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. When line reaming, these bearings should be reamed to .001" clearance.

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 counteract any tendency of the crankshaft to develop vibration periods.
The dampener flywheel has a V groove for the belt which drives the fan, water pump and generator.

VIBRATION DAMPENER REMOVAL

Removal can be accomplished from underneath the car with removal of either the radiator core or louvre panel.
1. Remove radiator louvre panel center moulding.
2. Remove front bumper bracket bolts and allow bumper to drop down.
3. Loosen generator mounting bolts and remove fan belt.

4. Unscrew the crankshaft starting jaw (screws into the end of the crankshaft).
5. Place jaw of vibration dampener puller over the dampener and place the screw of the puller tool thru the starting crank hole.
6. Turn the screw to draw off the dampener and remove it from underneath.

VALVE TAPPETS

The tappets are of the roller cam type which closely follow the cam, thus assuring quiet operation. They are adjustable and are set to .006" for intake and .008" for exhaust when hot.

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. Remove valve spring seat retainer, spring seat, spring dampener and spring.
3. Remove the tappet adjusting screw and replace by a short screw with a thin head.
4. Remove the tappet guide clamp screw and clamp.
5. The tappet and guide assembly can then be lifted out.

The above removal is recommended in cases where only a few of the tappets are to be replaced. If the complete set is to be replaced it is recommended that the cylinder head be removed and also the valves.

VALVE LOCATIONS

The 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 TAPPET ADJUSTMENT

1. Jack up front end of car.
2. Remove right front wheel.
3. Remove horn mounting bolts and push horn forward out of the way.
4. Remove fender dust shield to fender bolts, dust shield to frame bolts and fender apron support bolt.
5. Remove valve tappet chamber breather tube.
6. Remove valve chamber cover.

Set to .006" for intake
Set to .008" for exhaust
Normal running temperature

VALVES

Exhaust valves are of Silichrome alloy steel. Intake valves are of silicon steel and are 1-3/8" in diameter on 6 cylinder engines and 1-1/2" on eight cylinder. Exhaust head diameters are 1-3/8" on both 6 and 8 cylinder engines.

The valve seats are ground into the chrome alloy cylinder block.

Exhaust valves are fitted to a stem clearance of .004" and intake valve stems to .0025".

VALVE SPRINGS

The valve springs are cadmium plated and of special heat-treated steel wire and are encased in special dampeners or cups to prevent flutter at high speeds. They are set at a temperature far above the normal running temperature so that they maintain their initial strength for many thousands of miles.

Valve springs after they have been removed from the engine should be tested for pressure with tool U-15.

A new valve spring has a pressure that should be
40 pounds when compressed to 2"
80 pounds when compressed to 1-21/32"
Valve springs that show a pressure of less than 34 pounds at 2" should be replaced.

VALVE STEM GUIDE

The valve stem guides are removable. Use valve stem guide remover tool J 1188 to drive the guides out.

When replacing the guides use valve stem guide replacer tool J 883 A. This tool is designed to drive the guides so that the top of the guide in the 6 cylinder engine is 1-1/16" below the top of the cylinder block and in the 8 cylinder engine 15/16". This position of the guide must be accurately maintained. After the guides are replaced they should be reamed to .002" larger than the valve stem with tool J 129-2.

VALVE SEAT

Valves that are loose in the valve guides will not stay seated.

Therefore, before grinding valve seats check the valve stems and valve stem guides for wear.

Valve seats should be refaced with a 450 cutting tool. A hard glaze develops on the valve seats and a piece of emery cloth placed over the cutter pilot will remove the glaze. The cutter can then be used without chattering.

VALVE TIMING

The valve timing is determined by the mesh of the timing gears.

The crankshaft gear is keyed to the crankshaft and can be installed in only one position. The camshaft gear fits over the flange of the camshaft and is held by three cap screws. These cap screws are unequally spaced so that the cam gear can be located in only one position.

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 Figure 20.

TIMING GEAR COVER REMOVAL

1. Drain cooling system (Petcock at bottom of radiator and 1/8" pipe plug near lower rear corner of water jacket cover).
2. Loosen generator mounting bolt nuts and remove fan belt.
3. Remove radiator outlet hose.
4. Remove Vibration Dampener--see page 14.
5. Removing timing gear cover bolts: Timing gear cover
Timing gear cover gasket
Vibration dampener spacer
6. Remove leather oil seal in cover.

NOTE: 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 oil seal is pressed tightly in place.

TIMING GEAR COVER INSTALLING Reverse the order of removal.

NOTE: Check leather oil seal to be certain that it is not curled over as this will cause oil to seep thru.

Use a new timing gear cover gasket.

TIMING GEAR COVER

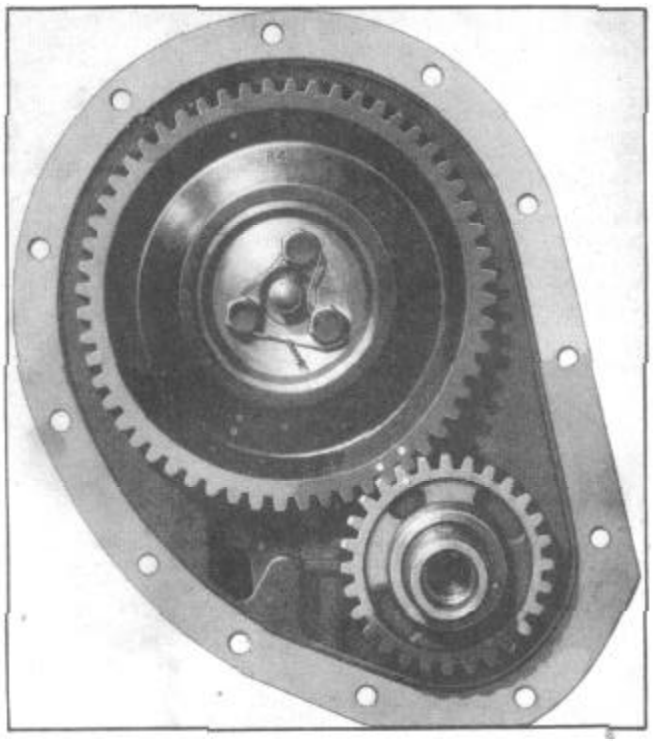


Figure 20--Timing Gear Markings

The 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.

TIMING GEAR LASH

The camshaft gear is of laminated fibre and the crankshaft gear is cast iron.

A special .008" oversize camshaft gear is available for service replacement. This gear may be identified from the standard gear by a spot of yellow paint on the front face.

The gear lash should be from .002" to .003" on the 6 cylinder engine and .004" to .005" on the 8 cylinder engine.

TIMING GEAR REMOVAL

1. Drain cooling system (Petcock at bottom of radiator and 1/8" pipe plug near lower rear corner of water jacket cover).
2. Loosen generator mounting bolt nuts and remove fan belt and radiator outlet hose.
3. Remove Vibration Dampener (see page 14).
4. Remove timing gear cover bolts.
   Timing gear cover
   Timing gear cover gasket
   Vibration dampener spacer
5. Turn engine over until timing gear marks on face of gear coincide (Figure 20).
6. Remove camshaft gear (3 cap screw and a lockwire).
7. Remove crankshaft gear using crankshaft gear puller Tool J 471.

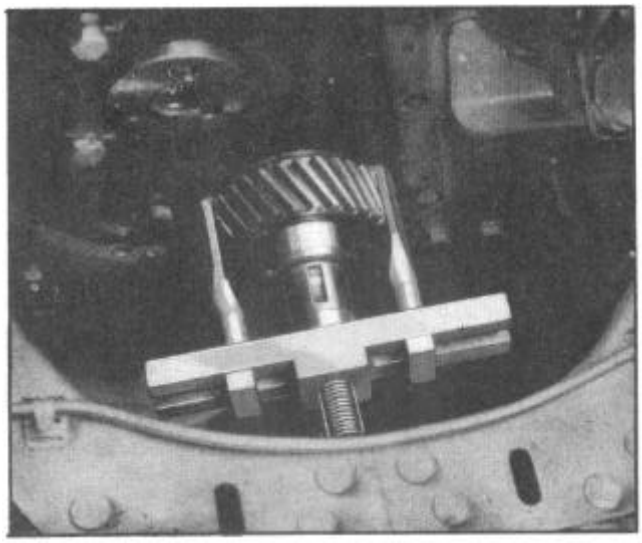


Figure 21--Crankshaft Gear Puller Tool J 471

TIMING GEAR INSTALLING

Reverse the order of removal.

Correct timing is obtained by meshing the punch marked tooth of the crankshaft gear between the two punch marked teeth of the camshaft gear.

The crankshaft gear should be replaced with the crankshaft gear replacing tool J 483.

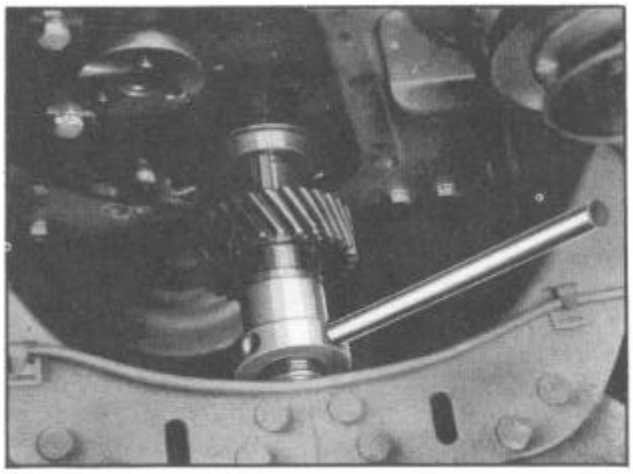


Figure 22--Crankshaft Gear Replacing Tool J 483

VALVE TIMING

The valve timing is determined by the mesh of the timing gears.

The valve timing for all models is as follows:
   Intake valves open 10° 40, B. U. D. C.
   Intake valves close 60° A. L. D. C.
   Exhaust valves open 50° B. L. D. C.
   Exhaust valves close 18° 44' A. U. D. C.

B. U. D. C. is before upper dead center.
A. L. D. C. is after lower dead center.
B. L. D. C. is before lower dead center.
A. U. D. C. is after upper dead center.

VALVE TIMING CHECK

Set number one valve clearance at .010" or for greater accuracy set the clearance at .012" and insert a .002" feeler gauge between the tappet adjusting screw and end of valve stem.

The valve will now just close as the feeler gauge is released, or the valve will be just opening as the feeler gauge is being gripped.

This valve should open with the piston at 100 40, B. U. D. C. or when the mark on the flywheel which is approximately four teeth before U. D. C. 1-6 or U. D. C. 1-8 lines up with pointer in the hole in the left front face of the rear engine support plate.

With the number one exhaust valve clearance set the same as outlined in the previous paragraph this valve should close with the piston 18° 44' A. U. D. C. or approximately 7 teeth after U. D. C. 1-8 lines up with pointer in left front face of rear engine support plate.

EXCESSIVE OIL CONSUMPTION

In cases where an exceptional quantity of oil is being used look for these conditions.

1. Scored cylinders.
2. Scored pistons.
3. Piston rings weak or broken.
4. Piston rings seized in grooves.
5. Piston rings loose in grooves.
6. Oil return holes clogged.
7. Cylinders out of round.
8. Improper grade of oil.
9. Inferior oil or diluted oil.
10. Worn valve guides.
11. Improper ignition or compression.

NOTE: Allows unburned gas to dilute the oil on the moving parts and this thin mixture of gas and oil finds its way past the piston rings further diluting the oil in the oil trough and oil pan.

12. Improper valve seating (see note above)
13. Sticking valves (see note above)
14. Cylinder head gasket leaking

NOTE: A leaking cylinder head gasket will cause improper compression and might permit water to enter the cylinders and further dilute the oil.

15. Also check for oil loss due to leaks. CYLINDER

BORING OR HONING

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

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

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 bore must be protected from any and all particles of grit; chips; honing too abrasive stone grit; etc.

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

INDEX

CLUTCH SPECIFICATIONS

Engaging spring, Models 40, 41, 48, when compressed to 1 3/4" have a weight of 155 lbs. + or - 5 lbs. The Models 43, 44, 45, 47 springs when compressed to 1 5/8" have a weight of 135 lbs. + or - 5 lbs.

Inner springs when compressed to 1 5/8" have a weight of 80 lbs. + or - 5 lbs.

Clutch finger alignment	Not over 005" clearance (see instructions)
Clutch throwout finger	7/64" movement between bottom of finger and cover
Clutch shifter yoke	13/22" maximum movement
Clutch lubricant	1/3 Pint of Hudsonite Lubricant only Fill at front of flywheel
Clutch pedal to floor board	Clearance 1 1/2" with clutch engaged
Clutch pressure plate warpage permissible	Not over .010"
Clutch facing	Cork
Clutch pilot bearing	Ball
Clutch throwout bearing	Ball Lubricate at Zerk Fitting on right side of bell housing every 1000 miles

CLUTCH DIAMETER AND ENGAGING SPRINGS

Model	Clutch Diam.	Outer Spring	Inner Spring
40 all (exce with overdrive and " x 5" engine)	9"	9	3
41 all and 40 with 3" x 5" engine	9"	9	6
43,48 and all 6 cylinder models with overdrive	10"	12	0
44,45,47 all	10"	12	3

CLUTCH

The clutch is oil cushioned and triple sealed and of the single plate type.

The triple sealing means that the clutch is (1st) sealed in front with a leather sealed throw- out bearing (2nd) sealed around the outside

flange against centrifugal action of the oil (3rd) sealed at rear against leakage.

The clutch driving plate has 90 (Model 40 and 41) or 108 (other models) cork inserts inserted into the plate where they are spread and fixed in oil under pressure, and heat treated for an hour after which they are cooled in oil and trimmed to a limit of .001".

The clutch pressure plate is of drop forged steel. The flywheel is of steel that is ground and polished and perfectly balanced.

CLUTCH LUBRICATION

A special clutch lubricant has been perfected by the Hudson Engineering laboratory for use in the clutch and it is called "Hudsonite". One third of a pint is used and it should be changed every 5000 miles. THE USE OF ANY SUBSTITUTE LUBRICANT MAY CAUSE THE CORKS TO GLAZE AND THE PORES TO CLOSE CAUSING DIFFICULTY OF OPERATION. If this condition is encountered, flush the clutch with Hudsonite or solution of carbon tetrachloride and acetone and relubricate with Hudsonite. A few hundred miles of driving will clean the corks and give a normal clutch action.

The Hudsonite lubricant in the clutch, in addition to lubricating the working parts, also cools the friction surfaces and keeps the pores of the cork clean.

The cushioning effect during engagement is obtained by having the corks saturated with oil. As the pressure plate and the flywheel come into contact with the cork the oil is wiped off the surface and engagement starts.

As the pressure is increased by further release of the clutch pedal the oil 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.

CLUTCH PEDAL ASSISTING

A heavy coil spring is attached to the clutch pedal at

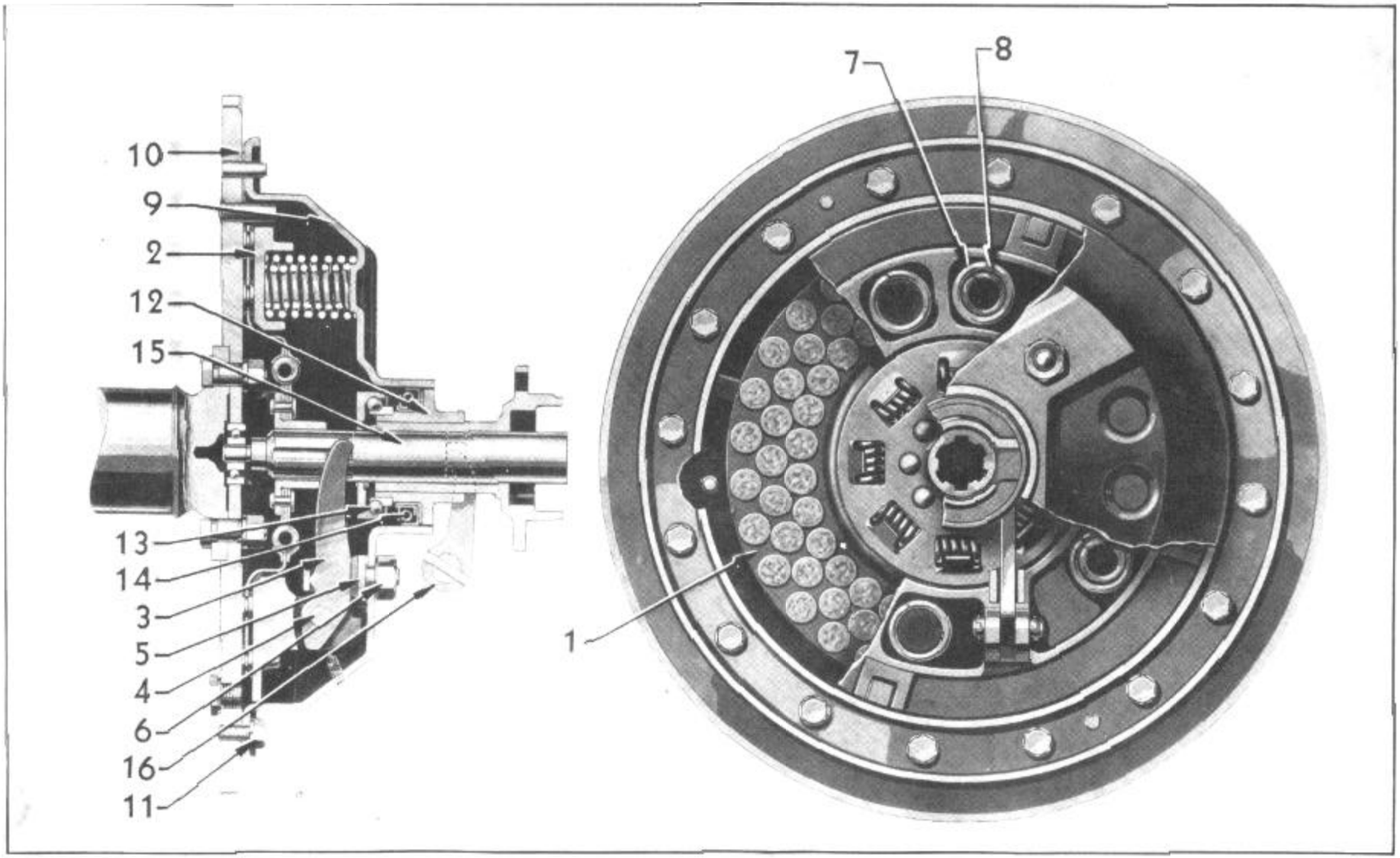


Figure 2--Clutch Assembly

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. Clutch Throwout Bearing Grease Retainer
16. Clutch Shifter Yoke

one end and a bracket attached to the left frame side member.

This is to assist in disengaging the clutch with a minimum of foot pressure, see Figure 1.

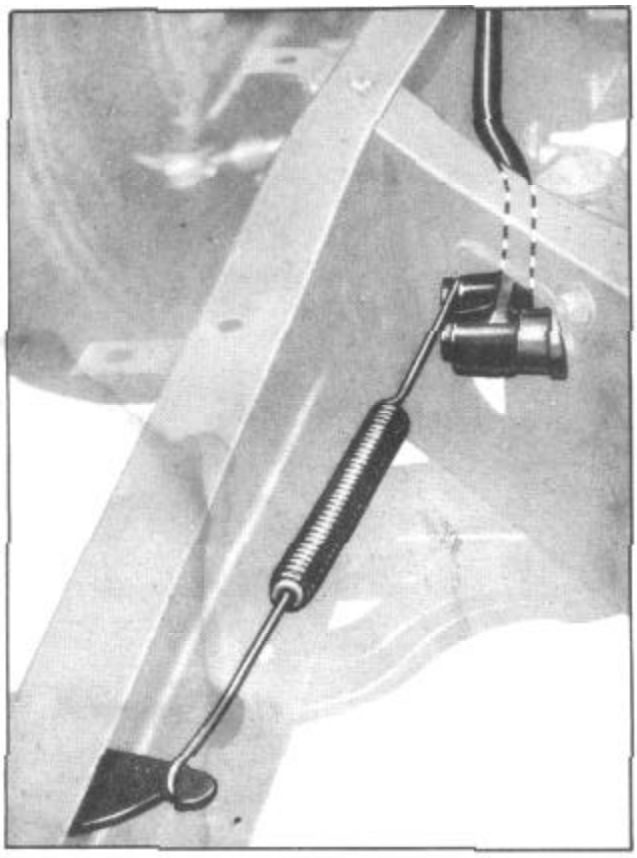


Figure 1--Clutch Pedal Assisting Spring

HUDSONITE CLUTCH LUBRICANT

Hudsonite clutch lubricant can be supplied in--
1/3 Pint can (exactly one filling)
Quart can
Gallon can
5 Gallon can

CLUTCH OPERATION

The rear face of the flywheel and the front face of the pressure plate (2), Figure 2 bear against the two faces of the driving plate surface (1). The pressure plate is held by springs (7) equally located around the circumference, supplemented in some models by inner springs (8).

The pressure plate is released from the driving plate by three fingers (3) which are mounted on the clutch cover (9) and moved by the ball thrust bearing (12).

CLUTCH LINKAGE

The throwout (12) bearing is operated by a yoke which is connected to the clutch pedal through linkage, part of which is carried in the clutch bell housing and the remainder on the frame.

The connection between these two parts of the linkage is designed 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 shown in Figure 3. These pads bear against a similar coupling lever with rubber pads.

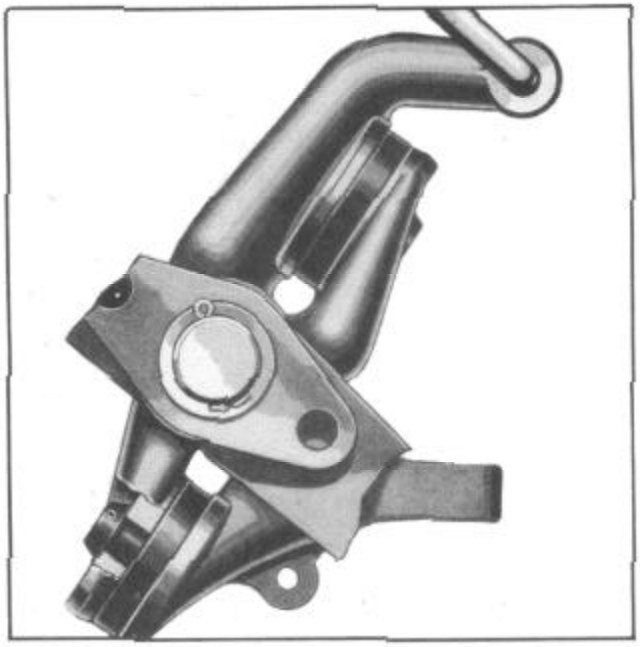


Figure 3--Clutch Linkage Rubber Pads

CLUTCH PEDAL ADJUSTMENT

The length of the rod which connects the clutch pedal to the cross shaft lever should be adjusted so that the center of the Clutch pedal clamp bolt is 1 1/2" from the toe board--see figure 4.

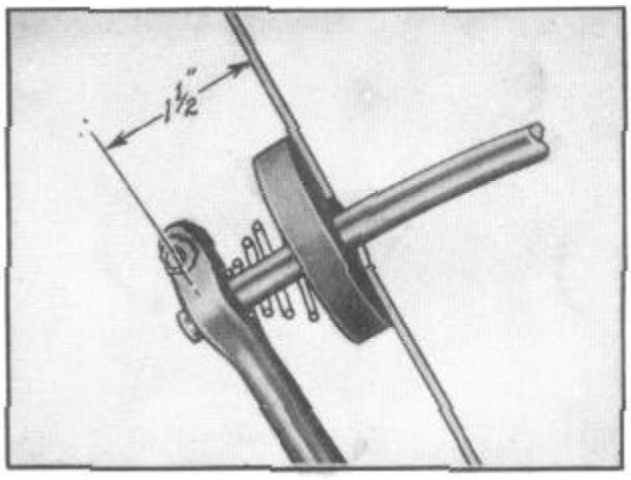


Figure 4--Clutch Pedal Clearance

Less clearance may cause the pedal to ride the toe board and cause the clutch to slip. More clearance reduces the pressure plate movements 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 (A). Remove clevis pin.

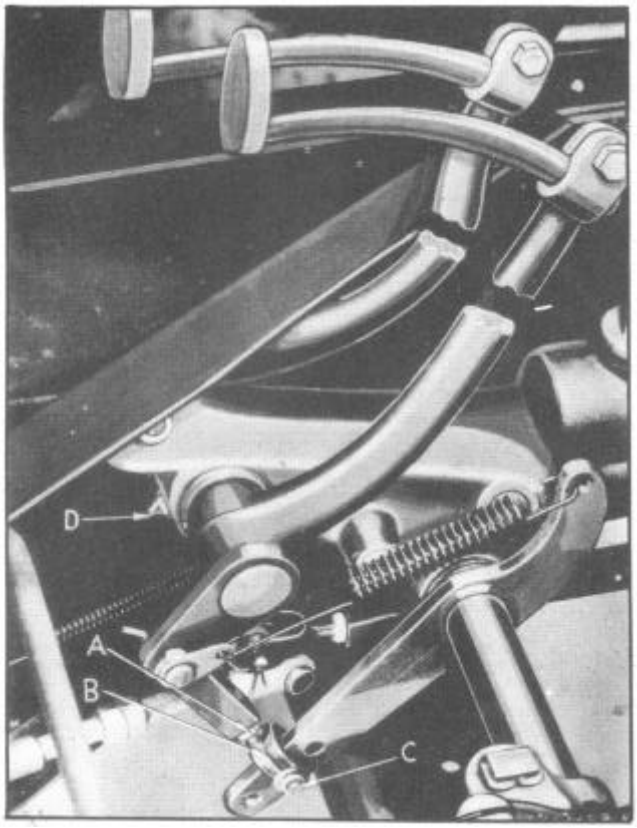


Figure 5-- Clutch Pedal Adjustment

(C) and turn yoke (B) to shorten or lengthen the rod as necessary.

TO DRAIN AND REFILL CLUTCH

Remove the plug, Figure 6, with a socket wrench.

Turn the engine slowly (about 1/3 of a revolution) until the star on the flywheel is in line with the pointer on the timing inspection hole. This brings the drain hole to the bottom and permits the Hudsonite lubricant to drain out.

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.

The measuring cup J 486 is calibrated and

and should be used for measuring the clutch compound unless the "one shot" one third pint can is being used.

Refill Set J 441 includes wrenches and filler equipment to handle clutch service.

The complete kit or any individual item can be purchased.

CLUTCH REMOVAL

1. Remove accelerator pedal by taking out cotter pins in the clevis pins of anchor bracket and bellcrank link.
2. Pull the rubber steering column hole cover up out of the way.
3. Remove the screws holding the kick pad to the dash and remove the six floor mat trim clips. Remove floor mat.
4. Remove the front seat cushion.
5. Remove the transmission opening floor cover bolts. Remove cotter pins holdin6 pedal link bellcrank to cross shaft rod. Take the floor cover off.

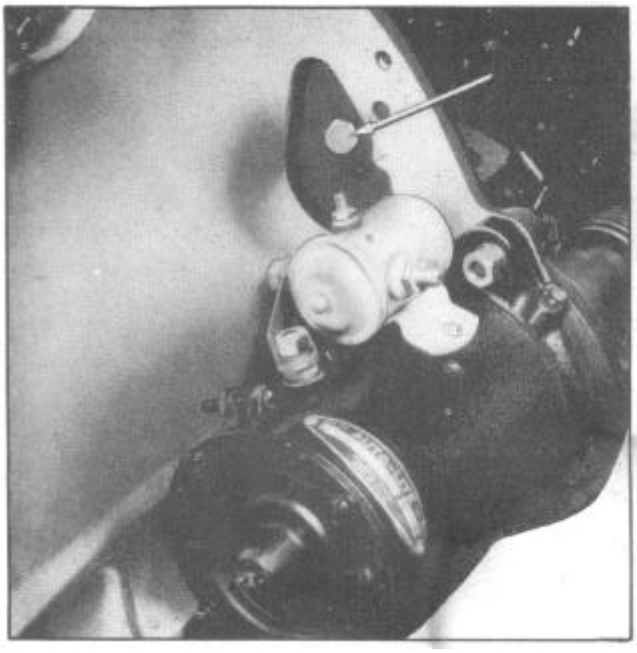


Figure 6--Clutch Lubrication

6. Remove the two propeller shaft U bolt lock nuts and the locks.

Disconnect the front universal joint.

'7. Unhook the clutch pedal lever return spring.

8. Remove the two cross shaft bracket bolts.
9. Remove the clutch control link clevis pin.
10. Release clutch pedal assisting spring.
11. Loosen inside nuts on the transmission side bumper. Pull up the side bumpers and remove the rubber bumpers and then push down the bumper rod out of the way.
12. Remove the transmission handy shift control tube to transmission cover rod clevis pin.
13. Remove transmission cover.
14. Jack up the car and from underneath remove two flywheel guard to clutch housing screws and two engine rear mounting bolts.
15. Jack up rear end of engine about 1/2" off the frame.
16. Remove the clutch housing to transmission bolts.
17. Disconnect speedometer cable at transmission.
18. Pull transmission back and lift out.
19. Loosen all clutch cover to flywheel bolts slightly to release the tension of the pressure springs. Remove the bolts and lift off the clutch.

CLUTCH INSPECTION

1. Check the condition of corks in driving plate (1), Figure 2. A black glaze indicates the use of an improper lubricant. The use of Hudsonite lubricant keeps the pores of the corks open and if the corks are not burned, soaking the driving plate in Hudsonite and the use of Hudsonite in the clutch after reassembly will very often clean up the cork surfaces.

Clean cork surfaces are necessary for a smooth, soft, perfectly operating clutch action.

The driving plate should run true and the springs and the spring cages should retain the hub in the disc without appreciable rotary or sidewise lost motion.

The hub splines must be free of burrs to permit free movement on the spline shaft.

2. Pressure plate (2), Figure 2, should be free of scores

blued spots. Blued spots indicate that the clutch has been operated at an excessive temperature in which case the engaging springs should be replaced as they have probably lost their tension.

Blued spots may mean that the pressure plate is warped. It is necessary to remove the pressure plate from the clutch to check for warpage.

Do not confuse gummed oil spots with blued spots. The gummed oil has a similar bluish appearance but gummed oil is easily scraped off.

DISASSEMBLING THE CLUTCH

Before disassembling look for the punch marks 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 position of the parts when the assembly was balanced at the factory and the unit should be reassembled with the marks together to maintain the original balance.

If the marks are not readily visible, make them so by using a prick punch.

Place the clutch assembly in the clutch fixture J 298 H, Figure 7, and clamp it tightly with the hand wheel. Remove the three nuts (6), Figure 1, from the back of

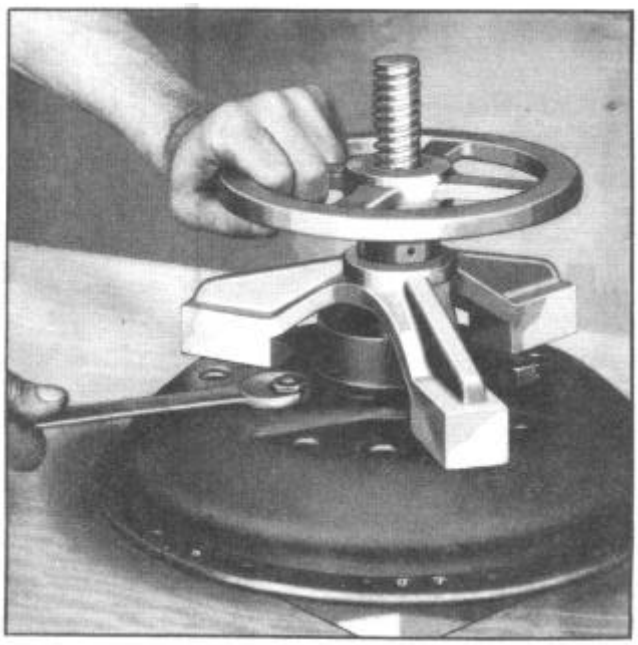


Figure 7--Disassembling Clutch

the cover and release the hand wheel. The cover can then be removed, exposing the springs (7) clutch fingers (3) and finger retainers (5).

CHECKING PRESSURE PLATE FOR WARPAGE

Use a surface plate if possible and if not lay the pressure plate face to face with a new plate and check by inserting a feeler gauge between the plates.

If a .010" feeler gauge can be inserted at any point between the plates there is sufficient warpage to make it advisable to replace the plate.

CLUTCH ENGAGING SPRINGS

The clutch engaging springs will last indefinitely and retain their original strength unless they become excessively hot or unusual usage has been given them.

The engaging springs (7), Figure 2, for Models 40, 41, 48 when compressed to 1 3/4" have a weight of 155 lbs. + or - 5 lbs. The models 43, 44, 45, 47 springs when compressed to 1 5/8" have a weight of 135 lbs. + or - 5 lbs.

The inner engaging springs (8), Figure 2, when compressed to 1 5/8" have a weight of 80 lbs. + or - 5 lbs.

USE SPRING TESTER TOOL NO. U15

If there is any doubt about replacement and it is apparent that the clutch has had hard usage replace the springs using Hudson part No.

45148 engaging spring for 9" clutch

45149 engaging spring for 10" clutch

155224 inner engaging spring for all clutches using an inner spring

These Genuine Hudson clutch springs are:

1. Pre-set
2. Tested for strength
3. Square at ends
4. Deflect true to their center line.

CLUTCH THROWOUT FINGERS

Check the throwout fingers for straightness and wear at the points where they rest against the retainer or throwout bearing.

The finger retainer washers should be replaced if not in good condition.

RE-ASSEMBLING CLUTCH

Using clutch fixture J 298 H, place the pressure plate (2) Figure 2, with the friction face down. Insert springs (7) and inner springs (8) if used, throwout fingers (3) finger retainers (5) and retainer washers in place.

Put cover in place making certain that the punch mark on pressure plate lines up with punch mark on cover.

Put the hand wheel of the fixture in place and guide throwout finger retainers into the holes in the cover as the wheel is being run down on the screw. Place nuts (6) on three throwout finger retainers. Draw down tightly. Remove hand wheel from fixture and remove clutch assembly from the fixture.

CLUTCH PILOT BEARING

Check flywheel face for smoothness and hold on nuts for tightness.

Pilot bearing should run smoothly and freely. If necessary replace it using J 877 clutch pilot bearing remover.

The end of the puller is passed thru the inner race of the bearing and then expanded by a thumbscrew so that it hooks behind the race.

RE-ASSEMBLING CLUTCH IN CHASSIS

Use a new clutch cover gasket and shellac it in place on the front face of the clutch cover flange.

NOTE: Before installing the transmission, wrap one strand of soft wire around the clutch throwout bearing leather seal to prevent it from curling over when placing the transmission. Twist the wire and place the long ends upward thru the clutch

housing. Twist the wire so that it comes off the oil seal after the transmission is in place.

The transmission must be lowered into position carefully and over the mainshaft drive gear so as to engage the splines in the clutch driving disc.

Use the clutch aligning arbor J 449, Figure 8

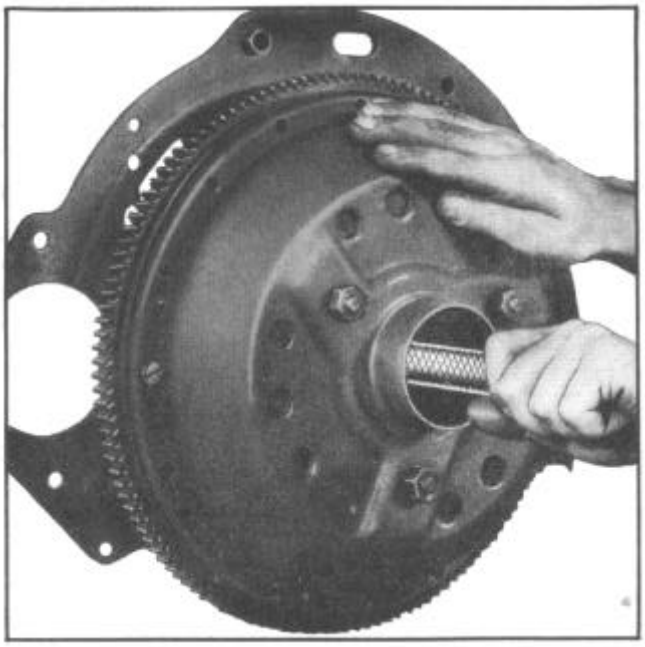


Figure 8--Assembly of Clutch to Flywheel

placing it through the hubs of the clutch cover and drive plate and entering into the Pilot bearing. Push the clutch assembly into place against the flywheel and then secure with the capscrews. Keep aligning arbor still in position so as to keep the drive plate centered. This will permit easy installation of the transmission.

Tighten the capscrews gradually drawing down opposite screws instead of in rotation so that a good gasket seal is insured.

CLUTCH FINGER ALIGNMENT

The three clutch fingers (3) must be in alignment to insure all of them contacting the throwout bearing. Improper alignment causes clutch finger rattle at idle speeds and uneven movement of the pressure plate which causes grabbing and chattering of the clutch.

Align the fingers by placing bar of the clutch finger adjusting gauge (J 774), Figure 9, against the rear of the clutch cover hub so that the pin is resting on one of the fingers.

Turn down the thumbscrew until it contacts the pin. Move to the other two fingers, turning the thumbscrew down if necessary, to take up clearance with the gauge pin. The final adjustment of the gauge will give the level of the lowest finger.

Swing the gauge around to one of the high fingers and strike the end of the finger retainer with a soft hammer until the gauge bar rests squarely on the cover hub.

Swing the gauge to the other high finger and repeat the operation.

Swing back to the low finger to check. The gauge should now rest squarely on the hub over all fingers. Clearance between the thumbscrew and pin of the gauge to be less than .005n. Check this clearance at each finger with a feeler gauge.

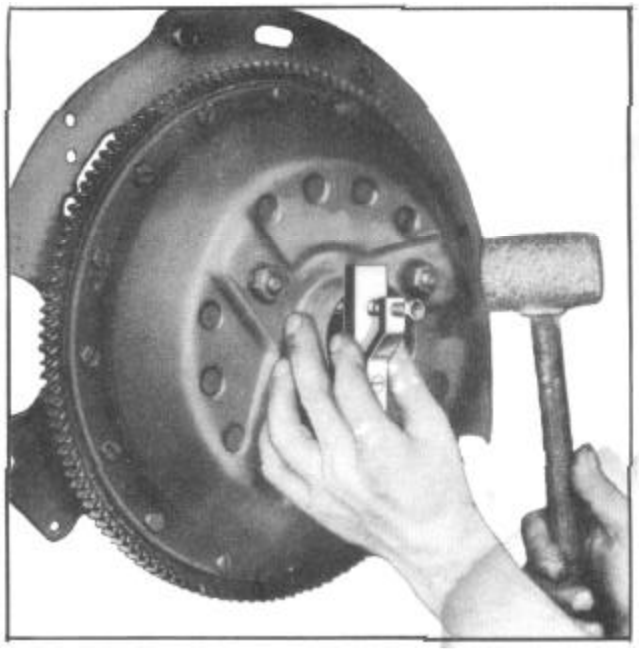


Figure 9--Clutch Finger Alignment

CLUTCH COLLAR WITH THROWOUT BEARING AND OIL SEAL

In production the clutch throwout bearing oil seal is pressed into the clutch collar and the throwout bearing is also pressed onto the collar.

To replace a clutch throwout bearing oil seal it is necessary to first press off the throwout bearing and then pry loose and pull off the oil seal.

Care must be used in pressing a new oil seal onto the throwout collar. It must be pressed on with a steady pressure at the inner edge. If the pressure is applied on the outer stamping

it will be distorted and pushed into the leather seal so that the leather may become loose in the inner stamping or torn.

An oil seal that has the leather loose in the inner stamping will spin with the clutch cover and carry the outer stamping with it and cause a rubbing sound between the two stampings of the seal

This noise could be mistaken for a noisy throwout bearing.

Whenever the clutch throwout collar is disassembled from the clutch the oil seal outer stamping should be checked to see that it is tight in the inner stamping. The check is made by turning the outer seal with one of your fingers. You can feel whether it is tight or not.

The throwout bearing should be clean and run smoothly. It should be pressed on the collar with a continuous pressure with the force applied through the ball races and balls. If the bearing is driven on with a hammer the races may be marked by the balls causing the bearing to become noisy.

An arbor press should be used to press on the oil seal and the throwout bearing. The arbor should be square and large enough in diameter to cover the entire surface of the bearing on which the clutch fingers normally rest. During the pressing of the bearing onto the collar it should be turned so that the balls move in the races as in that way the load is uniformly divided.

After installing the bearing it should be lubricated with a good quality of viscous grease through the pressure fitting on the right side of the clutch bell housing.

Lubricate every 1,000 miles.

CLUTCH DRIVING PLATE KIT (FOR 9" CLUTCH)

Whenever a clutch repair is undertaken that requires a driving plate assembly it is also necessary to install a cover gasket; throwout bearing oil seal and throwout bearing grease retainer.

Such a repair job will also require the refilling of the clutch with lubricant.

A service kit Part 161377 containing these very necessary parts is available and contains:

1 Clutch Driving Plate Assembly--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 1940 inclusive having the 9" clutch.

AUTOMATIC CLUTCH CONTROL

Automatic clutch control, operated by engine vacuum, is a means of operating the clutch pedal automatically by releasing and depressing the clutch pedal without the need for depressing the pedal manually. It is available as optional equipment on all models except Business cars.

Diagram T shows valve in vacuum position. Diagram U shows valve in atmospheric position.

The automatic clutch is of internal valve design. The power cylinder connects to the clutch operating lever by means of a bell crank and operating rod. It also connects to the accelerator pedal thru a threaded sleeve rod, valve lever and

a valve lever cam arrangement.

OPERATION

Operation of the Automatic Clutch Control is controlled by a knob located on the left side of the instrument panel. When the knob is pulled out the clutch is operated in the conventional manner. Pushing the button in permits automatic operation.

The clutch can be operated only when the engine is running and manifold vacuum is available. The clutch pedal

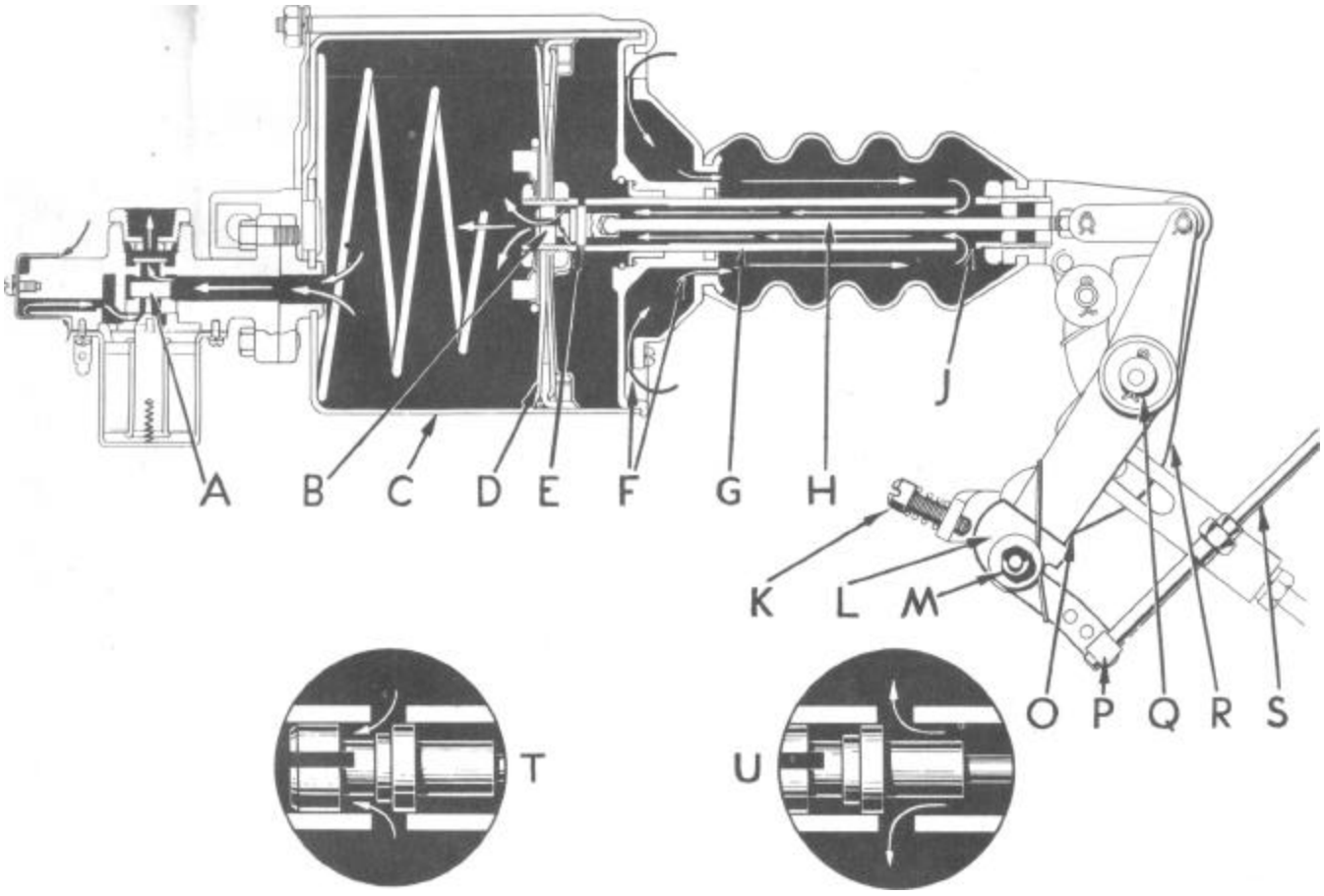


Figure 10--Automatic Clutch Cylinder and Valves

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.
H. Valve lever cam pivot.
N. Control valve lever cam spring.
0. Valve lever.
P. Accelerator linkage and guide block.
Q. Valve lever pivot.
R. Operating bell crank.
S. Control valve lever cam threaded sleeve rod.
Diagram T Shows Valve in Vacuum Position
Diagram U Shows Valve in Atmospheric Position

should be depressed manually when first starting the engine.

When the ignition switch is turned on the circuit thru the automatic clutch solenoid is completed and the solenoid valve (A), Figure 10, is opened. This establishes direct passages between the intake manifold and the forward end of the power cylinder (C).

The engine is started and vacuum is created within the power cylinder on the forward side of piston (D) to completely disengage and hold the clutch in the disengaged position.

To allow this movement, the vacuum has drawn the valve plunger (B) forward, uncovering ports (E) allowing air to enter the rearward end of the cylinder thru ports (E) along valve rod (H), piston rod ports (J) and air cleaner ports (F).

CLUTCH ENGAGEMENT

In causing an engagement of the clutch, the first movement of the accelerator pedal is transmitted directly to the valve lever cam (L) at the lower end of the valve lever (0). The valve lever is connected to bell crank (R) at a point about 2/3 of the way up from the bottom. This point (Q) serves as a fulcrum point.

As the accelerator pedal is depressed and the valve lever cam (L) moves forward, the upper end of the valve lever (0) and attached valve rod (H) moves rearward. As the valve rod is moved rearward the piston rod ports (E) are uncovered to connect the two sides of the piston (D) and vacuum within the forward end of the cylinder begins to withdraw the air from the rearward side of the piston. This tends to suspend the piston in vacuum or equalize the pressure on the two sides of the piston.

With the reduction of pressure on the rear side of the piston it starts to move rearward on its engaging stroke. As the piston moves rearward, the piston rod ports (E) tend to overtake the valve plunger (B) and seal the vacuum ports.

This follow up action takes place during the entire engaging stroke, and piston rod movement stops as soon as the valve (B) comes to a top position over the ports (E). In this position the ports are sealed so that air neither can enter or escape from the rearward side of the piston, see diagram T and U, Figure 10.

VALVE ACTION

In order that the clutch may be brought up to its first engaging or cushion point with the least possible delay, the piston rod ports (E) are uncovered to a greater extent than after this point has been reached. This is accomplished by the use of a spring loaded valve lever cam (L) at the lower end of the valve lever (0).

When the cushion point is reached the rapid movement of the valve ceases. This movement takes up the clearance between the valve lever cam (L) and the cushion point stop screw (K). As soon as the valve lever cam comes in contact with the cushion point stop screw any further movement of the valve lever (0) takes place only as the valve lever cam is rotated about its center (M) and the distance between the cam center and stop screw is reduced. This provides a finely regulated movement of the valve to cushion the clutch engagement.

As the cushion point is reached the throttle rod should take up its lost motion clearance,

so that as the clutch begins its initial engagement the throttle is also beginning to open.

After the initial clutch engagement has been made the valve lever cam angle changes quickly allowing the clutch to complete engagement quite rapidly.

COMPENSATOR

Two rates of clutch engagement are provided automatically. This is necessary because of the cork inserts becoming covered with clutch lubricant after the engine has stopped. Attached to the bell crank (C), Figure 11, is a two position compensation lever (B) which turns the eccentric pivot (D) changing the relation of the valve lever (A) with respect to its pivot point on bell crank (C).

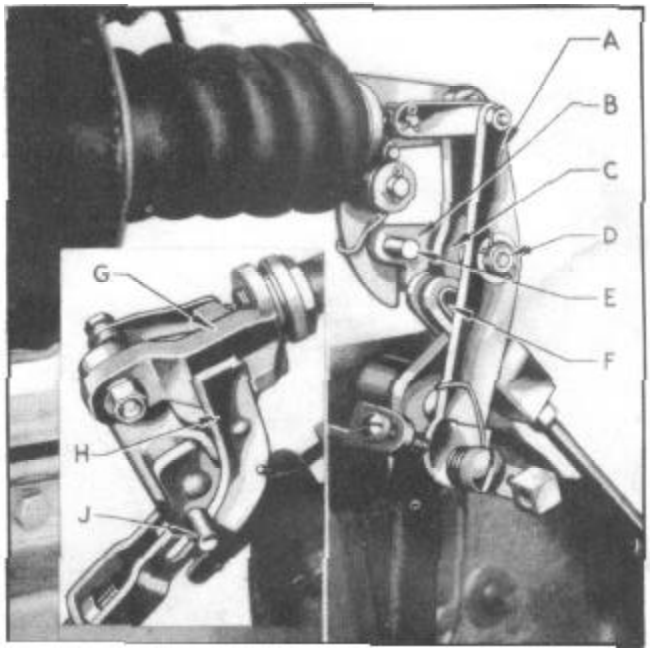


Figure 11--Clutch Compensator

When the clutch pedal is depressed by foot (when starting the car) the end of the bell crank yoke

(F) strikes pin (E) and swings the lever (B) forward and upward as shown in Figure 11. 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.

As soon as the clutch is automatically engaged after the first shift in high gear has taken place the trip lever (H) mounted on the piston rod end (G) will engage pin (J) and the compensator lever will be rotated back to a position for normal driving, as shown in inset, Figure 11.

CAUTION: The compensator must be in a normal driving position before making any automatic clutch adjustments.

DASH ACCELERATOR SWITCH

Starting with a wide open throttle or suddenly opening wide the throttle for rapid acceleration makes a positive and a rapid clutch engagement desirable.

This can be accomplished by breaking the ground circuit to the solenoid valve, allowing the vacuum port to close and permitting air to enter the forward end of the cylinder through the atmospheric ports of the valve body. This circuit is controlled by a dash accelerator switch mounted on the dash and operated by the throttle linkage.

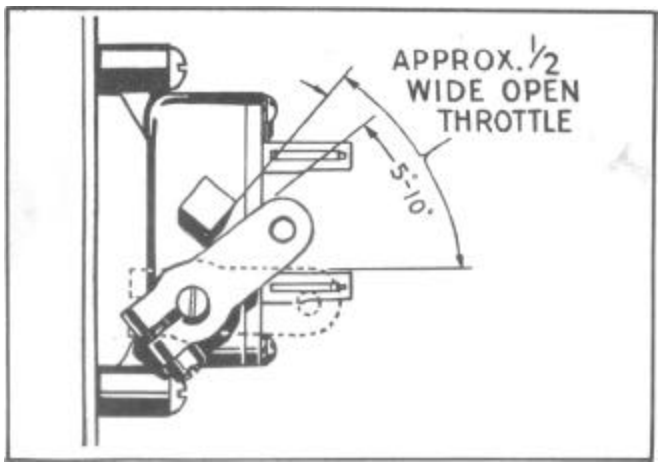


Figure 12--Accelerator Switch

The dash accelerator switch, Fig. 12, contains two sets of breaker points which are both operated from the same lever. When the lever is in the closed throttle position both sets of breaker points are closed and there is a circuit to ground through the solenoid, either through the (R W) wire to the governor or through the (Y) wire to the high gear shift rail switch and selector switch, see Fig. 13. With the throttle opened at from 50 to 100 travel of the switch lever, the circuit through the (R W) wire is broken. This disconnects the governor control which functions with the car in high gear.

With the throttle approximately one half open the second or (Y) circuit is broken and the shift rail switch and selector ground finger controls are no longer effective. These controls are functioning in reverse, first and second gears.

REPLACEMENT OF PISTON ROD GUARD

1. Remove valve lever by taking out cotter pin at eccentric pivot and hairpin at valve rod trunnion.
2. Remove piston rod end to bell crank bolt.
3. Remove piston rod guard from groove in piston rod end.
4. Hold piston rod end with a drift in the bell crank bolt hole and loosen the locknut against rod end. Remove piston rod end.
5. Replace piston rod guard and reassemble.
6. Adjust piston rod end to give a length of 13-11/16" from center of tripod mounting hole to center of bell crank bolt hole in piston rod end.
7. Replace valve lever and readjust cushion point stop screw (see Final adjustment Page 12).

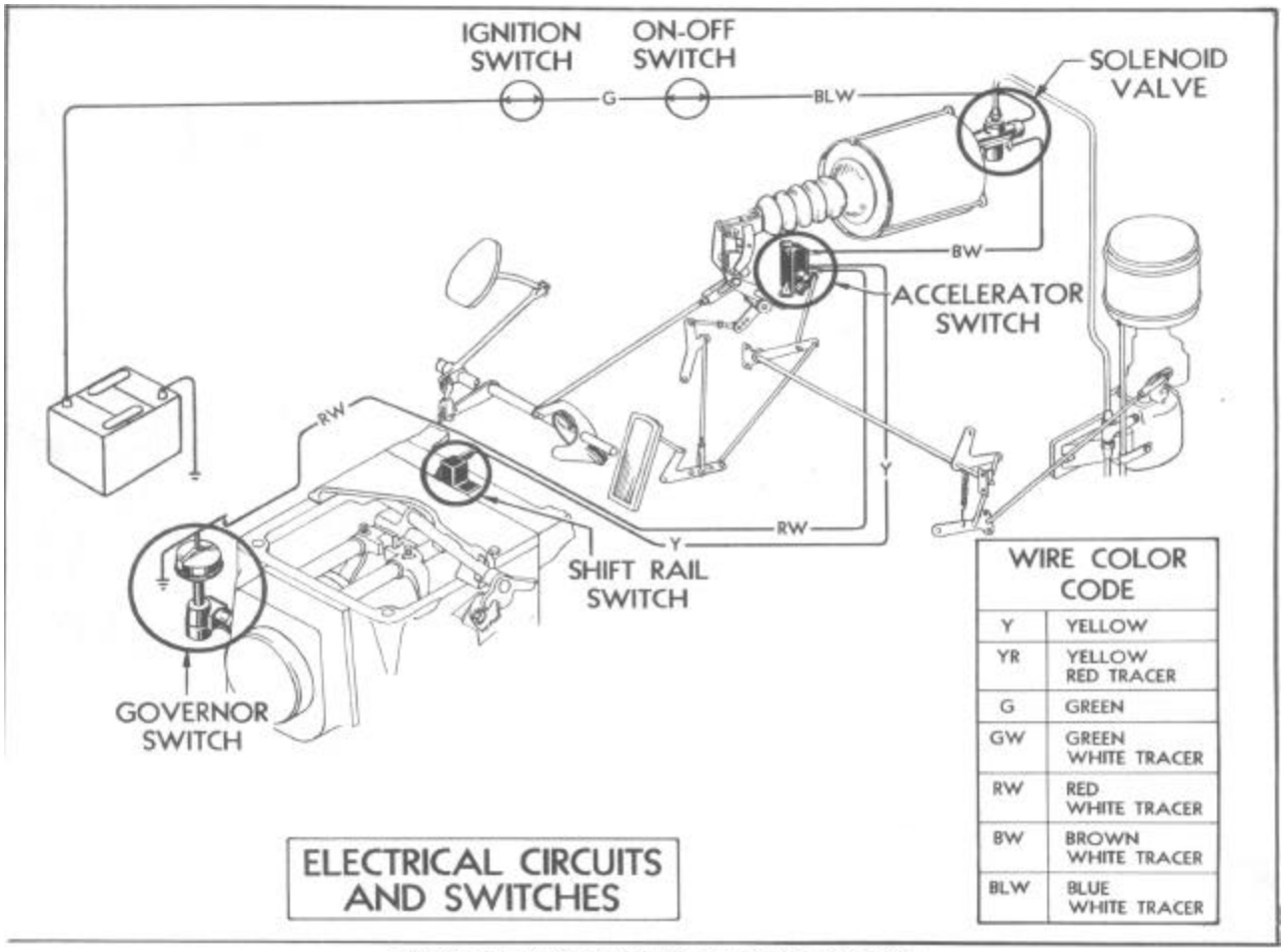


Figure 13--Electrical Circuits and Switches

POWER CYLINDER TENSION SPRING

A part of the weight of the rear end of the power cylinder is supported by a spring (Part No. 155839) and a clip (Part No. 33539).

The clip is assembled under the nut of the lower tripod clamp bolt and the small end of the spring is hooked into the clip. The large end of the spring is hooked into a hole in the adjusting screw lug of the bell crank bracket.

AUTOMATIC CLUTCH ADJUSTMENTS

1. ENGINE AND CLUTCH WARM-UP

Do not attempt any automatic clutch adjustment unless the engine has been properly tuned and thoroughly warmed up so that it idles smoothly. The engine should show a steady vacuum gauge reading of 18 to 21 inches of mercury at 7 to 9 miles per hour. The car should be driven long enough

to bring the clutch units to a normal operating temperature.

2. CLUTCH PEDAL ADJUSTMENT

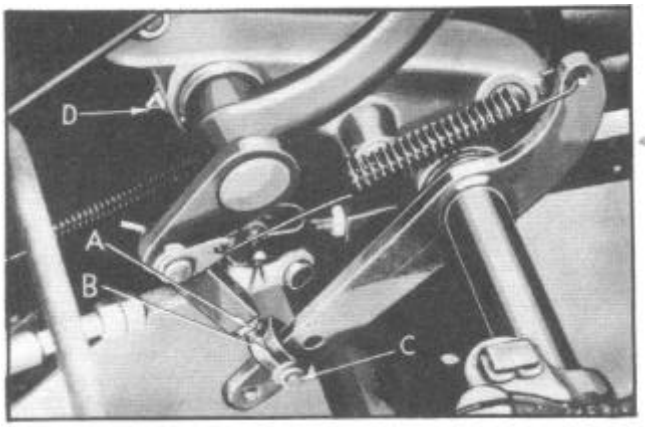


Figure 14--Clutch Pedal Adjustment

Adjust the clutch pedal by removing clevis pin (C), loosening nut (A) and turning yoke (B) so that the center of the pedal shank clamp bolt is 1-1/2" from the toe board when the clutch is fully engaged.

3. LINKAGE ADJUSTMENTS

All automatic clutch control and throttle linkage should work freely and without any binding. The dash accelerator switch arm (A), Fig. 15, must rest securely against its stop on the side of the switch by the action of the throttle return spring (B) acting through the dash accelerator switch operating rod (C). Set the accelerator pedal bell crank arm (D) to stop within 1/4" of the toe board by adjusting the throttle rod clevis (E).

Cars not factory equipped with the automatic clutch control have a rubber bumper on the accelerator pedal rod to act as a stop for the bell crank arm (D).

When installing automatic clutch control on a car never before equipped with it make certain that this rubber bumper is removed.

The dash accelerator switch arm (A) must act as a stop for the throttle linkage.

The threaded sleeve rod bell crank operating rod (F) must be in the third hole from the end in the lower arm

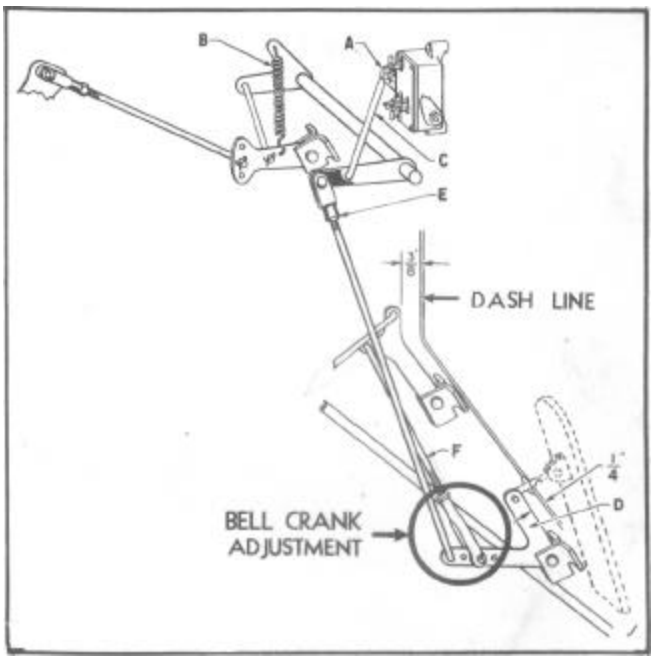


Figure 15--Linkage Adjustments

of the accelerator bell crank (D). Threaded sleeve (F) should be adjusted at clevis to obtain 3/8" clearance between bell crank and dash with motor idling and vacuum clutch on.

BELL CRANK YOKE ADJUSTMENT

All play should be removed between the power cylinder piston and the clutch operating lever. All pressure must also be removed from the clutch throwout bearing while the clutch is engaged.

With the engine stopped and the power cylinder piston rod (B), Figure 16, in its extreme rear position, remove the valve lever assembly (C). This is done by removing the cotter pin at (E) and the hairpin (D) at the valve

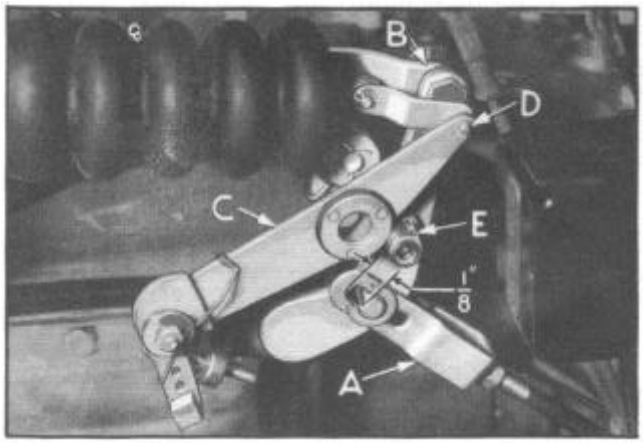


Figure 16--Bell Crank Yoke Adjustments

rod to valve lever link. This renders the bell crank operating rod yoke (A) accessible for adjustment. The distance between the front edge of the clevis pin and the front end of the slot in the yoke should be 1/8".

PISTON TRAVEL ADJUSTMENT

With guide block (A), Figure 17, in the rear hole of cam lever (B), adjust valve lever cam threaded

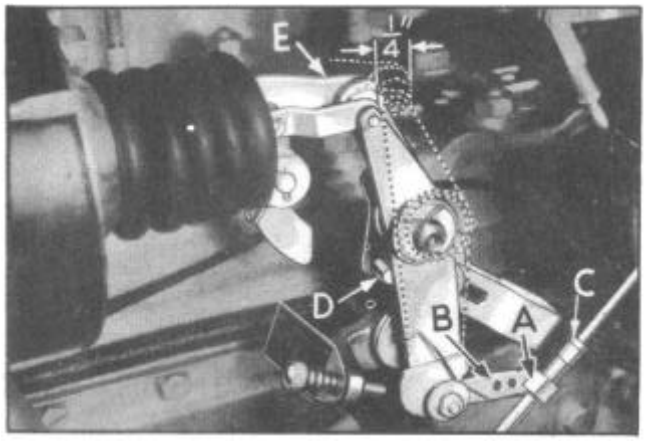


Figure 17--Piston Travel Adjustment

sleeve (C) to give maximum disengagement travel to the piston. With the engine running and the clutch disengaged and compensator pin (D) in its extreme rear position, screw the threaded sleeve (C) toward the dash until the piston rod (E) just reaches its extreme forward position. Screw threaded sleeve (C) away from the dash until the position moves to the rear 1/4 of an inch. This gives the proper adjustment for the forward travel of the piston.

AUTOMATIC CLUTCH CUSHION POINT

The preceding paragraphs covered clutch adjustment, throttle linkage, and operating rods and now the start of any adjustment of the automatic clutch is the determining of the cushion point. This adjustment is extremely important.

Block the wheels securely and start the engine. Do not set the brakes. Accelerate the engine several times while manually engaging and disengaging the clutch. This is intended to wipe off or dry the clutch disc.

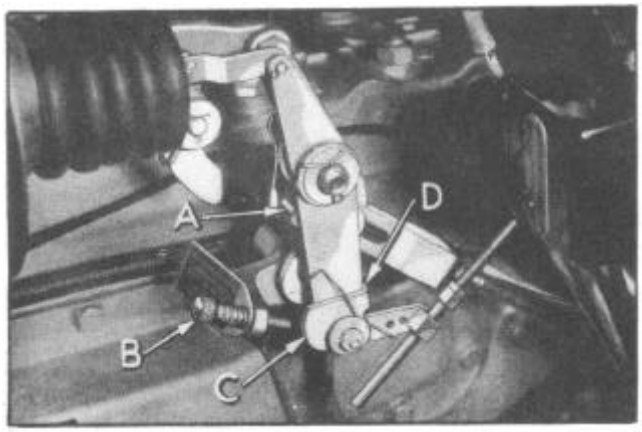


Figure 18--Finding Cushion Point

Swing the compensator (A) to the rear and turn the cushion point stop screw (B) clockwise (in) until it meets the cam (C). Shift transmission gears into low and hold cam (C) against the stop screw (B) by pressing forward at point (D).

At the same time slowly turn stop screw (B) counter-clockwise until the car shows a distinct tendency to move forward.

This is the cushion point or the point where the clutch disc begins to drag against the flywheel.

THROTTLE ROD CLEVIS ADJUSTMENT

Adjust the throttle rod at point (B), Figure 19, as follows:

Models 40,48.....Bottom hole
Models 41,43.....Top hole
Models 44,45,47.....Center hole

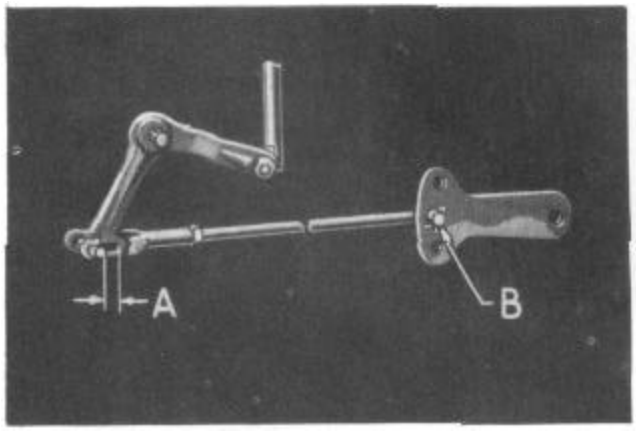


Figure 19--Throttle Rod Clevis Adjustment

Hold the accelerator down until cam (C), Figure 18, just touches the stop screw (B) as in operation described under Winding Cushion Point". This can be done by wedging the accelerator bell crank away from the toe board by inserting a drift, screwdriver or wood wedge behind the upper arm of the bell crank.

Do not attempt to open the throttle at any other point because that would change the relationship between the throttle and clutch valve linkages.

Adjust the clevis at (A), Figure 19, so that all lost motion is taken up. The adjustment should be at a point where any additional pedal travel will increase the engine speed. Remove the wedge.

Recheck this adjustment after removing the carburetor governor.

CLUTCH PISTON LUBRICATION

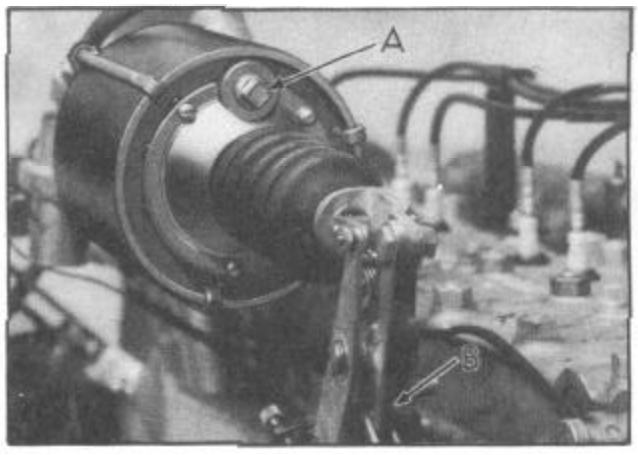


Figure 20--Lubricating Power Cylinder

In order that the piston seal be kept soft and pliable and assure a seal against the cylinder wall one ounce of Hudson shock absorber fluid should be poured into the cylinder every 10,000 miles.

Remove the pipe plug (A) in the cylinder end and inject lubricant. Remove the piston rod end to bell crank bolt and the valve rod to lever link. Rotate the piston with an in and out motion to distribute the oil over the entire piston and oil wick.

Two or three drops of oil in the bellcrank bracket oil hole (B) every 1000 miles will insure free operation.

FINAL ADJUSTMENT

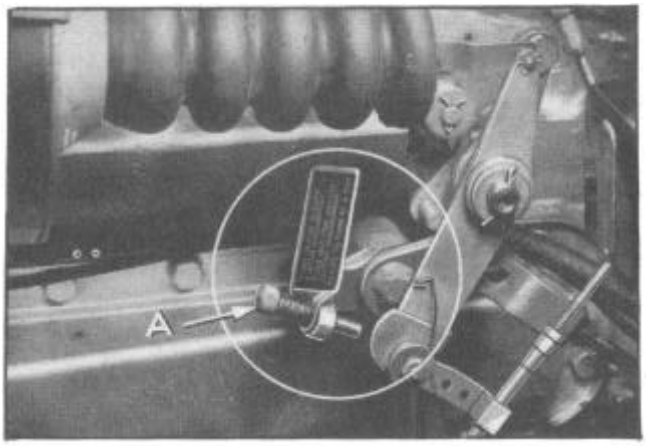


Figure 21--Final Adjustment

Shift transmission into second gear and gradually depress accelerator pedal with the engine running.

As soon as the throttle starts opening the clutch should engage. The cushion point stop screw (A), Figure 21, and throttle should be so adjusted that the car begins to move (slightly) upon the first increase of engine speed.

If the clutch engagement is slow and at the same time the engine speed is too great (slightly racing) then turn the cushion point stop screw (A) outward (counter-clockwise). If the clutch engagement is too fast causing the engine to stall then turn the screw inward (clockwise).

Do not turn the cushion point stop screw more than one half turn at a time.

SLOW OR ERRATIC CLUTCH OPERATION

Continued slow clutch operation or erratic operation can be caused by--

1. Leaks in automatic clutch
2. Friction in throttle or valve linkage 3. Sticky solenoid plunger

Check for piston leaks by sliding piston rod guard forward until the four circular ports are exposed in the piston rod. 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. Some suction is permissible but not a very strong suction.

Check all gaskets, pipes, and pipe fittings. Look over the linkage for any signs of slow or sticking action.

TESTING SOLENOID VALVE

The Solenoid Valve uses the principal of an ordinary magnet and is in operation when the ignition is turned on which causes the valve to open.

To check the Solenoid remove the blue-white tracer wire from it and attach this terminal to clip of a test lamp. Ground the wire terminal to which the brown white tracer wire is attached. Touch prod to the solenoid terminal from which the wire was removed and note the test lamp, A bright light indicates a short circuit. No light indicates an open circuit and a faint glow indicates a normal circuit.

A simple test lamp can be made by using a No. 87-15 C. P. bulb with suitable leads and lips.

If the circuit tests normal, remove vacuum pipe, bushing and bakelite valve disc.

Insert narrow scale in opening and press lightly against the valve plunger. If plunger does not move freely from 1/16" to 3/32", check valve rubber disc and plunger for interference. Replace fittings tightly to prevent leaks.

DASH OFF-ON SWITCH AND UPPER WIRING HARNESS

If the clutch does not engage with fully closed

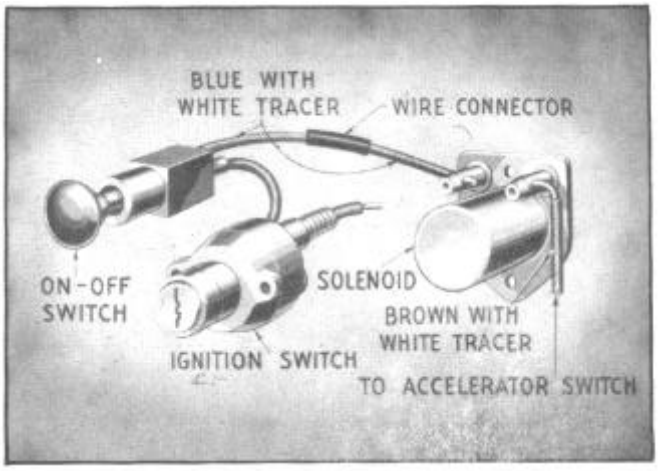


Figure 22--Dash Switch and Solenoid

throttle and the valve rod is in its extreme forward position, check the instrument panel off-on switch to see that it is "on" (pushed in). If it is, then connect a jumper wire from the battery cable terminal to the solenoid terminal that has the blue and white tracer wire attached. If clutch operates, then look for a poor contact or open circuit in the off-on switch or wiring from ignition switch to gas gauge to off-on switch to solenoid terminal'.

DASH ACCELERATOR SWITCH TEST

There are two branches of the grounding circuits through the dash accelerator switch.

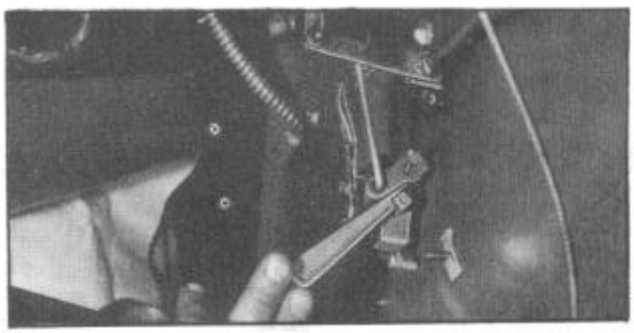


Figure 23--Accelerator Dash Switch Gauge

Disconnect the governor switch wire (Red-White) at dash accelerator switch terminal. Shift transmission into high gear see that ignition switch and instrument panel switch are on and accelerator in idle position. Ground one test lamp lead; touch other lead to dash accelerator switch terminal from which wire (R W) was removed. With 5° step of tool J 1190 test gauge, Figure 23, between switch lever and its stop, the test lamp should showa faint glow.

When 100 stop of gauge is inserted between switch lever and stop the lamp should go out.

Transfer test lamp lead from terminal (R W) to terminal (Y) on switch. Lamp should have a faint glow until throttle is open about half way and then go out.

Replace switch if faulty.

SHIFT RAIL SWITCH

The high gear shift rail switch, Figure 24, is at the forward end of the transmission and is to prevent the clutch being disengaged by the release of the accelerator pedal at speeds above 15

M. P. H. with transmission in high gear.

The switch is operated by the high speed shifter rail and is closed in all gear positions except high gear. The switch is opened when the transmission is shifted into high gear so that the automatic clutch is inoperative and will not disengage the clutch at speeds above 15 M. P. H.

SHIFT RAIL SWITCH TEST

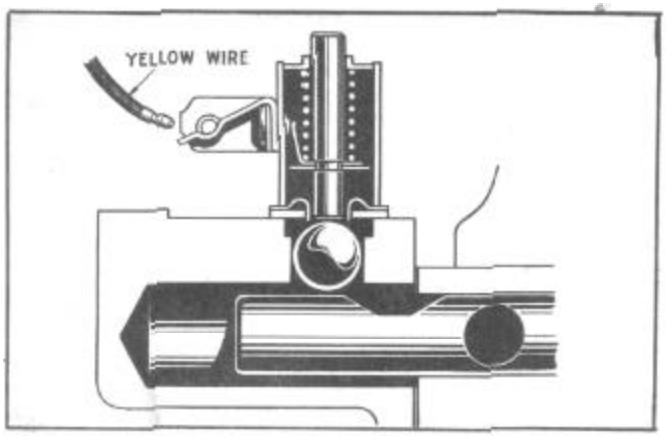


Figure 24--Shift Rail Switch

Disconnect Red-White wire from Governor switch. The automatic clutch should work in all gears except high, if it does not, ground shift rail switch. If operation is obtained, replace the switch or check for sticking operating ball; if not replace or repair yellow wire between accelerator switch and shift rail switch. If automatic clutch operates in high gear replace shift rail switch.

WIRE HARNESS

Remove the red-white wire from governor switch. Shift transmission into high gear, turn on ignition, ground one test lamp lead, connect other lead to harness connector. Test lamp should show faint glow. If lamp does not light wiring is faulty. Repeat the test at shift rail and governor switch terminals. Recheck accelerator switch before replacing wiring harness.

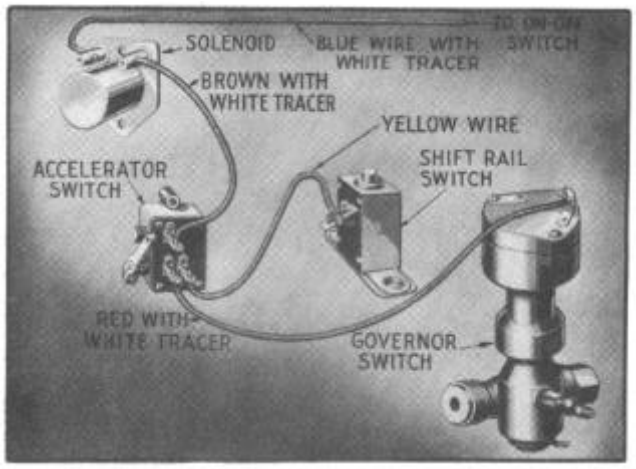
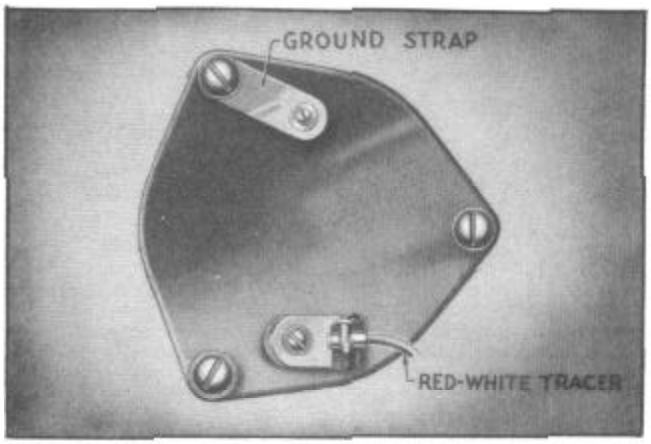


Figure 25--Wiring Tests



GOVERNOR SWITCH

Figure 26--Governor Switch

The governor switch is closed with the car standing still or when it is moving less than

15 M. P. H. thus completing the solenoid circuit to the ground so that the Automatic clutch is operative.

At speeds above 15 M. P. H. this switch is held open so that the solenoid circuit is broken and the Automatic clutch cannot operate unless the circuit is completed by the high gear shift rail switch.

The governor switch is on the speedometer take off at the transmission.

Check by road-testing or operating car with rear wheels blocked up so that the engine can be run with transmission in gear.

See that red-white wire is connected to the governor switch. Start engine. Rest the foot lightly on the clutch pedal in order to feel the clutch action. The automatic clutch should operate as the accelerator pedal is depressed and released. If it does not then replace the governor switch.

Shift transmission gears into high and increase the engine speed to 25 M. P. H. Release accelerator and note when the clutch disengages.

The clutch should remain engaged until the speedometer shows 20 M. P. H. but should be disengaged before the speedometer shows 15 M. P. H. on acceleration. If clutch disengagement is not within this 15-20 M. P. H. speed range, replace the Governor switch.

CLUTCH VACUUM CONTROL INSTRUMENT PANEL SWITCH KNOB --REMOVING

Loosen the set screw in the side of the knob and pull the knob off being careful not to lose the small flat tension or anti-rattle spring inside the knob.

The switch has a sleeve (threaded inside). The mounting collar on the instrument panel is threaded and screws into the sleeve on the switch. Loosen, by unscrewing, the switch from the collar, working from under the instrument panel and remove the collar.

Disconnect wiring from the switch and remove. See Wiring Diagram.

CLUTCH VACUUM CONTROL KIT

The clutch vacuum control kit for installation of this unit is different for Models 40,41,43,48 than for Models 44,45, and 47. The difference being in the cylinder mounting bracket with its stud nuts and lockwashers; bell crank bracket; and vacuum pipes at manifold also valve end.

The installation kit contains:

Cylinder assembly and tension spring.

Cylinder mounting bracket assembly.

Bell crank to coupling lever rod and play link with clevis pin; springs and attaching parts.

Bell crank bracket assembly.

Valve lever cam threaded rod assembly.

Valve lever cam adjusting screw and spring. Threaded sleeve rod bell crank with bracket and operating rod.

Accelerator switch with accelerator lever rod. Intake manifold vacuum connection.

Wire harness.

Vacuum pipes--manifold and valve ends.

Vacuum pipes hose and elbow.

Instrument panel switch with mounting collar and knob.

Shift rail switch (2nd and high) with operating ball.

Governor switch and adapter.

AUTOMATIC CLUTCH INSTALLATION

1. Drain cooling system.

2. Remove accelerator pedal, floor mat, and trans hole cover.

3. Remove speedometer cable at transmission.

4. Install governor switch adapter to transmission speedometer pinion.

5. Install governor switch to switch adapter.

6. Connect speedometer cable to governor switch adapter.

7. Install shift rail switch to top of clutch bell housing. Knock out plug and screw holes provided--Remove knock out plug and insert ball bearing in hole and mount switch over ball.

8. Install bell crank to coupling lever rod to pedal bracket.

9. Install vacuum control accelerator switch to dash with sheet metal screws. Mount switch in holes provided on dash directly above end of throttle cross shift and with accelerator switch arm towards cylinder head.

10. Install accelerator switch operating rod to accelerator switch arm and to hole provided in throttle cross shaft arm.

11. Install bell crank to coupling lever rod play link.

12. Install cylinder mounting bracket to 1st and 2nd studs from front of cyl. block on left side on 6 cyl. cars and to the 3rd and 4th studs from the front of cyl. block on left side on 8 cyl. cars.

13. Install bell crank bracket to second and third water jacket cover studs from rear of jacket and at the top and to the second from the rear at the bottom of the water jacket cover.

14. Mount front of power unit assembly to cylinder mounting bracket and fasten with bolt, nut and lock nut.

15. Mount rear of power unit assembly to bell crank bracket and secure with spring washer, flat washer and cotter pin.

16. Install large elbow to solenoid assembly with opening pointing towards rear or dash of car.

17. Install vacuum pipe to elbow and carry across engine.

18. Remove plug in intake manifold located towards the front of the car and directly below the heat deflector.

19. Install brass vacuum pipe adapter to hole in manifold.

20. Install vacuum pipe to adapter.

21. Install spring in short section of rubber hose and connect ends of two vacuum lines.

22. Install bell crank bracket with the open slot at the top to the toe board riser in the holes provided and install the bell crank to the bracket with the longer arm at the top.

23. Install valve lever cam threaded sleeve rod from upper hole in bell crank to square block on the valve lever cam arm.

24. Install threaded sleeve rod bell crank, operating rod assembly to lower hole of bell crank.

25. Install instrument panel switch--drill 25/64" hole 1 1/4" from cowl panel and 1" from bottom of instrument panel on left side.

26. Install wiring harness as follows:

A. Lead blue wire with white tracer inside of dash compartment through main cable hole in

dash and connect to instrument panel switch, see Figure 27.

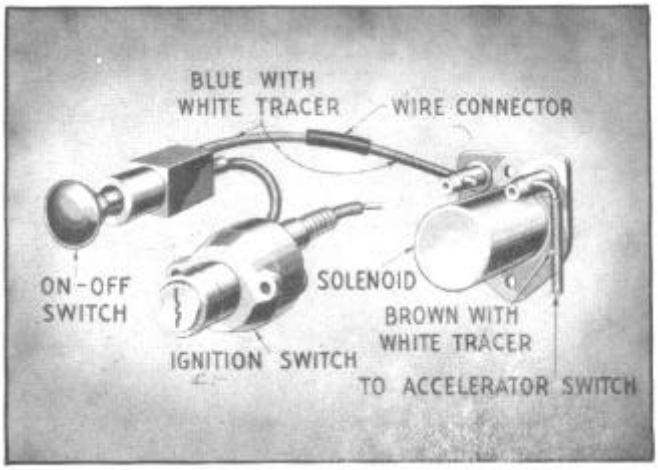


Figure 27--Upper Wiring Harness

B. Connect brown wire with white tracer, red wire with white tracer and yellow wire to dash switch according to markings on the switch.

C. Carry blue wire with white tracer and brown wire with white tracer along cylinder block to solenoid at front of power cylinder and connect brown wire with white tracer to solenoid connection towards the motor and blue wire with white tracer to solenoid connection towards the fender.

D. Carry red wire with white tracer Figure 28, and yellow wire down dash and over clutch housing and connect yellow wire to shift rail switch on top of clutch housing and red wire with white tracer to the governor.

27. Replace transmission hole cover, floor mat, and accelerator pedal.

28. Connect threaded sleeve rod bell crank, operating rod (see step 24) to the 3rd hole in the accelerator pedal link.

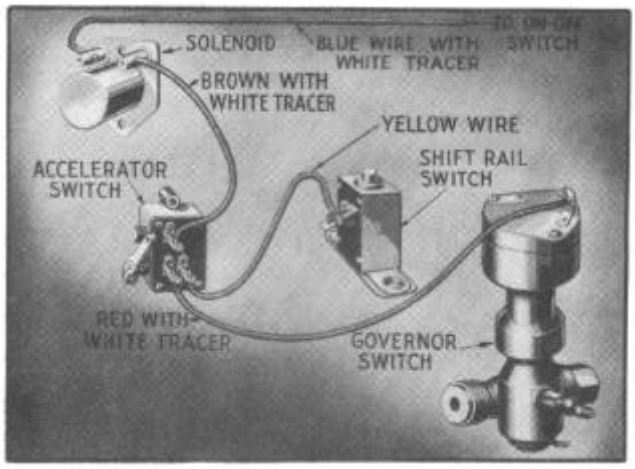


Figure 28--Lower Wiring Harness

29. Check clutch pedal adjustment.
30. Refill cooling system.
31. Adjust bell crank to coupling lever rod play link by removing cotter key, flat washer, and clevis pin spring from clevis pin at (E),

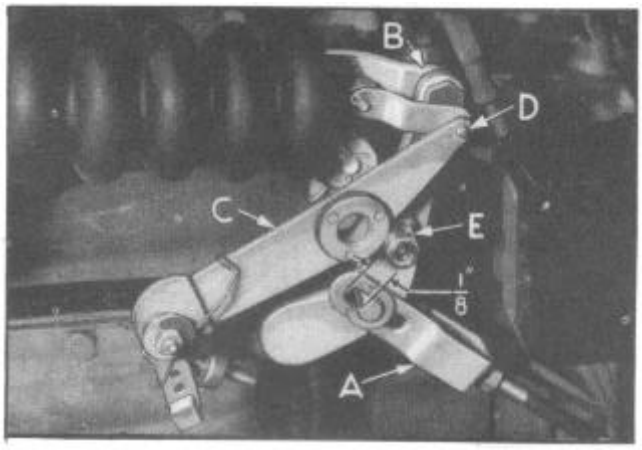


Figure 29--Bell Crank Yoke Adjustment

Figure 29 and pin (D) which retains valve lever (C)__ to bell crank and adjust play link (A) to obtain clearance between front of clevis pin and front end of slot in play link of 1/8".

Engine must not be running and piston rod (B) must

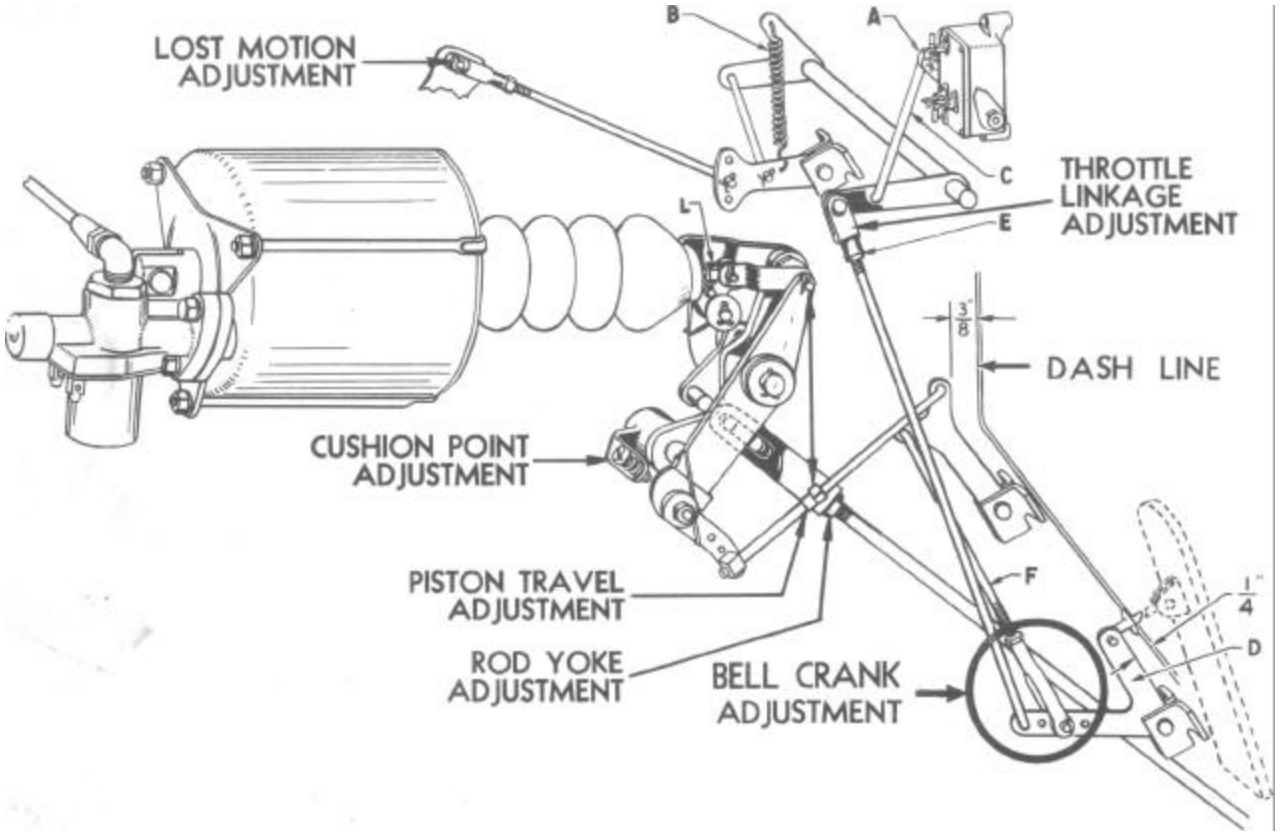


Figure 30--Linkage Adjustments

be in extreme rearward position.

32. Replace valve lever on clevis pin and replace spring, washer and cotter key.

33. Install cylinder tension spring connecting to front of cylinder and to bell crank bracket.

34. Adjust linkage for proper operation. All automatic control and throttle linkages must work free and without binding. The accelerator switch arm (A), Figure 30, must rest securely against its stop on side of switch by action of the throttle return spring (B) acting through the accelerator switch operating rod (C). Set accelerator pedal bell crank arm (D) to stop 1/4" of toe board by adjusting throttle rod clevis (E). On cars not equipped at factory, remove rubber bumper on accelerator rod as accelerator switch arm (A) must act as a stop for the throttle linkage. Threaded sleeve rod bell crank operating rod (F) must be in the third hole from the end in the lower arm of the accelerator bell crank (D). Adjust rod (F) to give 3/8" clearance between bell crank and dash with motor idling and the vacuum clutch on.

35. Piston travel adjustment must be made with guide block (A), Figure 31, in rear hole of cam lever (B), adjust valve lever cam threaded sleeve (C) to give maximum

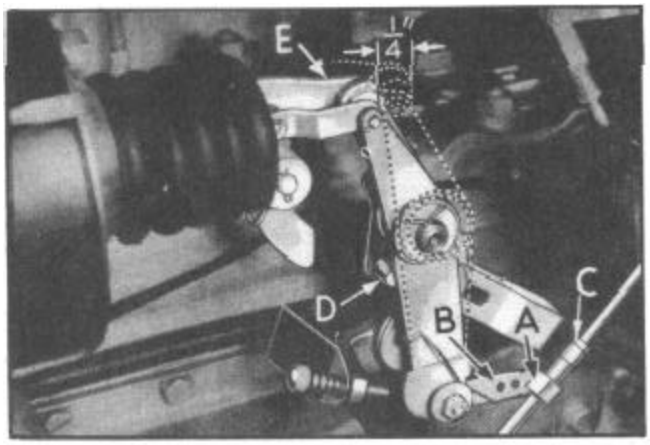


Figure 31--Piston Travel Adjustment

disengagement travel to the piston. With engine running, clutch disengaged, and compensator pin (D) in its extreme rearward position, screw threaded sleeve (C) towards the dash until piston rod (E) just reaches its extreme forward position. Then screw threaded sleeve (C) away from dash until piston moves rearward 1/4". This gives the proper adjustment for forward travel of the piston.

36. In determining the cushion point block the wheels securely and start the engine. Accelerate engine and engage and disengage the clutch several tines. This action tends to dry the clutch disc. Swing the compensator pin (A), Figure 32, rearward and turn cushion point stop screw (B) clockwise (in) until it meets the cam (C). Then with transmission in low gear, hold the cam (C) against stop screw (B) by pressing forward at point(D) and at the same time slowly turn stop screw (B) counter clockwise (out) until the car shows distinct tendency to move forward.

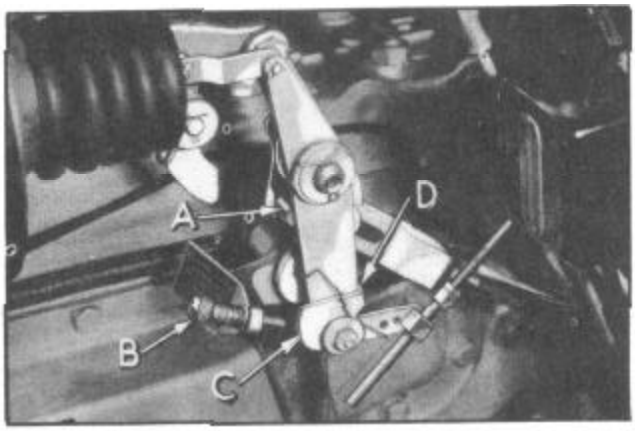
37. Throttle Rod Clevis Adjustment. The throttle rod must be adjusted at point (B), Figure 33, as follows:

Model 40 and 48.....Bottom hole
Model 41,43.....Top hole
Model 44,45 and 47.....Center hole

Hold accelerator down until cam (C), Figure 32, just touches the stop screw (B). Do this by wedging the accelerator bell crank away from the toe board. Do not attempt to open the throttle at any other point because that would change the relation between the throttle and clutch valve linkages. Adjust clevis at (A), Figure 33, until all lost motion is taken up, that is, any additional pedal travel will increase the engine speed

38. Final check should be made by shifting transmission into second gear and gradually depressing accelerator pedal with engine running. The cushion point stop screw and throttle should be so arranged that the car begins to move slowly forward upon initial opening of the throttle. If the clutch engagement is slow, accompanied by excessive motor speed, turn the

cushion point stop screw counter clockwise (out): if too fast, thereby stalling engine, turn screw clockwise (in). Do not turn screw more than 1/2 turn at a time.



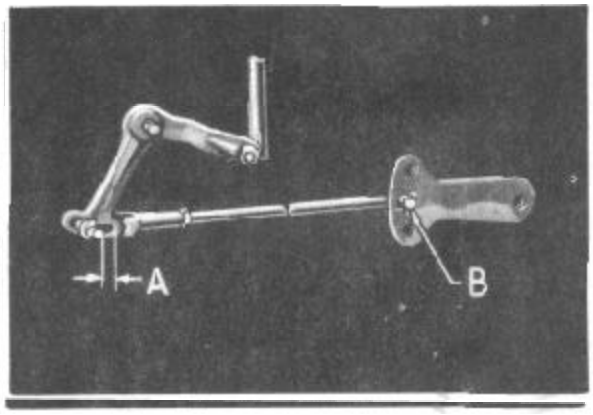


Figure 32--Finding Cushion Point

Figure 33--Throttle Rod Clevis Adjustment

TRANSMISSION

INDEX

TRANSMISSION SPECIFICATIONS

Speeds	3 forward and reverse	
Gear Type	Helical and spur	
Gear Ratios	Model 40	All Other Models
Low	2.42 to 1	2.94 to 1
Second	1.61 to 1	1.78 to 1
High - Without overdrive	1 to 1	1 to 1
Reverse	2.99 to 1	3.64 to 1
Lubricant	Summer S.A.E. 90 E.P. Winter S.A.E. 80 E.P.	
Capacity - Without overdrive	2 1/4 pounds (1.02 kgs.)	
- With overdrive	3 pounds (1.36 Kgs.)	
Bearings		
Main shaft pilot	Ball	
Main shaft bearings - Rear and front	Ball	
Main shaft pocket or needle bearing	Roller (26 used)	
Main shaft pocket thrust bearing	Ball (7 used - 3/16" steel ball)	
Countershaft bearings - Front and rear	Steel-backed babbitt	
Clearance	.0005"	
Main shaft intermediate gear	Steel-backed babbitt	
Clearance	.0005"	
End Play	.003" to .011"	
Countershaft End Play	.005" to .009"	
Adjustment	Shims	
Location	Rear bearing cap	
Main shaft end play	.008" to .012"	
Adjustment	Shim	
Location	Front bearing cap	
Back lash between reverse idler stationary gear and mating gear	.006" to .008"	
Back lash between main (shaft low and reverse gear and mating gear	.012" to .014"	
Shifter rail lock plunger to shifter rail lock rod link clearance	.005"	
Adjustment	Shim	

Gear Teeth	Model 40	All Other Models
Main shaft drive gear	17 teeth	19 teeth
Main shaft intermediate gear	23 teeth	24 teeth
Counter shaft drive gear	25 teeth	23 teeth
Counter shaft intermediate gear	19 teeth	18 teeth

TRANSMISSION

The transmission, Figure 1, 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 to prevent gears from demeshing while in operation are provided.

MAINSHAFT AND BEARINGS

The main drive gear and mainshaft are supported on two heavy duty annular thrust ball bearings (8 and 14), Figure 1, in the case, an annular ball bearing (7) in the crankshaft and needle roller bearings (12) between the shafts. The end thrust between the shafts is taken by seven ball bearings running in races machined in the ends of the shaft (at front end). Leather oil seals (9 and 58) prevent oil leakage.

End play in the main drive gear and mainshaft is adjusted by selection of shims located between the front face of the transmission case and the main drive gear bearing retainer (4).

The companion flange screw must be kept tight as it is depended upon to prevent slippage of the speedometer drive gear on the shaft. If this cap screw is loose, end play cannot be checked accurately and the speedometer drive gear may slip, giving a slow speedometer reading.

COUNTERSHAFT

The countershaft (21) is carried on two steel- backed babbitt bearings (22 and 23) while the thrust is taken on bronze and steel thrust washers (26 and 28) against the rear of the case. End play is adjusted by selection of shims between the rear face of the transmission case and the rear bearing cap (24). End play to be from .005" to .009".

SHIFTING RAILS AND FORKS

The shifting rails (52 and 53) and shifting forks (49 and 50) are built into the transmission case so that the control cover carries only the shifting lever.

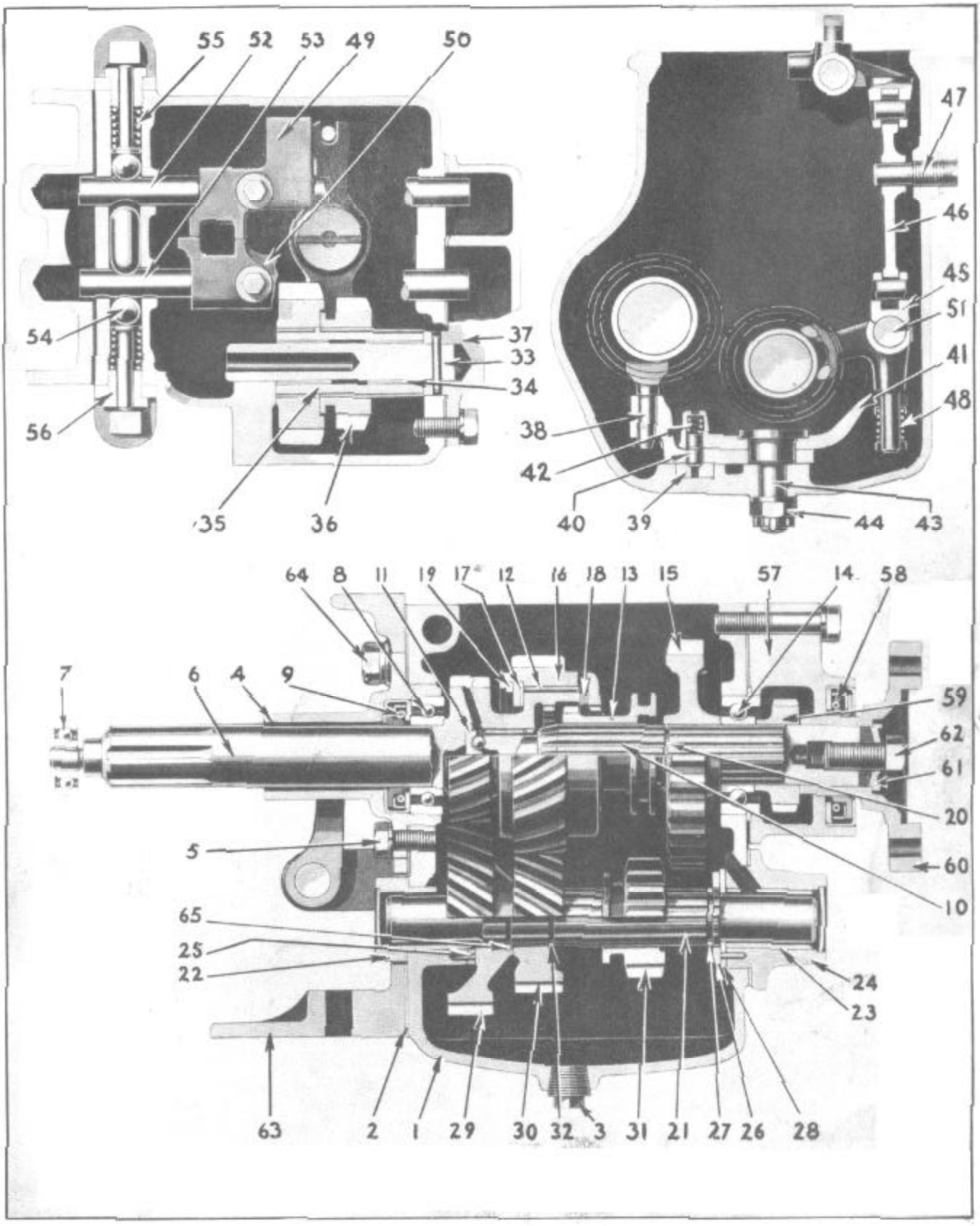


Figure 1--Transmission Assembly

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

SHIFTING RAIL LOCKS

A positive locking device is fitted to both (second and high also low and reverse) transmission shifting rails and are operated by the clutch linkage, see Figure 2. When the clutch is engaged the balls (77) are locked in the shifting rail notches. When the clutch pedal is depressed the lock rod links (78) move 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). The rod (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 half way, the rod should have moved upward far enough to bring the notch in line with the plunger so that the shift can be made.

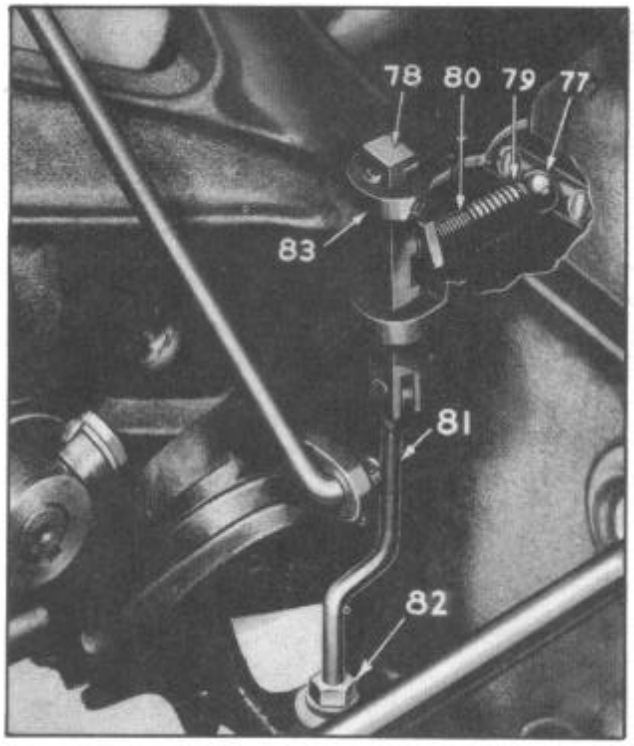


Figure 2--Transmission Shift Rail Locks

77. Shifting rail lock ball
78. Shifting rail lock rod link
79. Shifting rail lock plunger
80. Shifting rail lock plunger spring
81. Shifting rail lock link rod
82. Shifting rail lock link rod lock nut
83. Shifting rail lock guide

SECOND SPEED GEAR

The second speed gear (16), Figure 1, is fitted with a babbitt bushing and a two-piece steel-backed copper-lead thrust washer (17) locked in place by means of a heavy steel retaining ring (19) placed in the groove in the second speed gear.

PRESSURE VENT

A vent is located on top of the transmission cover to equalize the atmospheric pressure within the transmission.

TO REMOVE TRANSMISSION FROM CHASSIS

1. Remove accelerator pedal by taking out cotter pins in the clevis pins of anchor bracket and bell-crank link.
2. Pull rubber steering column hole cover up out of the way.
3. Remove the four screws holding the kick pad to the dash. Remove the six floor mat trim clips. Remove floor mat.

4. Remove front seat cushion.
5. Remove transmission opening floor cover bolts. Remove cotter pins holding pedal link bellcrank to cross shaft rod. Remove floor cover.
6. Remove the two propeller shaft Nit' bolt lock nuts and the locks. Disconnect front universal joint.
7. Unhook the clutch pedal lever return spring.
8. Remove the two cross shaft bracket bolts.
9. Remove clutch control link clevis pin.
10. Release clutch pedal assisting spring.
11. Loosen inside nuts on transmission side bumper and remove rubber bumpers then push the bumper rod out of the way.
12. Remove transmission Handy Shift control tube to transmission cover rod clevis pin.

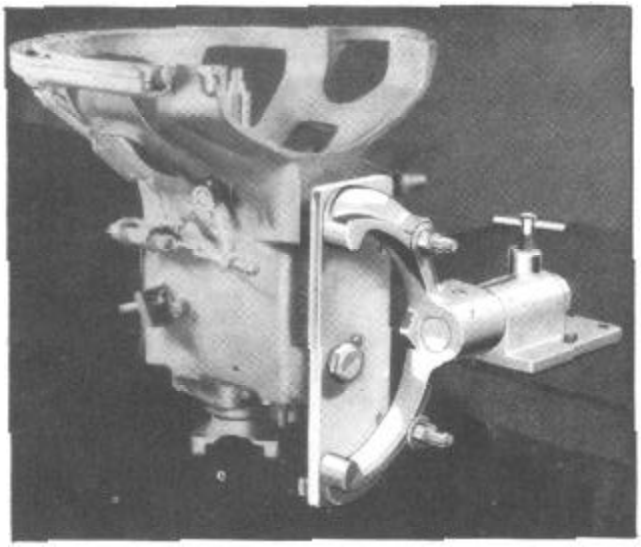


Figure 3--Transmission Holding Fixture J-814

13. Remove transmission cover.
14. Jack up the car and from underneath remove two flywheel guard to clutch housing screws and two engine rear mounting bolts. (Do not remove rear mounting to clutch housing bolt.)
15. Jack up rear end of engine about 1/21, off the frame.
16. Remove the clutch housing to transmission bolts.
17. Disconnect speedometer cable at transmission.
18. Pull transmission back and lift out.
19. Use transmission and differential holding fixture J-814, Figure 3, for doing all work on transmission.

DISASSEMBLY OF TRANSMISSION

20. Remove drain plug (3), Figure 1, drain out lubricant and thoroughly clean inside of transmission.
21. Remove the hex nuts from the bottom of connecting rods (81), Figure 2. Take off rods (81) and rail lock rod links (78).
22. Remove six bolts (64), Figure 1, holding clutch housing to transmission and take off clutch housing assembly.
23. Remove cap screw (62) from rear end of main-shaft and take off front universal joint companion flange using flange puller J-820, see Figure 4.
24. Remove three cap screws holding speedometer gear housing to transmission case and take off housing (57), Figure 1, and speedometer drive gear (59).
25. Remove low and reverse also high and intermediate lock ball spring caps (56), lock ball springs (55), lock balls (54), lock plungers (79), and shift rail lock rod guides (83).

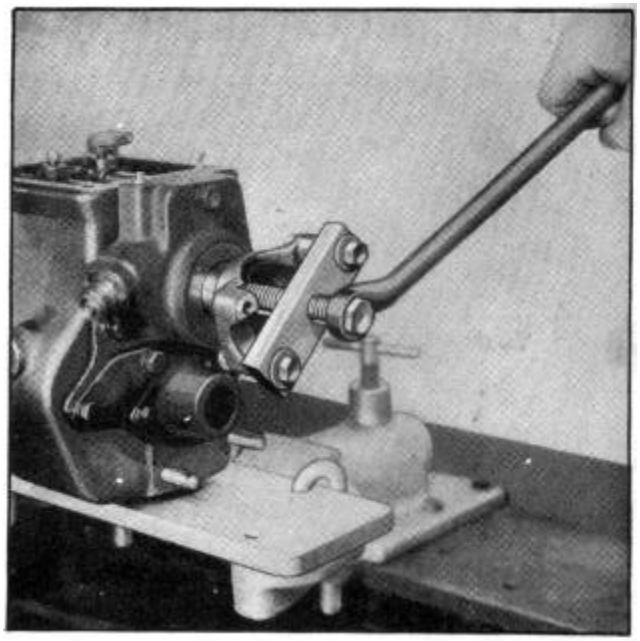


Figure 4--Removing Companion Flange Using J-820 Companion Flange Puller

26. Take out low and reverse also high and intermediate shifter lock screws and remove shift rails (52 and 53) and shifter forks.
27. Remove three cap screws (5) fastening main drive gear bearing retainer to transmission case and take out retainer (4) tapping with a soft hammer to free it from the case.
28. Remove mainshaft (10) and main drive gear assembly (6) by driving main shaft low and reverse gear (15) background on mainshaft far enough to remove the split lock ring (20). Use transmission gear drift J-786 which has a brass tip to prevent damage. At no time should mainshaft or main drive gear be pounded on the end when assembling or checking end play.
29. Pull mainshaft and rear bearing out of transmission case by means of adapter J-778 screwed into end of mainshaft and puller tool J-352, see Figure 5.

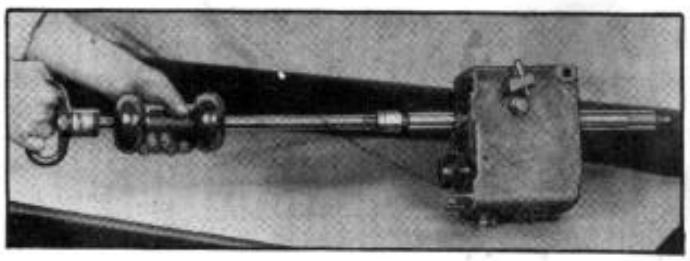


Figure 5--Removing Mainshaft and Rear Bearing Using Adapter Tool J-778 and Puller J-352.

30. Remove mainshaft low and reverse gear (15) Figure 1, also second and high shift sleeve (13) from transmission case.
31. Remove mainshaft drive gear assembly (6) by lifting through the top of the transmission case.

DISASSEMBLING OF MAINSHAFT DRIVE AND INTERMEDIATE GEAR

32. Remove the seven mainshaft thrust balls and the twenty-six mainshaft needle rollers (12). Place drive gear assembly in a vise and insert one jaw of the lock ring remover tool J-448-1 through the opening in the gear gripping

the lock or retaining ring (19), placing the opposite jaw just above the lock ring as shown in Figure 6.

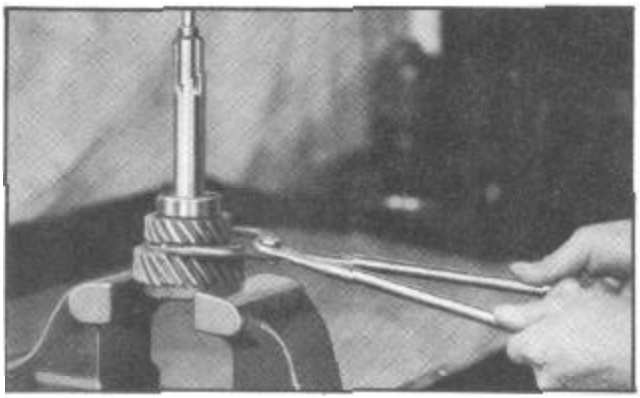


Figure 6--Removing Mainshaft Intermediate Gear Retainer Using Tool J-448-1

Compress the lock ring remover tool and lift one side of the lock ring out of the groove, next with a blunt punch, tap the other side of the lock ring and it will snap out. Complete the disassembling

operation by taking the gears apart and removing the front and rear thrust washers (17 and 18), Figure 1.

33. Remove main drive gear ball bearing from the gear by using bearing puller tool J-782 as shown in Figure 7.

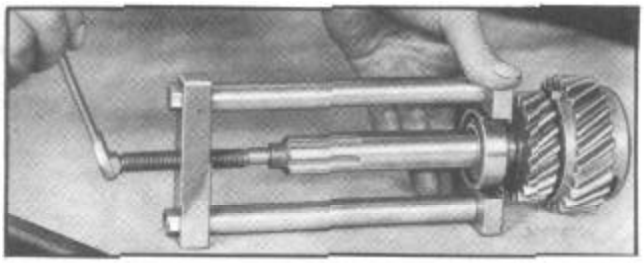


Figure 7--Removing Main Drive Gear Bearing Using Puller J-782

REVERSE GEARS - REMOVING

34. Remove reverse gear assembly (36), Figure 1, and stationary shaft by removing the two reverse gear shaft screws and withdrawing the cap (37) and shaft (33). This will permit the lifting of the rotating shaft and gear assembly out of the case. The stationary gear and the rotating shaft are pressed together and ground together and therefor cannot be supplied except as an assembly.

COUNTERSHAFT - REMOVAL

35. Take out cap screws holding countershaft rear bearing (23), and cap (24) to transmission case. This will allow removal of cap (24); thrust washer (26) and spacer (28).

36. Insert the beveled edge of the transmission gear drift J-786 between the countershaft drive gear (29) and the countershaft intermediate gear (30) thus separating the gears. After the countershaft (21) has been forced back out of the splines in the drive gear (29) by this method the countershaft should be turned slightly so that the splines of the shaft butt against the splines of the drive gear. Remove countershaft intermediate gear retainer (65).

37. Insert gear drift J-786 through the main- shaft rear bearing hole in transmission case and drive countershaft intermediate gear forward placing the brass end of the drift against the gear hub but do not drive the gear entirely off the shaft as shown in Figure 8.

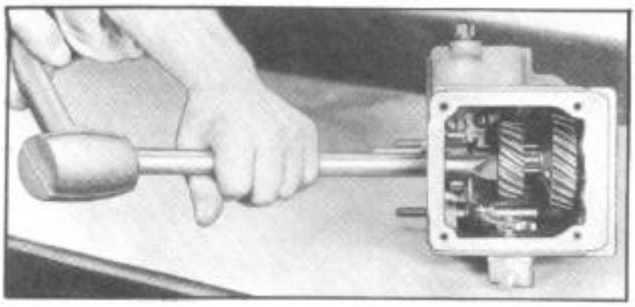


Figure 8--Removing Countershaft Gears Using Drift J-786

38. Place the low and reverse shifter lever in reverse position and move the countershaft to one side far enough to move the shifter lever to its neutral position.

39. Hold the three countershaft gears together and remove the countershaft through the rear of the transmission.

40. Remove the low and reverse intermediate lever stud (47), Figure 1, and take out lever (46).

41. Remove the small Allen set screw from the right side of transmission case and drive low and reverse shifter fork shaft (51) out of transmission case with a blunt punch.

42. Remove cotter pin and castellated nut (44) from the bottom of transmission case.

This will allow removal of the following:

Reverse gear shifter lever fulcrum (43), reverse gear shifter pickup lever (41), reverse gear shifter (38), locator pin (40), pickup plunger and pickup plunger spring (42).

INSPECTION

The transmission is now completely disassembled and the parts should be checked for wear. Bearings must be free of dirt and chips with no sign of roughness or looseness. All gears and shafts must be free of nicks on the teeth and splines as otherwise noisy operation and difficult shifting will result.

CAUTION: When placing any machined face in a vise always face the jaws of the vise with a lead facing or copper facing so that the vise jaws will not cut into or damage the part.

TRANSMISSION GASKET KIT

Seven transmission gaskets most frequently needed for transmission overhaul are furnished in a box under part No.BT 158344 and are available through the factory parts department.

The package consists of -

1 of part 44206 Speedometer Gear Housing Gasket
1 of part 40107 Countershaft Cap Gasket
1 of part 40079 Transmission Case Gasket
1 of part 44190 Reverse Gear Shaft Cap Gasket
1 of part 40532 Companion Flange Washer Seal
1 of part 41042 Companion Flange Screw Gasket
1 of part 158039 Transmission Cover Gasket

RENEWAL OF COUNTERSHAFT BUSHINGS

1. Drive out old bushings which are steel-backed bearing metal with bushing tool J-450 and replace new bushings with bushing replacer tool J-780 as shown in Figure 9.

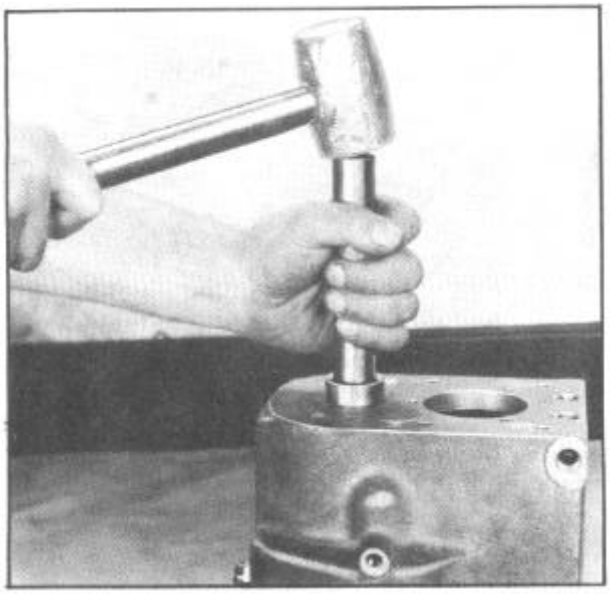


Figure 9--Removing and Replacing Countershaft Bushings with J-450 Bushing Driver and J-780 Bushing Replacer

2. The new countershaft bushings must be line reamed to exact size and alignment as shown in Figure 10 using countershaft bushing line reamer tool J-466.

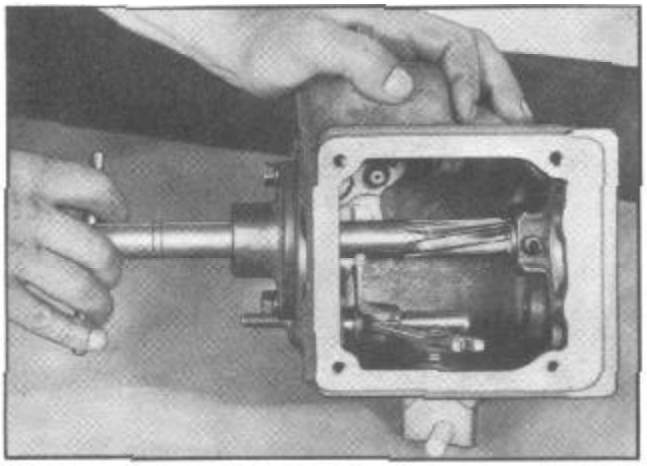


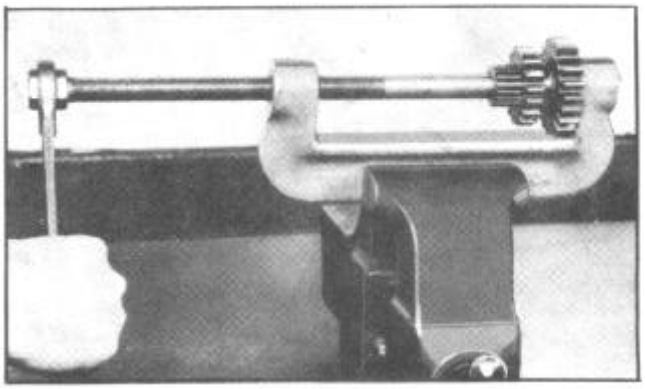
Figure 10--Reaming Countershaft Bushings Using J-466 Countershaft Bushing Line Reamer

3. When reaming the front bushing, insert the reamer through the countershaft rear bearing cap, bolt the cap in place and enter the pilot of the reamer in the 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 into position.

4. Press out old reverse gear rotating shaft bushings (34), Figure 1, either with an arbor press or use press J-488 which is hand operated as shown in Figure 9 and 12.

RENEWAL OF REVERSE GEAR BUSHINGS

Figure 11--Removing Reverse Gear Bushings



Using J-488 Bushing Press and Adapters

5. The necessary adapters are furnished with the press to remove the old bushings and to press the new bushings into place. The bushings are furnished to size so that no reaming is necessary.

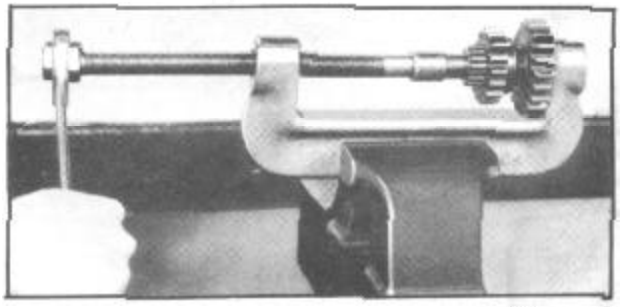


Figure 12--Installing Reverse Gear Bushings Using J-488 Bushing Press and Adapter

RENEWAL OF MAINSHAFT INTERMEDIATE GEAR BUSHING

6. If, because of excessive wear or damage, the rebushing of the mainshaft intermediate gear becomes necessary only a new gear assembly should be used. A special steel-backed babbit bushing is used and it is diamond bored by special machinery in order that the utmost in accuracy can be had which means quiet operation and a long life.

REASSEMBLY OF TRANSMISSION

7. Place reverse gear shifter lever and the reverse gear shifter pickup lever (41), Figure 1, together in their proper positions with the plunger and plunger spring (42) in the shifter lever as shown and the locator pin (40) in the lower lever.

NOTE: 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 and free from nicks and wear.

8. Place these parts, as a group, in the bottom of the transmission case and assemble by inserting the fulcrum (43) through the levers and the case and assemble with

and assemble with the copper gasket under the fulcrum nut (44).

9. Install reverse gear shifter (38) in the lever.

10. Install low and reverse shifter fork shaft (51) in the case and assemble the low and reverse shifter fork assembly (49). Lock shift securely in position with Allen set screw using wrench J-785.

11. Install low and reverse intermediate lever (46) and stud (47) and draw up stud nut securely. A copper washer must be placed under the stud nut.

12. Install expansion plugs in the front countershaft bushing also in rear countershaft bushing cap. Remove rear countershaft bushing cap from case.

13. Install countershaft thrust washer retainer (27) on countershaft using ring replacer J-781 as shown in Figure 13.

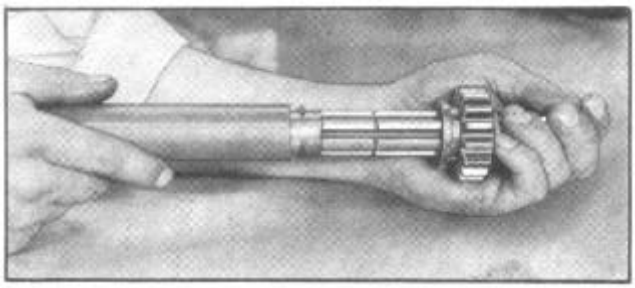


Figure 13--Installing Thrust Washer Retainer
Using J-781 Countershaft Retainer Ring Replacer

14. Assemble countershaft low and reverse gear (31) on countershaft.

15. Install countershaft intermediate gear retainer (32) on countershaft using replacer J-781.

16. Install countershaft intermediate gear (30) on countershaft and press until gear hub is over the retainer (32). Install second retainer (65) on countershaft using replacer J-781.

17. Place countershaft drive gear (29) and countershaft front thrust washer (25) in their correct relative positions over the front end of the countershaft.

18. Place low and reverse shifter lever in neutral position (straight up) and with the three countershaft gears held together, install assembly in transmission case.

19. 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).

20. Align countershaft drive gear so that countershaft splines are entered in the hub then drive countershaft forward until the drive gear hub is over the retainer (65).

21. Install spacer (26) on rear end of countershaft with oil groove facing to the rear. Place bronze thrust washer (28) on the front end of the rear bushing cap.

22. Install cap and thrust washer in position, placing a sufficient quantity of shims between the countershaft rear bearing and the case to allow an end play of from .005" to .009". See that the countershaft cap gasket is in good condition and draw the cap screws up tightly.

23. Install reverse rotating shaft stationary gear assembly and gear (36) in transmission case entering the sliding gear collar on the reverse gear shifter (38).

24. Install the stationary shaft (33) into the cap (37) with a dowel pin, then install in the case with the gasket and secure with the cap screws.

25. Install main drive gear ball bearing (8) on main drive gear (6) using the bearing installing tool J-779 as shown in Figure 14.

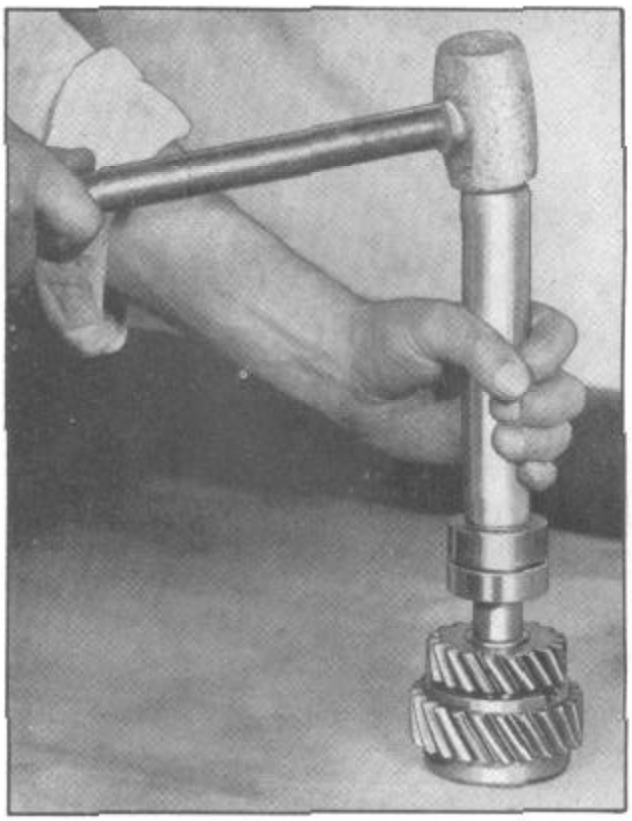


Figure 14--Installing Main Drive Gear
Bearing Using Installing Tool J-779.

26. Install mainshaft needle roller retaining ring using tool J-780.

27. When assembling main drive gear and main-shaft intermediate gear, place intermediate gear (16) in vise the same as was done for the disassembling.

28. Install mainshaft intermediate gear rear (bakelite) thrust washer (18) in gear (16).

29. Install intermediate gear thrust washer retainer (19) on main drive gear (6) ahead of bearing journal.

30. Enter rear end of main drive gear into intermediate gear and install the front thrust washer (17) which is a split washer, with the babbitt face downward.

31. Center the 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.

32. Force the mainshaft intermediate gear thrust washer retainer into the groove using installing tool J-448-5, as shown in Figure 15.

33. Install the seven thrust balls and the twenty six needle rollers (12), Figure 1, packing them with wheel bearing grease to hold them in place while assembling in the transmission.

34. Insert the main drive gear assembly through opening in top of the case.

35. Install mainshaft rear bearing (14) on main- shaft about one inch from the rear.

36. Insert mainshaft through opening in rear of transmission case and install mainshaft low and reverse gear also the second and high shift sleeve with the shifter collar to the rear.

37. Install the mainshaft low and reverse gear retainer (20) in groove in mainshaft using wheel bearing grease to hold parts of ring in place.

38. With mainshaft held firmly against the thrust balls, place bearing installing tool J-779 shown in Figue 15 over

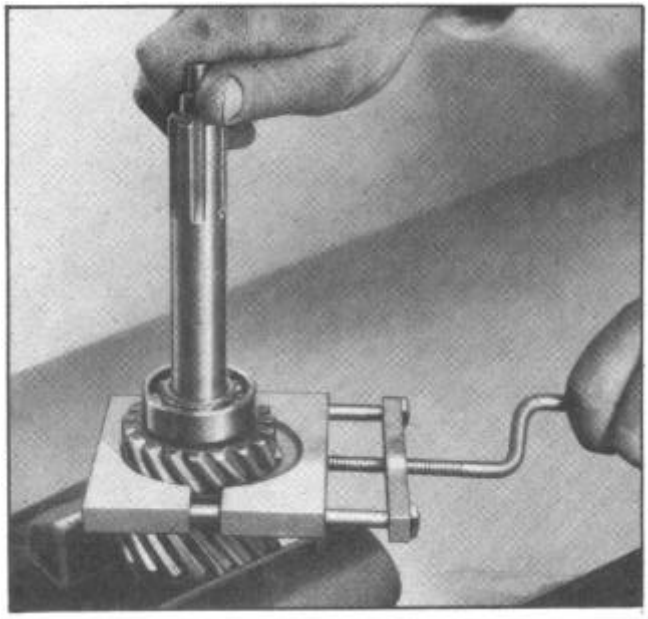


Figure 15--Installing Mainshaft Intermediate Gear Thrust Washer Retainer Using Installing Tool J-488-5

the mainshaft rear bearing (14) and drive bearing into place. This will also drive the mainshaft low and reverse gear forward to cover the retainer (20).

39. Install speedometer drive gear (59) making certain the gasket and oil seal (58) are in good condition and that the three cap screws are drawn up tight.

40. Install companion flange (60) also cork gasket washer seal, washer (61) and cap screw (62). The cap screw must be tight to prevent speedometer gear from slipping.

41. Install main drive gear bearing retainer (4) placing the necessary number of shims between retainer and transmission case to provide a total of .008" to .012" end play in the mainshaft. To insure accuracy when checking transmission end play an accurate dial indicator such as J-196 must be used.

The indicator is mounted on the top flange of the transmission case and readings taken from the front end of main drive gear shaft. Check carefully the condition of the leather oil seal (9) to make certain that the leather has not been turned under which might cause a front end oil leak. If satisfactory replace the retainer and tighten the five retainer cap screws.

SHIFTER FORKS AND SHAFTS

42. Install second and high shifter fork (50), Figure 1 in transmission and insert the shifter rail (53) through the case and fork.

43. Install shift rail interlock plunger.

44. Install low and reverse shifter assembly (49) and shift rail (52).

45. Install lock balls (54) lock balls springs (55), Figure 1 and plungers (79), Figure 2.

46. Install lock rod guides (83), Figure 2 and caps (56), Figure 1, on both sides, using correct number of shims between lock rod guides and transmission case to give a clearance of .005" between end of plungers (79) and lock rod link (78), Figure 2.

47. Install low and reverse also high and intermediate lock rod link (78) in guides (83) and place cotter pins through holes at top.

48. Install clutch housing assembly on the transmission case. Use a new gasket.

49. Insert threaded ends of high and intermediate also low and reverse shift rail lock rods (81) into holes provided in clutch throwout and locking device levers. Assemble sleeves, springs, plain and lockwashers on threaded ends of links and screw on nuts and lock nuts.

50. Connect upper ends of rods (81) to slots in lock rod links (78) and insert clevis and cotter pins.

51. Replace drain plug (3), Figure 1, and fill transmission with gear lubricant (see lubrication group) to the height of filler plug opening on left side of case.

52. Install transmission cover to transmission. Use a new gasket between cover and transmission case.

REPLACING TRANSMISSION IN CHASSIS

53. Reverse procedure shown on removal of transmission from chassis Pages 3-4.

54. Before installing the transmission wrap one strand of soft wire around the clutch throwout bearing leather seal to prevent it from curling over when placing the transmission. Twist the wire and place the long ends upward through the clutch housing. Twist the wire so that it comes off the oil seal after the transmission is in place.

55. The transmission must be lowered into position carefully and over the mainshaft drive gear so as to engage the splines in the clutch driving disc.

HANDY SHIFT - Figure 16

The 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.

SHIFTING GEARS

The Handy Shift permits the shifting of gears with exactly the same movements that nearly all drivers use. Raise the control lever and move it to the rear for low gear. Raise the control lever and move it forward for reverse gear. Depress the lever and move it forward for second speed. Depress the lever and move it to the rear for high speed.

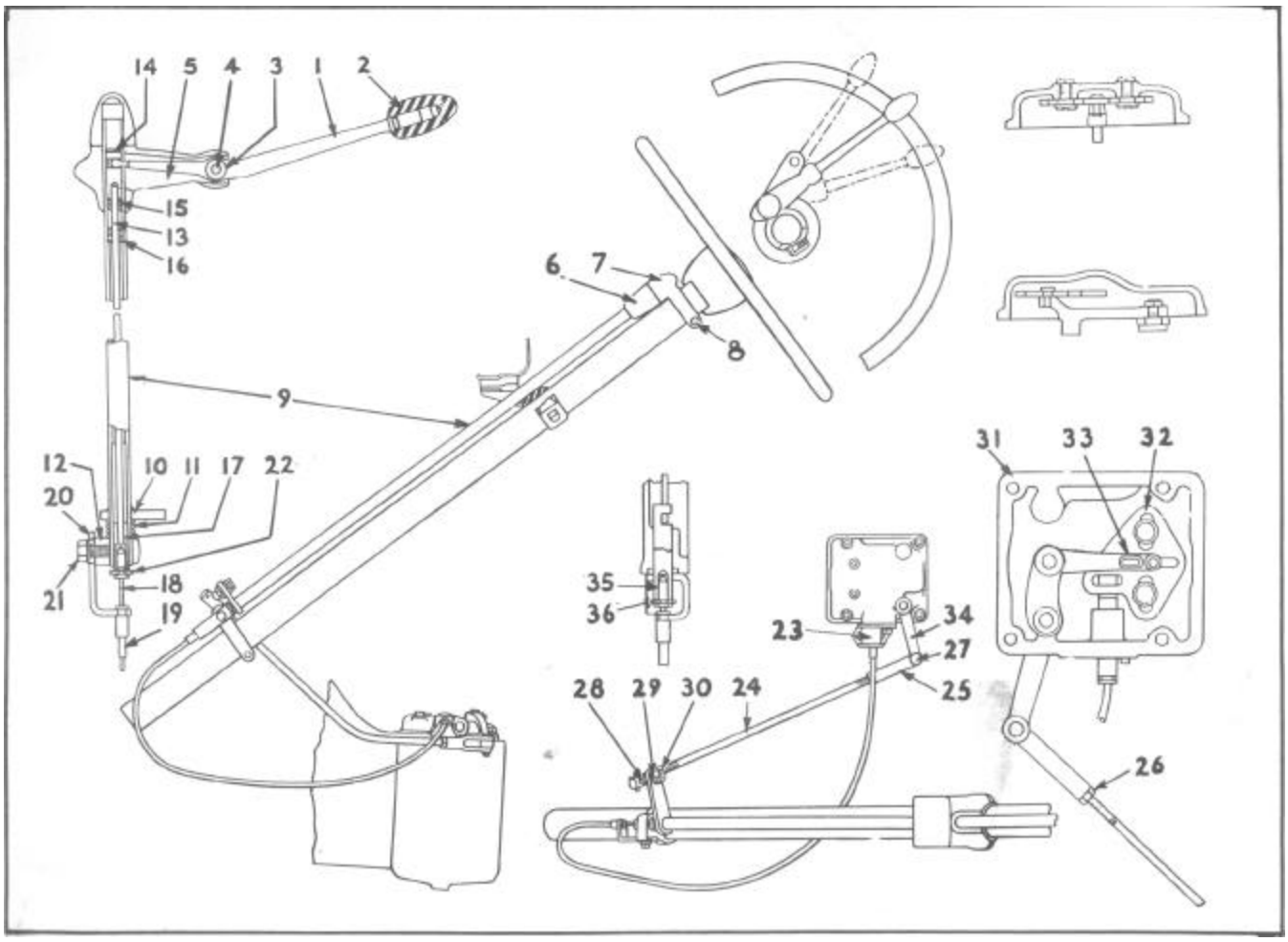
Forward and backward movement of the control hand lever (1), Figure 16, imparts a rotary motion to the tube (9) and the lever (10) which is attached to its lower end. This rotary motion is carried on through a rod (24) to a shifting finger

(33) that is mounted in the transmission cover (31). The lower part of this finger is provided with a

lug which engages the slots in the low and reverse also second and high, shifter forks. This moves the shift rails and gears into their different positions.

CROSS SHIFT

Movement of the shift finger (33) in a sidewise direction to engage with the shift rail corresponding to the gear desired, is accomplished by a shift selector plate (32) which is operated by a wire cable (18). A push rod end (14) at the upper end of this cable is moved up or down in the tube (9) by a corresponding movement of the control lever (1).



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 tube upper bracket
8. Control tube upper bracket clamp bolt
9. Control tube
10. Control tube lever
11. Control tube compression spring
12. Control tube lower bracket
13. Control lever push rod
14. Control lever push rod end-upper
15. Control lever push rod upper compression spring
16. Control lever push rod upper compression spring seat
17. Control lever push rod end-lower
18. Control wire
19. Control wire casing
20. Control wire casing anchor bracket
21. Control wire casing anchor bracket bolt
22. Control wire anchor clip
23. Control wire and selector plate push rod dust shield
24. Control tube to transmission cover rod assembly
25. Control tube to transmission cover rod clevis
26. Control tube to transmission cover rod clevis lock nut
27. Control tube to transmission cover rod clevis pin
28. Control tube to transmission cover rod ball joint
29. Control tube to transmission cover rod ball joint nut lock washer
30. Control tube to transmission cover rod ball joint nut
31. Transmission cover
32. Transmission cover shift selector plate
33. Transmission shift finger
34. Transmission shift lever - outer
35. Transmission cover shift selector push rod
36. Control wire anchor clip

HANDY SHIFT OPERATING ROD ADJUSTMENT

In neutral position the hand lever should be at right angles to the center line of the car. Adjustment is made by removing the clevis pin (27) and cotter pin in the yoke end of the operating rod (24) at the transmission end. With the transmission cover lever and shift lever in neutral position, loosen yoke lock nut (26) and turn yoke end (25) until clevis pin (27) will drop into lever (34) without moving either levers.

This adjustment can be made by raising the front end of the car and working from underneath.

HANDY SHIFT CROSS SHIFT ADJUSTMENT

Adjustment is made with the hand control lever in extreme up position which is between the low and reverse positions. Loosen cap screw (21) at lower end of steering column and pull casing bracket (20) up until all slack is out of casing and the transmission shift shaft in transmission is fully over to the low and reverse side. Tighten the bracket cap screw in place. Anchor clip (22) in control wire should have clearance at top and bottom of travel.

This adjustment can be made by raising the bonnet and working from the top.

HANDY SHIFT DISASSEMBLY AND INSTALLATION

To remove and install any parts of the Handy Shift control (with the exception of the lower control rod and cable) it is necessary to remove the horn button and steering wheel. (See "Steering Gear" group for instructions.)

HANDY SHIFT CONTROL TUBE UPPER BRACKET TO REMOVE

1. Remove horn button and steering wheel. (See "Steering Gear" group.)
2. Remove control tube upper bracket clamp bolt (8) use a Phillips screw driver.
3. Remove upper bracket (7) and fulcrum bracket ring (6).
4. To install reverse procedure of removal.

HANDY SHIFT CONTROL LEVER - REMOVING

1. Remove horn button and steering wheel. (See "Steering Gear" group for instructions.)
2. Remove control tube upper bracket clamp bolt (8) using a Phillips screw driver.
3. Remove upper bracket (7) and fulcrum bracket ring (6).
4. Remove control lever fulcrum (4) with an Allen wrench.
5. Withdraw lever (1) and anti-rattle washer
(36. Remove control wire anchor clip (22) at the bottom of the steering column and push end (17) of push rod (13) upward to expose control lever push rod end upper (14).

HANDY SHIFT CONTROL LEVER - INSTALLING

7. To reassemble, reverse the procedure of removal. Apply a small amount of viscous chassis grease in the bracket (7) before installing.

HANDY SHIFT CONTROL LEVER FULCRUM BRACKET

TO REMOVE

1. Remove front seat cushion, accelerator pedal and floor mat.
2. Remove transmission opening floor cover.
3. Remove horn button and steering wheel. (See "Steering Gear" group.)
4. Disconnect control rod (24) at steering gear end.
5. Remove control wire casing anchor bracket bolt (21) and wire anchor clip (22).
6. Remove jacket tube bracket cap.
7. Pull jacket tube and control tube (9) off steering column tube.
8. Remove control tube upper bracket clamp bolt (8) bracket (7) and bracket ring (6).
9. Remove control lever fulcrum (4), control lever (1) and anti-rattle washer (3).
10. Remove fulcrum bracket set screw.
11. Mark control tube (9) and fulcrum bracket (5) to insure bracket being reinstalled in the proper position and press tube out of bracket.

TO REPLACE

12. To reassemble, reverse the procedure of removal. Care should be taken when pressing fulcrum bracket (5) on control tube (9) to see that it is replaced in exactly the same position from which it was removed.
13. Before final tightening of control wire casing anchor bracket bolt (21) adjust casing anchor bracket (20) to provide proper clearance at the top and bottom for cable anchor clip (22).

HANDY SHIFT CONTROL TUBE LOWER BRACKET

TO REMOVE

1. Remove steering jacket tube and control tube (9) as outlined in operation 1 to 7 inclusive under "Handy Shift Control Lever Fulcrum Bracket Removal".
2. Remove lower control bracket clamp bolt (21) and slide off bracket (12).

TO REPLACE

3. To reassemble, reverse procedure of removal. When reassembling be sure control tube compression spring seat (16) is placed in position below spring (15). Adjust wire casing anchor bracket (20) to provide proper clearance at top and bottom for wire anchor clip (22).

HANDY SHIFT CONTROL WIRE CASING AND BRACKET ASSEMBLY -

TO REMOVE

1. Remove front seat cushion, accelerator pedal and front floor mat.
2. Remove transmission opening floor cover.
3. Disconnect control tube to transmission cover rod (24) at transmission by removing cotter pin and clevis pin (27).
4. Remove selector plate push rod dust shield (23) by bending back ears under casing bracket.
5. Remove bolt attaching bracket to transmission cover.
6. Remove control wire anchor clip (36).
7. Bend over clip attaching casing to frame at brake pipe frame tee.
8. Remove lower wire casing anchor bracket bolt (21) at steering gear.
9. Remove control wire anchor clip (22) and withdraw casing and wire assembly (18 and 19).

TO REPLACE

10. To reassemble, reverse procedure of removal. Adjust wire casing bracket (20) to provide proper clearance at top and bottom for wire anchor clip (22).

HANDY SHIFT CONTROL TUBE TO TRANSMISSION COVER ROD ASSEMBLY

TO REMOVE

1. Raise bonnet.
2. Remove ball joint nut (30) and lockwasher (29).
3. Raise front end of car.
4. Remove cotter pin and clevis pin (27) at rear end and remove the rod.

TO INSTALL

5. Reverse procedure of removal. Check operation of rod and if necessary to adjust remove clevis in and turn clevis (25) until the clevis pin (27) will pass through the clevis and the shift lever (34) with the transmission in neutral.

HANDY SHIFT CONTROL LEVER PUSH ROD

TO REMOVE

1. Remove horn button and steering wheel as given under "Steering Gear', group.
2. Remove upper bracket clamp bolt (8).
3. Remove upper bracket (7) and ring (6).
4. Remove control lever fulcrum (5), control lever (1) and anti-rattle washer (3).
5. Remove wire anchor clip (22) at lower end of steering column and disconnect wire (18).
6. Loosen wire casing anchor bracket bolt (21) and detach wire casing anchor bracket (20) from lower bracket (12).
7. Pull lower push rod end (17) down far enough to remove key attaching push rod (13) to push rod end.
8. Remove push rod (13) from control tube (9) by pushing upward from lower end.
9. Remove push rod upper end (14) by taking out key.
10. Remove upper compression spring (15) and seat (16) with a wire hook.

TO REPLACE

11. When reassembling push rod ends (14) and (17) to push rod (13) assemble the keys toward front of the car. Apply a coat of viscous chassis lubricant to push rod ends when assembling them in control tube.
12. Install upper compression spring seat (16) and spring (15) on push rod (13) and install in control tube (9).
13. Assemble upper push rod end (14) to push rod (13) with key assembled toward front of car.
14. Install lower push rod end (17) on push rod (13) and assemble with key toward front of car.
15. Install control lever (1) and anti-rattle washer (3) with end of lever engaged in push rod end (14). Install control lever fulcrum (4).
16. Install control wire (18) in lower push rod end (17) and install anchor wire clip (22).
17. Hold control lever in extreme up position and adjust control wire casing anchor bracket (20), tighten bolt (21) securely.
18. Reinstall steering wheel and horn button.

TRANSMISSION OVERDRIVE

Transmission overdrive is available as a factory installed option only, because of changes necessary in the design of such units as the clutch; transmission; propeller shaft and frame.

Overdrive is so named because it provides a driving ratio that is over or higher than direct drive. In overdrive the propeller shaft revolves at a faster rate than the engine. This is because of the number of teeth in the planetary pinions; sun gear and internal gear which speed up the revolutions of the propeller shaft about 38% above the engine speed. In other words the engine revolutions per mile in overdrive is 72% of the engine speed in direct (ordinary) drive at the same car speed.

When the propeller shaft is turning over at a rate of 1000 R.P.M. the engine speed would only be 720 R.P.M. thus giving greater gasoline and oil economy and exceptionally smooth operation at high speeds.

OPERATION

The transmission overdrive is constructed to give overdrive operation at speeds above 30 to 35 miles per hour on cars having standard overdrive rear axle ratios. When higher optional axle ratios are used the cut-in speed will be proportionately higher. The free wheeling unit used in conjunction with overdrive is constructed to operate at approximately five miles per hour below the cut-in speed. The operation of the entire overdrive unit is controlled through a button which is located on the instrument panel below the ignition switch. By pulling this control button out to the limit of its travel the overdrive and free wheeling units are held inoperative. In this out position the course of drive, see Figure 18, is from the transmission main shaft to the free wheeling cam, to the overdrive clutch sleeve, to the overdrive main shaft, through the universal joints and propeller shaft, to the rear axle and wheels.

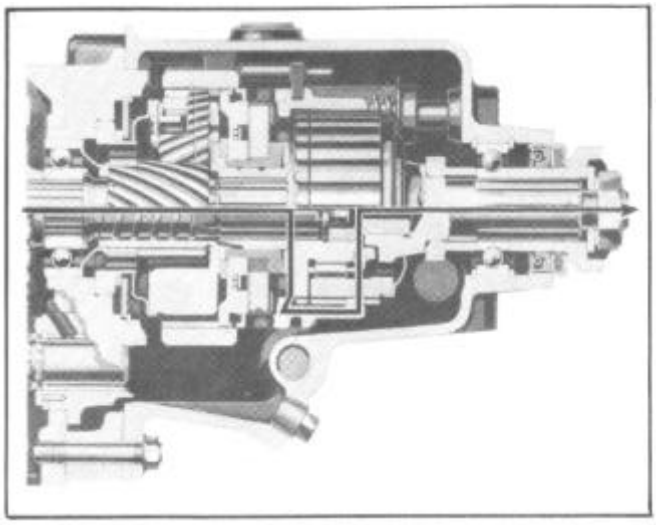


Figure 18--Overdrive Power Circuit (Direct Drive) - Button Pulled Out

1. Transmission main shaft to the -
2. Free wheel cam to the -
3. Clutch sleeve to the -
4. Overdrive main shaft and then through the propeller shaft to the rear axle and wheels.

With the control button pushed in, both the overdrive and free-wheeling become operative, the overdrive cutting in when the accelerator pedal is released above a speed of 30 to 35 miles per hour. After the overdrive has been engaged it will automatically disengage and the car will free-wheel when the car speed reaches a speed about 5 miles

per hour below the cut-in speed. The power circuit in overdrive, illustrated in Figure 19, is as follows: From transmission main shaft to the pinion cage and pinions, to the ring gear, to the clutch pawls, to the clutch sleeve, to the overdrive main shaft and then through the propeller shaft to the rear axle and wheels.

With the control button pushed in and overdrive

not engaged, the course of the drive with car speed of approximately 27 miles per hour and less, freewheeling is from the transmission main shaft to the free wheeling cam and rollers, to the overdrive main shaft, through the universal joints and propeller shaft, to the rear axle and wheels as shown in Figure 20.

When the circuit is operating in the free-wheeling position the overdrive clutch pawls are disengaged from the shell.

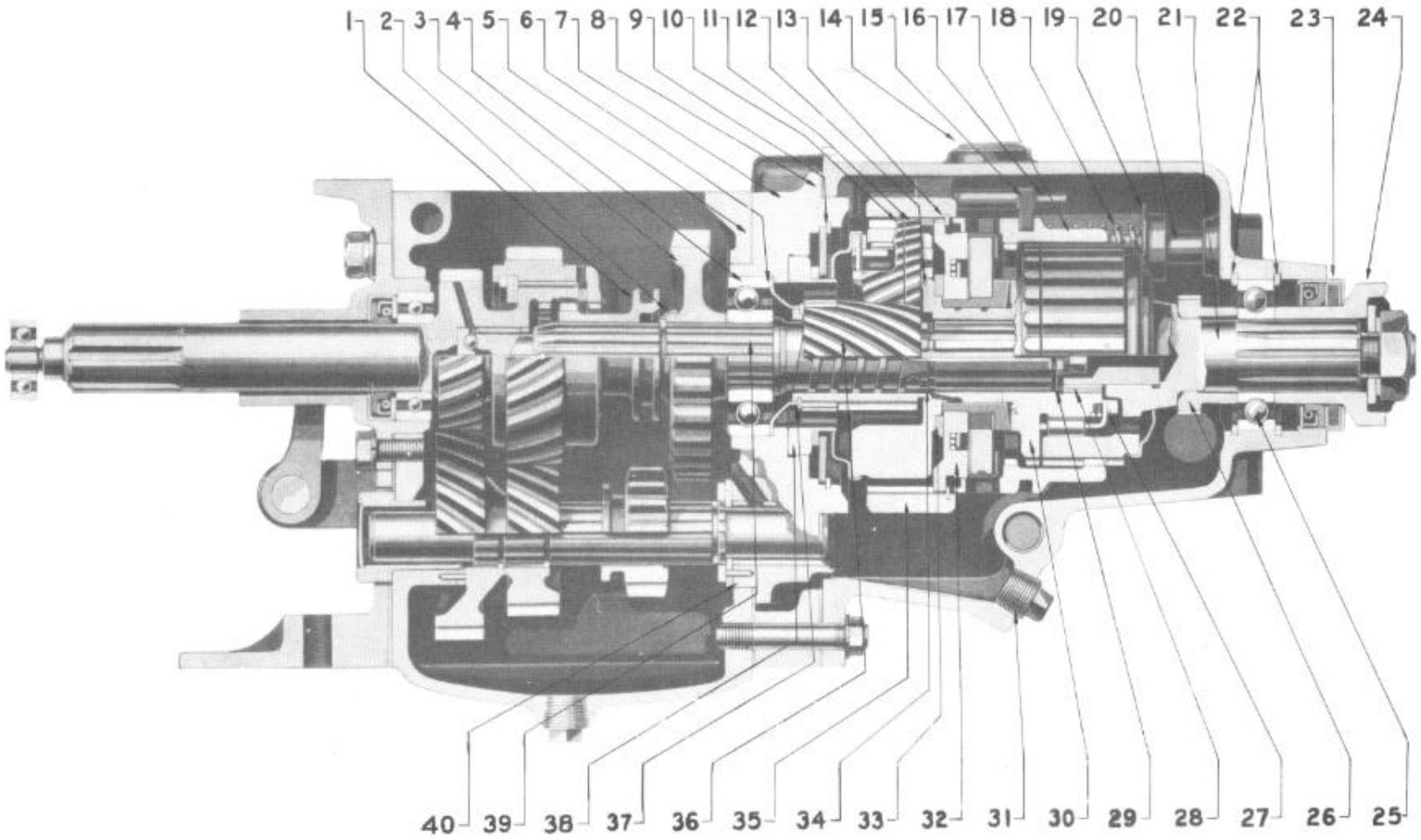


Figure 17--Transmission Overdrive

1. M/S 2nd. and High Shift Sleeve
2. M/S Low and Reverse Gear Retainer Lock
3. M/S Low and Reverse Gear
4. M/S Bearing
5. O/D to Transmission Case Gasket
6. M/S Oil baffle
7. Housing Adapter
8. Housing Gasket
9. Pinion Cage Snap Ring
10. Pinion (Wide)
11. Pinion (Narrow)
12. Pinion Cage
13. Ring Gear Snap Ring
14. Housing Lubricant Inspection Hole Plug
15. Shifter Rail Fork
16. Shifter Rail Reverse Lock Up Plunger
17. Clutch Sleeve
18. Rail Retractor Spring
19. Control Shaft "CI, Washer
20. Shifter Rail
21. O/D Main Shaft Assembly
22. M/S Bearing Snap Ring
23. M/S Oil Seal Assembly
24. Companion Flange
25. O/D Main Shaft Bearing
26. Speedometer Gear
27. F/W Cam Roller Retaining Snap Ring
28. O/D M/S Pilot Bushing
29. F/W Cam Retaining Washer
30. F/W Cam
31. Housing Drain Plug
32. Clutch Core
33. Clutch Core Thrust Washer
34. Pinion Cage Retaining Snap Ring
35. Ring Gear
36. Stationary Gear
37. Stationary Gear Snap Ring
38. Stationary Gear Plate
39. Transmission Main Shaft Assembly
40. C/S Cap Assembly

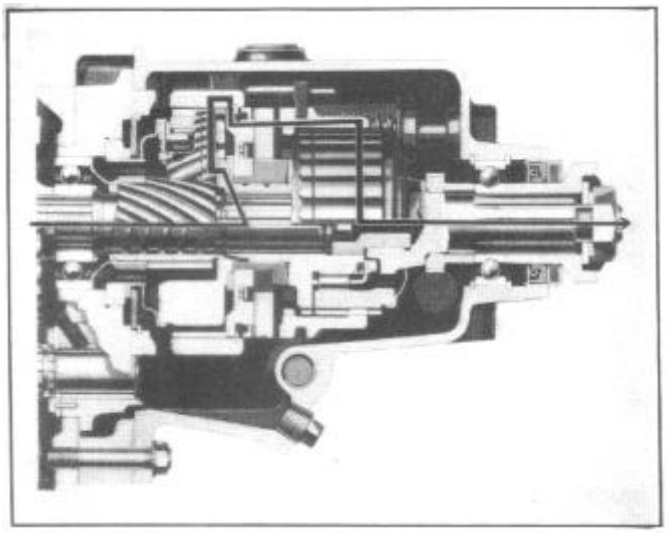


Figure 19--Overdrive Power Circuit (Overdrive

1. Transmission main seal to the -
2. Pinion cage and pinions to the -
3. Ring gear to the -
4. Clutch pawl to the -
5. Clutch sleeve to the -
6. Overdrive main shaft and then thru the propeller shaft to the rear axle and wheels.

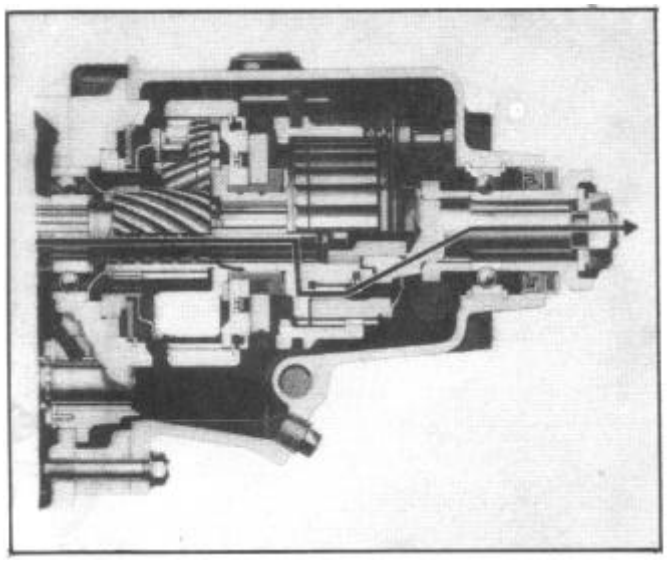


Figure 20--Overdrive Power Circuit (Free-Wheeling)

1. Transmission main shaft to the -
2. Free-wheeling cam to the -
3. Free-wheeling rollers to the -
4. Overdrive main shaft and then through the propeller shaft to the rear axle and wheels.
5. The stationary gear is locked in position and -
6. The clutch pawls are not engaged with the clutch sleeve.

If in overdrive operation additional speed is required for a quick pick up the overdrive unit may be cut out, by pressing the accelerator beyond the wide open position. This action automatically disengages the free-wheeling and overdrive unit. The car will then be driven in the conventional manner, engine and propeller shaft speeds being the same. To again get back into overdrive after this added acceleration it is necessary to momentarily release the accelerator and then press it again. The overrdrive will remain engaged and the free-wheeling unit will be locked out until the car speed is dropped to about 27 miles per hour, when the unit will automatically unlock and the engine will again drive the car, through the free wheeling unit.

This automatic "step-down" feature is accomplished electrically by a solenoid mounted in the left side of the overdrive adapter between the transmission and the overdrive cases.

The power circuit after overdrive has been in operation and after engaging the "step-down" is shown in Figure 21. The path of power is from the transmission main shaft to free-wheeling cam to free-wheeling rollers to overdrive main shaft, through the universal joints and propeller shaft, to the rear axle and wheels. In this circuit the stationary gear is unlocked and rotating due to the solenoid having become energized and withdrawing the pawl from the balk ring. The clutch pawls are engaged in the clutch sleeve.

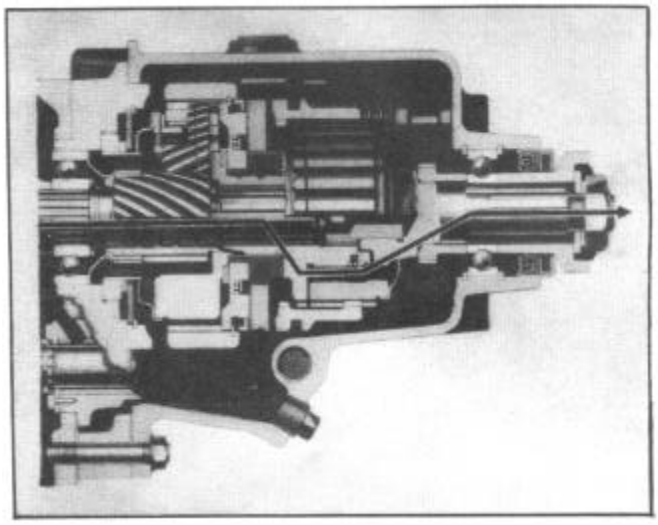


Figure 21--Overdrive Power Circuit (Step-down)

1. Transmission main shaft to the -
2. Free-wheeling cam to the -
3. Free-wheeling rollers to the -
4. Overdrive main shaft and then through the propeller shaft to the rear axle and wheels.
5. The stationary gear is free and revolving and -
6. The clutch pawls are engaged in the clutch sleeve.

When the accelerator is pressed beyond the wide open throttle position, the throttle switch is closed which completes the circuit in the solenoid relay which in turn closes the circuit in the solenoid (50), Figure 22. Closing of the circuit energizes the solenoid and sets up magnetic forces which draws the operating rod (56) and pawl (55) outward against pressure of spring (57). This action also cuts out the ignition momentarily by shorting out the breaker contacts and grounding the coil directly causing the engine to miss several firing impulses. As soon as this action is made pressure on the gear teeth is removed, momentarily, and the operating rod which is attached at one end to the pawl and which is held in overdrive position by the operating rod spring is drawn in, which releases the stationary gear plate (38) and the stationary gear (36). This allows the plate and stationary gear to rotate freely for direct drive. During the action of the operating rod it automatically opens the ignition contacts and restores the ignition. Part of the solenoid remains energized sufficiently to hold the pawl out of engagement. When the accelerator pedal is returned to any position below open throttle

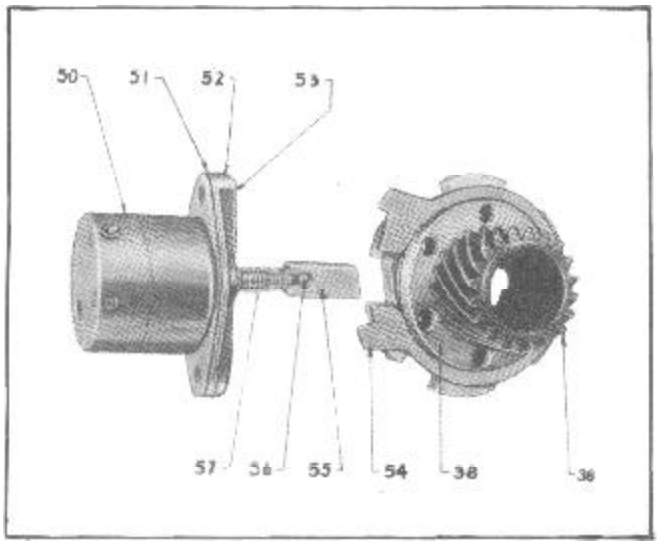


Figure 22--Overdrive Stationary Gear and Plate Assembly and Solenoid

36. Stationary Gear
38. Stationary Gear Plate
50. Solenoid Assembly
51. Solenoid Gasket
52. Solenoid Base
53. Solenoid Base Gasket
54. Stationary Gear Balk Ring
55. Stationary Gear Pawl
56. Stationary Gear Pawl Operating Rod
57. Stationary Gear Pawl Operating Rod Spring

throttle, the solenoid relay switch is opened and cuts out all electric current in the solenoid. When a reduction in engine speed is made by releasing the accelerator the opening in the stationary gear balk ring (54) comes in line with the pawl and the pawl spring pushes the pawl into the opening. Since the operating rod is attached to the end of the pawl it is also pulled along with the pawl. In doing this the contact points of the solenoid are ready for the next application of the solenoid relay switch which is operated by the accelerator.

The entire solenoid operation is so rapid and the ignition is cut out for so short an interval that it is hardly apparent to the operator. If for any reason the solenoid is unable to withdraw the pawl the current draw of the solenoid will cause the relay fuse to blow, restoring the ignition. The car will then operate in a normal manner except that it will not be possible to return to direct drive from overdrive.

The stationary gear (36) is free to revolve on the transmission main shaft and is held stationary when in overdrive by the spring loaded, solenoid controlled, stationary gear pawl (55) which is mounted on the overdrive adapter. This pawl engages in the stationary gear balk ring (54) and plate (38) and holds these two units stationary. When this pawl is withdrawn by the solenoid (50) to free the stationary gear (36) the stationary gear and plate revolve freely and the balk ring is dragged around sufficiently to block the pawl in the withdrawn position. When the engine torque is reversed by accelerator pedal release, the balk ring returns to its original position so that the pawl can engage.

The balk ring rotates only about 200 in either direction and is a snug fit on the hub of the stationary gear plate (38). Further rotation of the balk ring is prevented by lugs on the balk ring which strike the top and bottom of the pawl. It is this slight friction which causes the balk ring to revolve and thus blocks the pawl in its withdrawn position. When the rotation of the balk ring is completed the stationary gear plate continues to rotate and when this condition is obtained the overdrive unit is not operating. However, when the stationary gear and stationary gear plate are held rigid by the stationary gear pawl the overdrive is operating.

The overdrive clutch sleeve (17), see Figure 17, is constructed with two internal gears, one gear at the rear which is constantly in mesh with the external teeth on the front end of the overdrive main shaft. The other internal gear is at about the center of the sleeve and is meshed with the external teeth of the free-wheeling cam (30), when the overdrive control button is pulled out. The clutch sleeve slides back and forth by means of a shifter fork (15) operated by the control button. This shifter fork rides in a groove cut on the outside surface of the clutch sleeve and when the control button is pushed in, it actuates this shifter fork and moves the clutch sleeve forward. By pulling the control button out the clutch sleeve is moved backward which meshes the internal teeth of the sleeve with the external teeth of the free-wheeling cam. When the clutch sleeve and free-wheeling cam are in this position they are locked to the overdrive main shaft (21) through the internal teeth in the sleeve, causing all three pieces to rotate together as a solid unit, thereby preventing freewheeling and overdrive operation.

The overdrive clutch pawls (41), see Figure 23, are held out of engagement from the overdrive clutch sleeve by spring pressure. With the control button pushed in and with car speed of approximately 30 to 35 miles per hour centrifugal force overcomes the tension of these springs

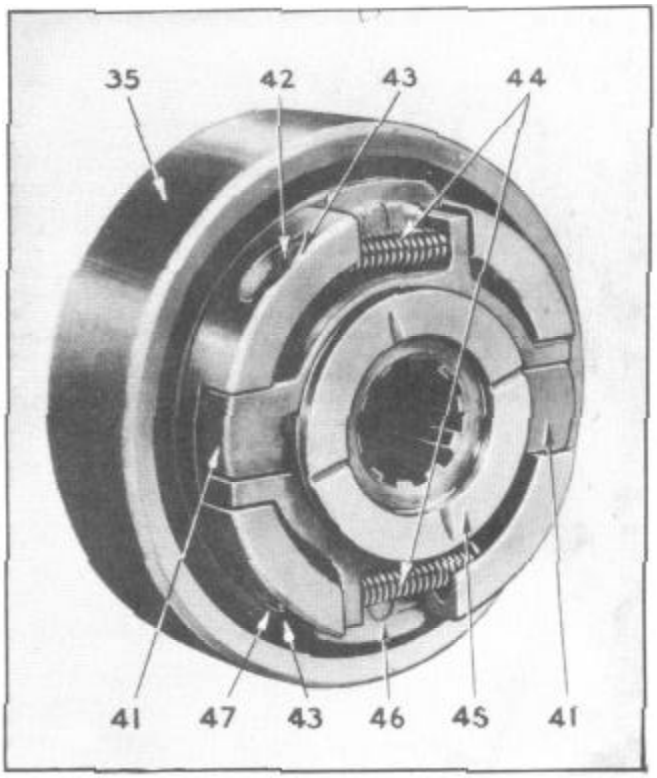


Figure 23--Overdrive Clutch Pawl and Core Assembly Complete

35. Ring Gear
41. Clutch Pawl
42. Clutch Pawl Adjusting Spring Screw (Slotted)
43. Clutch Pawl Adjusting Spring Washer
44. Clutch Pawl Adjusting Spring
45. Clutch Core Hub
46. Clutch Pawl Locking Ring
47. Clutch Pawl Adjusting Spring Screw

(44) and the outer ends of the pawls engage with the holes in the overdrive clutch sleeve (17), Figure 17. However, if the control button is in the out position the holes in the clutch sleeve will not line up with the pawls and the pawls are then held in a disengaged position by the pawl locking ring (46), Figure 23 which prevents the pawls from engaging, with the sleeve, thus preventing overdrive operation.

TO REMOVE TRANSMISSION AND OVERDRIVE ASSEMBLY FROM CAR

1. Drain lubricant from transmission and overdrive cases.
2. Disconnect front seat assembly and push back.
3. Remove accelerator pedal.
4. Push rubber steering column hole cover up on column.
5. Remove floor mat.
6. Remove transmission floor cover plate.
7. Disconnect propeller shaft at front universal joint.
8. Remove clutch pedal return spring,.
9. Remove clutch cross shaft.
10. Remove clutch pedal assist spring.
11. Release transmission side bumper and rod assemblies.
12. Remove transmission Handy Shift connections at transmission.
13. Remove speedometer cable at overdrive case.
14. Remove wires from solenoid.
15. Remove overdrive control cable clevis at lever on overdrive case.
16. Raise car and remove lower flywheel guard.
17. Raise rear of engine off frame and remove. clutch housing to cylinder bolts.
18. Pull transmission and overdrive assembly back and lift out of car.

DISASSEMBLY OF OVERDRIVE (After Transmission And Overdrive Have Been Removed From Car And Drained)

1. Place transmission and overdrive on bench holding fixture J-814.
2. Remove three cap screws and two stud nuts attaching overdrive case to housing adapter.

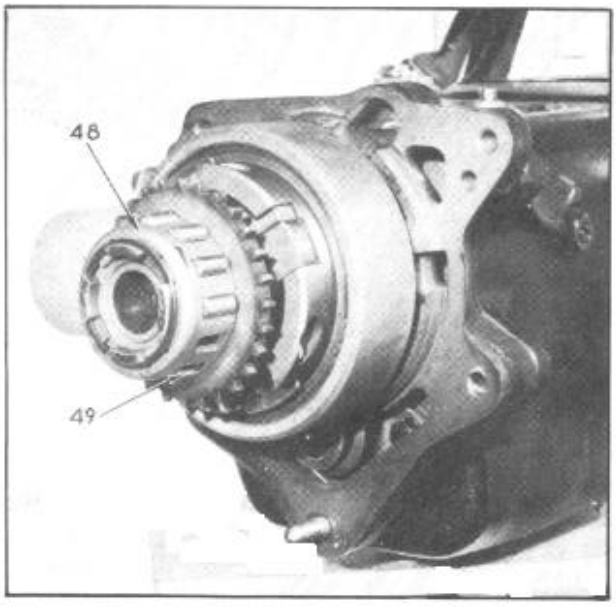


Figure 24--Removing Overdrive Case Assembly

3. Pull overdrive case assembly off rear end of transmission as shown in Figure 24. Overdrive main shaft (21), clutch sleeve (17), shifter rail reverse lock-up plunger (16), Figure 17, will come off with case. Some free wheel cam rollers (49) will drop into case. Be sure all rollers (12 in number) are accounted for.

REMOVING FREE-WHEEL CAM ASSEMBLY

4. Remove free-wheeling cam retaining bolt from end of transmission main shaft (39) and slide freewheeling cam assembly (48), Figure 24, off main shaft.
5. Overdrive clutch pawl and core assembly complete (32) and pinion cage assembly should be removed together to Preclude the necessity of rewinding the split pinions (10 and 11), Figure 17. Be careful not to damage oil thrower on front face of pinion cage. Individual parts of the pinion cage assembly are not serviced separately In event of damage the complete assembly must be replaced.

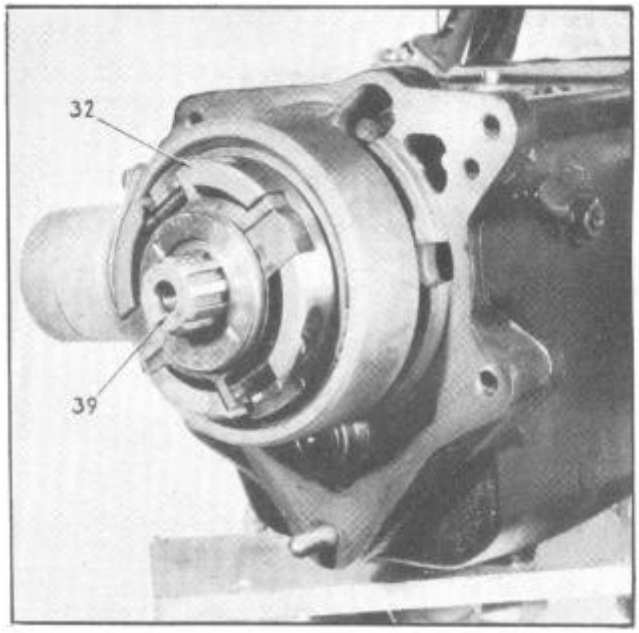


Figure 25--Removing Free-Wheel Cam Assembly

REMOVING PINION CAGE SNAP RING REMOVING STATIONARY GEAR PAWL

6. Remove pinion cage snap ring (9), Figure 17, with a screw driver and take out pinion cage oil collector ring cover (58).
7. Remove solenoid (50), Figure 26, base (52), operating rod (56) and spring (57).
8. Remove pinion cage retaining snap ring (34) from main shaft. Pull stationary gear (36), plate (38) and balk ring (54) off main shaft as an assembly. Lift out gear pawl (55).

REMOVING TRANSMISSION MAIN SHAFT

9. Remove transmission shift rails, shift rail forks, interlock, lock balls, springs and shift rail locks.
10. Remove transmission main shaft and reverse gear retainer lock (2), Figure 27, by prying with a pointed tool. Lift out two gear retainers (59).
11. Take out two cap screws attaching housing adapter (7) to transmission case and pull adapter off transmission. Transmission main shaft (39), main shaft bearing

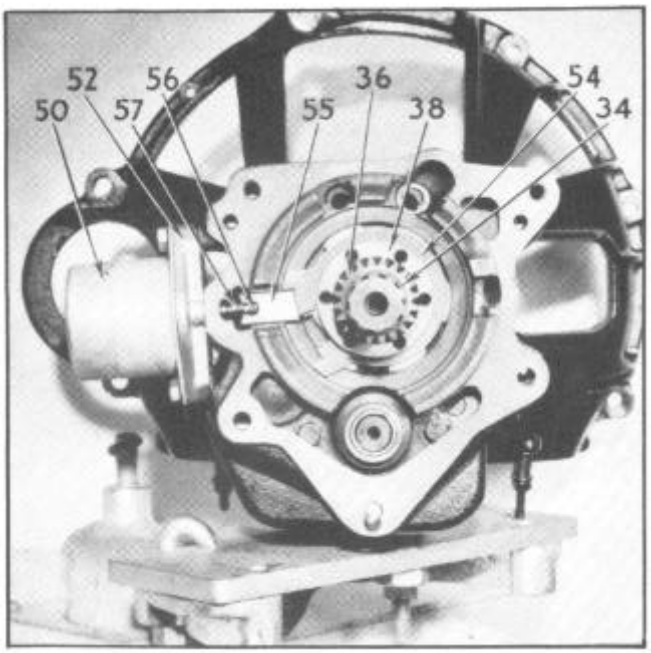


Figure 26--Removing Pinion Cage Snap Ring and Stationary Gear Pawl

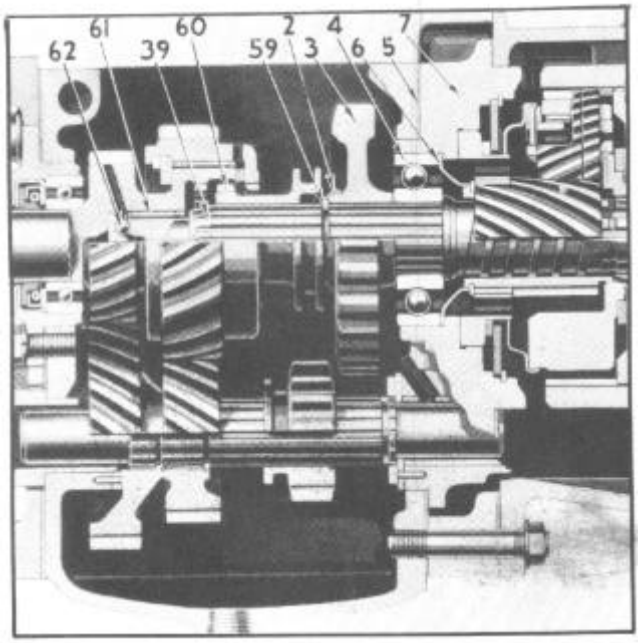


Figure 27--Removing Transmission Main Shaft

(4) and oil baffle (6) will come off with adapter. Main shaft low and reverse gear

(3) and shifter sleeve (60) will fall into case. Drive gear thrust balls (62) and needle roller bearings (61) will drop out of place in gear. 12. Press main shaft (39) and main shaft bearing

(4) out of adapter. Press bearing off main shaft. Remove baffle.

DISASSEMBLING OVERDRIVE CASE ASSEMBLY

1. Remove shifter rail reverse lock-up plunger (16), Figure 28, from front of case.

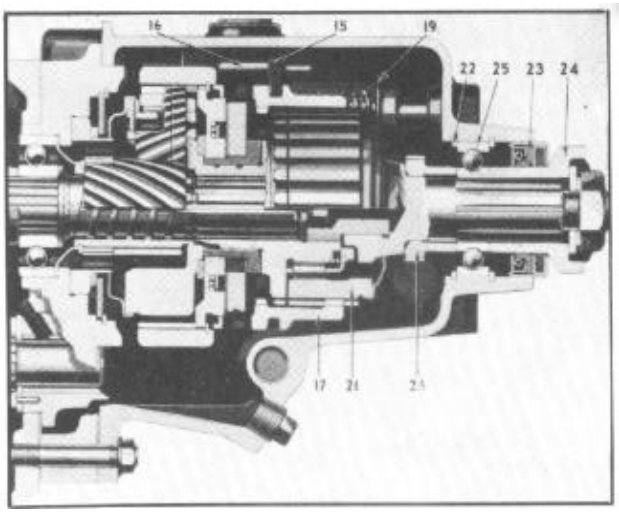


Figure 28--Disassembling Overdrive Case Assembly

2. Remove speedometer drive pinion and sleeve from case.

3. Remove universal joint flange (24) with puller J-820.

4. Pull overdrive main shaft (21) through front of case. Speedometer gear will fall into case.

5. Lift out clutch sleeve (17).

6. Remove overdrive main shaft bearing inner snap ring (22) and tap bearing (25) out towards front of case.

7. Tap oil seal (23) out towards rear of case.

REMOVING SHIFTER HEAD SCREW

8. Remove control shaft nut, lock washer and control lever from right side of overdrive case.

9. Remove shifter head screw (65), Figure 29, and lock washer with socket wrench through inspection hole.

10. Remove control shaft screw and lock washer.

11. Remove control shaft from inside case.

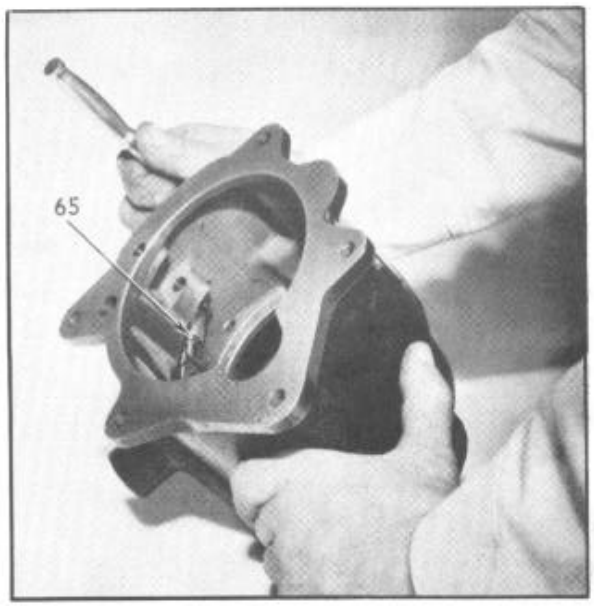


Figure 29--Removing Shifter Head Screw

REMOVING POPPET SPRING SEAT

12. Remove shifter head poppet spring seat (66), Figure 30, spring and spring ball.

13. Remove shifter rail ITC,, washer (19), Figure 31, turn case upside down and shifter rail (20) will drop out of case. Remove shifter head (67), shifter rail fork (15) and retractor spring (18).

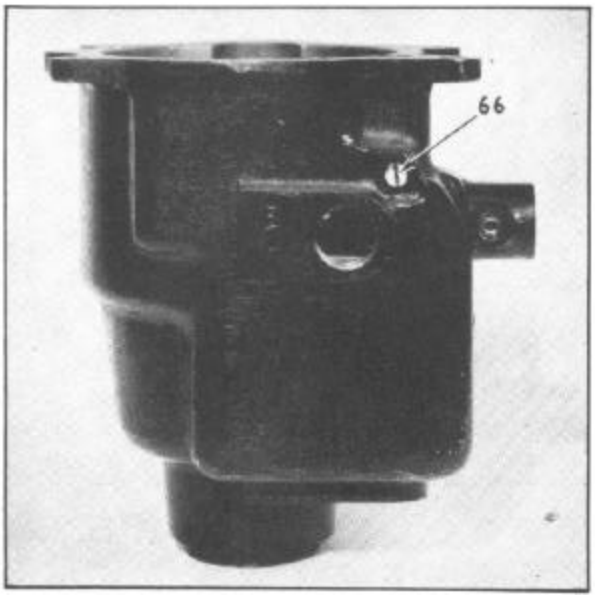


Figure 30--Removing Poppet Spring Seat

REASSEMBLING OVERDRIVE CASE ASSEMBLY

1. Install control shaft, felt washer and lock screw in right side of case reversing operation (10 and 11), Figure 29.

2. Assemble retractor spring (18), Figure 31, and shifter rail ,,C" washer (19) in shifter rail fork (15) as shown, and place in position in case,

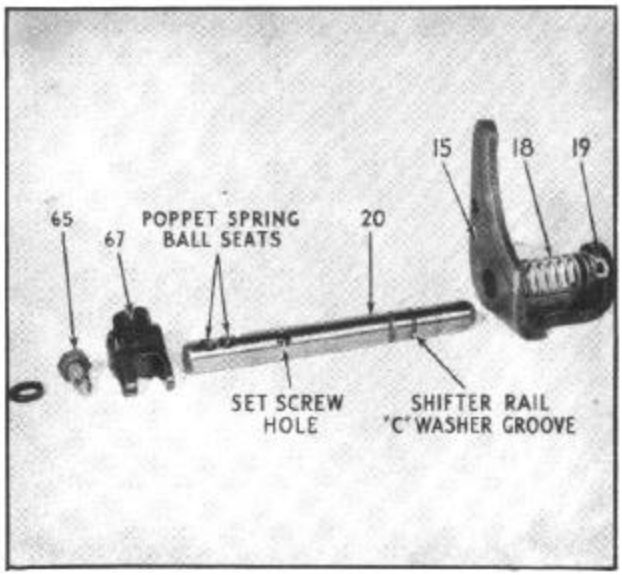


Figure 31--Reassembling Overdrive Case Assembly

3. Install shifter head (67) in case and engage on control shaft.

4. Install shifter rail (20) in case, line up poppet spring ball recess with hole in case and press rail through shifter shaft ,,Cu washer to engage it in lower groove.

5. Install shifter rail fork screw (65) and lock washer through inspection hole and tighten securely.

6. Install control lever, washers and lever nut and tighten securely reversing operation (8 and 9), Figure 29.

7. Install poppet spring ball, spring and spring seat. Spring seat should not be adjusted too tightly as it will restrict movement of control lever.

INSTALLING OVERDRIVE MAIN SHAFT

8. Install overdrive main shaft bearing (25), Figure 32, locking in place with inner snap ring (22).

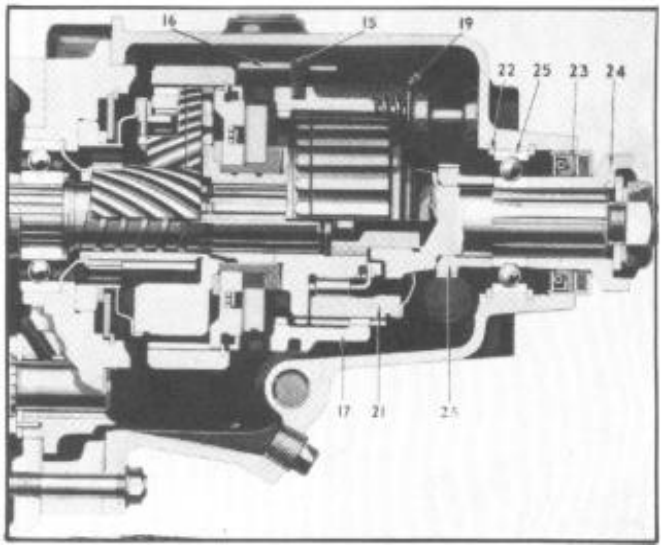


Figure 32--Installing Overdrive Main Shaft

9. Install main shaft oil seal assembly (23), leaving it protrude 9/32" from outer edge of case as shown.

10. Assemble clutch sleeve (17) in case, making sure groove in sleeve rides on shifter rail fork (15).

11. Place speedometer gear (26) with bevel facing the front on main shaft (21) and install main shaft in case.

12. Install universal joint flange (24), washer and nut and draw up snug.

DISASSEMBLING FREE-WHEEL CAM ASSEMBLY

1. Remove free-wheel cam roller retainer snap ring (27), Figure 33, from the free-wheel cam roller retainer (48).

2. Pull roller retainer (48) partly off the cam and, with pliers, pull the end of one spring (68), out of the hub of the cam (30), then pull the retainer further off the hub and pull the second spring out of the hub of the cam.

3. Mainshaft pilot bushing (28) is a light press fit in the cam and can be replaced separately.

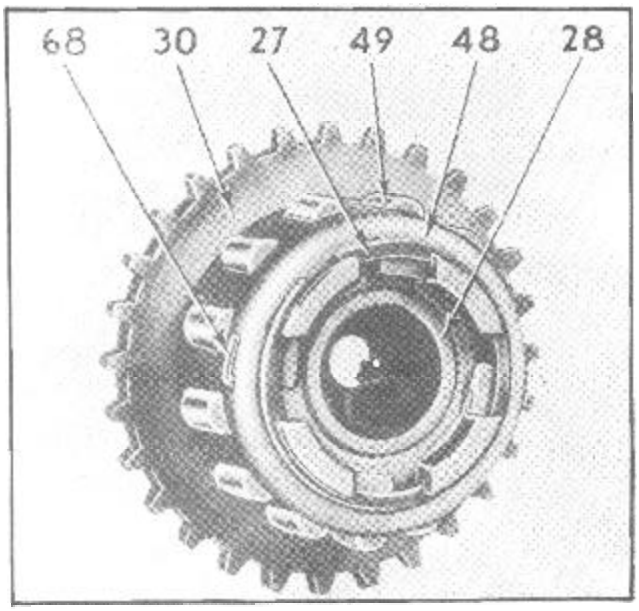


Figure 33--Free-Wheel Cain Assembly

REASSEMBLING FREE-WHEEL CAM ASSEMBLY

1. Insert ends of springs (68) in cam roller retainer (48) so ends point in a clockwise direction.
2. With small screw driver work spring around hub of cam and insert ends in holes in cam.
3. Replace lock ring (27).
4. Pack grease into roller retainer (48) and press rollers (49) into their pockets. TO FURTHER FACILITATE HOLDING ROLLERS IN POSITION FOR ASSEMBLY INTO THE BORE OF THE MAIN SHAFT PUT RUBBER BAND AROUND OUTSIDE OF ROLLERS, SEE FIGURE 19.

DISASSEMBLING CLUTCH PAWL AND CORE ASSEMBLY

1. Remove clutch pawl and core assembly from pinion cage.
2. Remove snap ring (13), Figure 34, and lift clutch pawl and core assembly (45) out of ring gear (35).

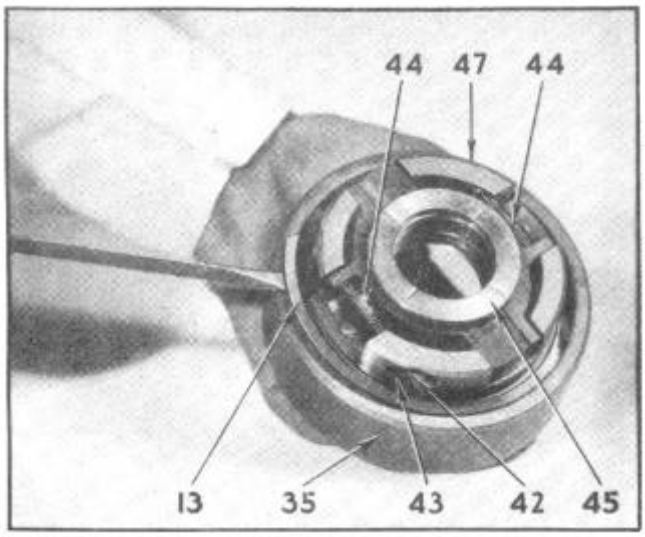


Figure 34--Disassembling Clutch Pawl and Core Assembly

3. Remove clutch pawl adjusting screws (42 and 47), washers (43) and springs (44).

REASSEMBLING CLUTCH PAWL AND CORE ASSEMBLY

1. Install clutch pawl adjusting screws (42 and 47), Figure 35, springs (44) and washers (43).

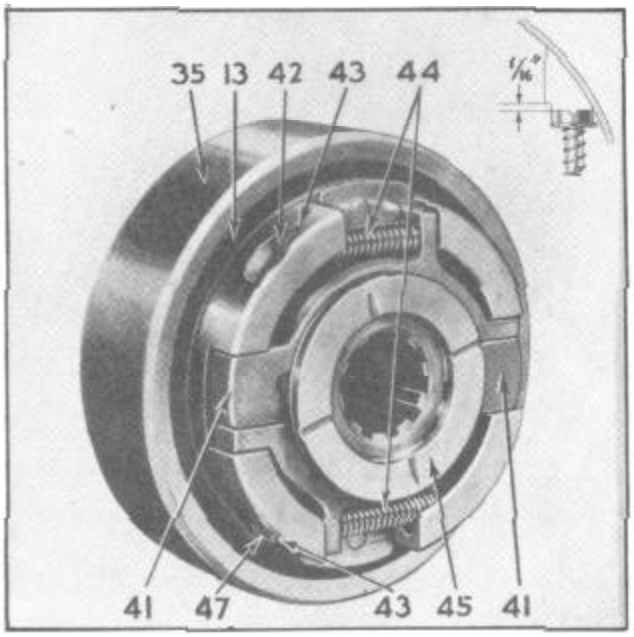


Figure 35--Reassembling Clutch Pawl and Core Assembly

When replacing and adjusting screws be sure to give each screw the same number of turns so as to equalize tension on springs. These adjusting screws and springs control the overdrive cut-in speed and both pawls (41) of the clutch should engage at the same time. To obtain the correct tension the screws should be turned in until top of head is exactly 1/16,1 below top edge of counterbore as shown in inset. The tighter the screws are turned the higher will be the cut-in speed.

The core (45) must have its bore concentric with the gear teeth. Since it is impossible to ream this core with the required accuracy, separate parts for this assembly are not supplied, therefore, this unit should not be disassembled further.

2. Place clutch pawl and core assembly (45) in ring gear (35) and secure in place with snap ring X13).

DISASSEMBLING STATIONARY GEAR AND PLATE ASSEMBLY

1. Remove snap ring (37), Figure 17, from stationary gear that holds stationary gear plate (38), Figure 36, to stationary gear (36) and slide plate off the gear.
2. The balk ring (54) grips the stationary gear plate (38) so that a pull of 8 to 10 pounds is required to rotate the balk ring on the gear plate.

REASSEMBLING STATIONARY GEAR AND PLATE ASSEMBLY

1. Assemble stationary gear (36) in plate (38) so that the three oil slots in gear plate align with the oil slots in the gear.
2. Replace snap ring (37) in groove in stationary gear (36).

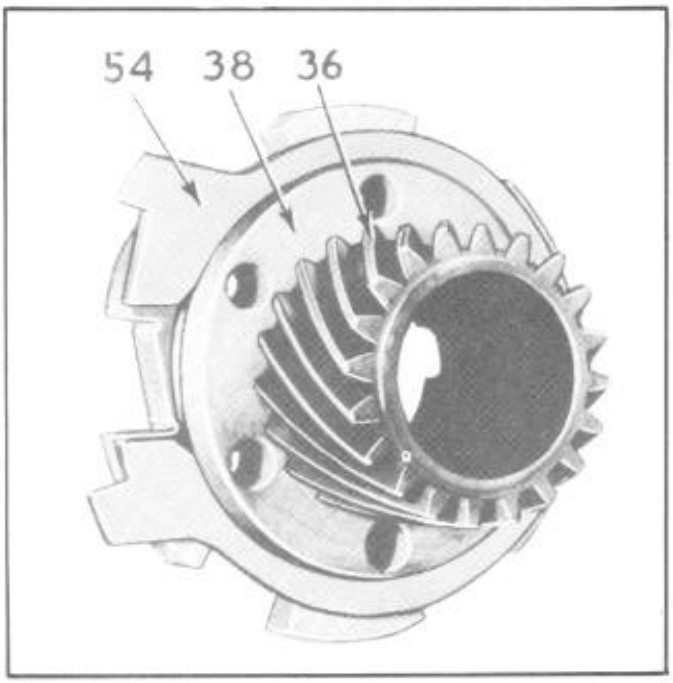


Figure 36--Stationary Gear and Plate Assembly

DISASSEMBLING SOLENOID PLUNGER AND STATIONARY GEAR PAWL ASSEMBLY

1. Remove two cap screws holding solenoid (50), Figure 37, to adapter.
2. Remove solenoid and gasket.

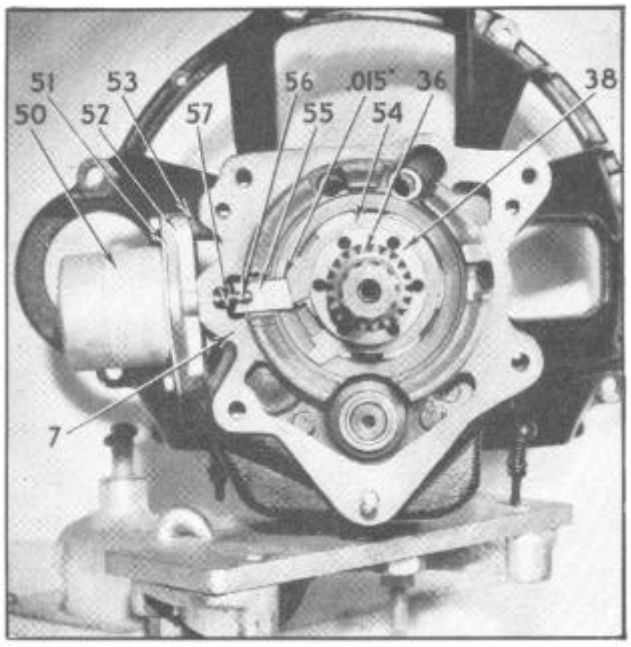


Figure 37--Solenoid Plunger and Stationary Gear Pawl Assembly

3. Disengage stationary gear pawl operating rod (56) and remove solenoid base (52), gasket (53) and operating rod spring (57).

REASSEMBLING SOLENOID PLUNGER AND STATIONARY GEAR PAWL ASSEMBLY

1. Install operating rod spring (57) in slot in adapter (7).
2. Install operating rod (56), base gasket (53), base (52) and engage ball end of rod in gear pawl (55).
3. Install solenoid gasket (51), solenoid (50)and attach securely with two cap screws. This gasket controls the clearance between end of pawl (55)and balk ring (54) which should be .015".

REASSEMBLY OF MAINSHAFT AND TRANSMISSION PARTS

1. Place needle roller bearings (61), Figure 38, and thrust balls (62) in position and hold in place with grease.

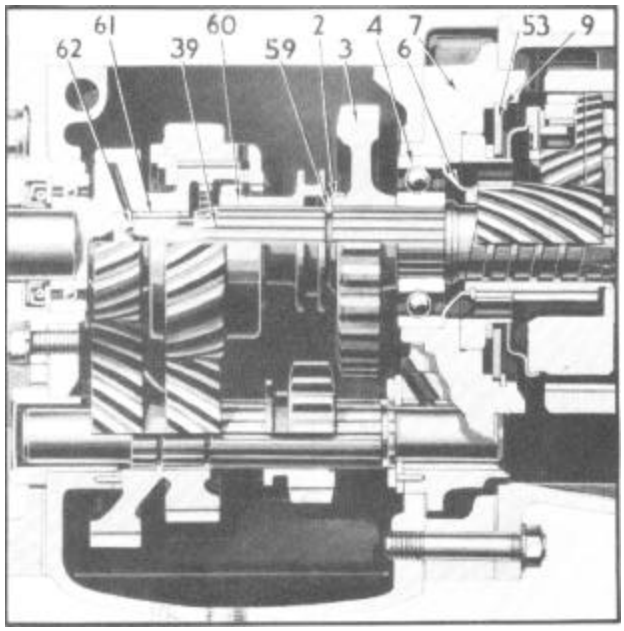


Figure 38--Reassemby of Mainshaft and Transmission Parts

2. Install main shaft oil baffle (6) in housing adapter (7) and press bearing (4) and main shaft (39) into adapter.
3. Place new gasket between transmission case and adapter (7) and slide main shaft (39) partially into transmission. Install low and reverse gear (3), gear retainer lock (2) and shift sleeve (60) onto main shaft (39). Continue sliding main shaft into main shaft drive gear, being careful not to disturb needle bearing rollers (61) and thrust balls (62).
4. Assemble adapter (7) to transmission case using two cap screws.
5. Install transmission shift rails, forks, interlock, balls and shift rail locks.
6. Put small amount of grease on gear retainers (59) and install them in groove on main shaft. Slide retainer lock (2) over gear retainers and lock into place in counterbore of gear using a narrow cold chisel.

INSTALLING STATIONARY GEAR

7. Install stationary gear (36), Figure 39, plate assembly (38) and balk ring (54) on main shaft.

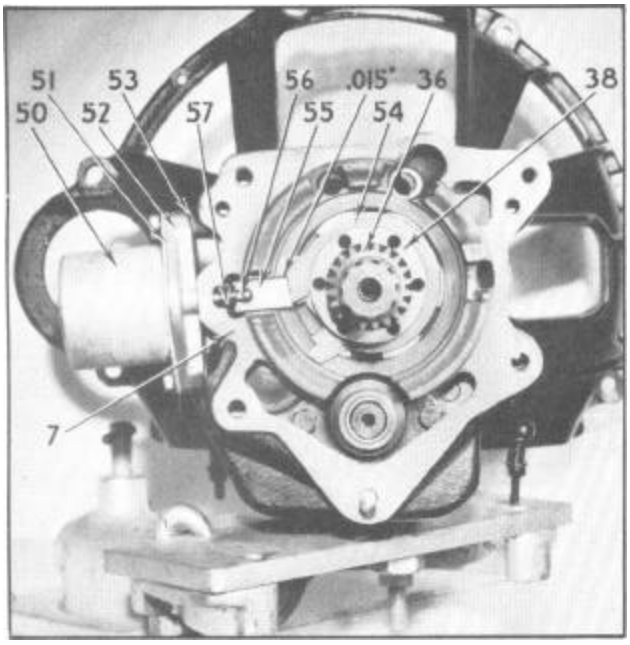


Figure 39--Installing Stationary Gear

8. Install gear pawl (55), operating rod (56), spring (57), solenoid base (52), gaskets (53 and 51) and solenoid (50).

9. Energize solenoid and check clearance between end of gear pawl (55) and balk ring (54) as indicated. This clearance should be .01511. Adjust by adding solenoid gaskets (51).

INSTALLING PINION CAGE RING COVER

10. Install pinion cage oil collector ring cover (58), Figure 40, and snap ring (9). Snap ring should be installed as shown to provide clearance

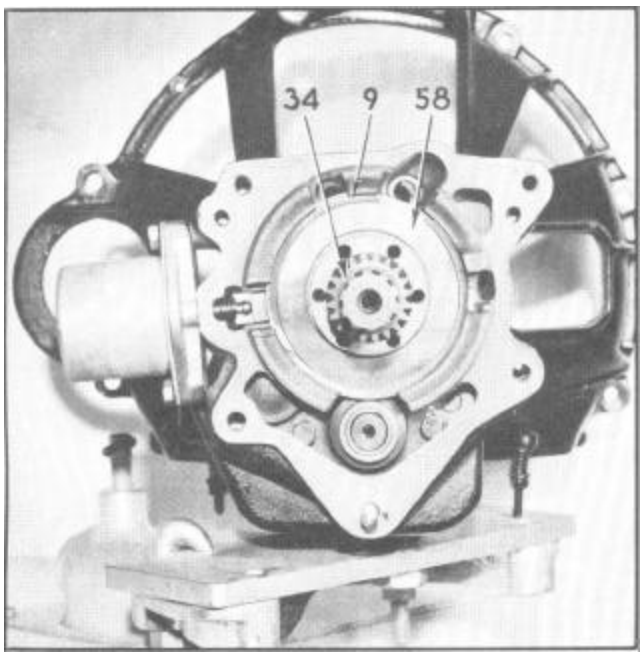


Figure 40--Installing Pinion Cage Ring Cover

for shifter rail reverse lock-up plunger (16), Figure 43.

11. Install pinion cage retaining snap ring (34) on transmission main shaft, being careful not to spread ring excessively.

INSTALLING PINION CAGE ASSEMBLY

12. Install pinion cage assembly (12), Figure 41, and clutch pawl and core assembly (35) on stationary gear, first meshing wide pinions (10) with stationary gear.

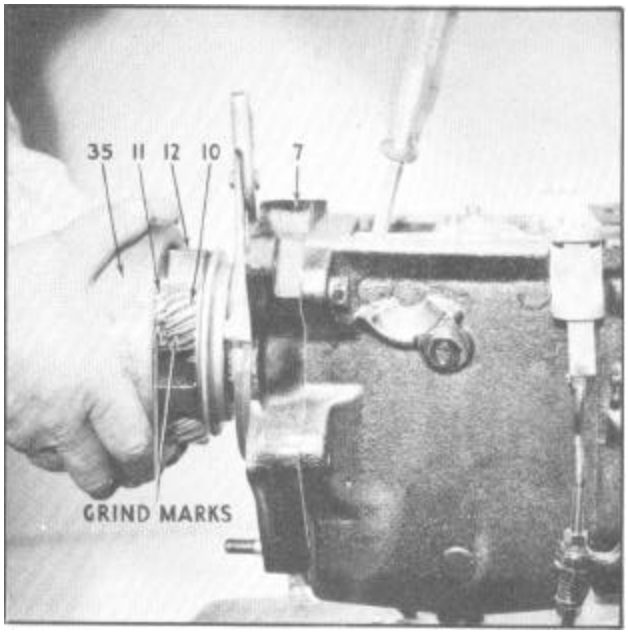


Figure 41--Installing Pinion Cage Assembly

If clutch pawl and core assembly has been demeshed from pinion cage assembly, assemble as follows:

(a) Install pinion cage assembly (12) on stationary gear and mesh wide pinions (10) only.

(b) Place pliers between pinion cage assembly and housing adapter (7), to prevent narrow pinions (11) meshing with stationary gear.

(c) Place wedge between low and reverse gear and transmission case, to lock gears.

(d) Coat one face of thrust washer (33), Figure 17, with grease and install on pinion cage (12).

(e) Wind clutch pawl and core assembly clockwise so that teeth of narrow pinions pass 1 1/2 teeth of wide pinions or until marked teeth on each pinion line up. Push core assembly onto wide pinions.

(f) Remove pliers and press cage assembly into proper position.

INSTALLING FREE-WHEEL CAM ASSEMBLY

13. Install free-wheel cam assembly (30), Figure 42, on main shaft.

14. Grease free-wheel cam (30) and install rollers (49), holding in place with a rubber band. (Do not remove rubber band as this will dissolve in lubricant.)

15. Install free-wheel cam retaining bolt (63) and lock washer and draw up snug.

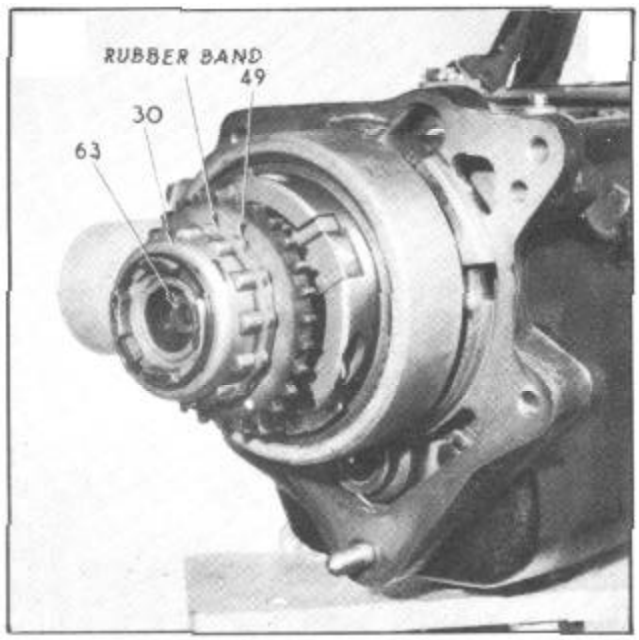


Figure 42--Installing Free-Wheel Cam Assembly

INSTALLING CASE ASSEMBLY

16. Install new, overdrive case to adapter gasket (8).
17. Move shifter lever (64) forward position. Hold overdrive case at a slight angle, as shown in Figure 43, moving shifter rail reverse lock-up plunger (16) into position to pass into housing.

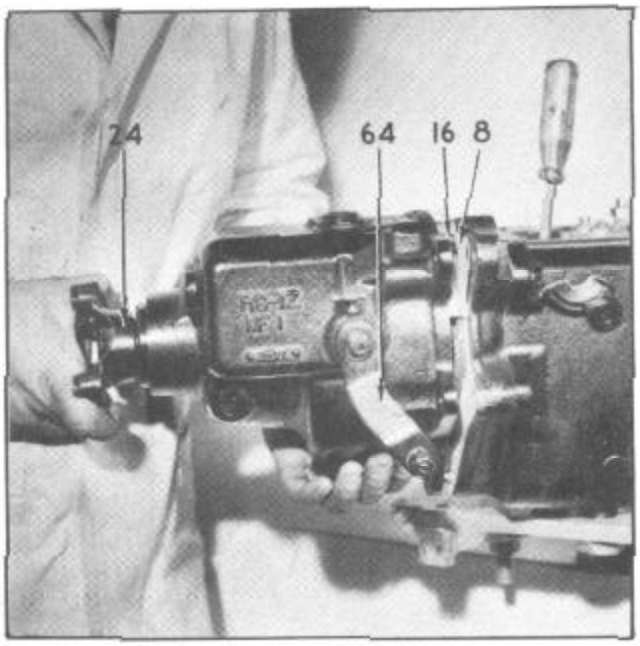


Figure 43--Installing Case Assembly

Turn overdrive main shaft companion flange (24) sharply counter-clockwise while pushing forward on case, causing free-wheel rollers to enter bore in overdrive main shaft.
18. Slide case into place and attach to housing adapter with cap screws and stud nuts.
19. Replace transmission and overdrive unit in car.
20. Connect overdrive control wire and adjust length at the button to provide 1/8" clearance between control button and bracket when lever is in extreme rear position and secure wire at control lever. See Figure 47.

OVERDRIVE SOLENOID RELAY FUSE

The principal function of the Solenoid (50), Figure 37, is to withdraw the stationary gear pawl from the stationary gear plate, releasing the gear and disconnecting overdrive. This operation also momentarily interrupts the ignition assisting in the withdrawal of the pawl. If, for any reason, the pawl cannot be disengaged by the solenoid, the continued shorting of the ignition would stall the engine. To prevent this, a fuse is inserted in the solenoid relay battery feed circuit, as shown in Figure 44. This fuse will blow if the duration of the flow of current through the solenoid exceeds a

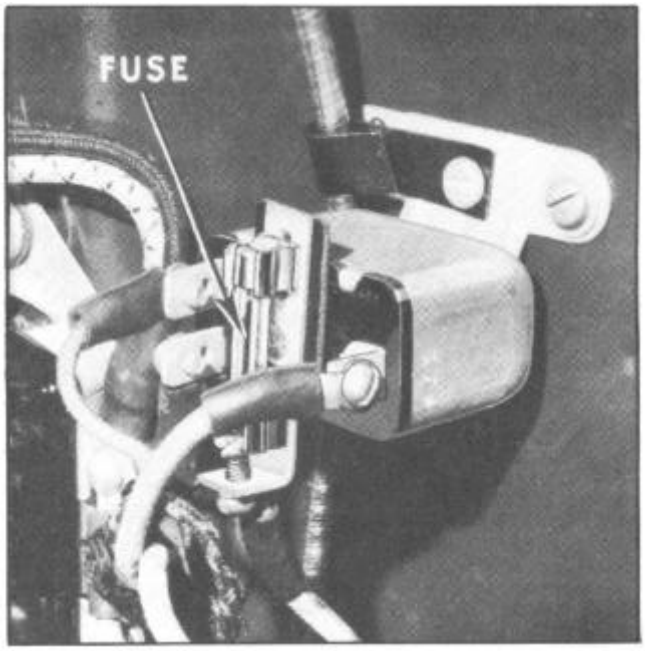


Figure 44--Overdrive Solenoid Relay Fuse

few seconds. When this happens, the ignition will be re-established but the step-down will be inoperative until a new fuse is installed.
A first type relay in which the fuse is held in place in a holder instead of clips was used before car number 48622.

SOLENOID CHECK

No servicing of this unit is required other than that of keeping terminals tight so as to make good electrical contact. Should it become necessary to test the solenoid proceed as follows:

SOLENOID TEST (AT ROOM TEMPERATURE)

Move the stationary gear pawl operating rod out of the solenoid to obtain an air gap of 3/8" as shown in Figure 45. Connect the solenoid to a battery of the proper voltage and note the maximum pounds load against which the

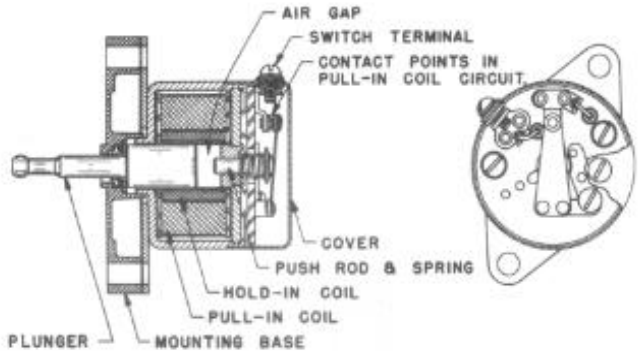


Figure 45--Checking Solenoid Operation

the rod will draw into the solenoid. This should be 16 pounds. An ammeter may be connected into the winding circuit to measure the solenoid current draw. This should be 28 to 34 amperes at 6 volts. After the operating rod pulls in, the contact points of the pull-in winding circuit are opened, and only the hold-in winding retains the operating rod in the solenoid. Measure the current draw of this winding, which should be .9 to 1.1 amperes at 6 volts, and the pounds tension against which the plunger will remain in the solenoid which is 16 pounds.

For overdrive wiring circuits see Figure 46.

WIRING FOR OVERDRIVE (OPTIONAL EQUIPMENT)

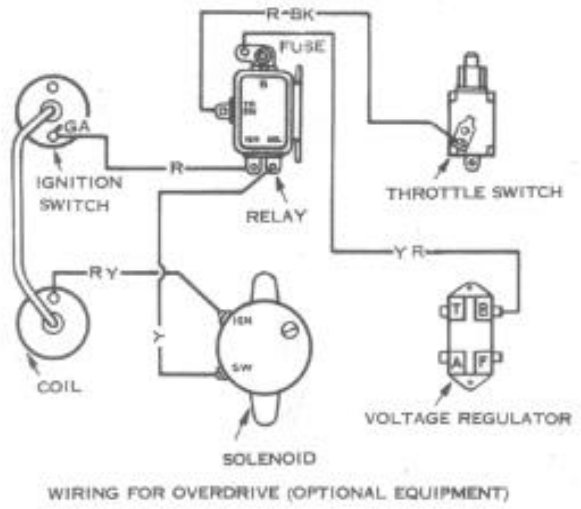


Figure 46--Overdrive Wiring Diagram

OVERDRIVE THROTTLE SWITCH

The overdrive throttle switch (69), Figure 47, should operate only when the accelerator is depressed beyond wide-open throttle. This adjustment should be made so that when the accelerator is depressed to wide-open throttle, the contact washer (70) should just be making contact with the switch plunger (71).

To adjust the washer (70) turn adjusting nuts (72) above washer and below washer up or down as required. The carburetor air cleaner should be removed from the carburetor so that the exact position of the butterfly valve may be observed. With the butterfly valve in the wide-open position adjust the contact washer by means of the adjusting nuts, so that it just touches the throttle switch plunger, as shown in inset.

This adjustment will allow operation of the car with wide-open throttle and, at the same time, complete the electrical circuit for shift from overdrive to conventional drive by pressing the throttle just beyond the wide-open position.

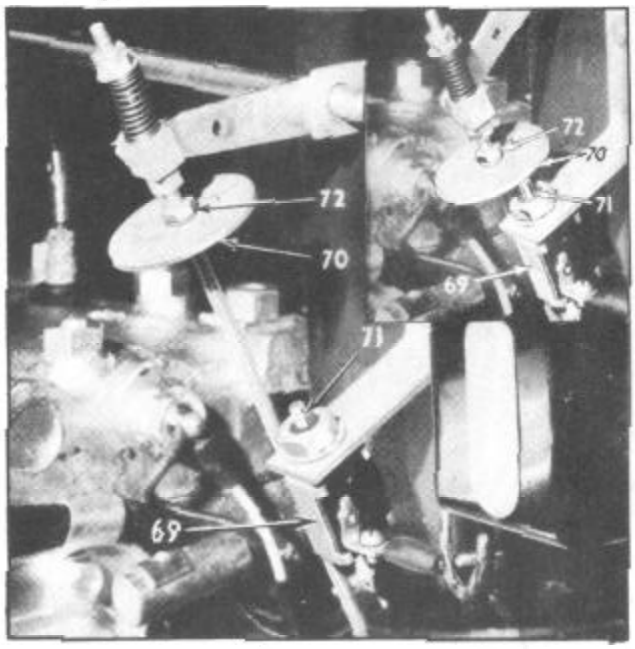


Figure 47--Overdrive Throttle Switch

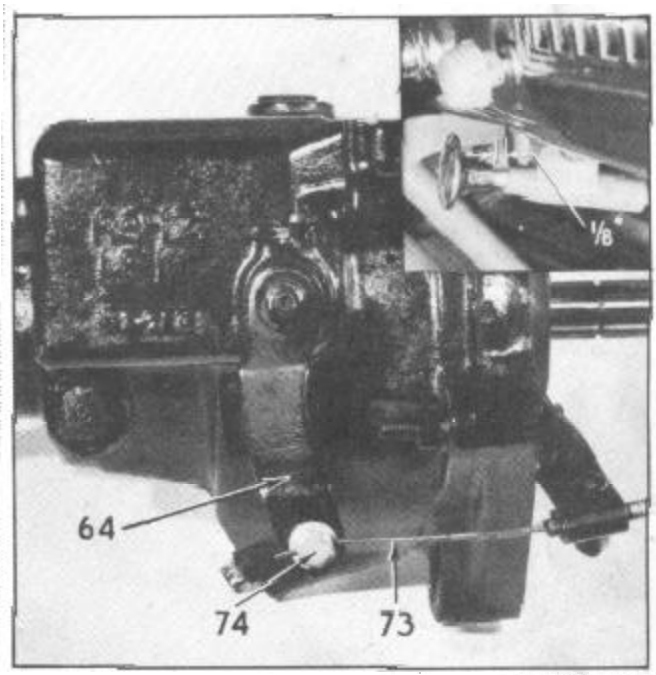


Figure 48--Overdrive Control Cable Adjustment

The overdrive control cable is adjustable for length at the lever (64), Figure 48, on the overdrive case. The cable (73) should be released at the binding screw (74) and the lever on the case 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 back out approximately 1/8" (as shown in inset) to insure full travel of the button. With the control button in this position tighten the binding screw on the wire at the lever on the overdrive case.

CAUTION: Be sure cable is properly anchored in lever to prevent it from slipping. Looseness at this point will prevent proper engagement of control into overdrive.

OVERDRIVE TROUBLE SHOOTING

Overdrive does not operate--blown fuse.

Fuse blows continually--ground or short in wiring circuit.

NOTE: Make certain that the ignition circuit is shorted out momentarily when the solenoid is first energized. It is necessary to relieve the gear load so that the solenoid can withdraw the pawl. See that the pawl plunger operates freely without binding.

The fuse is to prevent the control circuit from being overloaded, and to prevent the car from stalling, if the transmission control should not operate.

The car can be driven after a fuse blows because the ignition is automatically restored.

INDEX

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)
Adjustment	Shim
Lash in Gears	.0005"--.0035"
Lubrication	
Type--Summer and Winter	S.A.E. 90 E.P.
Capacity in Lbs	2-3/4 lbs.(1.24 Kgs)

GEAR RATIOS (WITHOUT OVERDRIVE)

	4-1/9	4-5/9	4-7/8
Model 40 Passenger Cars	Opt.	Std.	Opt.
Model 40 Commercial	Opt.	Std.	Opt.
Model 41 Passenger	Std.	Opt.	----
Model 43, 47	Std.	Opt.	----
Model 44, 45	Std.	Opt.	----
Model 48, 5 Passenger Sedan	Std.	Opt.	----
Model 48, 7 Passenger Sedan	Std.	Opt.	----
Model 48 Commercial	----	Std.	----

GEAR RATIOS (WITH OVERDRIVE)

	4-1/9	4-5/9	4-7/8
Model 40 Passenger Cars	Opt.	Opt.	----
Model 40 Commercial	Opt.	Opt.	----
Model 41 Passenger	Opt.	Std.	----
Model 43, 47	Opt.	Std.	----
Model 44, 45	Opt.	Std.	----
Model 48, 5 Passenger Sedan	Opt.	Std.	Std.
Model 48, 7 Passenger Sedan	Opt.	Std.	Std.
Model 48 Commercial	----	Opt.	Std.

REAR AXLE

GENERAL DESCRIPTION

The rear axle, Figure 1, is of the semi-floating type, incorporating helical cut bevel gears mounted in a sturdy pressed steel, banjo type housing. The differential is mounted in a heavily reinforced malleable iron carrier attached to the axle housing with cap screws. For additional rigidity the back cover is welded to the housing.

DIFFERENTIAL is of the two pinion type and the differential housing is in two sections held together with studs and nuts. Differential pinions are bronze bushed and operate on a large diameter journal on which is also mounted the hardened steel spacer to absorb the axle drive shaft end thrust. Differential side gears are internally splined to receive the inner ends of the axle shafts and have large thrust surfaces. Thrust washers are inserted between the differential pinions and gears and the case to reduce thrust wear.

DRIVE GEAR is of nickel molybdenum steel and is fastened to the differential case flange by special alloy steel bolts and the entire differential assembly is mounted on two large tapered roller bearings. These bearings have adjusting cages threaded into the carrier housing to provide adjustment for the bearings as well as adjustment for the side mesh of the gear teeth with the pinion.

DRIVE PINION is forged integral with the pinion shaft and is supported on two adjustable tapered roller bearings. A sleeve or spacer 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 and the fore and aft mesh of the pinion with the drive gear is taken care of by a shim pack between the front face of the pinion and the rear bearing.

UNIVERSAL JOINT FLANGE on the pinion shaft is held to the shaft by means of splines and a large castellated nut. An oil seal of the hydraulic leather type riding on the flanges prevents pinion shaft oil leaks.

LUBRICATION of pinion shaft bearings is provided by oil thrown up by the drive gear which is forced through a large passage cast into the housing and thus to the bearings. A similar passage at the bottom returns the oil to the main supply. See Figure 2.

AXLE DRIVE SHAFTS are made of alloy steel and have their largest diameter near the outer ends where they are taper ground to fit into the wheel bearings. The rear wheel hubs are taper machined and are secured to the tapered axle shafts by keys and castellated nuts. Axle shaft end thrust is taken on hardened steel thrust buttons at the inner ends of the shafts contacting the differential spacer.

REAR WHEEL BEARINGS are of the adjustable tapered roller type with the outer cups seating directly in the outer ends of the axle housing. Adjustment for end play is provided by shims inserted between the

bearing retaining caps and the housing flanges. Spring pressed hydraulic leather oil seals fitted between the caps and the rear wheel hubs prevent leakage of oil onto the brake shoes.

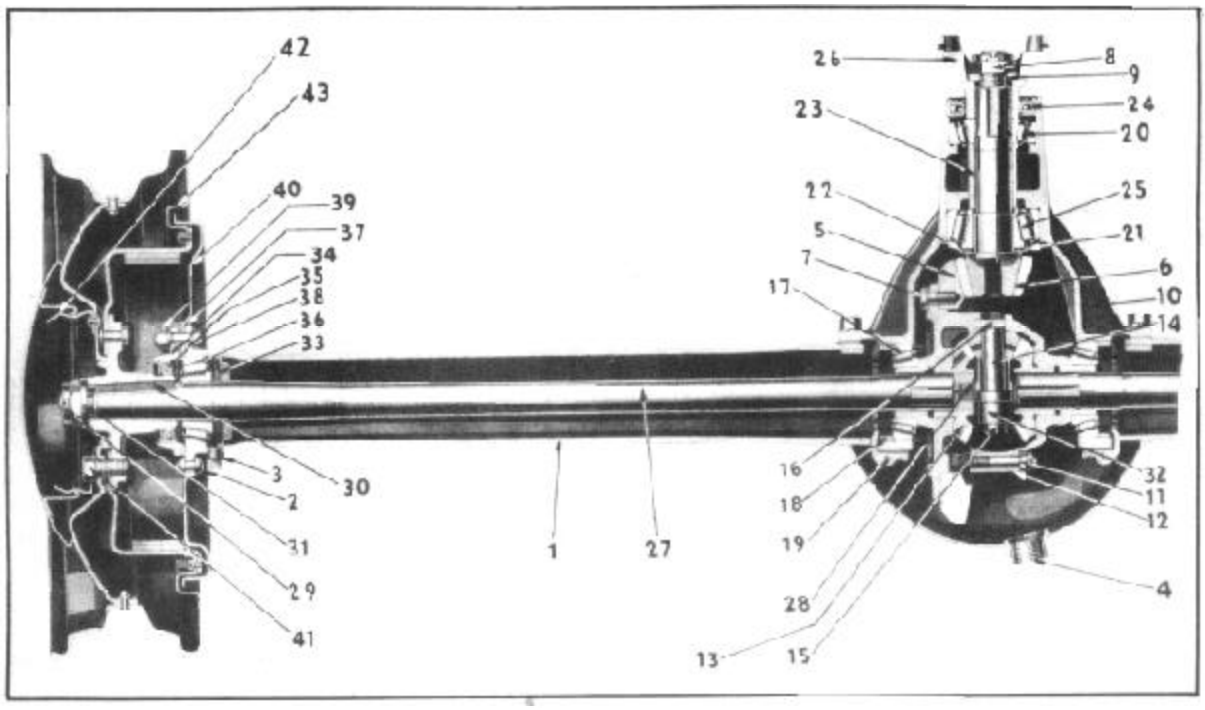


Figure 1--Rear Axle Assembly

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 screw
8. Drive pinion nut
9. Drive pinion washer
10. Differential carrier and cap assembly
11. Differential case stud
12. Differential case stud nut
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 assembly
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

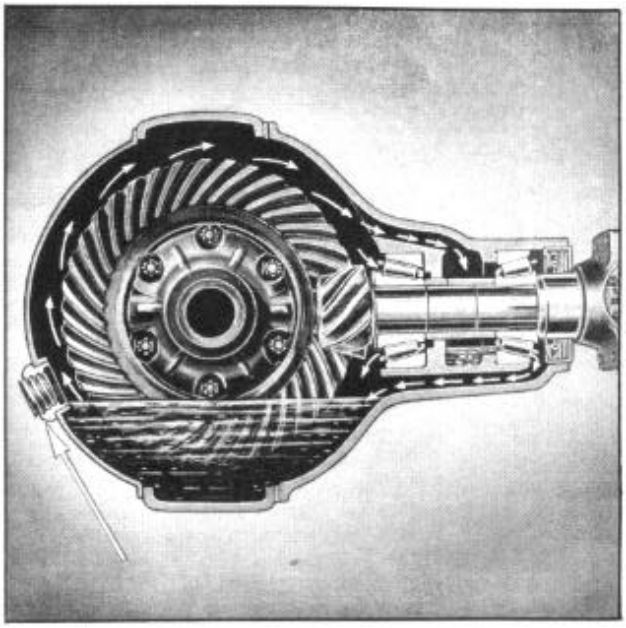


Figure 2--Circulation of Lubricant in Differential

41. Hub bolt
42. Hub cap clip
43. Brake drum seal

REAR AXLE DISASSEMBLY

1. Remove drain plug (4), Figure 1.
2. Jack up rear of car, re move hub caps and take off the rear wheels.
3. Remove axle shaft nuts (29), also washers using axle shaft nut wrench J 351.
4. Remove rear wheel hubs and brake drums from axle shaft using wheel puller tool J 736, Figure 3.

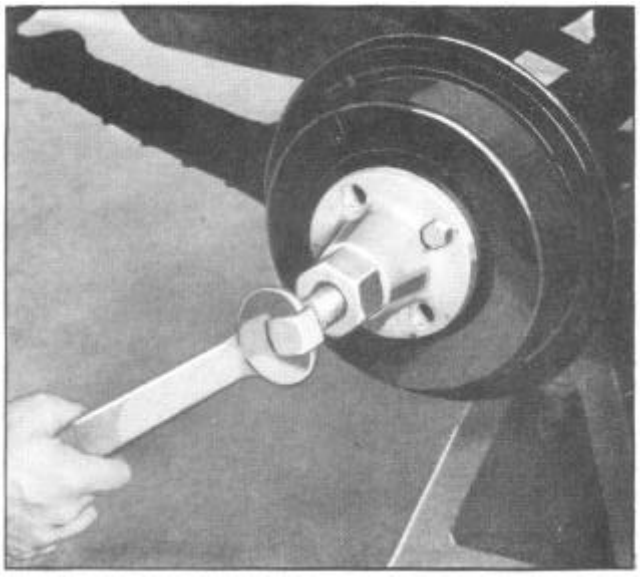


Figure 3--Removing Rear Wheel Hub

NOTE: Under no circumstances should a knock-out type of puller be used as serious and costly damage can be done to the differential parts by this method.

5. Remove the four nuts (39), Figure 1, holding the wheel bearing adjusting caps (34) and shims (37). Remove caps.

6. Remove rear wheel bearings and axle shafts using axle shaft and bearing puller tool J 352, Figure 4.

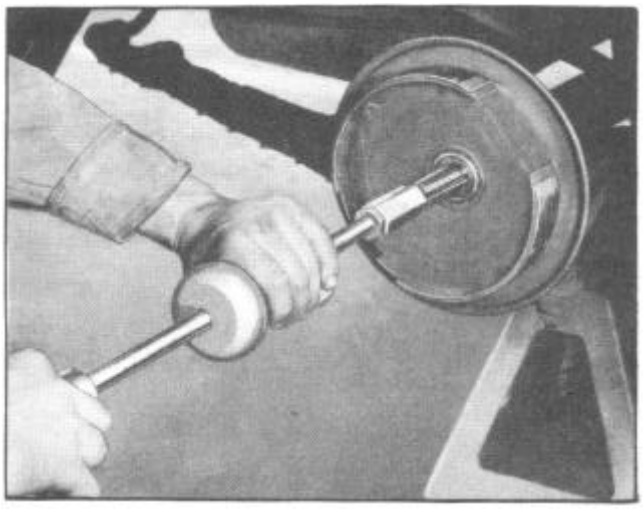


Figure 4--Removing Rear Axle Shaft and Wheel Bearing

7. Remove bearing cap oil seal assembly (35), Figure 1, and install a new one using tool J 353-1 as shown in Figure 5.

8. Remove rear wheel bearing cone and rollers (36) from axle shafts using bearing remover tool J 3584.

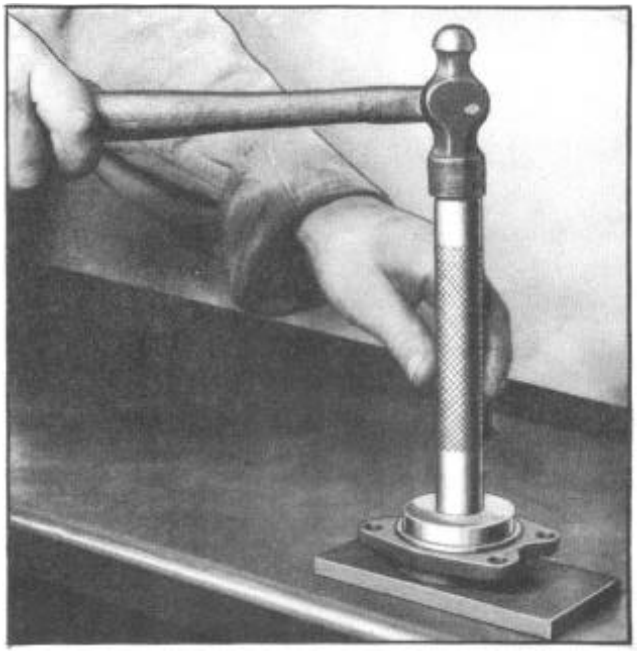


Figure 5--Replacing Bearing Cap Oil Seal

TO RENEW AXLE SHAFT THRUST BUTTON

9. Grind off thrust button (28), Figure 1, flush with the end of the shaft on an emery wheel.

10. 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"-I6 tap and screw a 3/8"-16 hexagon cap screw that is 1-1/2" or 2" long into the tapped hole.

11. Place head of screw in a vise and (using a soft hammer) tap the end of the axle shaft removing the button.

12. Clean out the hole.

13. Drive in a new thrust button making certain it is firmly seated in the shaft.

REMOVING BROKEN AXLE SHAFT

14. If axle shaft is broken off in the housing it can be removed by using broken axle shaft remover tool HM 540, as shown in Figure 6.

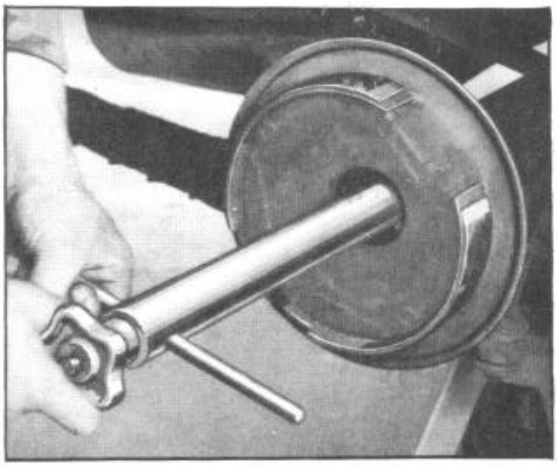


Figure 6--Removing Broken Axle Shaft

15. Remove axle shaft oil seal and retainer (33), Figure 1, using axle shaft and pinion shaft oil seal remover tool HM 555 as shown in Figure 7.

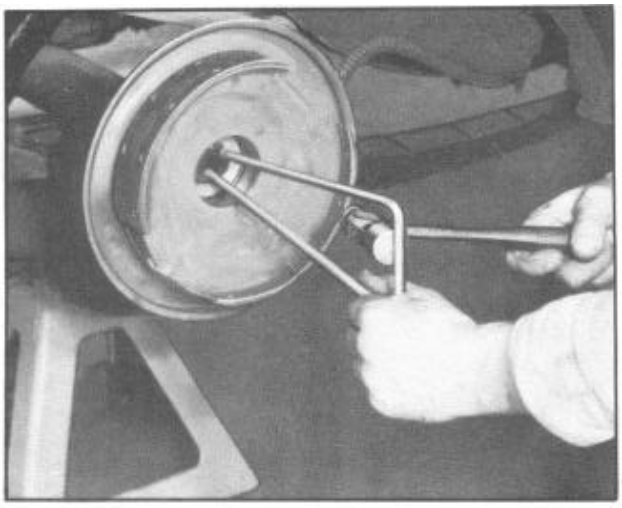


Figure 7--Removing Axle Shaft Oil Seal

16. Disconnect brake conduits and cables at backing plates.

17. Disconnect axle tee to rear wheel brake tubes at backing plates.

18. Disconnect rear wheel cylinder hose at axle tee and remove axle tee.

19. Remove wheel cylinders and brake shoes.

20. If backing plates are to be removed, cut rivet heads off with a sharp cold chisel. Install new backing plates and re-rivet to axle housing.

21. Remove bolts attaching propeller shaft to pinion shaft and drop rear end of propeller shaft.

22. Remove bolt nuts attaching differential carrier to axle housing and lift out carrier and gear set assembly.

REMOVING REAR AXLE HOUSING

23. Jack up rear end of car and place stand jacks under frame side members just ahead of the rear springs. Place roller jack under center of axle housing.

24. Disconnect rear lateral stabilizer at axle end.

25. Disconnect rear shock absorbers at lower end.

26. Remove rear spring clip nuts.

27. Lower roller jack and remove axle housing from under car.

DIFFERENTIAL CARRIER AND GEAR SET DISASSEMBLY

28. Remove cotter pins from differential bearing adjusting nut locks and take out the locks (19), Figure 1.

29. Remove cap screws from differential bearing caps and take off the caps and adjusting nuts. Differential assembly and drive gear can now be removed from carrier.

30. Remove cotter pin from pinion shaft nut (8) and remove nut also washer (9).

31. Remove pinion shaft companion flange (26) using companion flange puller tool J 456, as shown in Figure 8. Pinion (6) Figure 1, bearing spacer (23) and shims can now be removed from inside carrier.

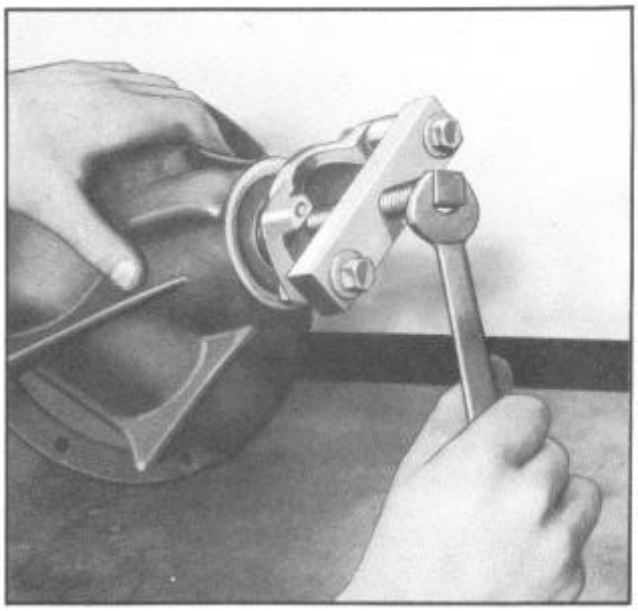


Figure 8--Removing Pinion Shaft Companion Flange

32. Remove rear pinion shaft bearing cone (20), Figure 1, from pinion shaft using pinion shaft bearing remover tool J 1301 as shown in Figure 9.

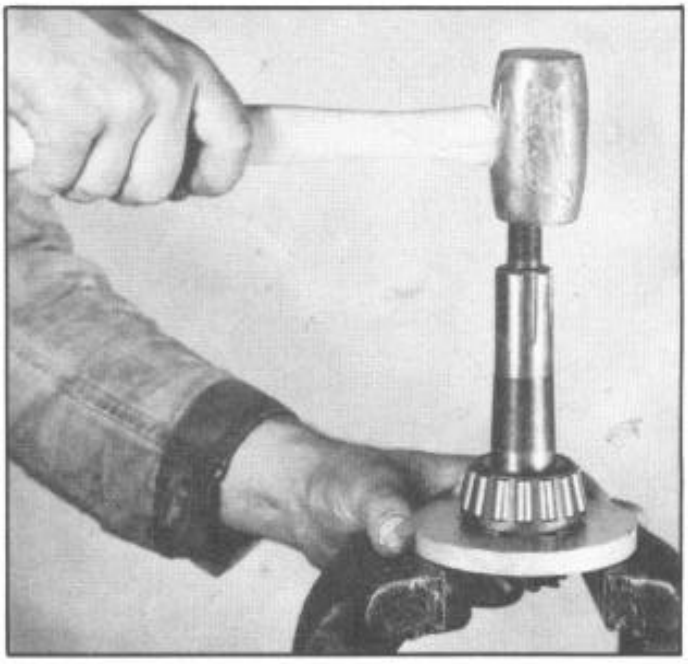


Figure 9--Removing Rear Pinion Shaft Bearing

33. Remove pinion shaft oil seal (24), Figure 1, from carrier using pinion shaft oil seal puller tool J 489 as shown in Figure 10. Pinion shaft front bearing cone can now be removed.

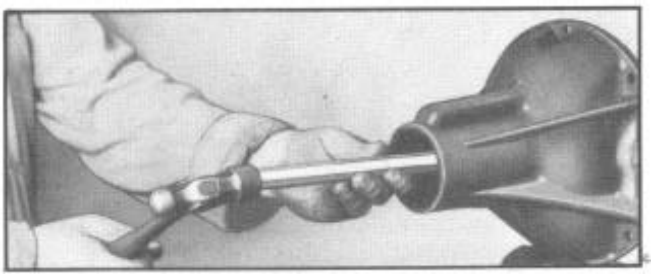


Figure 10--Removing Pinion Shaft Oil Seal

34. Remove front and rear pinion shaft bearing outer cups from carrier using pinion bearing cup remover HM 63 as shown in Figure 11.

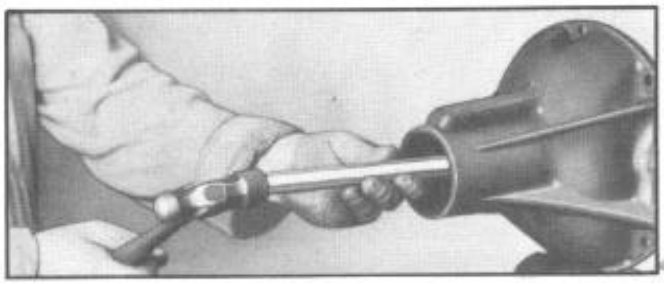


Figure 11--Removing Front and Rear Pinion Shaft Bearing Cups

DIFFERENTIAL DISASSEMBLING

35. Remove differential bearing cones (17), Figure 1, from differential case hubs using bearing puller tool J 354-A as shown in Figure 12. Puller fingers fit in the notches that are in the differential case.

Figure 12--Removing Differential Bearing Cone and Roller

36. Remove drive gear bolts and lockwashers and take off drive gear (5) Figure 1.

37. Remove cotter pins and nuts (12) Figure 1, from differential case. Separate the right and left cases and 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 REASSEMBLING

1. Wash all parts in gasoline and inspect for
A. wear
B. roughness
C. cracks or fractures.

Replace any worn parts also any that there is reason to suspect may be damaged.

2. Check ring gear bolting flange on the differential case for eccentricity and side run out using dial indicator J 390 X and placing hubs of differential case in V blocks. If they do not run true within .002" it will be necessary to true up the flange in a lathe or install a new case assembly.

3. Place differential gear (13), Figure 1, and thrust washer in left hand differential case.

Differential gear thrust washers are available in various oversize thicknesses. Select washers that will give no appreciable 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 differential gear.

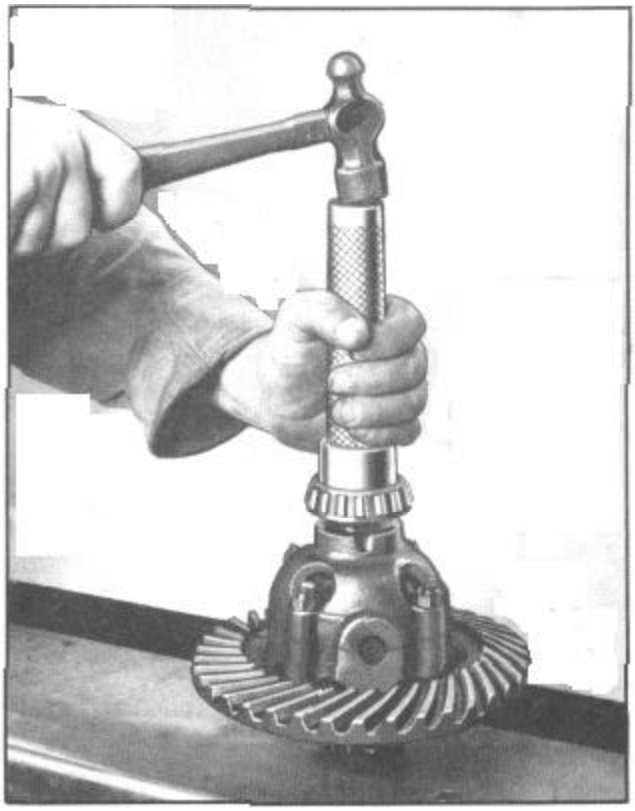


Figure 13--Installing Differential Bearing-Cone and Roller

4-5. 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.

6. Install differential gear thrust washer and differential gear in right hand differential case and assemble to left case.

7. Replace nuts (12) on differential case studs (11) and tighten securely. Insert and spread cotter pins in all studs.

8. Place drive gear in position on differential case flange so that the holes line up properly. Install lockwashers and bolts and draw bolts up tight.

CAUTION: 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.

9. Install differential bearing cones (17), Figure 1, on differential case hubs using differential bearing driver tool J 355, as shown in Figure 13.

REASSEMBLING PINION AND BEARINGS

10. Install pinion shaft front and rear bearing cups in carrier using pinion bearing cup replacer tool J 270-11 as shown in Figure 14.

Figure 14--Installing Pinion Shaft Bearing Cups

11. Place front pinion bearing cone (20), Figure 1, in position in cup and install pinion shaft oil seal (24) using pinion shaft oil seal replacer tool J 353-1 (also use for rear wheel bearing cap oil seal).

CAUTION: The oil seal leather must be smooth and not worn through at the retaining spring.

12. Install shim pack (22) and pinion shaft rear bearing cone (25) on drive pinion (6) using Pinion Shaft Bearing Remover and Installer Tool J 1301.

CAUTION: Use the same number and thickness of shims as were removed when disassembling.

13. Install bearing spacer (23) on pinion shaft ahead of rear bearing cone and place pinion bearing adjusting shims on the pinion ahead of the spacer.

14. Install pinion and assembled parts in position in carrier, inserting forward end of pinion through the pinion shaft front bearing cone.

15. Install companion flange (26) on front end of drive pinion and assemble pinion shaft nut (8) and washer (9). Tighten nut as much as possible using pinion shaft nut wrench J 351 and flange holding tool J 789 as shown in Figure 15.

NOTE: If the correct number of shims have been used between the pinion shaft front bearing (20) and spacer (23) (instruction No. 13) it should be just possible to turn the pinion shaft, with one hand. If the adjustment is tighter than this, add one thin shim at a time until this hand test is obtained.

Insert cotter pin in pinion shaft and bend over.

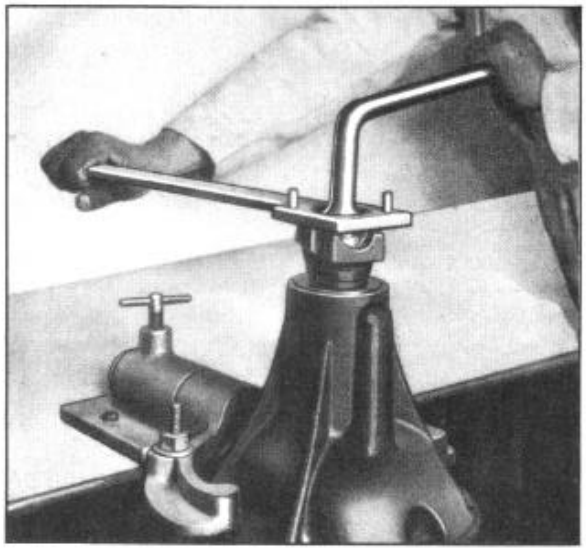


Figure 15--Installing Pinion Shaft Nut

DRIVE GEAR AND PINION ADJUSTMENT

16. Install differential and drive gear assembly in the carrier and assemble differential bearing cups and differential bearing adjusting nuts (18), Figure 1, so that the drive gear and drive pinion teeth bottom.

17. 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.

18. Turn the left hand adjusting nut to right (clockwise) until no play can be felt between drive gear and pinion shaft.

19. Turn the right hand adjusting nut to right (clockwise) and draw it up tight using Differential Bearing adjusting nut wrench J 972, as shown in Figure 16.

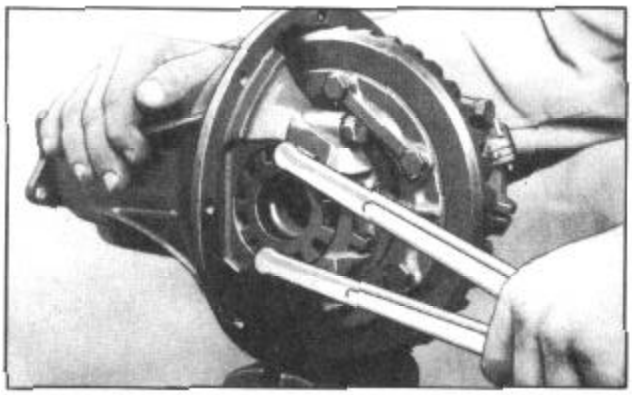


Figure 16--Adjusting Differential Bearings

20. Mount Dial Indicator J 390-X, Figure 17, on the differential carrier flange and turn left hand adjusting nut to the left (counter clockwise)one half

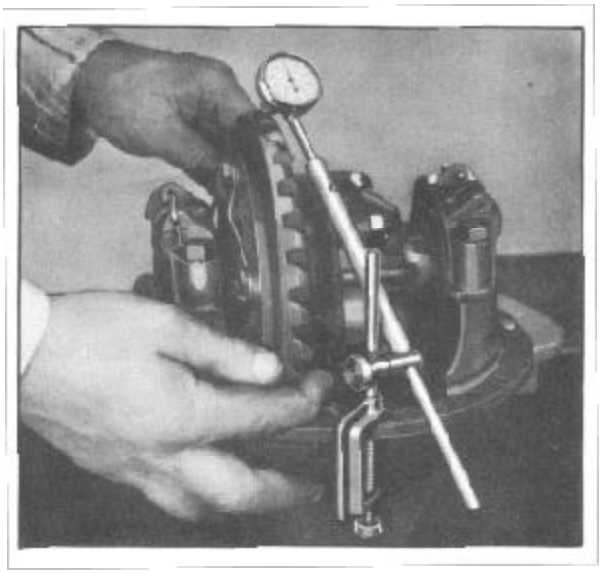


Figure 17--Checking Drive Gear and Pinion Backlash

notch. Turn right hand adjusting nut to the right (clockwise) one half notch.

21. 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 then turn adjusting nuts one half notch at a time until it is obtained.

22. Tighten left bearing cap screws. Turn right differential bearing adjusting nut to the right (clockwise) one full notch.

NOTE: This additional tightening provides the necessary "spread" to the differential carrier for proper operation.

23. Draw up cap screws tightly on right differential bearing cap.

24. Install differential bearing adjusting nut locks (19') and secure them with cotter pins.

DIFF. CARRIER AND GEAR SET

INSTALLATION IN HOUSING

25. Examine the differential carrier and gear set thoroughly for dirt; chips, foreign matter of any kind. Damage to gears and bearings from such causes will make costly repairs necessary.

26. Install a new gasket between the differential carrier and axle housing. Place gasket carefully over the cap screws.

27. Install differential carrier and gear set and tighten carrier cap screw using lockwashers under all nuts. Check for tightness at the end of first 500 miles.

REINSTALLING REAR AXLE HOUSING

28. Place axle housing in position on rear springs.

29. Install spring clips, plates, clip cushions and clip nuts and tighten securely.

30. Assemble propeller shaft to pinion shaft flange.

31. Attach shock absorbers to studs.

32. Attach brake cables and conduits to brake backing plates.

33. Install brake tube tee in axle housing.

34. Assemble rear wheel cylinder hose to tee.

35. Install wheel cylinders and brake shoes.

36. Assemble rear lateral stabilizer to axle housing.

WHEEL BEARING AND AXLE SHAFT INSTALLING

37. Install axle shaft oil seal assemblies using oil seal replacer J 353-2.

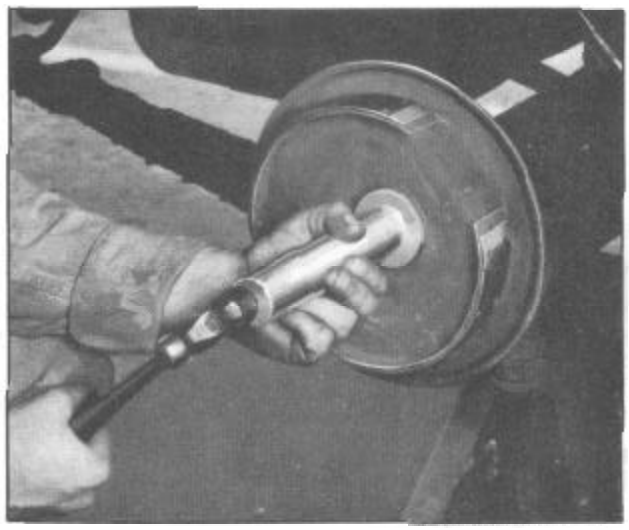


Figure 18--Installing Axle Shaft Oil Seal Assembly

38. Install rear wheel bearing cone on axle shaft using rear bearing replacer tool J 358-H.

39. Install axle shaft with bearing cone in housing and assemble rear wheel bearing outer cup in axle.

Pack bearings with wheel bearing lubricant.

40. Install wheel bearing adjusting shims (37), Figure 1 between adjusting cap (34) and end of housing. Nuts (39) with lockwashers under them should be drawn up tight.

41. 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.

42. Check end play which should be from .002" to .004" each wheel.

43. Adjust end play by removing or adding shims (37), Figure 1, between the axle housing and bearing adjusting cap (34).

44. Install axle shaft keys in keyways and rear wheel hubs also brake drums on axle shaft.

45. Install drive shaft nut washers (31) and nuts (29) on axle shafts and tighten nuts securely using axle shaft nut wrench J 351. This wrench has an extra long handle permitting the leverage needed to securely tighten these nuts and also the pinion shaft nut.

46. Adjust brake shoes.

47. Bleed all wheel cylinders.

48. Replace wheels and tighten wheel hub bolts securely,

49. 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.

50. Fill axle to proper level with S.A.E. 90 E.P. lubricant through filler hole and replace filler plug.

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.

REAR AXLE NOISES

Sometimes different types of noises that are heard are charged to the rear axle whereas they are from other causes, such as muffler or tires. Tire noise is usually attributable to low pressures, incorrect wheel alignment or uneven tire wear. This noise is more pronounced between 20 and 28 miles per hour, whereas axle noise will show a definite variation under varying operation conditions; such as, part throttle, acceleration and deceleration.

Having definitely determined that the tires are not the source of the noise, tests should be made to determine what type of axle noise is present. There are three types of axle noise:

1. Drive Noise
2. Coast Noise
3. Bearing Noise

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:

1. Drive noise which is noticeable on constant acceleration from 15 to 45 M.P.H. and is most pronounced between the speeds of 22 to 35 M.P.H. When determining the extent of this noise or hum, it must be remembered that a slight hum is normal if noticeable only 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.

2. Coast noise should be checked as follows: Bring the car up to a predetermined speed, preferably above 45 M.P.H., and then with clutch engaged release the throttle, allowing the car to decelerate through its speed range to approximately 15 M.P.H. Here again discretion should be used in determining the noise as here also a slight noise or hum is permissible. However, if the noise is heavy and irregular, the differential should be adjusted.

3. Bearing Noise - Bearings improperly adjusted worn or rough will aggravate the above conditions. However, 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.

Should it be definitely 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, as 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".

Bearing noise results from improper adjustment, dirt, looseness or irregularities in the bearings and can best be remedied by removal, cleaning, proper adjustment or replacement.

REMOVING AXLE SHAFT

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.
4. Remove rear wheel bearing adjusting cap and shim.
5. Remove rear wheel bearing and axle shaft using puller J 352.
6. Remove rear wheel bearing cone from axle shaft using tool J 1301.

REPLACING AXLE SHAFT

1. Install bearing cone using tool J 1301.
2. Install axle shaft. (See operations 38-45 inclusive
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

INDEX

BRAKE SPECIFICATIONS

Type 4 Wheel Bendix Hydraulic

Type 4 Wheel Bendix Hydraulic	
Drum Diameter	
Model 40 Pass.-40 Trav.	9 1/16" drum
Model 40 Commercial	10 1/16" drum
Model 41 Passenger	10 1/16" drum
Model 43,44,45 and 47	10 1/16" drum
Model 48 Passenger and Commercial	10 1/16" drum
Drum Material alloy steel	
Lining	
Primary Shoe moulded	moulded
Secondary Shoe woven	woven
Width	1 3/4"
Thickness	7/32"
Length per wheel--40 Pass. and 40 Travler	19"
Length per wheel--40 Commercial-41,48	22 1/8"
Length per wheel--43,44,45,47	23 15/16"
Pieces per wheel 2	2
Lining Area in Square Inches	
Model 40 Passenger-40 Traveler	133"
Model 40 Commercial-41,48	155"
Model 43,44,45,47	167 1/2"
Adjustments	
Anchor Pin Model 40 Passenger-40 Traveler	Pivot
Anchor Pin All Other Models	Radially
Front and Rear Shoe	Eccentric and Screw
Shoe Clearance	
Anchor Pin End of Shoe	.010"
Adjusting Screw End of Shoe	.010"
Maximum Variation Per Shoe	
Model 40 Passenger-40 Traveler	None
All Other Models	.003"
Mechanical Follow-Up	1 1/4"
Pedal to Floor Board Clearance	1/4"

BRAKES

The brake equipment of all models incorporates the Duo-Automatic hydraulic principle for complete safety and Duo-Servo features for efficiency and long life.

Model 40 Passenger and Travelers cars use the double floating anchor feature and all other models use the single anchor type brake.

HYDRAULIC SYSTEM

The hydraulic brake system Figure l, consists of a compensating type master cylinder operated by an adjustable link from the brake pedal, four double piston wheel cylinders mounted on the brake backing plates and the connecting tubing.

When the brake pedal is depressed, fluid is pushed out of the master cylinder into the wheel cylinders, separating the pistons and applying the brakes.

When the foot is removed from the pedal the brake shoe springs return the wheel cylinder pistons to their normal position thus forcing the fluid back through the lines into the master cylinder

MECHANICAL SYSTEM (REAR WHEELS ONLY)

The rear wheel brakes are connected up for mechanical operation by the use of cable and conduit connections to the hand brake and the foot pedal linkage.

If for any reason should the hydraulic system become inoperative, continued pressure on the foot brake pedal results in pedal push rod adjustable end nut (16), Figure l, coming into contact with the front face of pedal push rod (14). Push rod adjustable end (15) is a sliding fit in the push rod (14). To prevent application of the cables during a normal brake application and to assure proper application of the cables, should the hydraulic system become inoperative, a definite clearance of 1 l/4" must be maintained between the rear face of nut (16) and front face of push rod (14).

Movement is then transmitted through the push rod to cable lever (10), and finally through cables (23 and 24) to rear brake shoes.

Application of the cables on the rear shoes is as follows:

MODEL 40 PASSENGER AND 40 TRAVELER

The lever strut (J), Figure 2, is placed between the rear shoes just under the cylinder and acts parallel with the cylinders. This bar is operated by a lever (K) which is pivoted on the secondary shoe anchor link at (L).

MODELS 41,43,44,45,47 AND 48

The brake link (7), Figure 3, mounted between the shoes is actuated by brake lever (9), which is pivoted pivoted on the secondary shoe at (8).

FLOATING TYPE SHOES - MODEL 40 PASSENGER CARS' 40 TRAVELER

The brake shoes are direct acting in that the upper ends of both primary and secondary shoes rest against the wheel cylinder pistons without links between them as shown at (B) Figure 2. This places the cylinder (C) higher up on the backing plate so

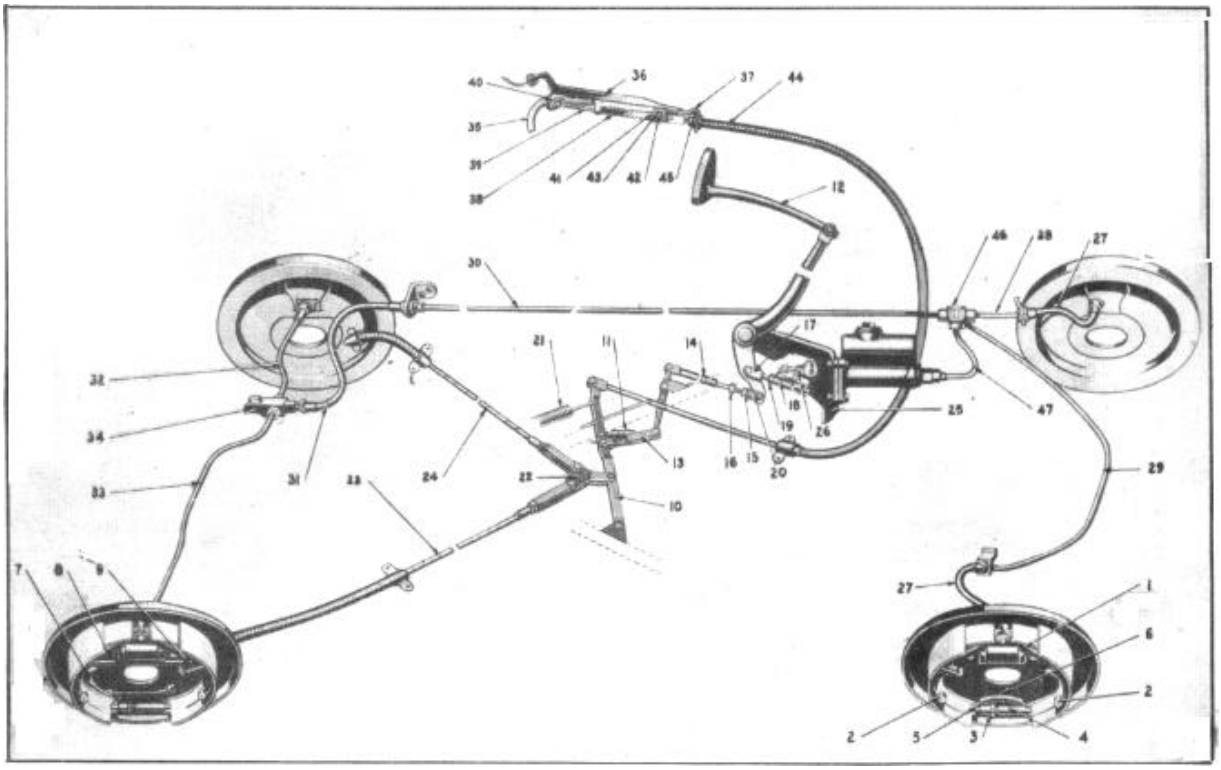


Figure 1--Brake Control

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. Brake Control Lever Assembly
11. Control Lever Return Spring
12. Brake Pedal
13. Play Link Assembly
14. Push Rod - (to Brake Control Lever)
15. Push Rod - Adjustable End Lock Nut
16. Push Rod - Adjustable End
17. Pull Rod Assembly
18. Pull Rod Adjustable End
19. Pull Rod Adjustable End Nut
20. Push Rod Adjustable End Yoke Pull Rod
21. Lever Return Spring
22. Brake, Control Lever Cable Toggle
23. Rear Brake Cable Assembly - Right Hand
24. Rear Brake Cable Assembly - Left Hand
25. Master Cylinder Mounting Bracket
26. Master Cylinder Operating Lever Assembly
27. Wheel Cylinder Hose Assembly
28. Tube Assembly - Frame Tee to Left Hand Front Hose
29. Tube Assembly - Frame Tee to Right Hand Front Hose
30. Tube Assembly - Frame Tee to Rear Hose
31. Wheel Cylinder Hose Assembly
32. Tube Assembly - Rear Axle Tee to Left Hand Rear Wheel
33. Tube Assembly - 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 Stabilizer - (Inner)
42. Hand Brake Ratchet Stabilizer - (Outer)
43. Hand Brake Ratchet Stabilizer Spring
44. Hand Brake Cable and Conduit
45. Hand Brake to Dash Retainer
46. Frame Tee
47. Tube Assembly - Master Cylinder to Frame Tee

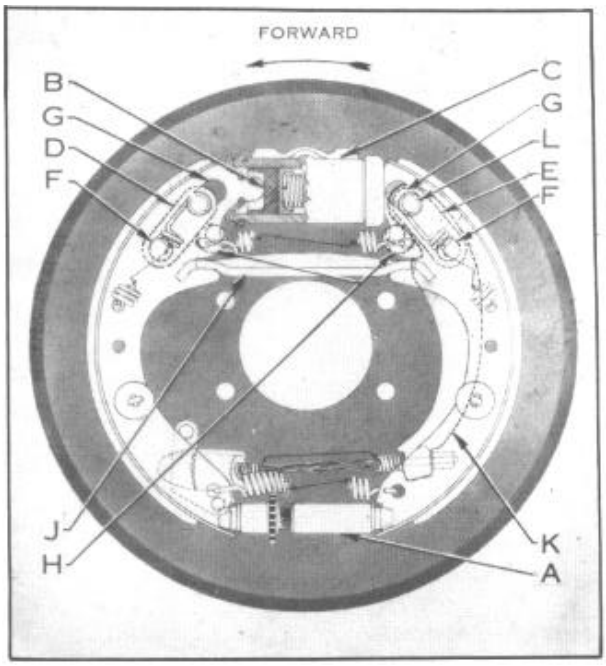


Figure 2--Floating Type Shoes
(Double Anchor) Model 40
Passenger Cars, 40 Traveler

A. Adjusting Screw
B. Wheel Cylinder Piston
C. Wheel Cylinder
D. Anchor Link
E. Anchor Link
F. Anchor Link Pivot
G. Anchor Link Slot
H. Eccentric Adjustment
J. Shoe Expanding Bar
K. Shoe Expanding Bar Lever
L. Secondary Shoe Anchor Link

that no portion of the shoe overhangs the point of application.

The floating anchors consist of short forged steel links (D) and (E) near the top of each shoe. These are pivoted on the backing plates at one end (F) and operate in short slots (G) in the shoe webs at the other end.

In the forward motion the wheel cylinder piston pushes the primary shoe out against the drum with anchor link (D) free to slide in its slot in the shoe. The primary shoe is forced against the adjusting screw (A) and the reaction load is carried over the bottom of the secondary shoe. The reaction is then carried to the anchor link (E) acting against the end of its slot (G) as an anchor. Braking action in reverse rotation is in exactly he opposite operation. Link (D) becoming the anchor as link (E) swings free. Only one anchor acts in each direction of rotation.

The brake anchor link nut and felt washer is used to seal the water and dirt from the bearing and prevent the anchor links from freeing in the backing plate.

The links are arranged so that the pull on them is approximately endwise. This leaves the shoes and anchors free to swing within the limits of the lining to drum clearance maintained by the eccentric adjustments (H). This allows the complete shoe assembly to move with the drum thus eliminating high spots due to irregular drums.

SINGLE ANCHOR SHOES - MODELS 41,43,44,45,47, AND 48

These models use the single anchor, two shoe duo-servo action brake adopted in 1936. The two shoes are marked "P" for primary or front and "S" secondary or rear. Irrespective of the position in which the brake assembly is mounted, the primary shoe (l) Figure 3, is always "ahead" of the anchor (16) in the direction of the forward rotation of the

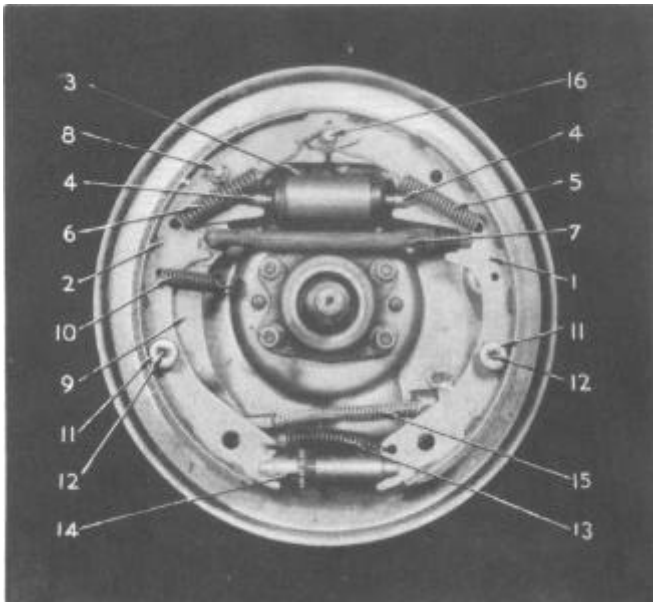


Figure 3--Single Anchor Brake-Rear - Models 41,43,44,45,47,48 and all Commercial

drum, and transmits servo action to the secondary shoe (2), through adjusting screw (14), during a forward braking application. In reverse the opposite brake application takes place.

HANDBRAKE

The hand brake is applied through a pull type, self locking, pistol grip, hand control located under the instrument panel to the left of the steering column, see Figure 4.

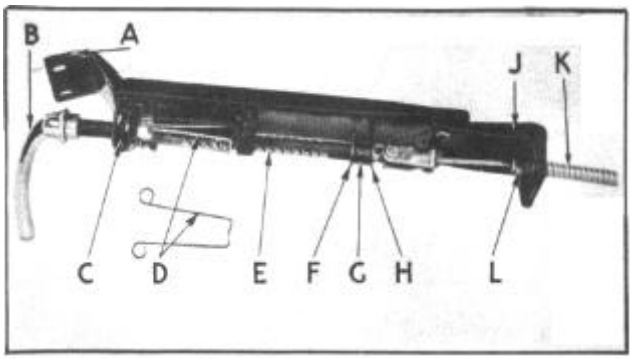


Figure 4--Hand Brake

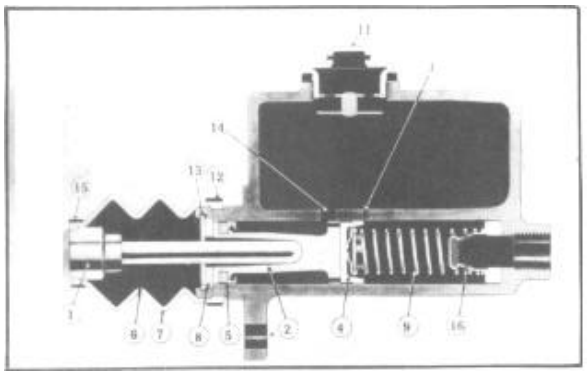
A. Hand Brake Mounting Bracket
B. Hand Brake Grip
C. Hand Brake Ratchet Rod Housing

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

The application of the hand brake can be made much easier by depressing the brake pedal in the ordinary way and pulling upward on the hand brake lever at the same time. This relieves the load imposed on the hand brake cables in expanding the shoes against the brake drums and also eliminates any possibility of a vacuum being created in the rear wheel cylinders which might otherwise cause air to be drawn into the hydraulic system past the rubber cups behind the pistons as the shoes are expanded manually.

BRAKE MASTER CYLINDER

Figure 5--Master Cylinder



1. Push Rod
2. Piston
3. Outlet Port
4. Piston Cup Primary
5. Piston Cup Secondary
6. Push Rod Guard
7. Push Rod Guard
8. Piston Stop Plate
9. Piston Spring
10. Outlet
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

The master cylinder, Figure 5, is a combined supply tank and master cylinder in which compensating features are incorporated.

The master cylinder performs two supplementary functions.

1. Maintains a constant volume of fluid in the system at all times, regardless of expansion due to heat or contraction due to cold.

2. It acts as a pump during the bleeding operation.

The return to released position of piston (2) and cup (4) is much faster than the return of the fluid through outlet (10) into the master cylinder. A momentary vacuum is created in the cylinder barrel and additional fluid is drawn into the system from the reservoir through the drilled holes in piston (2) and past the lip of the cup (4). The pressure exerted on the fluid by the brake shoe retracting springs is sufficient to lift valve (16) off its seat to permit the fluid from the lines to return into the master cylinder. Any excess is returned by port (3) into the reservoir filling the cylinder with fluid for the next brake application.

It is necessary that rod (l) which is attached to the brake pedal operating rod be adjusted for clearance where it seats in piston (2) so that there is 1/411 free movement of the brake pedal pad before the pressure stroke starts.

This permits cup (4) to be clear of port (3) when piston (2) is in its released position. If it was not clear 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). Supply tank filler cap (11) is conveniently located under the left side of the bonnet for checking fluid level.

Supply tank should be kept at least one-half full of fluid.

CAUTION: Clean off the filler cap and all around it before removing the cap. Dirt must not be allowed to get into the master cylinder.

MASTER CYLINDER SCRATCHED AND PITTED

Grit and abrasive substances that get into the master cylinder will cause the cylinder barrel to become scratched or pitted and when either of these conditions exists it is necessary to remove the master cylinder for inspection.

MASTER CYLINDER DISASSEMBLY

1. Remove large boot strap (12), Figure 5, that fastens boot to cylinder casting.
2. Remove boot: link and small boot strap.
3. Remove retainer spring (13) using a sharp pointed screw driver.
4. Remove internal parts.
5. Check condition of rubber parts and the cylinder bore for scratches or pits.

MASTER CYLINDER HONING

If the cylinder walls are scratched or pitted have the cylinder honed. The walls have to be highly polished for efficient operation.

Wagner Electric Corporation branches have the equipment necessary for reconditioning master cylinders.

MASTER CYLINDER REASSEMBLING

1. Use new rubber cups.
2. Wash master cylinder and the cups in clean alcohol.
3. Dip master cylinder and all parts in Genuine Hudson Hydraulic Brake fluid for lubrication.
4. Install valve (16), Figure 5, and return spring (9).
5. Install primary cup (4) Piston assembly (2) and piston ring (8).
6. Snap the retainer spring in its groove.
7. Assemble boot and link in place.
8. Replace the large boot strap.

Install on car.

MASTER CYLINDER REPAIR KIT

A master cylinder repair parts kit is available and is a very convenient way of obtaining all of the parts necessary for the repair of the master cylinder.
Consists of:
1 Piston complete

1 Piston cup (primary)
1 Check valve assembly
1 Check valve seat
1 Master cylinder head gasket
1 Outlet fitting bolt gasket (needed when car has "Hill Hold")
1 Outlet fitting bolt gasket (needed when car is not equipped with "Hill Hold")
1 Outlet fitting gasket

WHEEL CYLINDER

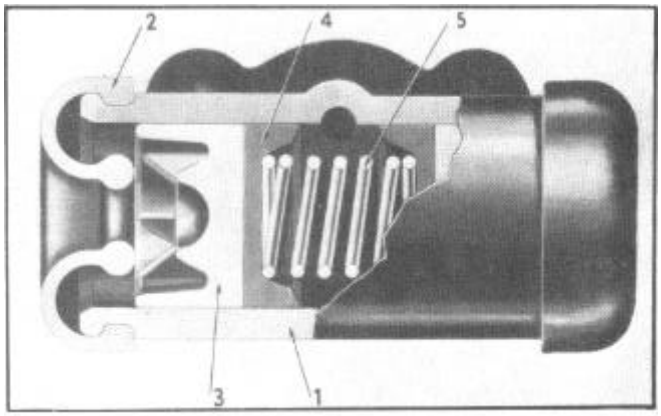


Figure 6--Wheel Cylinder

The wheel cylinder is the unit which changes the applied hydraulic pressure into a mechanical force.
The wheel cylinder is composed of:
1. Wheel cylinder casting.
2. Wheel cylinder end guard.
3. Pistons (opposed to each other).
4. Piston cups (opposed to each othe:). 5. Piston cup return spring.
At the uppermost position and between the piston cups is a bleeder connection used to expel air from the system.

FRONT WHEEL CYLINDER REMOVAL

Model 40 Passenger and, 40 Traveler.
The wheel cylinder may require new cups or honing the same as the master cylinder.
To remove:
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 tool K.M.O. 145 on wheel cylinder as shown in Figure 7.
5. Remove brake shoe retracting springs (4) and (5) and (6) Figure 12, which permit the shoes to move outward.
6. Cylinder and hose may be withdrawn as a unit.

REAR WHEEL CYLINDER REMOVAL

Model 40 Passenger Cars, 40 Traveler.

The wheel cylinder may require new cups or honing the same as the master cylinder.
To remove:
l. Disconnect tube at wheel cylinder on rear of brake shield.
2. Remove two wheel cylinder fastening screws on rear of brake shield.
3. Place piston clamp tool K.M.O. 145 on wheel cylinder as shown in Figure 7.
4. Remove brake shoe retracting spring (4) and (5) and (6) Figure 12 which permit the shoes to move outward.
5. Cylinder can be withdrawn.

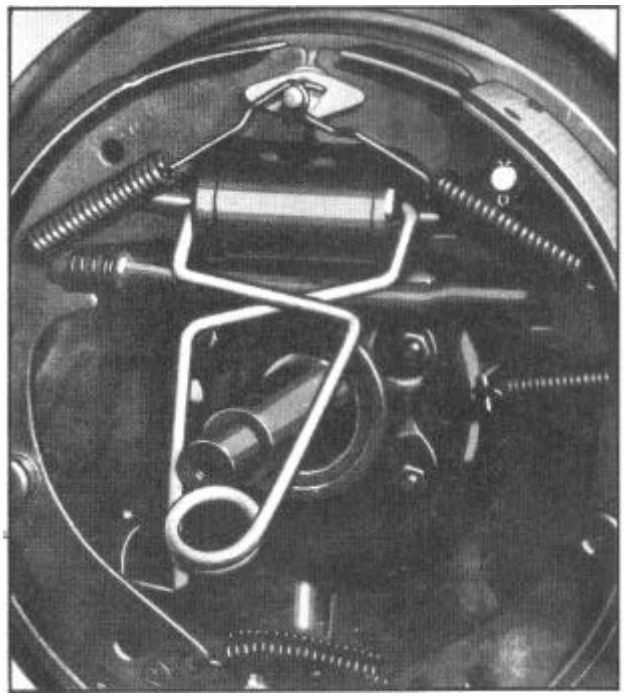


Figure 7--Wheel Cylinder Clamp

FRONT WHEEL CYLINDER REMOVING

Models 41, 43, 44, 45, 47, 48 and all commercial.

The wheel cylinder may require new cups or honing the same as the Master cylinder.
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 piston clamp on wheel cylinder Figure 7.
5. Remove brake shoe retracting spring (56-10) Figure 3 which permits shoe to move outward.
6. Remove connecting links (4) between cylinder pistons and brake shoes. Cylinder and hose may be withdrawn as a unit.

REAR WHEEL CYLINDER REMOVING

Models 41, 43, 44, 45, 47, 48 and all commercial.

The wheel cylinder may require new cups or honing the same as the master cylinder.
1. Disconnect tube from cylinder fitting.
2. Remove the two cylinder fastening screws on rear of brake shield.
3. Place piston clamp on wheel cylinder as shown in Figure 7.
4. Remove brake shoe retracting springs (56-10) Figure 3, and connecting links (4). Cylinder may then be withdrawn.

WHEEL CYLINDER DISASSEMBLY - All Models

The front and rear wheel brake cylinder requires the same inspection as the Master Brake cylinder.

See Master Cylinder Brake Fluid.

See Master Cylinder Honing Page 4.

To disassemble--

1. Remove end guards (2) Figure 6.
2. Remove pistons (3).
3. Remove piston cups (4).
4. Remove piston cup spring (5).

WHEEL CYLINDER REASSEMBLING

1. Use new rubber cups.
2. Wash master cylinder and the cups in clean alcohol.
3. Dip master cylinder and all parts in Genuine Hudson Hydraulic Brake fluid for lubrication.
4. Assemble as shown in Figure 6.

WHEEL CYLINDER REPAIR KIT

Wheel cylinder repair kits are available through the Factory Parts Department which contain all of the parts necessary for efficiently repairing wheel cylinders.

They consist of:

2 wheel cylinder pistons
2 wheel cylinder piston cups
2 wheel cylinder end guards
1 wheel cylinder tube fitting gasket

HYDRAULIC BRAKE FLUID

A good 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 at all.

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. Never wash any hydraulic brakes parts in gasoline as even the slight amount of mineral oil present in gasoline will affect the rubber parts.

Plain alcohols (most of which contain up to 10% water) should not be used because alcohol has no lubricating quality and due to its extreme thinness will leak past the rubber cups and possibly saturate the brake linings.

USE

Hudson Hydraulic Brake Fluid.

It is supplied in--

1 quart cans
1 gallon cans

Clean Hydraulic Brakes Parts with clean alcohol.

BLEEDING AT ALL WHEELS

Whenever a main pipe line is removed from the master cylinder or the supply tank becomes empty then the brake system must be bled at all four wheels.

BLEEDING AT ONE WHEEL

Whenever a line is disconnected from any individual wheel then that wheel cylinder only must be bled.

HOW TO BLEED

The bleeding operation should be performed at only one wheel cylinder at a time and repeated at the other wheel cylinders if necessary.

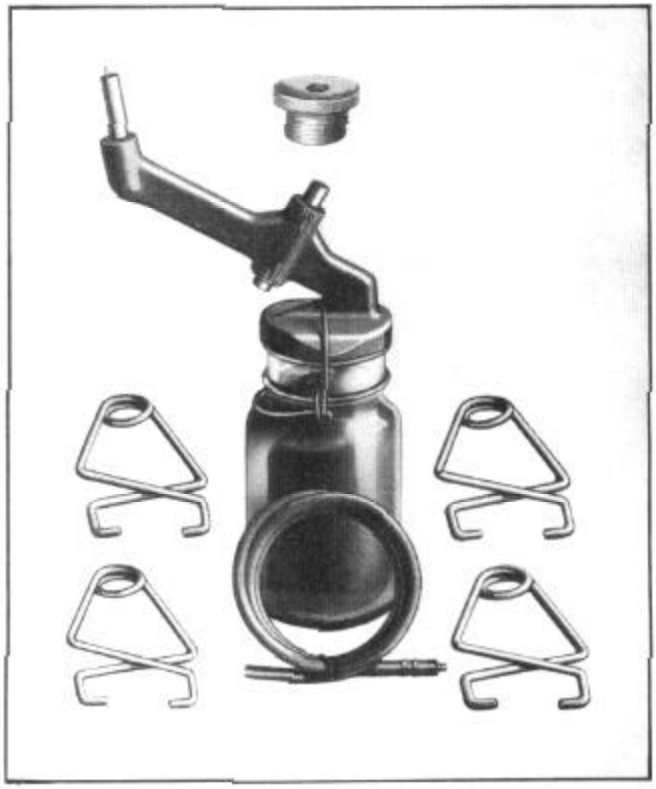


Figure 8--Filling and Bleeding Equipment
Consists of Filler Bottle with Threaded
Adapter J 713-B--Bleeder Drain Tube
J-628 Wheel Cylinder Clamps KMO-145
(Set of 4)

1. Fill the bottle J 713 Figure 8 using

GENUINE HUDSON HYDRAULIC BRAKE FLUID

2. Put nozzle in master cylinder reservoir and open filler bottle valve before starting.

NOTE: This will keep the tank half full of fluid during the bleeding operation.

If the filling bottle is not used fill the reservoir with Hudson Hydraulic Brake Fluid and keep it at least half full during the bleeding operation.

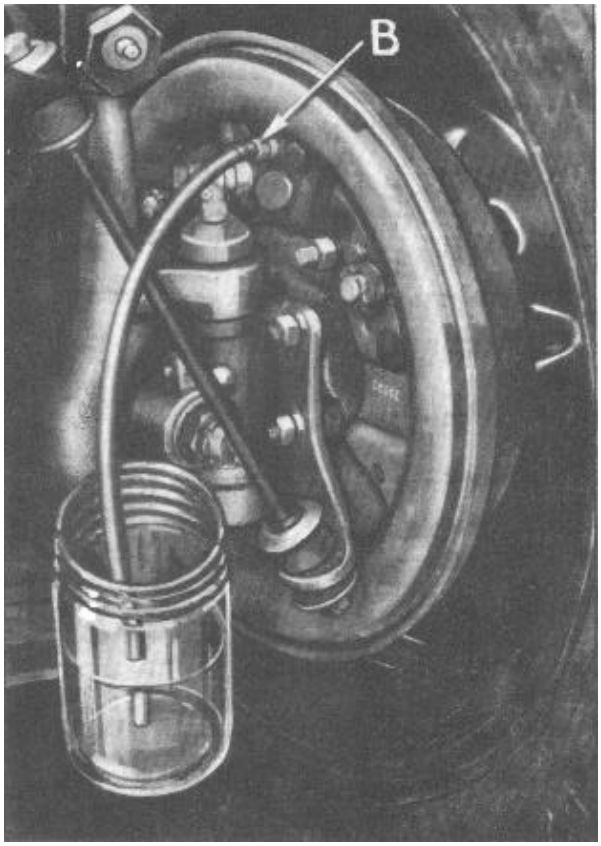


Figure 9--Bleeding Wheel Cylinder

3. Remove screw, Figure 9, from end of bleeder valve and attach bleeder tube (J 628) Figure 8. Allow tube to hang in a clean container partly filled with fluid such as a pint Mason jar.

4. Unscrew bleeder valve (B), Figure 9, three fourths of a turn and depress foot pedal by hand, allowing pedal to return to released position slowly. This gives a pumping action which forces fluid through the tubing and out at the wheel cylinder carrying with it any air that may be present.

CAUTION: After the brake pedal is depressed it must be allowed to return slowly otherwise air may be drawn into the system.

5. Watch the flow of fluid from hose and when all air bubbles cease to appear close the bleeder connection.

NOTE: The end of the hose must be kept below the surface of the fluid in the pint jar.

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 PEDAL ADJUSTMENT - All Models

1. Pedal return spring holds the bottom of master cylinder operating lever (26), Figure l, against the stop.

Check to see if the lever is in position.

NOTE: If the pedal shank (in the fully released pedal position) touches the floor board or has more than 1/4" clearance, it should be adjusted.

2. Loosen pull rod adjustable end nut (19) on the pull rod assembly (17).

3. Remove clevis pin from the bottom of master cylinder operating lever (26).

4. Turn the pull rod (18) to increase length until the clevis pin just enters the rod with the pedal shank (12) one fourth of an inch from the toe board and the bellcrank against its stop.

5. Reinsert clevis pin in the bottom of master cylinder operating lever (26) and tighten pull rod adjustable end nut (19).

This adjustment is important because if the master cylinder piston does not return to the end of the cylinder the brakes will drag.

"HARDER" BRAKE PEDAL ADJUSTMENT - All Models

The brake control cylinder operating lever, (26), Figure l, has two holes for an adjustment in cases where a "harder" brake pedal adjustment is desired with a less sensitive brake action.

The factory standard adjustment utilized the left hole, see Figure l.

Changing the clevis pin of the master cylinder operating linkage from left hole to right hole will give a harder brake pedal with a less sensitive brake action.

Recheck brake pedal adjustment.

PEDAL PUSH ROD ADJUSTMENT

1. With brake control lever (10), Figure 1, against stop, loosen lock nut (15) and adjust push rod (16) until rear face is 1 l/4" from front end of push rod (14).

2. Tighten lock nut.

NOTE: This adjustment is important to obtain the proper mechanical follow up to the hydraulic operation of the rear brakes. The safety factor of having mechanical brakes following the hydraulic brake action is lost unless this adjustment is checked on every car whenever brake work or inspection is done.

BRAKE LINING WEAR - All Models

3 POINT ADJUSTMENT ON MODEL 40 PASSENGER AND 40 TRAVELER CAR BRAKES (FLOATING SHOES)

1. Primary shoe eccentric adjustment. Positions anchor end of the primary shoe.

2. Secondary shoe eccentric adjustment. Positions anchor end of secondary shoe. 3. Star wheel adjustment. Establishes the correct clearance between the brake linings and the brake drums after the eccentric adjustments have been made.

3. Star Wheel Adjustment

Establishes the correct clearance between the brake linings and the brake drums after the eccentric adjustments have been made.

2 POINT ADJUSTMENT ON MODELS 41, 43, 44, 45, 47,48 AND ALL COMMERCIAL CARS

1. Secondary shoe eccentric adjustment.
   Positions anchor end of all shoes.
2. Star wheel adjustment.
   Establishes the correct clearance between the brake linings and the brake drums after the eccentric adjustment has been made.

NOTE: An anchor pin adjustment is provided but should not be made unless all other adjustments have been properly performed and have failed to produce satisfactory results.

BRAKE LINING WEAR ADJUSTMENT - Model 40 Passenger Car, 40 Traveler

1. Jack up car so that all wheels are clear of floor.
2. Remove wheels.
3. Disconnect rear brake cables at cable lever toggle (22), Figure l, by removing clevis pins.
4. Remove inspection hole covers from the brake drums and brake backing plates.
. Insert a .010" feeler gauge between the drum and the upper end of the lining of primary or front shoe.

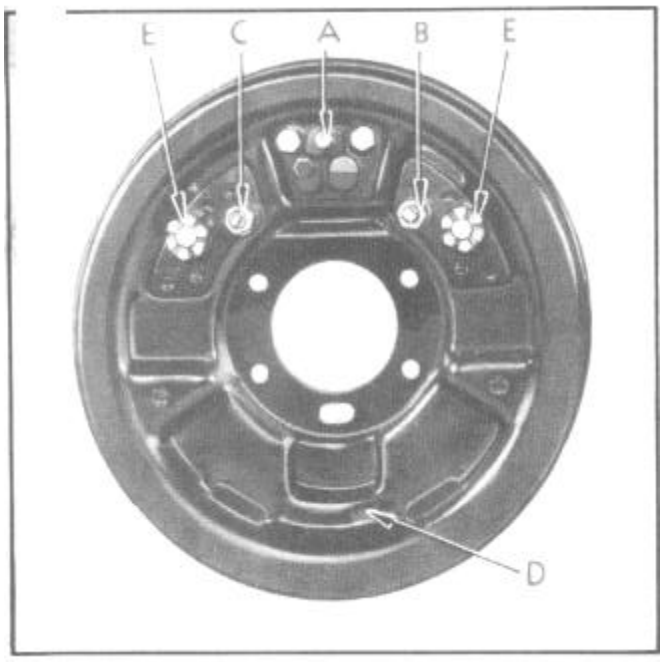


Figure 10--Brake Backing Plate - Floating Shoe - Double Anchor Brake - Model 40 Passenger and 40 Traveler

A. Bleeder valve hole.
B. Eccentric and lock nut (primary or front shoe).
C. Eccentric and lock nut (secondary or rear shoe).
D. Adjusting hole.
E. Anchor link.

6. Loosen eccentric lock nut (B), Figure 10.
7. Turn the eccentric in direction of forward wheel rotation until feeler gauge is just snug.
8. Hold eccentric in position and tighten lock nut.
9. Repeat the above adjustments 5-6-7-8 on the secondary or rear shoe by means of adjusting eccentric (C).
10. Expand the lower ends of the shoes against the drum by turning the adjusting screw with brake adjusting tool J 1028 inserted through the slotted hole (D). Move outer end of the tool toward the center of the backing plate until the drum can just be turned by hand.
11. Pull the hand brake lever two notches from full release or until a l/8" clearance is obtained between the hand brake control lever (10), Figure l, and the end of the slot in the lever guide plate.
12. Pull the cables tight and adjust the ends so that the clevis pins just enter holes in the toggle (22), Figure 1.
13. Release the hand brake.
14. Back off the adjusting screw through the slot (D), Figure 10, by moving the outer end of the tool away from the center of the backing plate until the drum is just free of the lining drag.
Be certain to back each screw off by the same number of turns.
15. Replace the adjusting screw hole covers and brake drum hole covers.
16. Reinstall the wheels and lower the car.
17. Test for operation on a level road. Do not test on the side of a crowned road.

COMPLETE BRAKE ADJUSTMENT - Model 40 Passenger Car, 40 Traveler

The following complete brake adjustment and lubrication procedure is to be followed in cases where an adjustment for wear does not give satisfactory results or when relining is necessary or new shoes are being installed.

NOTE: During all inspection or disassembly of brakes the hydraulic part of the system should be left intact so that bleeding of the lines will not be necessary.
1. Install wheel cylinder clamps on all wheel cylinders, see Figure 7.

CAUTION: Do not depress the brake pedal at any time the brake drums are not in place.

2. Remove, clean, and inspect all drums and shoes.
3. Remove links (E), Figure 10, from backing plates.
4. Clean thoroughly all of the brake parts and apply a thin film of Bendix Lubri-Plate lubricant to--
Hand brake cable ramps
Shoe support ledges (on backing plates) Eccentrics
Anchor link side (rests against backing plate reinforcement)
All points where there is a frictional contact.
5. Replace anchor links (E) felt seal and spring washers. Adjust anchor link nuts so that the links are free to turn with all side play removed. Install cotter pins on nuts.
6. Disconnect hand brake cables at equalizer bar.
7. Clean the exposed portion of all hand brake cables and then pull the cable thru conduit from the wheel end to expose that part of cable sheathed by conduit. Clean this portion of cable and lubricate freely with Bendix Cable Lubricant.
8. Push cable into conduit and after shoes have been reinstalled connect cable to shoe operating lever (12), Figure 12, leaving adjustable yoke end of cable disconnected.
9. To connect brake cable to shoe operating lever, move cable return spring away from cable end and place end into groove at end of operating lever.

NOTE: After cable is in place allow cable return spring to return against the lever to hold cable in place

10. Before installing new shoes, turn the primary and secondary shoe eccentrics so that the high side of the eccentric is away from the anchor link.
11. After installing shoes and shoe parts, remove adjusting hole cover from backing plate at each wheel and back off on the star wheel.
12. Install brake drums making certain that the front wheel bearings are properly adjusted and lubricated and that rear hub nuts are securely tightened with all cotter pins in place.
13. Adjust as in 1 to 16 on Page 8.

BRAKE LINING WEAR ADJUSTMENT - Models 41, 43, 44, 45, 47, 48 and All Comm.

1. Jack up all wheels clear of the floor.
2. Remove wheels.
3. Remove clevis pins that attach the rear wheel brake cables to the cable lever toggle (22), Figure 1.
4. Remove inspection hole covers from the brake drums and brake backing plates.
5. Insert a .010" feeler gauge between the drum and the lining of the secondary or rear shoe.
6. Loosen eccentric lock nut (B), Figure 11

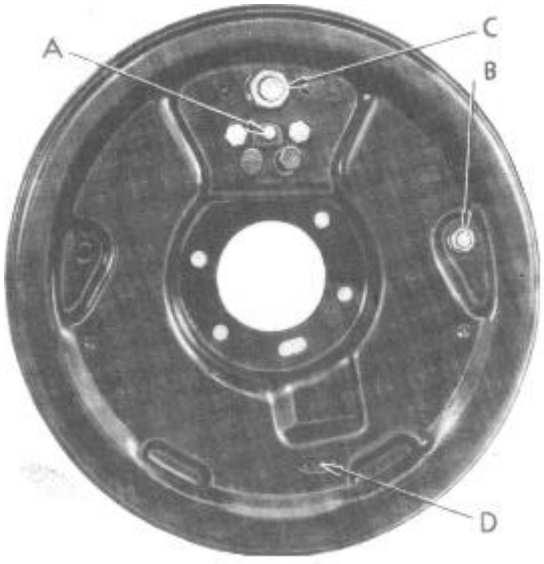


Figure 11--Brake Backing Plate
Single Anchor - Models 41, 43,
44. 45, 47

A. Bleeder valve hole.
B. Eccentric and lock nut.
C. Anchor.
D. Adjusting hole.

7. Turn the eccentric adjustment (B) in the direction of forward wheel revolution until the .010" feeler is just snug at the anchor (top) and at the adjusting (lower) ends of the secondary shoe.
8. Hold eccentric in position and tighten eccentric lock nut.

NOTE: The clearance at both ends of the secondary shoe should not vary more than .003".
If the variance is greater than .003" it will be necessary to relocate the anchor pin.
If there is slight clearance variation it is desirable that the clearance at the anchor end be less than at the adjusting end.

CAUTION: Do not adjust the anchor pin unless this inspection shows it necessary.

9. Expand the brake shoes tightly against the drums by turning adjusting screw with brake adjusting tool J 1028 inserted through the slotted hole (D) moving outer end of adjusting tool toward the center of the backing plate until the drums can just be turned by hand (moving tool in opposite direction releases shoe).
10. Pull hand brake lever two notches from full release or until l/8" clearance is had between the brake control lever (10), Figure l, and end of slot in lever guide plate.
11. Pull cables tight and adjust the ends so that clevis pins just enter the holes in the toggle (22), Figure l.
12. Release hand brake.
13. Back off adjusting screws through slot (D), Figure 11, until brake drum is just free of a lining drag.

NOTE: Back off each screw the same number of turns.

14. Replace adjusting hole covers on the brake drums and backing plates.
15. Reinstall wheels and lower the car.
16. Test for operation on a level road. Do not test on the side of a crowned road.

Tools Used
Brake eccentric lock nut wrench J 615.
Brake shoe feeler gauge HM 20001.
Brake adjusting tool J 1028.
Brake anchor pin nut wrench J 784.

COMPLETE BRAKE ADJUSTMENT - Models 41, 43, 44, 45, 47, 48 and All Comm.

See adjustment 8 under heading of "Brake Lining Wear Adjustment" and if necessary adjust anchor pin as follows:
At all four wheels loosen the anchor pin nut one turn and tap anchor pin slightly in necessary direction with a soft hammer, turning the eccentric in the direction of forward wheel rotation to give the specified clearances of .010" at the adjusting screw end and .010" at the anchor end of the shoe against which the eccentric operates. Tighten the anchor pin nut as tight as possible with a 16" wrench. Tighten eccentric lock nut.

BRAKE SHOES AND MOUNTINGS DISASSEMBLY - Model 40 Passenger and 40 Traveler

1. Place wheel cylinder clamps on wheel cylinders. Figure 7.
2. Remove brake shoe to anchor pin primary spring (4) Figure 12, secondary spring (5) and brake shoe springs (primary and secondary) (6).
3. Remove brake shoe cable lever strut (10).
4. Remove brake shoe hold down spring cups (8) springs and spring pin (7).
5. Remove brake adjusting screw spring (14) and screw (13).
6. Remove shoes (l) and (2).
7. Remove anchor links (9) by taking off nuts and spring washers on backing plate.
8. Remove eccentrics (11) by taking off nuts on backing plate.
9. On rear brakes only remove brake shoe cable lever by sliding end of cable out of slot at the lower end.
10. If necessary to remove wheel cylinders, disconnect hose at frame bracket, remove two cylinder mounting bolts and withdraw cylinder and hose with cylinder clamp in place.
To reassemble reverse order of removal.
Wash and thoroughly clean all parts and then lubricate.

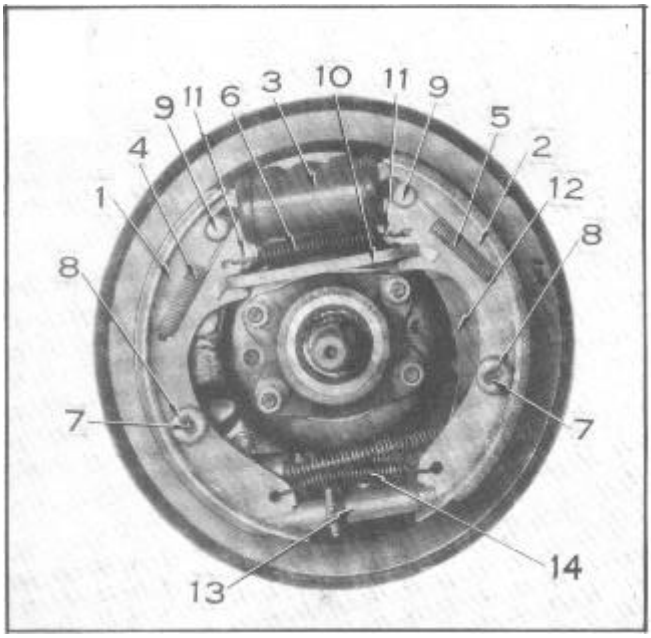


Figure 12--Floating Type Shoes - Model 40 Passenger and 40 Traveler

1. Primary Shoe
2. Secondary Shoe
3. Wheel Cylinder
4. Brake Shoe to Anchor Pin Spring--Primary
5. Brake Shoe to Anchor Pin Spring--Secondary
6. Brake Shoe Spring--Primary and Secondary
7. Brake Shoe Hold Down Spring Pin
8. Brake Shoe Hold Down Spring Cap
9. Brake Anchor Link
10. Brake Shoe Cable Lever Strut
11. Brake Eccentric
12. Brake Shoe Cable Lever
13. Brake Adjusting Screw (Star Wheel)
14. Brake Adjusting Screw Spring

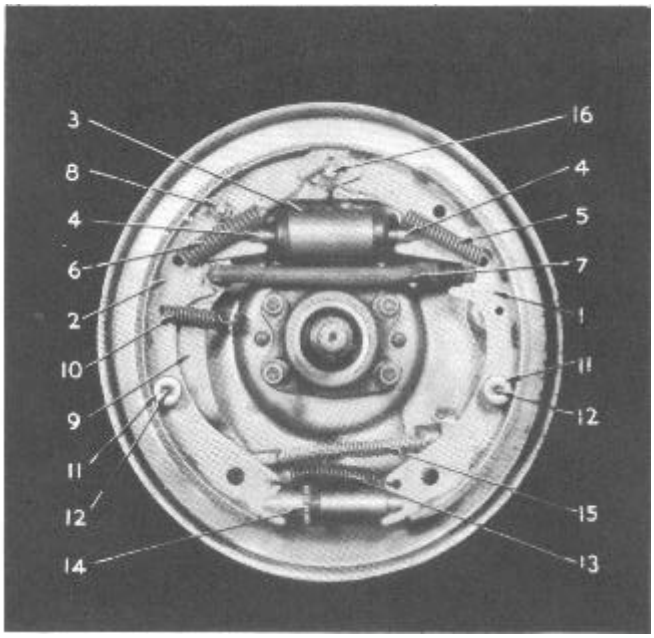


Figure 13--Single Anchor Brake-Rear Models 41,43,44,45,47,48 and all Commercial

1. Primary Shoe
2. Secondary Shoe
3. Wheel Cylinder
4. Shoe to Cylinder Link
5. Shoe to Anchor Pin Spring--Primary
6. Shoe to Anchor Pin Spring--Secondary
7. Shoe Cable Lever Strut
8. Shoe Cable Lever to Shoe Pin
9. Shoe Cable Lever--Rear Brake
10. Shoe to Anchor Bracket Spring
11. Shoe Hold-down Spring Cup
12. Shoe Hold-down Spring Pin
13. Adjusting Screw Spring
14. Adjusting Screw
15. Rear Brake Cable
16. Anchor Pin

BRAKE SHOE AND MOUNTING DISASSEMBLY - Models 41, 43,44,45,47,48 and all Commercial

1. Place wheel cylinder clamps on wheel cylinders. Figure 7.
2. Remove retracting springs for both primary shoe and secondary shoe (5 and 6) and anchor bracket spring (10) (Figure 13).
3. Remove brake shoe hold down spring cups (11) springs and spring pins (12).
4. Remove shoes (l) and (2).
5. Remove brake adjusting screw spring (13) and screw (14).
6. Remove shoe to cylinder links (4) and shoe cable lever to shoe pin (8).
7. Disconnect rear brake cable (15) shoe cable lever (9) shoe cable lever strut (7).
8. Remove eccentric by taking off nut (B), Figure 11.
9. Remove wheel cylinder by disconnecting hose at backing plate. Remove two cylinder mounting bolts and withdraw cylinder with cylinder clamp in place.

To reassemble reverse order of removal.
Wash and thoroughly clean all parts and then lubricate.

BRAKE LINING - All Models

The Hudson primary shoe lining is constructed to give a slightly harder pedal at the low end and thereby minimizing the tendency of the brakes grabbing on slow speed.

Different linings have different characteristics and when relining brakes this should be kept in mind otherwise it will produce a different brake operation on one wheel than another with a tendency of the car to pull sidewise.

1. Do not attempt to wash and use greasy linings as they cannot be cleaned.
2. Linings that are chipped should be replaced.
3. Lining surfaces not accurately ground should be replaced. Lining surfaces must fit squarely and evenly against the drum.
4. Linings held with loose rivets should be replaced.
5. Lining ends not properly chamfered should be replaced.

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 in-

BRAKE SHOE SETS LINED

New brake shoes with the proper lining; accurately fitted and ground are available for replacement of shoes with worn linings.

The use of these new brake shoe assemblies makes it possible to reline brakes in a very short time. The time of removing old linings, installing new linings, etc. is saved.

There is no exchange allowance for the old shoes.

POINTS OF CAUTION - All Models

Oil or grease should never come in contact with the brake linings.

All surplus grease after filling the wheel hubs must be removed.

No oil or grease should be used on the cams or pins of the brakes and the shoes should be free of any oil or grease.

The drums should be inspected for oil or grease and it should be removed if present. This applies particularly in cases where the wheel hub assemblies have been removed and are being remounted.

LINKAGE LUBRICATION

A thin film of graphite grease should be applied to parking brake cable connections; brake eccentrics; anchor links and all moving or possible friction contact points.

In particular a film of graphite grease should be placed on the brake shoe support ledge on the backing plate as in the course of time an accumulation of rust may interfere with a free brake
shoe action. This lubrication has to be done with the hubs and drums removed and with brake cylinder clamps in place. Slide the brake shoes away from the backing plate.

MAINTENANCE HINTS

BRAKE PEDAL GOES TO FLOOR BOARD

If brake pedal goes to floor board the cause is--

1. Normal wear of lining.
2. Leak in hydraulic system.
3. Air in hydraulic system.
4. No fluid in master cylinder.

Remedy--

1. When a driver states that 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. Shoes should be set to .010" clearance. See Page 9. Brake drum should be cool. Do not disturb brake anchor pin settings on single anchor brakes.

2. 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 then remove the master cylinder and check the bore for scores or scratches. See Page 4.

3. Air in the hydraulic system will cause a springy or rubbery action of the pedal. Should a sufficient quantity 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--See Page 6.

4. The fluid level in the master cylinder should be checked. If the tank ever becomes empty then air will get into the system and make it necessary to bleed the hydraulic system. (See Page 6.)

ALL BRAKES DRAG

Cause--

1. Mineral Oil in system.
2. Port hole in master cylinder is closed. (See Page 4.)

1. The use of any oil having a mineral base (engine oil; kerosene 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.

The system will have to be thoroughly flushed out with clean alcohol and then refilled with Genuine Hudson Hydraulic Brake Fluid.

2. The port hole (3) Figure 4 must not be blocked by the piston cup not returning to its proper release position. This port hole is a relief port and the pressure in the hydraulic system will gradually build up and cause the brakes to drag.

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 .010" clearance.
3. See "All brakes drag."
4. Tighten wheel bearings.
5. Remove dirt and flush out entire system with alcohol.

CAR PULLS TO ONE SIDE

Cause--

1. Oil soaked lining.
2. Brake shoes set incorrectly.
3. Brake backing plate loose.
4. Brake linings are of different makes and, therefore, have different characteristics.
5. Tire not inflated correctly.
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. See Page 10.

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.

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. Adjust brake shoes. See Pages 8-9.

3. A loose backing plate will allow the brake assemblies to shift on their locating bolts. These locating bolts determine the exact centers and any shift causes an unequal brake efficiency.
Tighten backing plates and readjust the brake shoe.

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.

See "Brake Lining" Page 10.

Genuine Hudson Brake Lining (in sets) give positive assurance of the best engineering skill to give the best results.

5. Check front tires for proper inflation and approximate equal wear.

6. Check front wheel castor--See "Suspension,' section.

7. Adjust wheel bearing.

8. Dirt or foreign matter on the face of the lining. Seriously scored 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 Pages 8-9).
2. Air in hydraulic system. See "Brake Pedal goes to Floorboard" on Page 11 Remedy Number 3.

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 a partial contact with brake drum.
5. Pedal rod adjustment incorrect.

Remedy--

1. Adjust brake shoes. (Pages 8-9)
2. The use of the incorrect grade of brake lining will cause it to lose its gripping power in a short time making an extra heavy pressure necessary on the brake pedal in an attempt to make up for that lost gripping power the lining should be giving.
3. Oil or grease that has been on the brake lining for the length of time necessary for it to soak in cannot be removed by washing. Replace brake lining that has oil or grease on it.
4. Remove high spots.
5. Adjust pedal rod (Pedal Push Rod Adjustment Page 7).

LIGHT PEDAL PRESSURE BUT SEVERE BRAKES

Cause--

1. Brake shoes incorrectly adjusted.
2. Loose backing plate.
3. Grease soaked lining.
4. Improper lining.

Remedy--

1. Adjust brakes (Pages 8-9).
2. Tighten backing plates.
3. Replace brake lining (Page 10).
4. Install Hudson lining.

BRAKES SQUEAK

Cause--

1. Backing plates bent or shoe twisted.
2. Dirt imbedded in lining.
3. Lining rivets loose or lining not held tight against the shoe at the lining ends.

Remedy--

l. Straighten or replace damaged parts.
2. Remove all dirt or replace lining. Replace lining. Replace drums that are seriously scored.
3. Replace rivets.

HILL HOLD OPTIONAL EQUIPMENT - All Models

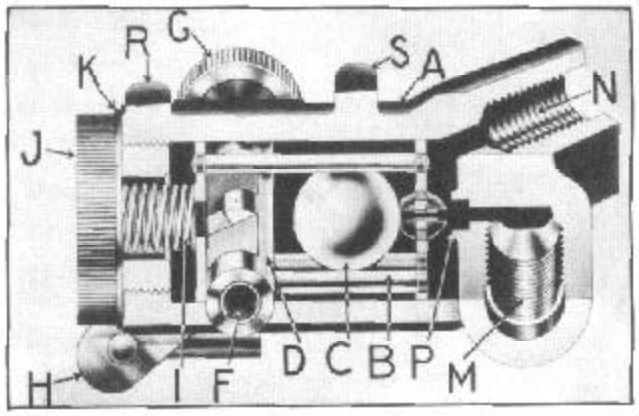
The Hill Hold is designed to keep the brakes applied and prevent the car from rolling backward when it is stopped on any up grade such as on a hill or in traffic.

The Hill Hold unit is a small cylinder attached to the hydraulic brake master cylinder with a valve actuated by depressing and releasing the clutch pedal.

Brake Fluid from the master cylinder passes through the Hill Hold cylinder enroute to the wheel brakes when the brake pedal is depressed, and returns through the same course when the brake pedal is released. When both the clutch and the brake pedals are depressed, the Hill Hold valve (actuated by the clutch pedal) holds the brake fluid in the lines and keeps the brakes applied, after the brake pedal has been released. The brakes will remain applied as long as the clutch pedal is depressed.

The car can be started on an up grade by normal operation of the clutch pedal and accelerator without any roll back.

Automatic clutch control operation holds the clutch pedal in a clutch engaged position, therefore, it is necessary to depress the clutch pedal with the foot in order to have the Hill Hold take effect. The reason is that the clutch pedal operates the Hill Hold and the pedal must be depressed for it to function.



DESCRIPTION

Figure 14--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 P. Valve seat
R. Boss
S. Boss

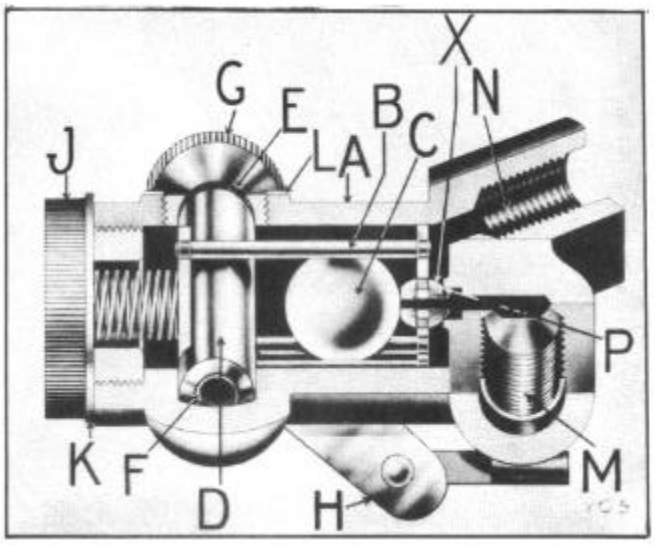


Figure 15--Hill Hold with Clutch Pedal Depressed

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

HILL HOLD VALVE CONSTRUCTION

The valve body (A), Figure 14, has an inlet (M) connected direct to the master cylinder also it has an outlet (N) connected to the wheel cylinder lines.

The valve cage (B) with its ball (C) is free to slide in the Hill Hold. It is pressed toward the valve seat (P) by the spring (I) but it can be pulled away from the seat by the camshaft (D) when the camshaft is rotated by lever (H). This lever is connected to the clutch pedal linkage.

HILL HOLD VALVE OPERATION

The brake pedal is depressed and fluid is forced from the master cylinder into (M) thru the valve seat (P) and out of (N) to the wheel cylinders. This applies the brakes.

If the clutch pedal had been depressed before the brake pedal the parts would have been in the position shown in Figure 15. 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.

Now with the brakes applied and the clutch pedal depressed (it makes no difference which occured first) the foot can be removed from the brake pedal and the fluid still will be retained in the
wheel cylinder, because the cage (B) is on its seat (P) and the ball (C) blocks the return of the fluid thru the cage valve (X).

When the clutch pedal is released the cage (B) is moved to the left (forward) by the rotation of the camshaft (D) so that the fluid is free to return to the master cylinder from (N) to (P) to (M).

NOTE: The ball (C) is free to roll in the cage (B). The ball will always roll to the back against seat (X) whenever the car is heading up grade and the Hill Hold will operate. The ball will always roll to the front of its cage and leave the passage open whenever the car is heading down grade. Hill Hold does not operate.

The Hill Hold will prevent a roll back of the car when starting on an up grade.

HILL HOLD LEVELING

The Hill Hold unit must be level in order that the ball (C) be on its seat at the back of cage (B) when the car is heading up grade and off its seat when the car is heading down grade.

The Hill Hold unit must also be level so that the ball is rolling forward when the brakes are applied and the car is moving forward.
(See "Installation on Car" Page 14.)

HILL HOLD TO CLUTCH PEDAL ROD ADJUSTMENT

The rod that connects the clutch pedal shaft to the Hill Hold must be adjusted to time the applying and releasing of Hill Hold with the timing of the clutch engagement and disengagement.

The brakes must not be delayed in disengaging after the clutch is engaged.
The car must not roll backward when the clutch is engaged as the car is starting up grade.

See "Hill Hold Linkage Adjustment" Page 15.

HILL HOLD REMOVAL FROM CAR

1. Disconnect hill hold unit to frame tee hydraulic line at outlet connection.
2. Remove cotter pin (T), Figure 16, washer (P), spring (0) and remove rod from valve lever (N).
3. Remove mounting bolt (C) and take off hill hold unit.

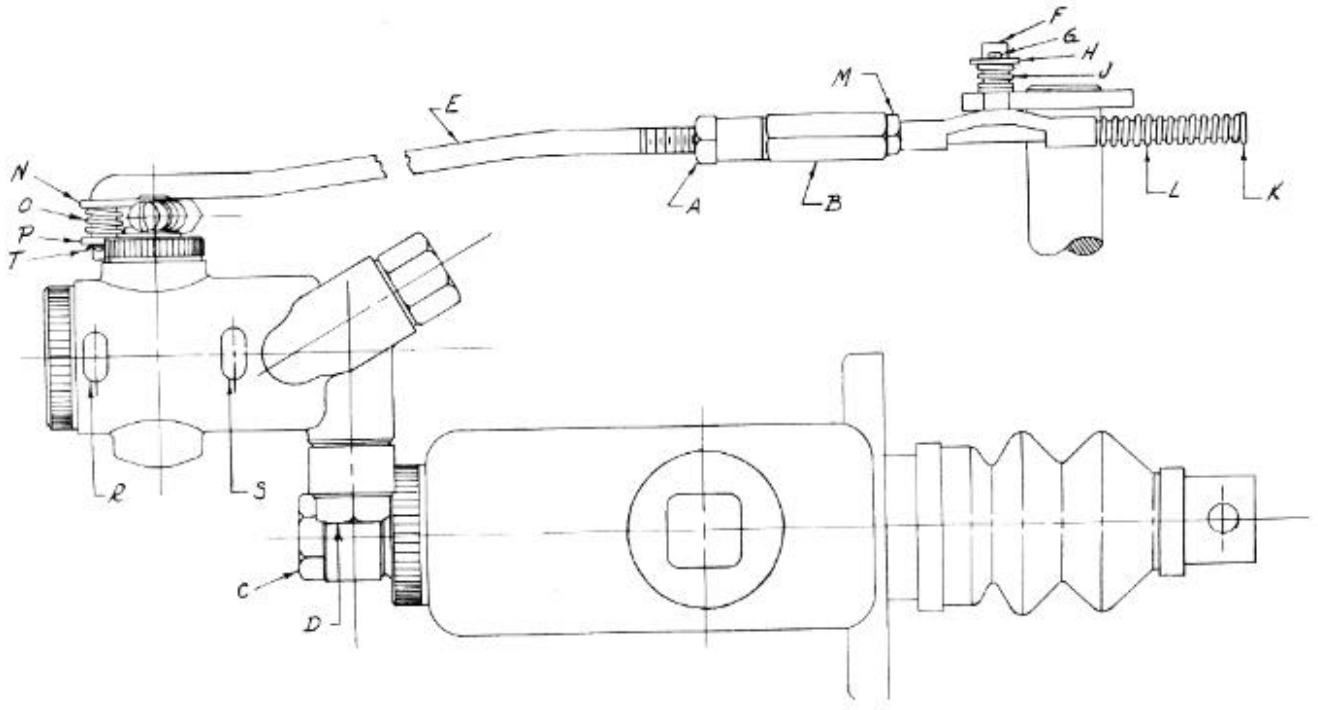
DISASSEMBLING HILL HOLD UNIT

1. Using a center punch mark the shaft and the lever (H), Figure 15, so that they can be put back in the same position.
2. Remove lever (H) by loosening lock screw.
3. Remove head (J), gasket (K), and spring (I).
4. Remove camshaft plug (G), camshaft (D), and spring (F) can then be removed.
5. Remove ball cage (B) and ball (C). Clean and inspect all parts, in particular the valve seat (X), Figure 14, in the cage.

The valve seat (X) is rubber and will be harmed by the use of mineral oils in the brake system just the same as piston cups. Use only-- Genuine Hudson Hydraulic Brake Fluid.

Reassembling Hill Hold Unit.

1. Insert ball cage (B), Figure 15, with the two large ball rails on the under side of the camshaft (D).
2. Insert spring (F) in camshaft (D) and insert both in the housing. Make certain that spring (F) remains in place in the shaft.
3. Install plug (G).
4. Replace lever (H) being certain it is in the same position as originally on the camshaft (D) and pointing down.
5. Use new gasket on head (J) and put spring (I) in the head and install in the body.



A. Hill Hold rod connector lock nut
B. Hill Hold rod connector
C. Brake master cylinder outlet fitting bolt
D. Hill Hold to master cylinder fitting bolt
E. Hill Hold rod - valve end
F. Hill Hold rod guide and pin assembly
G. Hill Hold rod guide cotter pin
H. Hill Hold rod guide washer
J. Hill Hold rod guide pin to clutch lever spring
K. Hill Hold rod spring end
L. Hill Hold rod spring
M. Hill Hold rod connector lock nut
N. Hill Hold valve lever
0. Hill Hold rod to valve lever spring
P. Hill Hold rod to valve lever spring washer
R. Leveling Boss
S. Leveling Boss
T. Hill Hold rod to valve lever cotter pin

HILL HOLD INSTALLATION

(Cars equipped with Hill Hold at factory.)

The entire installation of the Hill Hold must be made with the car resting on a level floor.

1. With unit in place insert bolt (C), Figure 16, and draw bolt snug but not tight.
2. Bolt (D) should also be snug but not tight so as to permit accurate leveling of the Hill Hold unit.
3. Lay a small spirit level on boss (R) and boss (S).
4. Turn unit on bolt (D) until the bubble in spirit level is in zero position and tighten bolt (D) securely. Remove spirit level.
5. Place the spirit level crosswise on boss (R) and swivel the unit on bolt (C) and tighten bolt securely and remove level.
6. Reinstall hill hold to frame tee brake line.
7. Assemble rod (E) in valve lever (N) and install spring (0), washer (P) and cotter pin (T).
8. Fill Master Cylinder Reservoir and bleed lines at all four wheel cylinders as described on Page 6.

HILL HOLD ACCESSORY KIT INSTALLATION

Cars to be equipped in the field.

The installation of a Hill Hold unit on cars not equipped with one at the factory requires changes in the brake lines and clutch linkage.

1. The car must be setting level. Proper installation cannot be made with the car on an incline or grade.
2. Remove the short tube that connects the master brake cylinder to the tee junction on the frame side member.
3. Assemble the Hill Hold unit to the master brake cylinder by inserting bolt (C), Figure 16, snug but not too tight. Bolt (D) should also be snug but not tight so that the Hill Hold unit can be accurately leveled.
4. Hill Hold unit body should be above the master brake cylinder outlet hole.
5. Place a small spirit level on boss (R) and boss (S).
6. Turn unit on bolt (D) until the bubble in spirit level is in zero position and tighten bolt (D) securely. Remove spirit level.
7. Place the spirit level crosswise on boss (R) and turn the unit on Bolt (C) until the unit is level and tighten bolt (C) securely. Remove level.
8. Recheck the leveling instructions in 5 and 6.
9. Install the new hill hold to frame tee brake tube included in the kit. Tighten all fittings.
10. Recheck the leveling instructions in 5-6-7-8.
11. Fill master brake cylinder with Hudson Hydraulic Brake Fluid and bleed the brake lines at all four wheel cylinders (See Page 6).
12. Wipe all connections dry.
13. Hold the brake applied for one minute and then examine connections for leaks.
14. Install operating rod assembly threading rod (E) into connector (B) for approximately one half of the thread length and assemble pin (F) to end lever on clutch cross shaft with anti-rattle spring (J), washer (H) and cotter pin (G).
15. Install hook end of operating rod (E) to valve lever (N) of hill hold unit and secure with spring (O),

washer (P) and cotter pin (T).

16. Place car heading up incline and apply brakes and disengage clutch.

17. If car rolls backward when attempting to start forward by engaging the clutch while depressing the accelerator, shorten rod (E) by backing off nut (A) and turning sleeve (B) so that it screws onto rod (E).

18. If the brakes are delayed in disengaging as the clutch is engaged, lengthen rod (E) by turning the sleeve (B) off rod (E) one or two turns as necessary. Tighten nut (A).

19. When the hydraulic hill hold is properly adjusted the brakes will release as the clutch engages.

HILL HOLD LINKAGE ADJUSTMENT

The clutch rod (E), Figure 16, connects at the Hill Hold unit to the lever (N) and is held by washer (P), cotter pin (T) and anti-rattle spring (0). At the clutch shaft end, rod (E) screws into connector (B) and is held by lock nut (A). Spring rod (K) with spring (L) threads into connector (B) and is held by nut (M). Pin (F) on rod guide passes through clutch pedal shaft lever and is held by spring (J), washer (H) cotter pin (G).

Adjust the length of clutch rod (E) by loosening lock nut (A) and turn the sleeve (B) to either shorten or lengthen it.

Place car heading up an incline and apply brake and disengage clutch.

With the engine running engage the clutch and depress the accelerator.

If the car rolls backward before it has time to start to pull forward then the Hill Hold rod needs shortening so that Hill Hold will operate and keep the car from rolling backward.

Shorten rod (E), Figure 16, by backing off nut (A) and turning sleeve (B) so that it screws into rod (E).

With the engine running engage the clutch and depress the accelerator. If the brakes hold and car does not roll backward but the brakes hold too long causing the car to pull against brakes that are still holding then the Hill Hold rod needs lengthening so that the Hill Hold will not delay or retard the car from moving forward.

Lengthen rod (E) by turning the sleeve (B) off rod (E) one or two turns whichever is necessary. Tighten nut (A).

HILL HOLD KIT CONTENTS

The Hill Hold Kit shipped for any car contains the following installation on parts:

1 Hill Hold Assembly

1 Hill Hold valve rod, spring and guide assembly (connection to clutch shaft)

1 Hill Hold to frame tee tube assembly

1 Master cylinder outlet fitting bolt gasket - small

1 Master cylinder outlet fitting bolt

1 Master cylinder outlet fitting bolt gasket large

INDEX

FRONT SUSPENSION

FRONT SUSPENSION SPECIFICATIONS

Caster	0° preferred-+1/4° to-1/4° permissible
Camber	l/4° to 3/4°
Maximum variation between Right and Left	
Wheel Caster or Camber	1/2°
Toe-in	0-1/16"
Pivot Pin Inclination	4° 36′
Toe-out	+ or - 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
Tie Rod Adjustment-To Increase	Turn in direction of forward wheel travel
Tie Rod Adjustment-To Decrease	Turn in opposite direction

FRONT SUSPENSION

The 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 the possibility of road variations causing "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 the car to 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 makes for easy steering because it is possible to eliminate many frictional points otherwise not possible with off center steering control.

OPERATION OF FRONT SUSPENSION

The vertical or up and down movement of the front wheels on the road is taken care of by--

Upper Support

1. The steering spindle is bolted to the brake backing plate.
2. The steering spindle support is attached to the spindle by a hardened and ground steel pivot pin which has seven ball bearings at the top to carry the thrust load.
3. The steering spindle support is held at the bottom by a pivot pin riding in a hardened and ground steel bushing. At the top it iS held by an eccentric bushing which is clamped in a centralized position by a lock screw.

NOTE: 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.

4. 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.

Lower Support

5. The lower support arms carry the vertical movement of the front wheels and they are joined to the steering spindle support by a pivot pin and nut which rides in a hardened and ground steel bushing.
6. 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 and a shim for adjustment of spring tension.
7. In the center of the coil spring is the shock absorber operating in a vertical plane.
8. The lower support arms fasten to a pivot which is held to the front frame cross member and rides in hardened and ground steel bushings.

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 it limits the upward movement of the suspension.

FRONT WHEEL SUSPENSION BUSHINGS

The attaching points of the front wheel suspension are:

See 13 Figure 8 - Lower support arm pivot
17 Figure 8 - Lower support arm to spindle support pivot
22 Figure 11 - Upper support arm pivot bushing--Front
23 Figure 11 - Upper support arm pivot bushing--Rear
24 Figure 11 - Eccentric bushing

These points are fitted with hardened steel threaded bushings which provide means for adjustment.

The clearance is from .012" to .026" between threaded pins and their bushings. This provides all necessary clearance for lubrication; the rolling action that is necessary; the side adjustment and sufficient freedom of action for movement.

The pivot pins and their hardened and ground steel bushings being threaded into one another are tied together even if one fits loosely in the other due to wear.

Wear and noise will not be experienced if the bushings are properly lubricated and if lubrication is neglected and they become noisy they should not be replaced. Adjustment will eliminate noise.

CAUTION: Never use lead or any other metal substance to reduce thread clearance.

LUBRICATION

The threaded bushings used in the front end suspension require thorough lubrication 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 1000 miles.

A grease pressure relief valve is installed in the expansion plug at the bottom of the steering pivot bolt--see Fig. 15.

GENERAL INSPECTION

Make the following inspection before starting any adjustments:

1. Inflate all tires to the proper pressures.
2. Check front wheel bearing adjustment and if incorrect adjust it. See Chassis Section.
3. Check for looseness at the steering spindle pivot pin and if it is excessive it must be corrected before alignment readings have any value. See Page 10.
4. Check for looseness at drag link and connecting rod ends. Adjust drag link if necessary. See Steering Section. Replace connecting rod ends.
5. Check for run out of wheels and tires and correct if necessary. See Chassis Section.
6. Check the wheels and tires for balance and correct if necessary. See Chassis Section.
7. Check shock absorber action and correct if necessary. See Page 23.

FRONT END ALIGNMENT

There are five factors that comprise the proper adjustment of the front wheels and all are related and dependent on each other.

Caster is the backward tilt of the steering spindle pivot pin usually measured in degrees.

Camber is the outward tilt of the front wheels at the top and usually measured in inches or degrees.

Toe-in is the drawing together of the front wheels at the front.

Pivot pin inclination is the inward tilt of the steering spindle pivot pin at the top.
Steering Geometry is the relationship between the front wheels on turns controlled by the amount of steering arm inclination inward at the back.

A wheel alignment, therefore, necessitates a general check of all these factors.

JIFFY CASTER AND CAMBER GAUGE

The front end alignment can be checked with the jiffy caster and camber gauge with turning angle plates available through the Hinckley-Myers Company of Jackson, Michigan.

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. Wooden blocks l-1/4" thick should be placed under the rear wheels to compensate for the height of the turning angle plates.

See "Checking Caster Angle" for procedure and "Checking Camber Angle" for procedure.

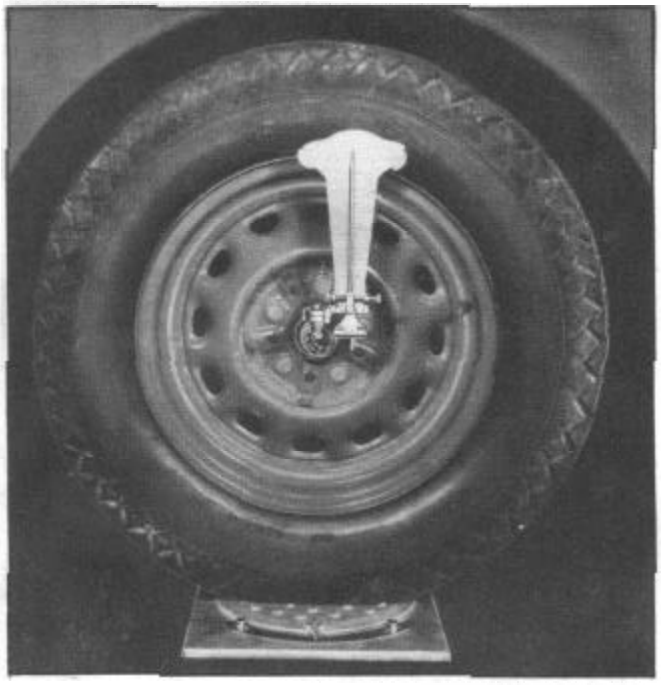


Figure l--Jiffy Gauge and Turn Plate in Starting Position

CHECKING CAMBER ANGLE

Camber is the outward tilt of the wheels at the top and brings the bottom of the wheel more nearly under the load.

Always make the "General Inspection," on page 2, before checking or adjusting camber angle.

The weight of the car must be on the wheels and the tires properly inflated. The car must also be level crosswise. Always rock the car back and forth several times and allow it to settle before checking the camber. Do not rock at the bumper but at the side of the car. General inspection check number 5 is the wheel and tire run-out on page 2 and the place where the run-out chalk mark is the heaviest on the tire should be placed toward the front or rear of the car.

The amount of toe-in depends upon camber and, therefore, the toe-in should be considered every time camber is checked or corrected. See "Checking Toe-in" on page 5.

No camber correction should be made before the caster angle and pivot pin inclination have been checked.

See "Camber, Caster, and Steering Pivot Pin Correction" for adjustment and Figure 2 for details of checking camber angle.

Figure 2--Jiffy Gauge-Checking Camber

CHECKING PIVOT PIN INCLINATION

Pivot pin inclination is the inward tilt of the pivot pin at the top.

Before checking pivot pin inclination always perform the seven operations under "General Inspection" on page 2.

When checking the pivot pin inclination angle it is necessary that all readings be taken with the weight of the car on the wheels, tires properly inflated and the car level crosswise. Rock the car sidewise several times before starting any check-- do not rock the car at the bumper.

Pivot pin inclination should be 4° 36'. The difference from one side to the other should not be over l/20. See Figure 22 also Camber, Caster, Pivot Pin Inclination on page 4.

Pivot pin inclination can be checked very accurately with tool J 800-A, Figure 2, used along with two full floating turn tables.

Incorrect pivot pin angle indicates bent suspension arms of steering spindle supports.

CHECKING CAMBER AND PIVOT PIN INCLINATION WITH JIFFY GAUGE

1. Set wheels in straight ahead position and adjust scales on turning angle plates to zero.
2. Remove outer and inner hub caps from front wheels.
3. Remove left hand spindle nut and washer and install jiffy caster and camber gauge as shown in Figure 1 so that level bubble is between gauge lines when pointer is set at zero.
4. Turn the head of the jiffy gauge so that it is parallel to the axle as shown in Figure 2 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 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 l/4º to 3/4º positive. If camber is insufficient or reversed, check pivot pin inclination as follows:
5. Tu0rn the head of the jiffy gauge parallel to the wheel as shown in Figure 3 and turn wheels to left until pointer on left turning angle plate points to 25°.
6. Set pointer on zero and turn gauge on spindle until level.
7. Turn left wheel to right 25° and adjust level. The pointer reading on the top scale is the pivot pin inclination. This should be 4° 36'.

NOTE: If the pivot pin inclination and the camber are off in approximately the same amount (for example, camber 1/40°, pivot pin inclination 4°), 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 3/40; however, a decrease in caster, if pivot pins are not loose in the bushings, is not detrimental to steering unless an actual reverse camber exists.

CHECKING CASTER ANGLE

Caster is the angle formed by the backward tilt of the pivot pin at the top with a vertical line.
Before checking caster follow "General Inspection" on page 2.

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.

See "Camber, Caster, and Pivot Pin Inclination Correction" also Figure 2 for details of checking camber angle.

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.

LUBRICATION EFFECTS CASTER

The actual amount of caster a front end requires depends on the friction in the spindle pins, tie rod ends and the steering linkage. A well lubricated car requires less caster than one infrequently lubricated.

CHECKING CASTER WITH JIFFY GAUGE

1. Turn the wheels back to the straight ahead position and reset the jiffy gauge as in paragraph 3, see Figure l.
2. Turn the wheels to the right until the pointer on the left turn plate is at 25º, 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 (Figure 4). 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.
4. Repeat operations 3 to 7 and 1-3 above 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, Figure 3, and 25° to the left for the second caster reading, Figure 4.

The correct caster settings are as follows--

0° preferred with plus l/4° to minus l/4° permissible and should not vary more than 1/20 between both front wheels.

Figure 3--Jiffy Gauge-Checking Caster-First Position

CAMBER, CASTER AND STEERING PIVOT PIN CORRECTION

If camber is incorrect the inclination of the pivot pin should be checked--see Figure 22. Pivot pin inclination is 4° 36'.

If pivot pin angle is incorrect it indicates bent suspension arms or steering spindle supports which have a direct effect on the camber.

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.

If the camber and the pivot pin inclination are found to differ from the recommendations given in "NOTE," page 4, by approximately the same amount it is an indication that the camber and pivot pin inclination can be corrected with the camber and caster eccentric bushings.

Whenever the eccentric bushing is turned the caster, camber and pivot pin inclination must be checked as all three are affected by it.

It is seldom necessary to turn the eccentric bushing over a half turn to obtain 1/2° for camber and this half

Figure 4--Jiffy Gauge-Checking
Caster-Second Position

turn should be all that is ever necessary for camber adjustment and give a minimum of caster change.
If camber is increased, pivot pin inclination is decreased and if camber is decreased pivot pin inclination is increased.

NOTE: 1. Turning eccentric bushing into the support increases caster.

2. Turning eccentric bushing out of the support decreases caster.

3. One complete turn of eccentric bushing changes caster 1/2°.

4. First set caster to 0° preferred with 1/4° negative or l/4° positive permissible but in equal amounts on both wheels if possible but never over l/2° variation Right and Left.

5. Set camber with the least possible change of caster.

6. Set camber to l/4° to 3/4° with normal top of the frame horizontal.

CAUTION: Always rock the car back and forth several times and allow it to settle before checking or adjusting caster or camber or pivot pin inclination. The purpose of this is to relieve any tension in the front end suspension or in the tires.

Do not rock at the bumper but at the side of the car.

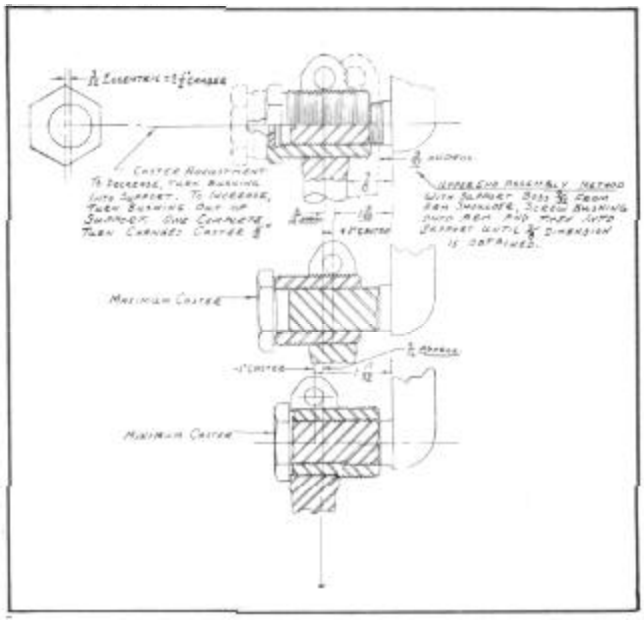


Figure 5--Caster Adjustment

CHECKING TOE-IN

Make the "General Inspection" on page 2 before attempting any check or adjustment of toe-in.

Toe-in is the setting or adjustment of the front wheels by means of tie-rods, so that the distance between the wheels is less at the front than at the rear. Camber tends to cause the wheels to run out or separate at the front and sufficient toe-in is necessary to compensate this tendency and make the wheels run straight.

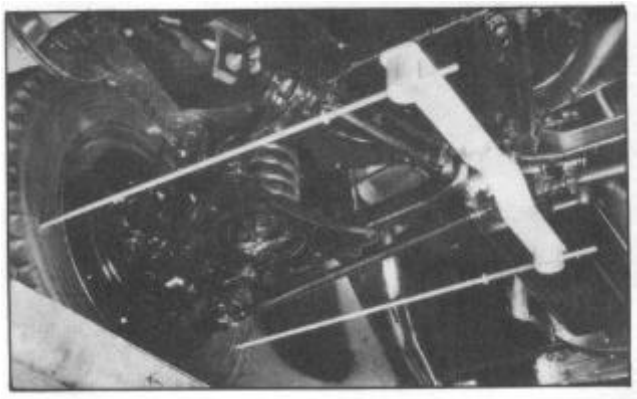


Figure 6--Checking Toe-In and Centralizing
Steering Center Arm with Tool J 1442

Accurate toe-in is of great importance in obtaining the maximum of tire life and must always be maintained within definite limits of 0" to l/16" measured on the complete car at the wheel rim.

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.

When making the adjustment or check the rear end of the center steering arm should be exactly at the center (crosswise) of the car. Use tool J 1442 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 underside 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. 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.

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 or the bottom of the wheel.

Toe-in is adjusted by means of the tie rods which are of equal length. Tie rod ends are removable-- see Tie Rod End, page 12.

NOTE: If the toe-in is seriously out it will indicate a possible bent steering spindle arm.

Toe-in must be corrected before checking toe-out on turns.

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.

STEERING GEOMETRY

Steering geometry or toe-out on turns is controlled by the movement and angularity of the tie rods.

TOE-OUT

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.

Toe-out of the front wheels should be as shown under “Adjustment of Steering Geometry".

The toe-out is checked by turning the wheels to the right or left, locating the inside wheel in a definite position.

Errors in the setting of the outside wheel are due to bent tie rods. When the tie rods are bent the wheels will not turn in their proper relation on curves. This will affect the toe-out and result in excessive tire wear. Straight ahead driving will not be affected. When the tie rods are badly bent they should be replaced with new ones. 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 tie rods or the steering arm.

CAUTION: Always rock the car back and forth several times before making any checks or adjustments. Do not rock at the bumper but at the side of the car.

ADJUSTMENT OF STEERING GEOMETRY

Steering geometry 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		Right Turn	
Left wheel	Right wheel	Left wheel	Right wheel
30°	25°	25°	30°

NOTE: The variation between the left and right wheel angle must not vary more than 30 minutes plus or minus.

SETTING STEERING ON DEAD CENTER - Figure 6

To properly set the center steering arm, disconnect the drag link at the pitman arm attach tool J 1442 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--see page 5.

STEERING GEAR HIGH POINT

The setting of the front wheels in a straight ahead position is given under "Steering Gear', group.

FRONT WHEEL SUSPENSION - REMOVING

If it should become necessary to remove the front wheel suspension for the replacement of a frame it may be done as follows:

1. Raise car and place stand jacks under inner ends of the lower support arms.
2. Remove wheel and hub assembly.
3. Remove brake backing plate and place so as not to injure the brake hose.
4. Remove steering arm using tool J 1373.
5. Remove shock absorbers.
6. Remove lower support arm pivot to frame bolts.
7. Raise car allowing coil springs to expand and remove the springs.
8. Remove upper support arm pivot to frame bolt nuts.
9. Remove front wheel suspension assembly.

FRONT WHEEL SUSPENSION - REPLACING

1. Replace assembly and fasten upper support arm pivot to frame cross member securely.
2. Replace spring making sure flat end is to the top and rests in the frame cross member. Also be sure open end of spring rests in the stamped recess in the lower support arm.
3. Lower car which will compress spring and replace lower support arm pivot to frame bolts and tighten securely.
4. Replace shock absorber.
5. Replace steering arm.
6. Replace backing plate.
7. Replace wheel and hub assembly.
8. Remove car from stand jack and lower car to floor.
9. Adjust caster, camber and toe-in.

RIDING HEIGHT

Where the car does not seem to be level and a check of the coil spring height is desired proceed as follows:
Place the car so that the front end is level crosswise and then rock the car sidewise several times--not at the bumper but rock it at the center --and allow it to settle. This will remove any binding that might cause a dimensional
difference.

Measure the distance from the top of the seat from the lower support arm rubber bumper (Figure 7) to the bottom of the bracket (Figure 7) which is for the upper rebound rubber and is riveted to the frame.

Measure the distance on the other side.
If the two measurements are not approximately the same a shim that is .120" thick can be added at the top of the coil spring.

If more than two shims are required it is advisable to replace the coil spring.

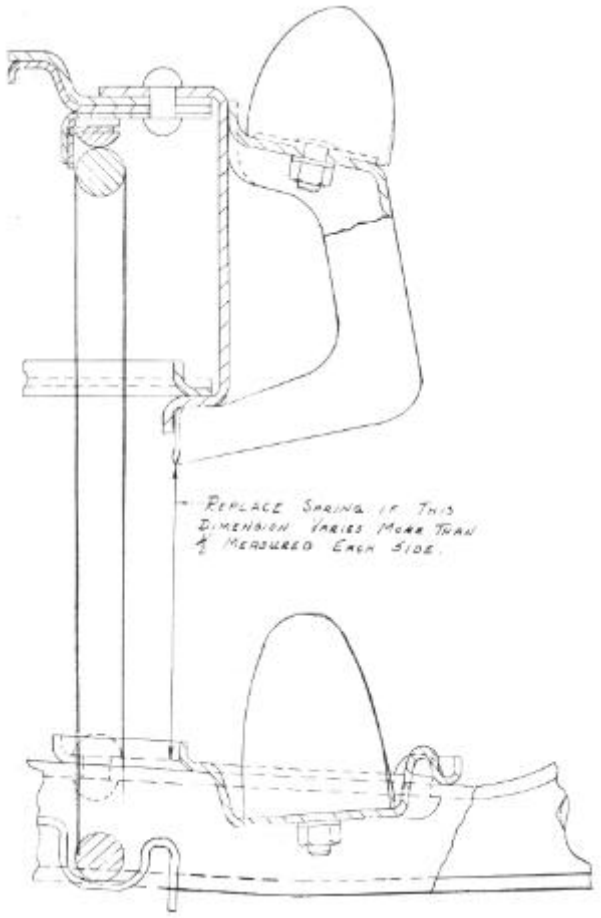


Figure 7--Checking Coil Spring Height

COIL SPRING

To determine whether a coil spring is sagged measure the distance as shown in Figure 7 at curb weight.

NOTE: Rock the car sidewise several times before making any measurements. Do not rock car at the bumper. An insulator or silencer made of rubber and fibre is assembled in the upper seat in frame front cross member.

A shim .120", thick can be used at the top of the coil spring for adjustment of Riding Height.

The coil springs are all identified after inspection by marking them in the following manner:

Part No.	Color Identification	Load at Pass. Height	Rate	Models
160510	Light Blue	1396	290	40,41,48
160511	Yellow	1456	326	43
160512	White	1630	326	44,45
160512	White	1630	326	47 Right side
160513	Green	1735	326	47 Left side

Brinell mark, part number 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.

REMOVING FRONT COIL SPRING - Figure 8

1. Jack front wheels clear of the floor.
2. Place a stand jack under the inner side of the lower support arm (9) on the side that the spring is being removed from. Lower car until it touches the stand.
3. Remove shock absorber.
4. Remove the four bolts (16) that fasten the lower support arm pivot (13) to the frame cross member at the inner end of the lower support arm (9).
5. Raise car carefully thus allowing the coil spring to expand and drop out of place.

CAUTION: The coil spring is under heavy pressure and care must be exercised in releasing it.

REPLACING FRONT COIL SPRING

Reverse above procedure.
Check these points,—
1. Flat end of spring must be at top.
2. Bottom end must rest in the seat stamped in the lower support arm spring seat (12).
3. Silencer material must be in the upper spring seat.
4. Check "Riding Height" and use shims if necessary.
5. If installing a new spring be certain it is the correct one. Coil springs are all identified.

REMOVING FRONT SHOCK ABSORBER - Figure 8

1. Remove top retainer nut, washer and rubber bushing.
2. Remove the two screws (45) holding shock absorber anchor plate (44) to the lower support arm (9).
3. Turn the shock absorber one fourth turn and lower thru the opening.

INSTALLING FRONT SHOCK ABSORBER Reverse above procedure.

REMOVING LOWER SUPPORT ARM

1. Perform the 5 operations of removal of front coil spring.
2. Remove the lower support arm outer pivot (17) according to procedure on page 9.

REPLACING LOWER SUPPORT ARM - Figure 8

1. Install front coil spring.
2. Install all lower support arm pivot to frame bolts (16).

3. Install the lower support arm outer pivot (17) according to procedure on page 9.

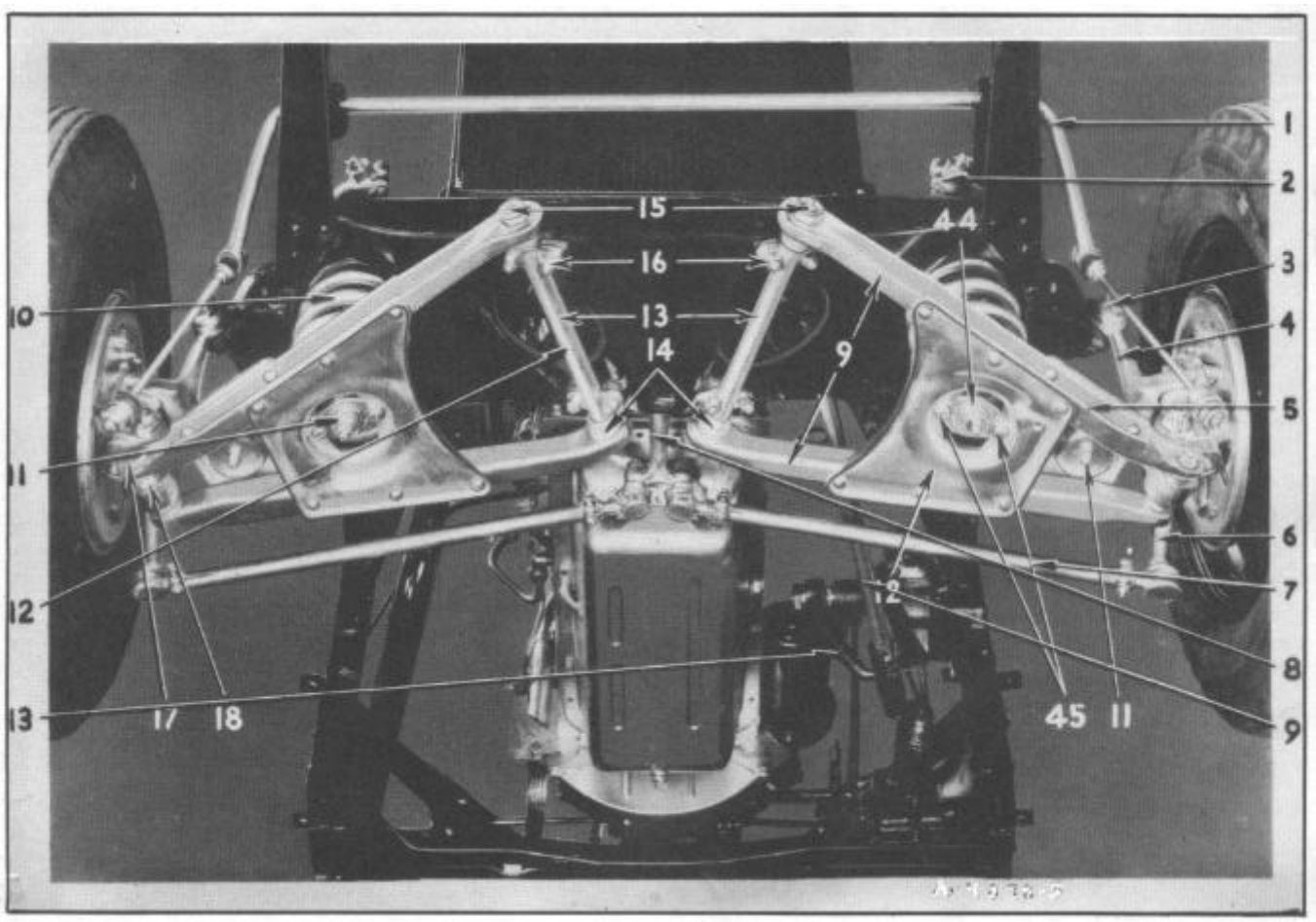


Figure 8--Front Suspension Detail

9. Lower support arm assembly.
11. Lower support arm rubber bumper stud.
12. Lower support arm 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

.

LOWER SUPPORT ARM PIVOT AND BUSHING - REMOVAL - Figure 8

1. Jack front wheels clear of the floor.
2. Place stand jack under inner side of lower support arm (9).
3. Remove front (15) and rear bushings 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).

NOTE: Use tool J 1052 Figure 9 to maintain the exact distance of 11-l/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.

Figure 9--Maintaning Lower Support Alignment Using Tool J 1052

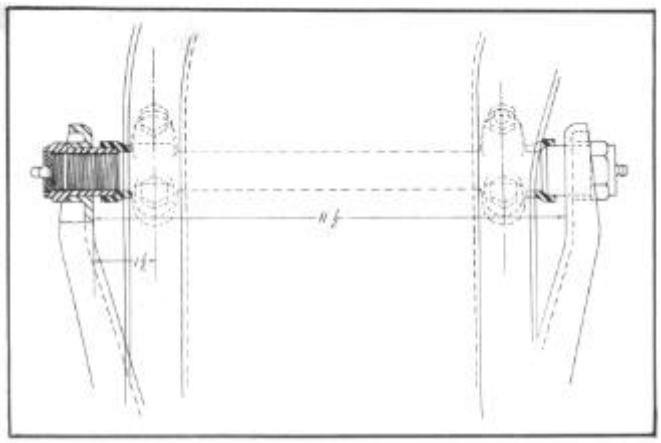


Figure 10--Lower Support Arm Bushing Adjustments

REMOVING LOWER PIVOT PIN AND BUSHING - Figure 11

1. Place a jack under the lower support arm (9) 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.

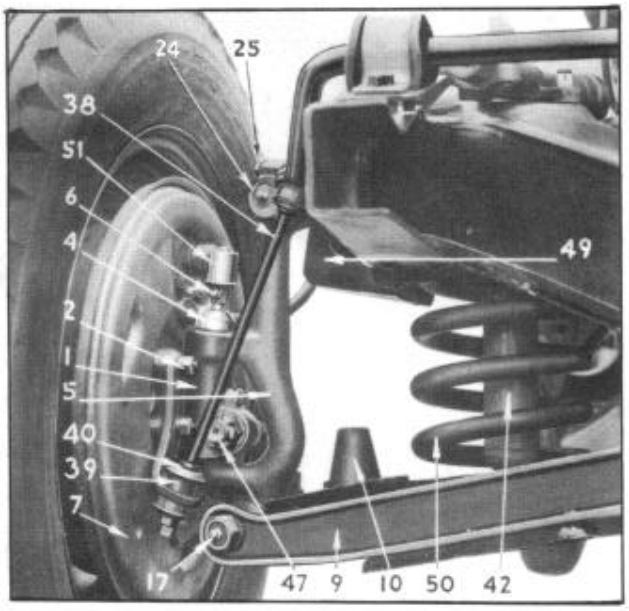


Figure 11--Front Suspension Detail

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.
9. 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.
49. Upper rubber bumper and bracket (on frame).
50. Front coil spring.
51. Steering spindle pivot pin oil reservoir (all except Model 40).
52. Upper rebound rubber.
53. Upper rebound rubber bracket.

REPLACING LOWER PIVOT PIN AND BUSHING - Figure 11

1. Hold the steering spindle support (5) squarely between the yoke (formed by lower support arm) (9).
2. 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).
3. Screw the outer pivot pin (17) in place.
4. Install the washer; the nut; and the cotter pin.
5. Check caster, camber and toe-in.

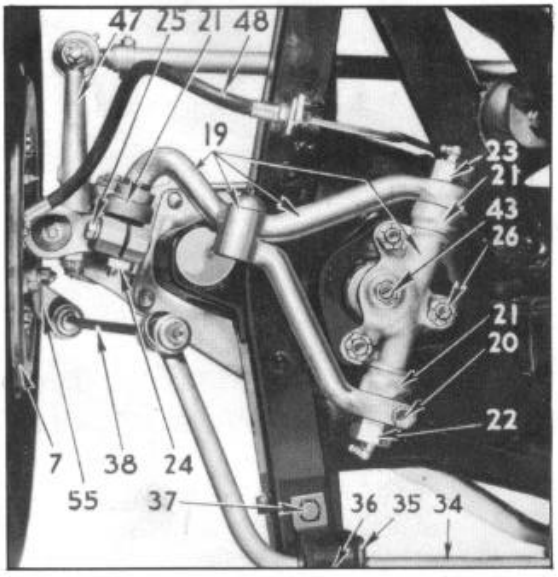


Figure 12--Front Suspension Detail

7. Front wheel brake backing plate.
19. Upper support arm and pivot assembly.
20. Upper brace clamp bolt.
21. Upper support arm pivot seal.
22. Upper support arm pivot front bushing.
23. Upper support arm pivot rear bushing.
24. Upper support arm eccentric bushing.
25. Upper support arm eccentric bushing lock screw.
26. Upper support arm pivot to frame bolt.
34. Auto-poise bar.
35. Auto-poise rubber bushing.
36. Auto-poise bracket.
37. Auto-poise bracket bolt.
38. Auto-poise connector.
43. Shock absorber upper stud nut.
47. Steering arm.
48. Front wheel hydraulic brake line.
55. Auto-poise connector bracket-on steering spindle.

UPPER STEERING SPINDLE SUPPORT ARM AND PIVOT - REMOVING - Figure 12

1. Jack up car so that wheels are clear of the floor.
2. Remove wheel and hub assembly.

3. Remove shock absorber retaining nut (43) at top of pivot.
4. Remove the three cap screws (26) holding pivot to cross member.
5. Remove eccentric bushing (24).
6. Remove upper steering spindle support arm and pivot (19).

NOTE: The eccentric bushing is removed by removing lock screw (25) and unscrewing eccentric bushing off from the upper arm. Check caster and camber after replacing. Use tool J 1360 in reinstalling the pivot bushings (22 and 23). Place tool on the outer stud (26) of the pivot and locate the bushing so that the pivot is central with the tool.

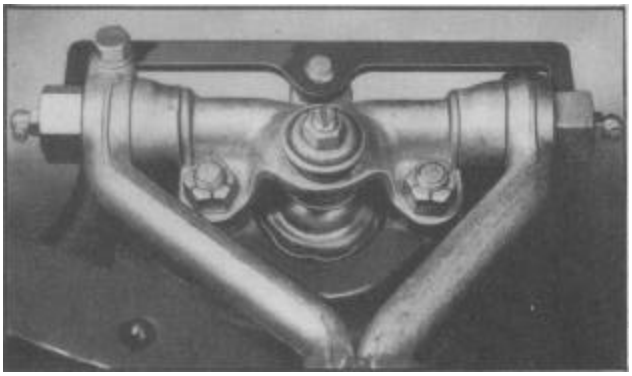


Figure 13-- Locating Pivot Bushing With Tool J 1360

UPPER SPINDLE SUPPORT ARM PIVOT FRONT BUSHING - REMOVING - Figure 12

1. Jack up car so that wheels are clear of the floor.
2. Remove upper arm bushing clamp bolt (20). 3. Screw bushing (23) off of the pivot.

NOTE: Use tool J 1360 in reinstalling the bushing. Place tool on the outer stud (26) Figure 13 of pivot and locate the bushing so that pivot is central with the tool.

UPPER SUPPORT ARM PIVOT REAR BUSHING - REMOVAL - Figure 12

1. Jack up car so that wheels are clear of the floor.
2. Screw bushing (22) out of upper support arm and off the pivot arm.

NOTE: Use tool J 1360 in reinstalling the bushing. Place the tool on the outer stud of the pivot (26) Figure 13 and locate the bushing so that the pivot is central with the tool.

REMOVING ECCENTRIC BUSHING - Figure 12

The eccentric bushing (24) can be removed by:
1. Place jack under lower support arm and raise the car off from the floor.
2. Remove the eccentric bushing lock screw (25).
3. Remove the bushing 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 - REPLACING

1. Hold the steering spindle support 9/32" away from the boss on the upper support arm. See Figure 5.
2. Screw the eccentric bushing onto the upper support arm until it starts to enter the steering spindle support.
3, Continue turning the eccentric onto the upper support arm until this upper support arm is located 7/8" from the boss. See Figure 5.

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 10 of caster and two complete turns (3/16") from the positions given in number 3 would give a minus l° of caster.

The correct caster setting is 0 preferred with l/40 negative or l/4° positive permissible but in equal amounts on both wheels if possible but never over l/2° variation between right or left sides.

See Camber, Caster and Steering Pivot Pin Correction page 4.

4. Set Camber and Caster--See page 5.
5. Install eccentric bushing locking screw and tighten securely.

LOWER SUPPORT ARM RUBBER BUMPER - REMOVING AND REPLACING

1. Remove the cap screw nut and shake proof washer.
2. Lift the bumper out of position.
3. To replace--reverse procedure.

FRONT SUSPENSION UPPER RUBBER BUMPER (ON FRAME) REMOVING AND REPLACING

Remove the cap screw nut and shake proof washer.
2. Lift the bumper out of position.
3. To replace--reverse procedure.

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 appreciable amount of movement in and out at the top of the tire the bushings should be replaced.

STEERING SPINDLE PIVOT PIN REBUSHING KIT

A package or kit has been made up for convenience in replacing worn pivot pins and bushings.
Wear at the spindle pivots is very seldom confined to one part and, it is advisable therefore, to renew the parts on both sides.
The Rebushing Kit Part No. 159519 for all 1940 cars contains:

2 Pivot pins
2 Pivot pin bushings
2 Pivot pin thrust washers and ball cups 14 Pivot pin balls
4 Pivot pin oil seals
2 Pivot pin key seals
2 Pivot pin expansion plugs and relief valve assemblies

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.

STEERING SPINDLE PIVOT BOLT EXPANSION PLUG AND RELIEF VALVE - Figure 15

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 expansion plug and any possibility of the grease pressure blowing it out.

To install the expansion plug and relief valve--

1. Leave the relief valve in the expansion plug.
2. Coat edges of expansion plug with white lead.
3. Use a short piece of tubing or hollow pipe that will clear the relief valve and place it over the relief valve and against the plug.

REMOVING STEERING SPINDLE - Figures 11 and 15

1. Jack front wheels clear of the floor.
2. Place a stand jack under the inner side of the lower support arm and if both spindles are to be removed place stand jack under both lower support arms.
3. Pry off front wheel hub cap. Remove inner cap with tool J 728 A. Remove steering spindle nut cotter pins.
4. Remove steering spindle nuts, spindle washer, outer bearing cage, front wheels and brake drum assemblies.
5. Remove the nuts from the four bolts holding brake backing plate (7) to the spindle. Push Auto-Poise connectors (38) out of the way.
6. Remove brake backing plate (7) and place it or wire it to the front suspension upper arm assembly.
7. Remove key, nut and washer holding the steering arm (47) to the steering spindle (l).
8. Drive steering arm (47) out of steering spindle (l) with tool J 1373.
9. Remove cotter pin, nut and lower control arm pivot bolt (17).

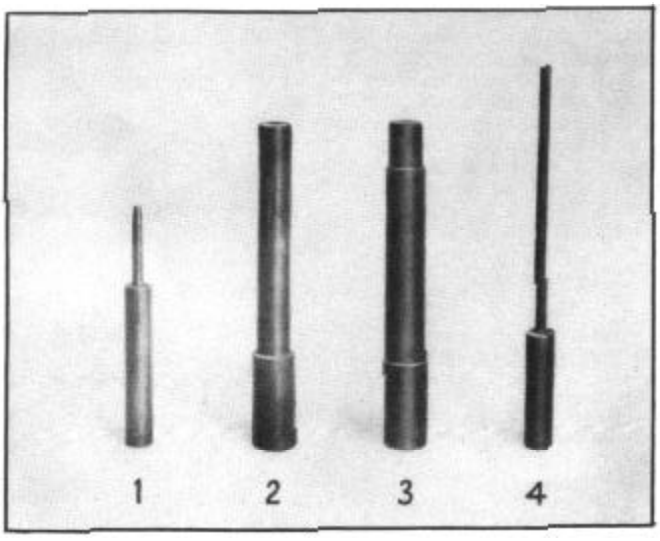


Figure 14--Steering Spindle Pivot Pin and Bushing Removing and Replacing Set

1. J 479-l Driver for loosening pivot pin.
2. J 469-l Driver for installing lower bushing.
3. J 990 Driver for removing lower bushing and installing upper bushing.
4. J 419-2 Driver for removing pivot pin.

10. Remove eccentric bushing locking screw (25) and bushing (24).
11. Remove steering spindle (l) and steering spindle support (5) together.
12. Remove grease fitting (6) at the top of steering spindle (l).
13. Drive pivot pin (60) from the top using tool J 479 (No. 1 Figure 14) thru the hole in the upper end of steering spindle left when the oiler was removed.
14. The expansion plug and relief valve (67) at the bottom of the spindle will be forced out.
15. Then insert the long driver tool J 479 (No. 4 in Figure 14) and drive pivot pin (60) out.

CAUTION: Remove steering spindle pivot pin carefully so that the 7 ball bearings (62) will not be lost.

16. The removal of the steering spindle pivot pin separates the steering spindle (l) from the steering spindle support (5).

Reverse procedure for reassembly.

See page 12 under "Steering Spindle Support Installation" for adjustment procedure.

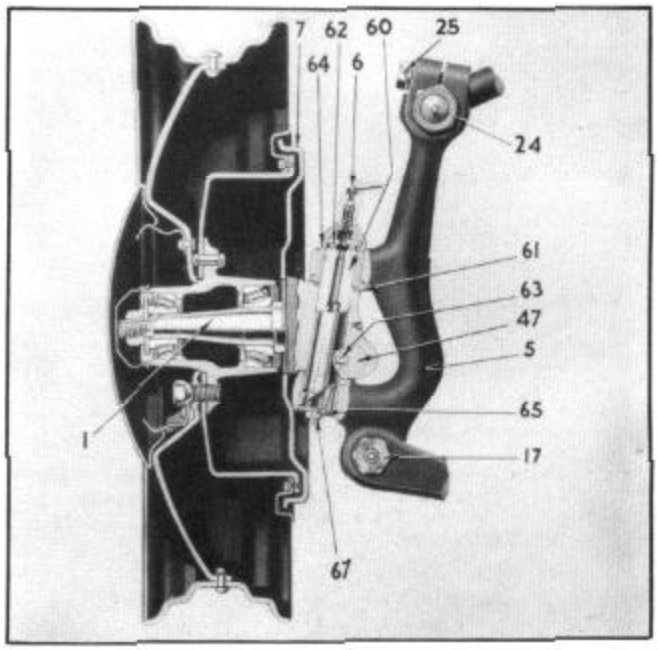


Figure 15--Steering Spindle Section

1. Steering spindle.
5. 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.

REMOVING STEERING SPINDLE SUPPORT BUSHING AND THRUST BALL CUP - Figure 15

l. Hold steering spindle support (5) in a vise so that bushing can be forced out.

2. Drive thrust ball cup (upper bushing) (64) out with a copper hammer.
3. Insert driver tool J 990, Figure 14, into the lower bushing (65) and drive it out.

REPLACING STEERING SPINDLE SUPPORT BUSHING AND THRUST BALL CUP - Figure 15

1. Support steering spindle support (5) in a vise so that bushing (65) and thrust ball cup (64) can be driven in.
2. Use the tool J 990 (No. 3 in Figure 14) and install the thrust ball cup (upper bushing). Have the top of steering spindle support well supported.
3. Use the tool J 990 (No. 3 in Figure 14) and install the lower bushing. Have the bottom of steering spindle support well supported.

NOTE: 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 bearing pressed into it.

REMOVING STEERING SPINDLE SUPPORT - Figure 11

1. Place jack under lower support arm (9) and raise front wheels clear of the floor.
2. Remove outer hub cap, and inner hub cap, using tool J 728 A, outer wheel bearing, tire wheel and hub assembly and inner wheel bearing.
3. Remove brake backing plate (7) and place on top of frame so as not to injure or disconnect hydraulic brake tube.
4. Remove cotter pin nut and washer holding steering arm (47) to steering spindle (l).
5. Drive steering arm (47) out of the steering 4 spindle (1) with tool J 1373.
6. Remove cotter pin, nut, and lower support arm outer pivot bolt (17).
7. Remove eccentric bushing lock screw (25).
8. Remove eccentric bushing (24) and steering spindle (l) with steering spindle support (5).
9. Remove grease fitting (6).
10. Drive pivot pin from the top using tool J 479 (No. 1 Figure 14) thru the hole in the upper end of the steering spindle left when the oiler was removed.
11. The expansion plug and relief valve at the bottom of the spindle will be forced out.
12. Then insert the long driver tool J 479 (No. 4 in Figure 14) and drive the pivot pin out.

CAUTION: Remove steering spindle pivot pin carefully so that the 7 ball bearings will not be lost.

13. The removal of the steering spindle pivot pin separates the steering spindle (1) from the steering spindle support (5).

STEERING SPINDLE SUPPORT INSTALLATION - Figure 11

The reassembling of the steering spindle support on the car requires particular attention to two adjustments.
Lower pivot pin and its bushing.
Eccentric bushing--controlling the caster and camber setting.
The steering spindle support is held to the lower support arms by the lower pivot pin removed in operation 6. This steering spindle support must be squarely between the yoke formed by the lower support arms. In installing, index the pivot pin so that the spindle support is centralized between the inner faces of the outer end of the lower support arm.
The eccentric bushing controls the caster and camber setting and it must be installed as follows:
1. Hold the steering spindle support 9/32" away from the boss on the upper support arm. See Figure 5--page 5.
2. Screw the eccentric bushing onto the upper support arm until it starts to enter the steering spindle support.
3. Continue turning the eccentric onto the upper support arm until this upper support arm is located 7/8" from the boss. See Figure 5.
This setting should give a zero caster and a zero camber.
See "Eccentric Bushing Replacing" page 10.
4. Set caster and camber--page 5.
5. Install the eccentric bushing locking screw and tighten securely.

REMOVING FRONT WHEEL

1. Place jack under lower support arm and raise front wheels clear of the floor.
2. Remove hub cap, inner hub cap, spindle nut and washer.
3. Remove wheel and hub assembly.

STEERING ARM REMOVING

1. Remove cotter key, nut and washer from steering arm.
2. Remove tie rod cotter key and nut and remove the tie rod (tool HM 844 C).
3. Remove steering arm (tool J 1373).

TIE ROD END

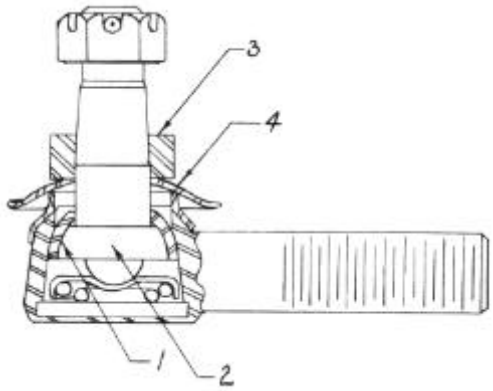


Figure 16--Tie Rod End

1. Tie rod end bearing.
2. Tie rod end stud.
3. Tie rod end rubber seal.
4. Tie rod end dust cover.

The tie rod ends are the self-adjusting type.
The ground steel bearing (1) 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.
The lubrication is by means of the pressure fitting and lubricating instructions are in the "Lubrication Section".

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.

Models 40, 41, 43, 48 should require 26 lbs maximum pull.

Models 44, 45, 47 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 on page 12.

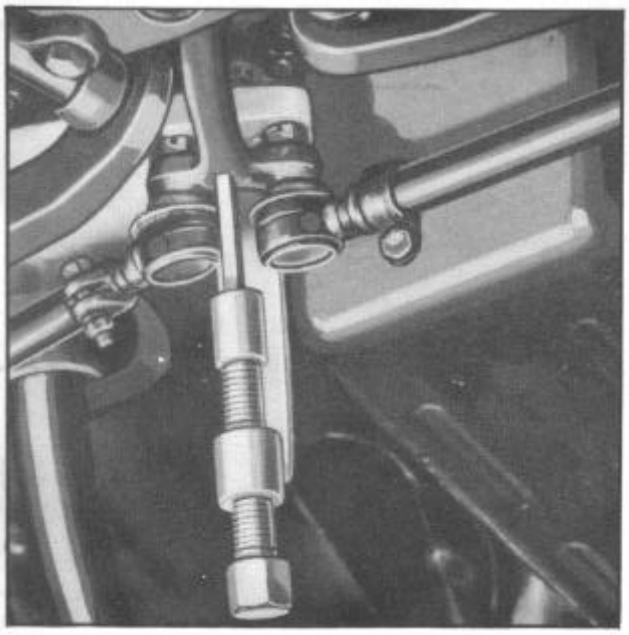


Figure 17--Steering Arm Ball Stud Screw Press J-624-H

STEERING CENTER ARM REMOVING

1. Remove drag link at front. See Steering Section.
2. Remove tie rod ends (8) from steering center arm (28) using tool J-624-H--See Figure 17.
3. Remove bolt (30) holding steering center arm to frame cross member.
4. Remove steering center arm.

NOTE: Bushings are pressed in and can be removed in an arbor press.

TIE ROD END KIT

A service kit is provided for convenience in ordering tie rod ends.

Part No. 159782 tie rod kit contains:
- Tie rod end assembly--Right
- Tie rod end assembly--Left
- With necessary clamps, bolts and nuts

The replacement of a tie rod end usually requires the replacement of both ends and this package has the parts necessary for a repair.

TIE ROD REMOVAL

1. Remove cotter key and nut from both ends of the tie rod.
2. Use tool HM-844-C to remove outer end. 3. Use tool J-624-H to remove inner end. See Figure 17.

TIE ROD INSTALLING

It is necessary to adjust toe-in when installing tie rods. Reverse process or removal and then adjust toe-in.

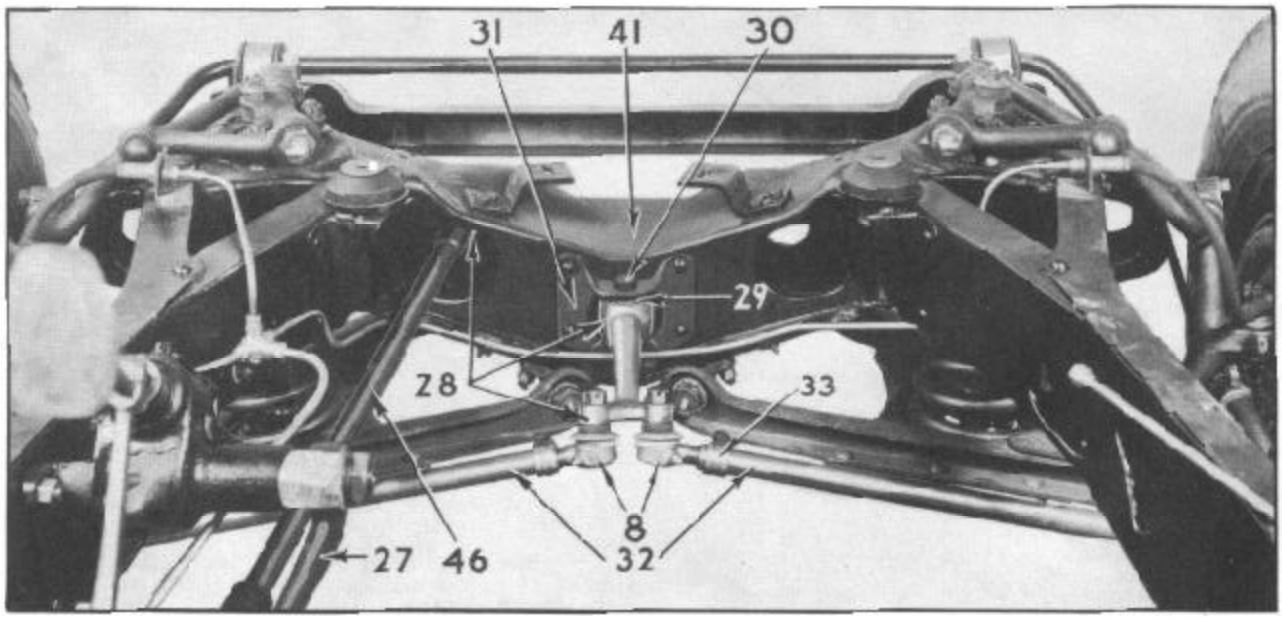


Figure 18--Front Suspension Detail

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

AUTO-POISE CONTROL - Figure 12

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 (34) are connected to the brake backing plate (7) by means of connectors (38).

AUTO-POISE PURPOSE - Figure 12

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 again.
The Auto-Poise 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 or very rough roads and if this is accompanied by sudden gusts of side wind then caster does not function.
Caster and camber adjustments are necessary and are provided for (See Page 5).
Auto-Poise rides in rubber bushings (35) hold to frame by brackets (36) and the connectors (38) holding the Auto-Poise to the brake backing plate (7) are cushioned in rubber with retainers
No lubrication is necessary as the friction of the Auto-Poise in its rubber bushings assists its action.

INSTALLING AUTO-POISE

Where 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.
Due to the twisting characteristics improper position of the bar in the rubber bushings may cause the front wheels to pull to one side.
To check this condition:
1. Jack up front of car so that wheels are clear of floor.
2. Disconnect drag link at steering gear pitman arm.
3. Note carefully the position of both front wheels as related to their straight ahead position A tendency of the car to steer to the right would indicate unequal projection of the torsion bar to the right.
Steering to the left would indicate unequal projection to the left.

NOTE: When checking be sure the steering spindle pivot pins are properly lubricated.

ADJUSTING AUTO-POISE - Figure 12

1. Loosen the two bushing bracket bolt nuts (37) on both sides just enough to relieve the pressure of the bushings on the bar.
2. Turn the wheels to the extreme right and then to the extreme left to equalize the position of the bar in the bushings.

NOTE: When the distance between the center of the connector and the outside surface of the frame side member is equal on both sides, the front wheels will automatically return to the straight ahead position when turned to either right or left and released.
3. After proper position has been determined, tighten bushing bracket bolts, (37) and again turn the wheels to extreme right and left positions as a final check.
4. Attach drag link to pitman arm.

NOTE: It is necessary to adjust the Auto-Poise bar whenever any of the following operations are performed:
1. Remove and install Auto-Poise bar.
2. Remove and install Auto-Poise bar connecting bracket.

AUTO-POISE REMOVAL - Figure 12

1. Disconnect Auto-Poise bar (39) at the top of connectors (38) (both sides).
2. Open the bonnet.
3. Remove Auto-Poise bushing brackets (36) (on frame).
4. Cut one rubber bushing (35) off from Auto- Poise bar slicing thru the bushing so that it can he used again.
5. Work shaft out of the hole in the fender on the opposite side from which the rubber bushing was cut.
6. Remove the shaft from the other fender working from bonnet opening.

AUTO-POISE INSTALLING

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. 5. Be sure to centralize bar in bushings before final tightening. See "Adjusting Auto-Poise".

STRAIGHTENING 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 under-heating makes the part brittle and easily broken.

HARD STEERING

If the hard steering seems to be caused by tightness in the steering mechanism the cause may be--
1. Low or uneven tire pressure.
Inflate tires according to pressures given in Chassis Section.
2. Steering gear or steering connections adjusted too tight.

Jack up front wheels off the floor and test the steering system for binding. Adjust if necessary and lubricate.

3. Insufficient or incorrect lubricant used. Check lubricant in the steering gear and lubricate steering system. See Lubrication Section.

4. Too much caster.

5. Support arms bent or twisted.

Check wheel alignment by testing camber, steering spindle bolt inclination and caster. If arms are out of car check against specifications shown on Figure 19-20-21. Replace arms with new--do not attempt straightening.

6. Front springs sagged.

Check over all length of springs. The distance from the bottom of the upper rebound bumper bracket to the lower support arm bumper bracket should not vary more than l/2" each side. See Figure 7, Page 7.

7. Frame bent or broken.

Check frame for proper alignment. See Chassis Section.

8. Steering spindle, steering spindle support, steering arm are bent.

Check against specifications on Figure 21-22-23. Replace if bent.

Do not attempt straightening.

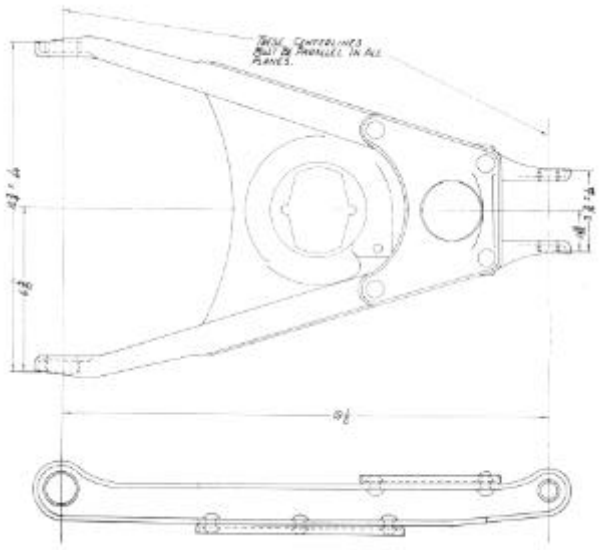


Figure 20--Lower Support Arm Alignment

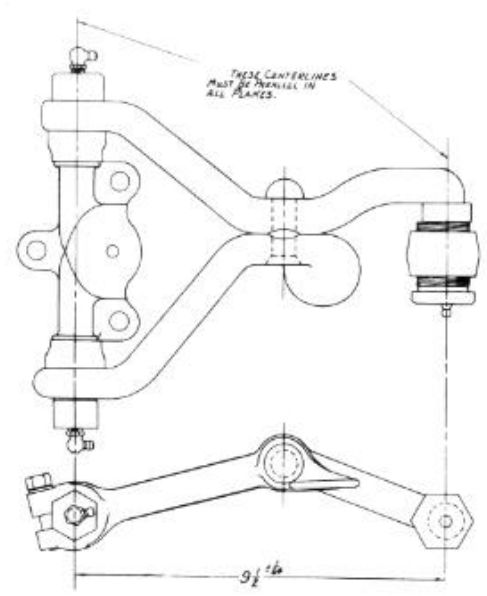


Figure 19--Upper Support Arm Alignment

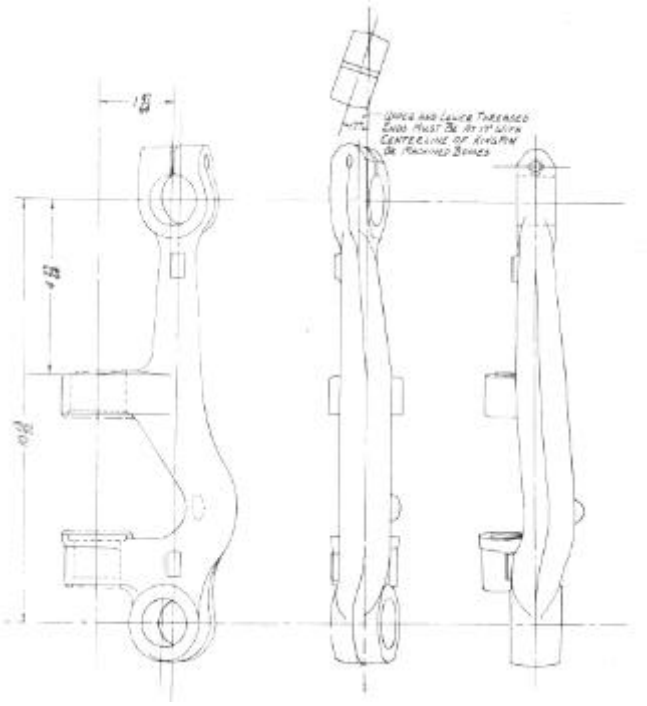


Figure 21--Steering Spindle Support Alignment

LOOSENESS OR EXCESSIVE PLAY IN STEERING SYSTEM

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.

STEERING ERRATIC WITH BRAKES APPLIED

1. Low or unequal tire pressures
2. Brakes incorrectly or unevenly adjusted.
3. Oil soaked brake lining.
4. Coil springs weak.

Replace or shim. See Page 7.

5. Insufficient or uneven caster.
6. Steering spindle or spindle support bent. Check according to Figures 21-22 and replace it necessary.

CAR PULLS TO ONE SIDE

1. Low or uneven tire pressure.
2. Rear wheels not tracking with front wheels. Check alignment of rear wheels with front wheels and correct if necessary.
3. Oil soaked brake linings.
4. Shock absorbers not functioning at all or partly operating.

Check shock absorbers for lack of fluid; adjustment; and dirt in the operating parts (See Page 22).

5. Wheel bearings adjusted too tight.

Check for binding with front wheels off the floor. Adjust bearings and lubricate.

6. Toe-in incorrect.
7. Incorrect or unequal caster or camber.

8. Coil springs sagged.
Check as shown in Figure 7.
9. Rear axle shifted.
Check spring clips for looseness. Check distance from rear spring pivot bolt to axle housing. This distance should be the same on both sides. Check the rear spring center bolt to determine if it is sheared.
10. Frame bent or broken.
Check frame for proper alignment. See Chassis Section. Also possible breakage.
11. Steering spindle; spindle support; or steering arm bent.
Check according to Figures 20-22-23.
12. Auto-Poise not centralized.
See Page 14.

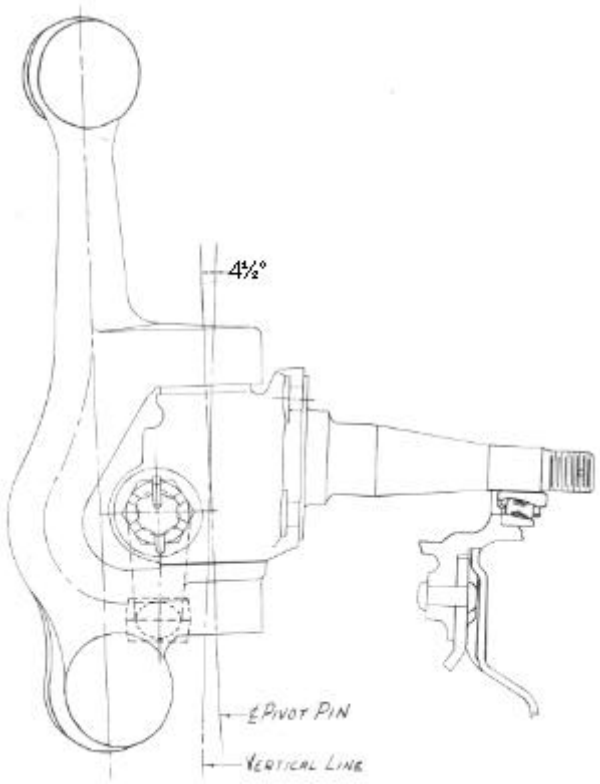


Figure 22--Pivot Pin Inclination

SCUFFED TIRES

1. Tires incorrectly inflated.
2. Toe-in incorrect.
Adjust tie rods to give front wheels correct toe-in.
3. Wheels or tires out of true. Check for wheel and tire wobble. Check wheel and tire mounting.
4. Steering spindle bearings worn.
5. Suspension arms bent or twisted.
Check wheel alignment by testing camber. Spindle pin inclination; and caster. If steering spindles are out of the car check them against specifications in Figures 19-20-21.
6. Unequal caster.
7. Toe-in incorrect on turns. Check for bent tie rods; steering arm.
8. Steering spindle or tie rods bent. Install new steering spindles or tie rods. 9. Turning corners at high speeds.

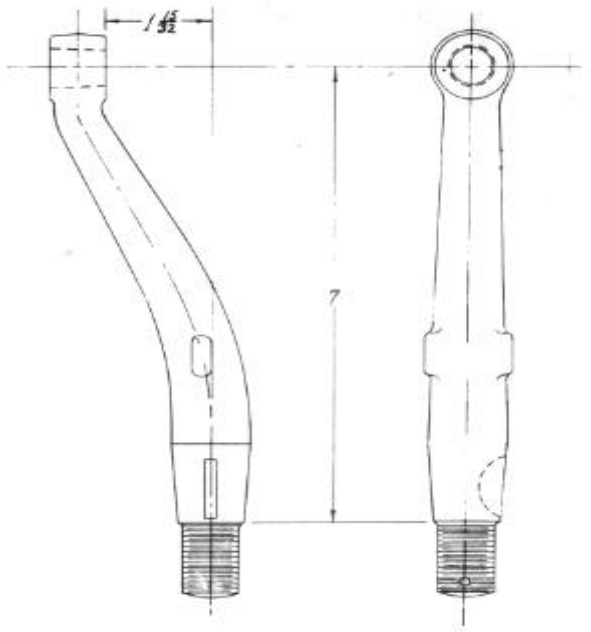


Figure 23--Steering Arm Alignment

CUPPED TIRES

1. Tires incorrectly inflated.
2. Normal cupping of tires can be expected--tires should be frequently interchanged.
3. Dragging brakes.
4. Wheels, Tires or brake drums out of balance. Balance tires and wheels. Check for bulged or eccentric tire conditions.
5. Steering spindle bearings or wheel bearings worn or out of adjustment.
6. Unequal caster.
7. Steering spindle or spindle support or tie rods bent.

FRONT WHEEL SHIMMY

1. Low or unequal tire pressure.
2. Steering connections worn or incorrectly adjusted.
3. Steering gear incorrectly adjusted.
4. Front wheel bearings worn or incorrectly adjusted.
5. Wheels, tires or brake drums out of balance.
6. Wheels or tires out of true.
7. Incorrect or unequal caster.
8. Shock absorbers low or out of fluid or dirt in them.
9. Steering spindle or tie rods bent.
10. Lack of lubrication or wrong lubricant. See Lubrication Section.
11. Eccentric or bulged tires.
12. Auto-Poise incorrectly installed. See Page 14.

WHEEL TRAMP

1. Wheels, tires and brake drums may be out of balance.
2. Coil springs weak.
3. Shock absorbers low or out of fluid or dirt in them. •
4. Lack of proper lubrication.
5. Auto-Poise incorrectly installed.
See Page 14.

CAR WANDER

1. Low or unequal tire pressure.
2. Steering gear or connections too loose or worn.
3. Steering gear or connections adjusted too tight.
Check for binding with front wheels off the floor--Lubricate.
4. Steering spindle bearings worn.
5. Wheels toe-in too much or toe-out in straight ahead position (bent tie rods).
6. Caster incorrect or unequal.
7. Steering spindle bent.
8. Steering spindle pivot pin bent.
9. Rear axle shifted.
Check spring clips for looseness.
Check distance from rear spring pivot bolt to axle housing. The distance should be the same on both sides.
10. Auto-Poise incorrectly installed.
See Page 14.
11. Tread better on rear tires than on the front.
Put tires with the best tread on the front.

ROAD SHOCK

1. Low tire pressure.
2. Steering gear or connections incorrectly adjusted.
3. Too much caster.
4. Shock absorbers low or out of fluid. Dirt in them.
5. Coil springs weak or sagged.
6. Incorrect size or type of tires.
7. Steering spindle bent.

REAR SUSPENSION

REAR SPRING

Rear springs on all models are 60" in length, 1 3/4" wide with 9 and 7 leaves and are splay mounted with the widest portion at the rear.

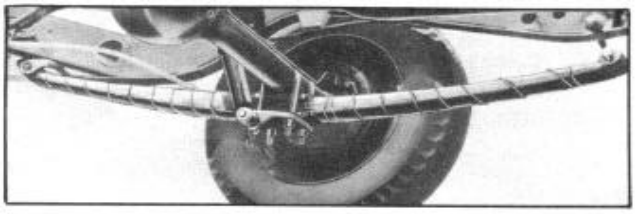


Figure 24--Rear Spring Suspension

The leaf spring clips are doweled for the 1 and 4 locations with spacers between them and this together with the rear lateral stabilizer 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 thru 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 thru 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 thru 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

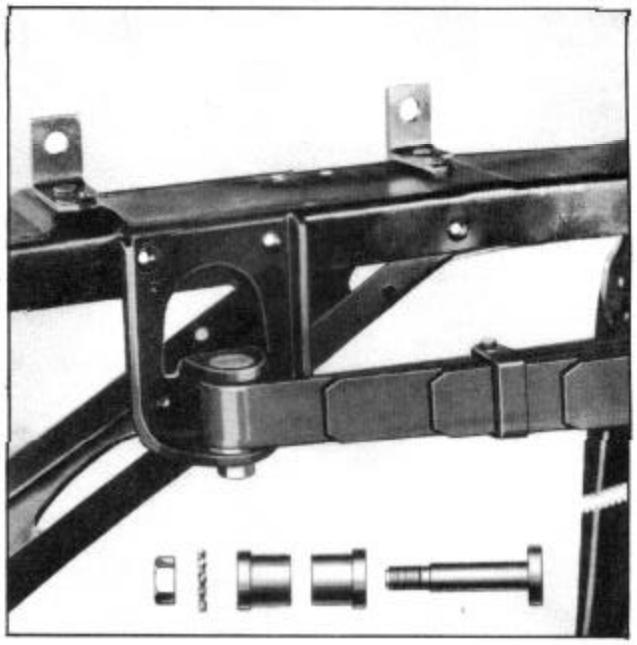


Figure 25--Rear Spring Front Mounting

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 lubricant 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 (Figure 27).
6. Unscrew the threaded bushing in the spring frame bracket at the shackle end of the rear spring.

On cars having the spare tire well in the rear compartment (trunk) 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.

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.

4. Remove the center bolt and nut.
5. Open the vise and disassemble the spring.

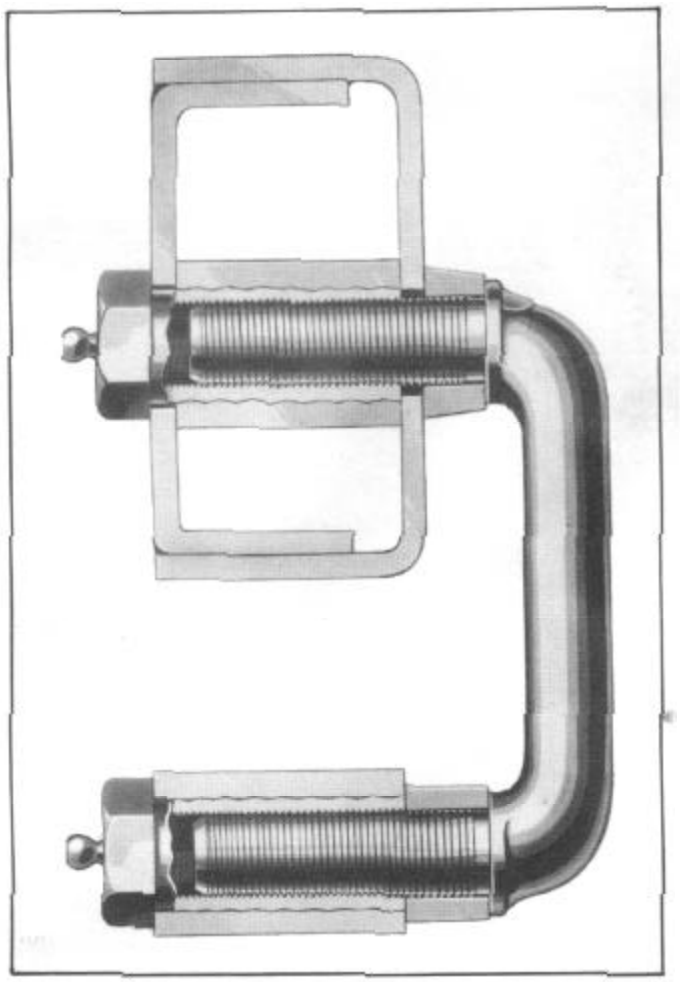


Figure 26--Rear Spring Shackle Mounting

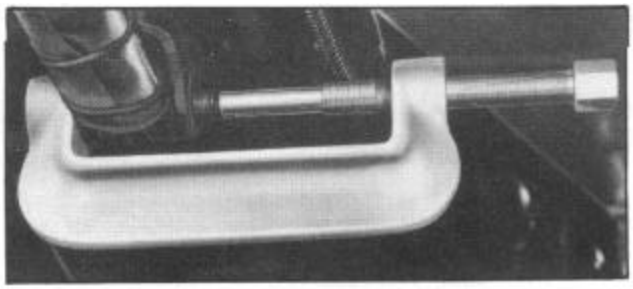


Figure 27--Rear Spring Pivot Bolt Remover and Replacer Tool J 1438

REAR SPRING ASSEMBLING AND INSTALLING

1. The leaves should be lubricated with viscous chassis lubricant and assembled in their proper order with a piece of 1/4" rod passing thru the center bolt hole of each leaf.
2. Clamp the loose assembly in a vise and draw the leaves together keeping them in alignment as the vise is tightened.
3. The bracket for holding the brake cable clip is assembled under the second from front leaf clip. Use two new box type leaf clips, bolts, nuts, and spacers.
4. Insert the center bolt and tighten the nut.
5. Use the original leaf clips that are riveted to the bottom spring leaf at outer ends, install the spacers, the bolts, and nuts.

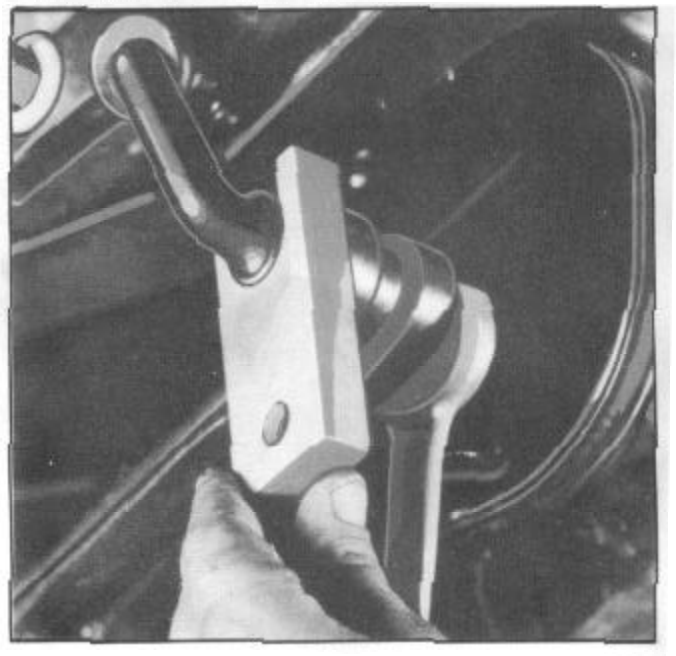


Figure 28--Rear Spring Shackle Bushing Locating Gauge J 524

6. Insert one end of the rear spring shackle thru 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 Figure 28.
7. Start the threaded bushing in the shackle thread and draw it tightly into the spring eye.
8. Place the spring in position with the shackle passing thru the threaded tube welded into the frame side rail.
9. Locate the shackle with the spacer tool J 524 as shown in Figure 28 and start the threaded bushing on the shackle and draw it tightly into the mounting.

CAUTION: 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.

NOTE: In using shackle bushing locating gauge it is necessary to slide rubber dust seals out of the way.

10. Replace the rear spring front mounting pin using tool J 1438 (Figure 27).
11. Replace clip plate and clips. Tighten securely.
12. Connect lower end of shock absorber to the clip plate.
13. Remove stand jacks and lower car to floor.

REAR SPRING LEAF KIT

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.

The extra leaf will be the Number 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 l/16" wide on the head.

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 - All Models except 40 Traveler and Commercial Cars

A lateral stabilizing bar to control horizontal movement of the car body and frame is mounted to the frame at one end and to the axle at the other end.

These points (at frame and at axle) are cushioned in rubber.
Vertical movement of the frame and body is controlled by the shock absorber.
Side to side or lateral movement is controlled by the lateral stabilizer bar.
The stabilizing bar eliminates axle "hopping" and the setting up of vibrations in the axle that continue indefinitely after the original cause has gone.

There is no torque or twist action in this bar and replacement of the rubber cushions is practically all that is required in servicing this unit.

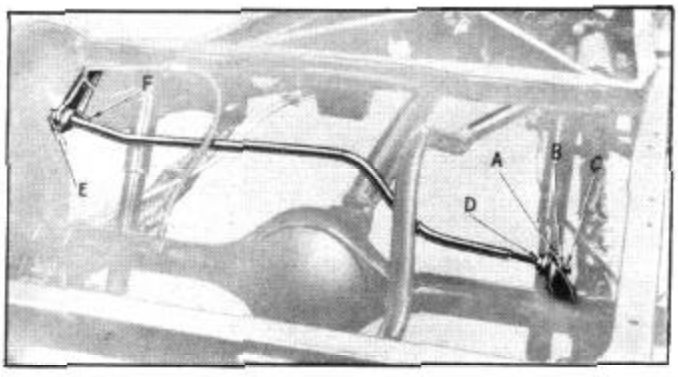


Figure 29--Stablizing Bar

REAR AXLE STABILIZING BAR REMOVAL - Figure 29

1. Start at the rear axle end of the stabilizing bar and remove the outside nut (C), the cushion (rubber) (A) and the cushion washer (B).
2. Loosen the inside nut (D) and run it up on the threads. Push the cushion and washer up on the bar and remove the cushion spacer.
3. At the frame end remove the pal nut and the hexagon nut (E). Remove the cushion, the washer, and the spacer.
4. Push the stabilizing bar toward the axle stabilizer bracket and remove the frame end of the bar from the frame.
5. Do not lose or destroy the rubber grommet in the frame for the stabilizer bar guide rod (F) (welded to the bar).
6. Pull the bar toward the frame stabilizer bracket and out of the axle stabilizer bracket.

REAR AXLE STABILIZING BAR REPLACEMENT

1. Start the installation at the frame end of the stabilizing bar. 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 thru the axle bracket and then put the frame end in place with 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. Tighten the nut and install the pal nut.
NOTE: The shoulder on the bar rests against the cushion spacer and frame and allows the bar to pass thru the frame far enough to install the nuts and tighten them in place. This locates the bar in position.
4. Place the outside cushion, cushion washer and spacer on the axle end of the bar and install the outer nut. Tighten it securely. The nut tightens the spacer against a shoulder on the bar.
5. Run the inside locking nut and rubber cushion down on the threads and up against the axle bracket. Tighten it securely.

SHOCK ABSORBERS

SPECIFICATIONS

The Monroe Shock Absorber is standard equipment on the Models 40, 41, 48 and Delco on Models 43, 44, 45, 47.

The following calibration is standard:

Front	3-8 and 6-(4) E 2 on compression	10 and 10 recoil
Rear	5-8-(4) A 2 on compression	10 and 10 recoil

The 8 and 6 on the front recoil means one .008u and one .006" valve put on top of one another. The same condition is true on the 10 and 10 on both front and rear.

The valve code is stamped on the dust shield and is translated as follows:

The last figure represented by a letter and a numeral such as (E 2) is the compression relief valve code.

Other figures in this code represent the piston rebound valve code.

1st digit is orifice disc.

2nd digit and/or 3rd digit is the spring disc.

Digit in parenthesis is the spacer disc.

Last or last two digits preceding the compression valve code are spring discs.

Front valving 3-8-6-(4)-10-10-E 2. This represents a No. 3 orifice disc; a No. 8 and a No. 6 spring disc; a No. 4 spacer disc and two No. 10 spring discs. Compression valve is code E 2.

Rear valving 5-8-(4)-10-10-A 2. This represents a No. 5 orifice disc; a No. 8 spring disc; a No. 4 spacer disc and two No. 10 spring discs. Compression valve is code A 2.

Capacity	Front	Rear
Ounces	3-3/4	6-1/4

OPERATION OF THE SHOCK ABSORBER
5COMPRESSION STROKE - Figure 30

When the car spring is being compressed, the piston (X) moves toward the lower end of the cylinder. Fluid is

end of the cylinder. Fluid is forced through the holes (M) in the piston, lifting intake valve plate (C) and entering the upper chamber (B). The volume of fluid thus displaced by the piston is forced out of the lower chamber (F) through compression valve (U) and into the surrounding reservoir (A). 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 (J).

allowing the fluid to fill the inner chamber (F).

FRONT SHOCK ABSORBER - REMOVING

1. Remove shock absorber nut and pal nut and rubber bushing at the top of the shock absorber.
2. Remove the two cap screws, Figure 32, holding the shock absorber support plate to the lower support arm.
3. Turn shock absorber 1/4 turn and remove.

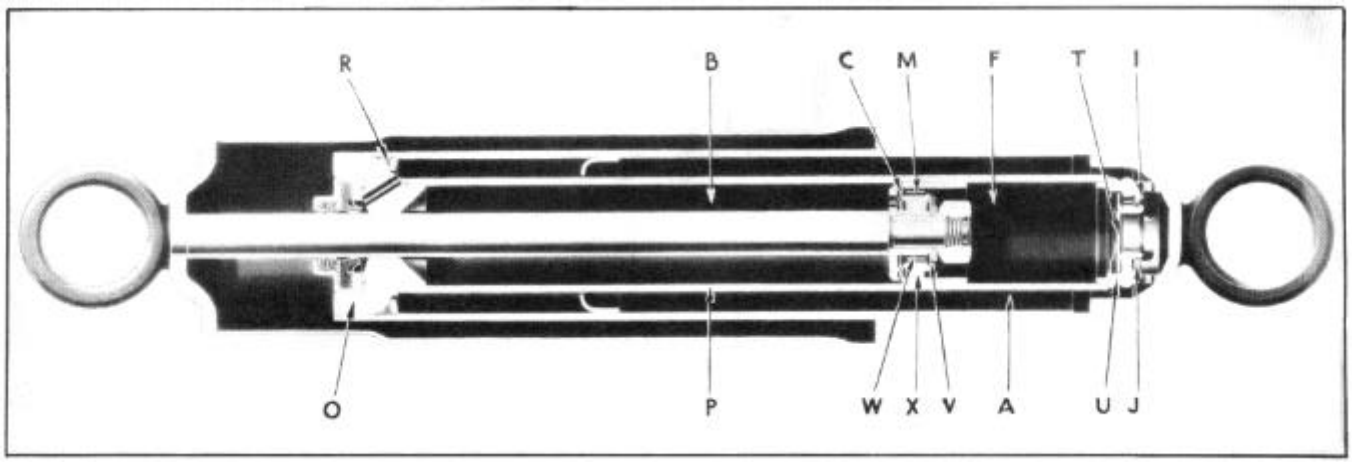


Figure 30--Delco Shock Absorber - Sectional View

A. Reservoir.
B. Upper chamber.
C. Intake valve plate.
F. Lower chamber.
J. Spring discs.
M. Piston ports.
T. Valve plate.
U. Compression valve.
V. Metering washer.
W. Piston ports.
X. Piston.
Z. Valve ports.

REBOUND STROKE

When the car spring rebounds, the resistance is instantly effective. As the piston (X) is pulled up, the fluid in the upper chamber (B) is forced through the slot in valve plate (C) through holes in piston at (W) against metering washer (V).

This Valve Assembly is known as a 2-Stage Valve, see Figure 31. Metering washer (V) and spring disc (D) can be considered the 1st stage. Spring disc (E) and valve back plate (G) can be consider ed the 2nd stage. Spacing disc (H) from its name acts as a means of separating the 2nd stage of the valve from the 1st stage.

The lst 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 (F), Figure 30. 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 (A) \through compression valve (U). The valve plate (T) is lifted off its seat in this operation

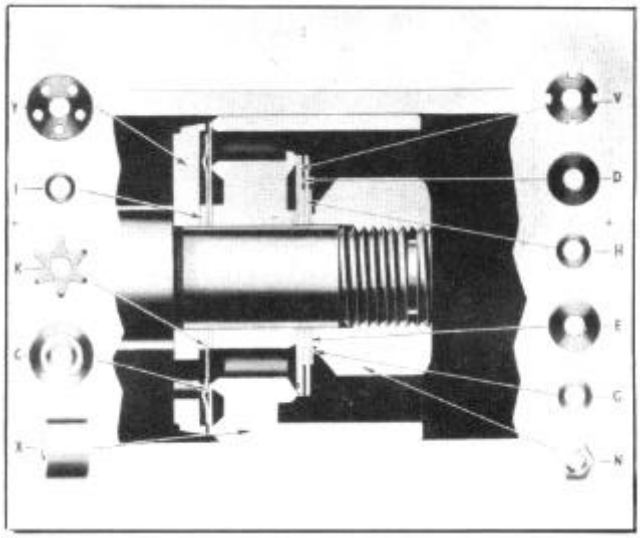


Figure 31--Delco Shock Absorber
Relief Valve Detail

C. Intake valve plate.
D. Valve disc.
E. Valve disc.
G. Valve back plate.
H. Spacing disc.
I. Spacing washer.
K. Star spring.
N. Piston nut.
X. Piston.
V. Metering washer.
Y. Valve washer.

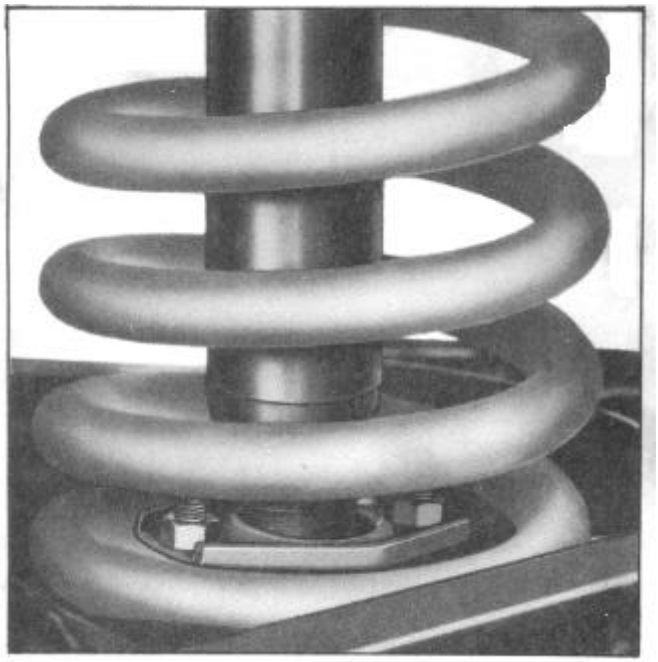


Figure 32--Front Shock Absorber Mounting

To reinstall reverse procedure of removal.

NOTE: In reinstalling place shock absorber stud nut on so that 1/4f, of stud projects for installing pal nut.

REAR SHOCK ABSORBER - REMOVING

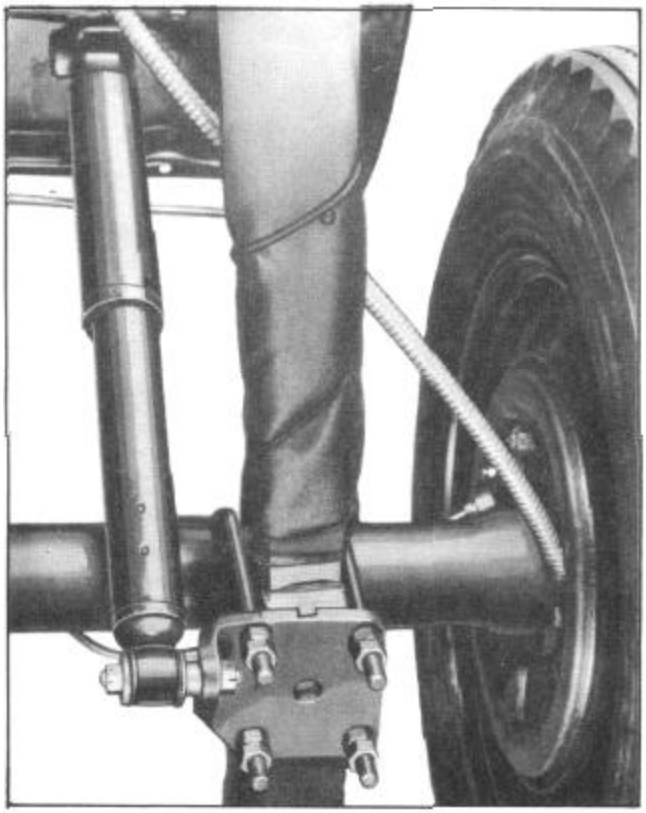


Figure 33--Rear Shock Absorber Mounting

1. Remove lower stud nut and washer, Figure 33.
2. Remove upper mounting bolt and nut and remove shock absorber.

To reinstall reverse procedure of removal.

SHOCK ABSORBER - DISASSEMBLY - DELCO OR MONROE - All Models

1. Remove the shock absorber from the car.
2. Clean the outside of the shock absorber thoroughly.
3. Extend the shock absorber fully and place lower end of the shock absorber in a vise using holding fixture J 993-l and with the double spanner wrench J 993-2 inserted thru the slots in the dirt shield tube, engage the notches of the piston rod guide and unscrew the guide.

DO NOT CLAMP THE TUBE OR STUD IN A VISE

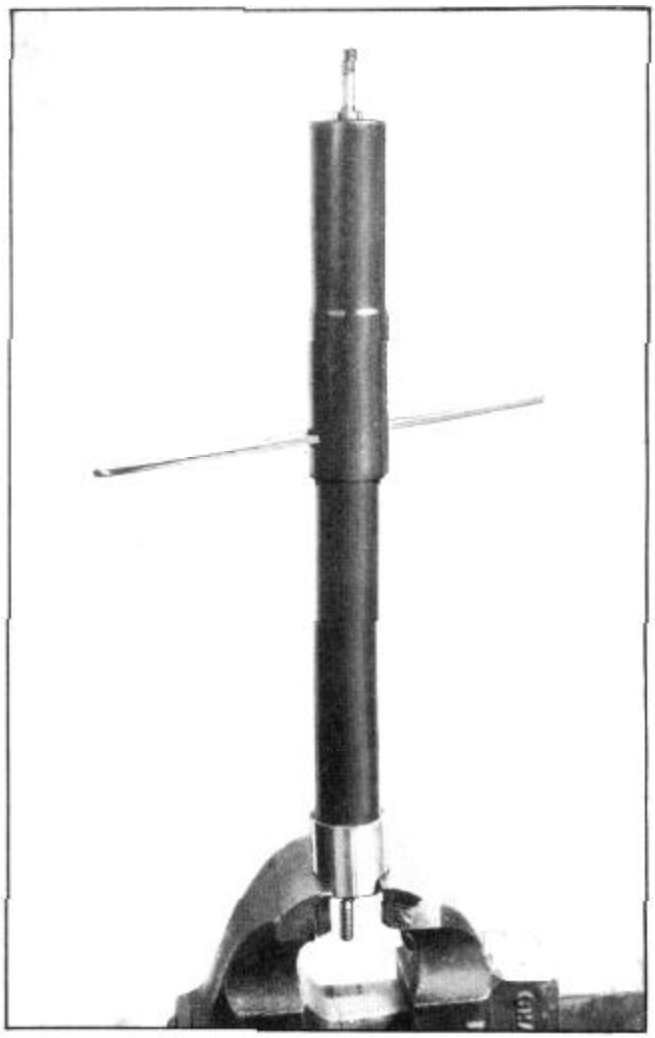


Figure 34--Shock Absorber Holding Fixture and Spanner Wrench

4. Pull out the upper part of the shock absorber.
5. Remove the lower part from the vise and empty out the old fluid.
6. Remove the rubber gasket at the top of the reservoir tube (A), Figure 30. Discard this gasket and always use a new one when rebuilding.
7. Open compression valve (U), Figure 30, by pressing it inward and drain fluid from inner chamber (F).

8. Remove compression valve assembly (U) from bottom of pressure tube (P). This valve is a light press fit in tube and can be easily taken out by placing a punch or screw driver against the ITV" groove machined on the outside of the valve body and tapping lightly with a hammer.
CAUTION: 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 993-1 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. Remove the following on the Front Shock Absorber in the order given--See Figure 35:

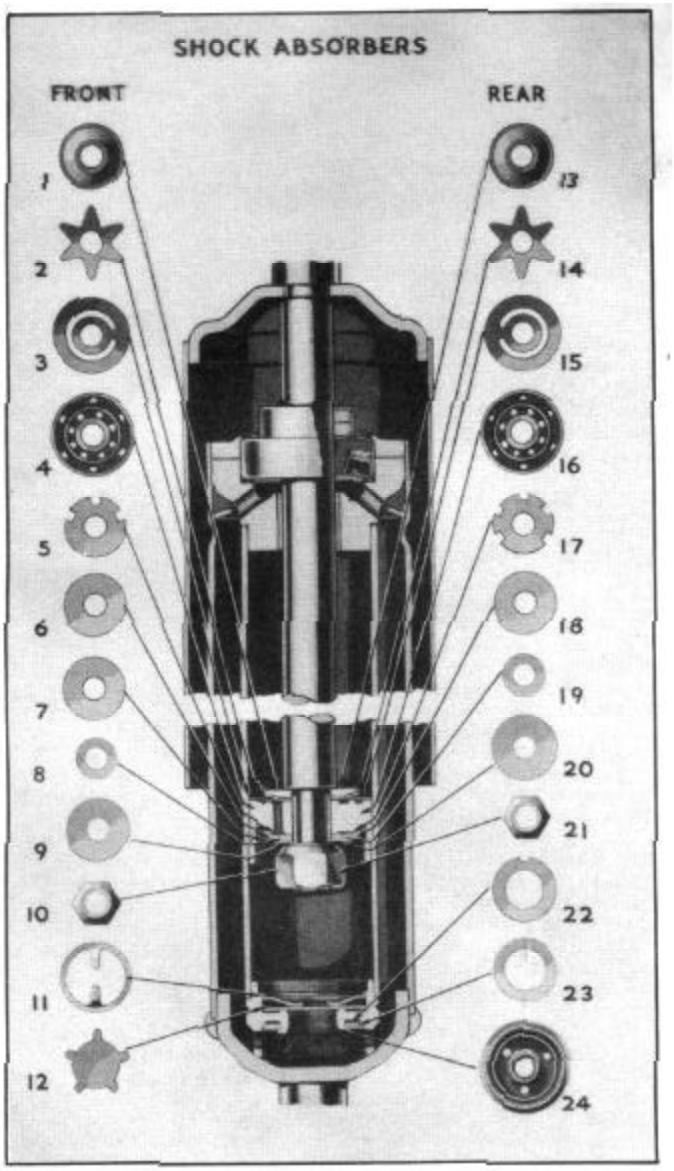


Figure 35--Shock Absorber - Monroe

PARTS OF FRONT

1. Support washer.
2. Intake valve star spring.
3. Intake valve.
4. Piston.
5. Metering washer.
6. Pressure relief valve disc.
7. Pressure relief valve disc.
8. Pressure relief valve back plate.
9. Pressure relief valve disc (2 used). 10. Piston rod nut.
*11. Intake compression valve spring.
*12. Intake compression valve.
*22. Intake compression valve metering washer.
*23. Intake compression valve spring disc 3 required.
*24. Cylinder end.

PARTS OF REAR

13. Support washer.
14. Intake valve star spring.
15. Intake valve.
16. Piston.
17. Metering washer.
18. Pressure relief valve disc.
19. Pressure relief valve back plate.
20. Pressure relief valve disc (2 used).
21. Piston rod nut.
*11. Intake compression valve spring.
*12. Intake compression valve.
*22. Intake compression valve metering washer.
*23. Intake compression valve spring disc
3 required.
*24. Cylinder end.

* Part of Intake Compression Valve--not sold separately--order a complete valve.

VALVE DISASSEMBLY - FRONT MONROE SHOCK ABSORBER

Remove piston rod nut (10), Figure 35, pressure relief valve disc (9) (2 used), pressure relief valve back plate (8), pressure relief valve disc (7), pressure relief valve disc (6), metering washer (5), piston (4). Be sure to mark location of piston on rod to insure it being replaced in same position, intake valve (3), intake valve star spring (2) and support washer (l).

VALVE DISASSEMBLY - REAR MONROE SHOCK ABSORBER

Remove piston rod nut (21), Figure 35, pressure relief disc (20) (2 used), pressure relief valve back plate (19), pressure relief valve disc (18), metering washer (17), piston (16). Be sure to mark location of piston on rod to insure it being replaced in same position, intake valve (15) intake valve star spring (14) and support washer (15).

VALVE DISASSEMBLY - DELCO SHOCK ABSORBER - FRONT AND REAR

Remove piston nut (N), Figure 31, back plate (G), relief valve disc (E), spacing disc (H), relief valve disc (D), metering washer (V), piston (X), intake valve plate (C), star spring (K), spacer washer (I) and valve washer (Y).

The component parts of the piston rod guide and oil seal assembly (0) are not replaceable separately; therefore, if any 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 (P) and is best removed by inserting a fibre or wood rod and tapping the guide against it.

SHOCK ABSORBER CHECK-UP

Check all shock absorber brackets to be sure that they are tight.

Check rubber mounting bushings and replace if worn.

Check piston operation by pulling the shock absorber back and forth to insure the piston is not binding in the cylinder tube and that it is perfectly free.

Check valve assembly to see that the parts are thoroughly clean and in correct relation to each other as shown in Figures 31 or 35.

See that piston nut is tight.

See that the rod guide is screwed down tightly and that the seal assembly or gasket is not leaking.

CHANGING VALVES - DELCO AND MONROE - All Models

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 should be checked.

The change to a slightly stiffer shock absorber action to take care of certain road or load conditions can be made as follows:

FRONT SHOCK ABSORBER VALVE CHANGE

1. Disassemble the front shock absorber and replace the piston metering washer (V), Figure 31, or (5), Figure 35, having 3 slots with a piston metering washer having 2 slots.

2. Also remove the pressure relief valve disc (D)*, Figure 31, or (7), Figure 35, .008,1 thick and also disc (D)*, Figure 31, or (6), Figure 35, .006" thick. Install in their place one only .01011 thick.

* Two discs, one .006!, and .008" are used in Delco front shock absorbers.

REAR SHOCK ABSORBER VALVE CHANGE

1. Disassemble the rear shock absorber and replace the piston metering washer with 5 slots (V), Figure 31, or (17), Figure 35, with a washer having 3 slots.

2. Also replace the pressure relief valve disc .008" thick (D), Figure 31, or (18), Figure 35, with a disc .010!! thick.

CAUTION: 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.

Reassemble shock absorbers, replacing parts in sequence shown in illustration. Refill with new Hudson Shock Absorber Fluid.

TO REASSEMBLE

1. Place end of shock absorber in vise fixture so piston rod and tube point upward.

2. Screw thimble supplied in shock absorber repair kit onto threaded end of piston rod, Figure 36. This should always be done in order to prevent damaging the piston rod oil seal when reassembling.

3. Install the pressure tube and piston rod guide, sliding oil seal over piston rod.

4. Install piston and valve parts on piston rod in the reverse order from which they were removed, and exactly as shown in Figures 31 and 35. 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.

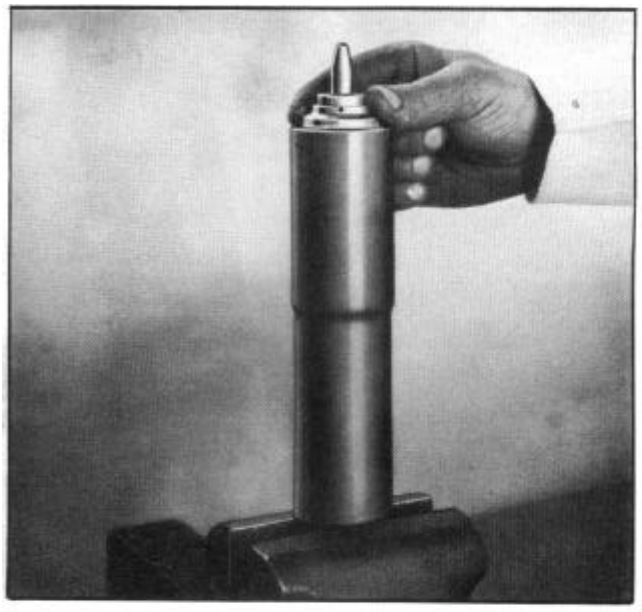


Figure 36--Piston Rod Thimble

5. Replace and tighten piston rod nut and move pressure tube up and down on piston a few times to check for freedom of movement. In the event that 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.

6. Securely tighten piston rod nut and stake to prevent loosening.

7. With shock absorber filler cup J 993-3-A properly adjusted, measure out the exact quantity of genuine Hudson Shock Absorber Fluid to fill unit being serviced (3 3/4 ounces for front, 6 l/4 ounces for rear).

8. Pull pressure tube upward on piston to full extent or until piston contacts guide; then pour into the tube enough of the measured fluid contained in the measuring cup to fill it.

9. Install relief valve assembly in end of pressure tube, carefully tapping it in place, so that shoulder contacts edge of tube all around.

10. 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 in any way.

11. Install new piston rod guide rubber gasket (R), Figure 30, on top of retainer after soaking it in shock absorber fluid and stretching to fit properly.

12. Pour into reservoir tube remainder of the previously measured quantity of 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 upward on upper half of shock absorber until the slots in the dirt shield tube are above piston rod guide, then insert double spanner wrench and engage notches in top of guide. Complete tightening operation with wrench, making sure that piston rod guide is drawn down tightly on gasket to preclude possibility of leakage.

15. Remove air from pressure tube by moving the upper half of the shock absorber up and down a few times.

This can best be done by holding the lower eye in a vise as it is imperative that the unit be held in a vertical position as on the car. A certain amount of air is necessary in the reservoir chamber for proper operation. As this is largely determined by the level of the fluid it will be seen that it is absolutely essential to use exactly the recommended quantity when servicing.

SHOCK ABSORBER REFILLING

It is unnecessary to refill shock absorbers unless the unit is disassembled for repair or changing valve control.

INDEX

STEERING GEAR SPECIFICATIONS

TYPE All models	
	Worm and roller tooth
RATIO	
Models 40,41,44,45,48	18.2 to 1
Models 43,47	18.4 to 1
ADJUSTMENTS	
Worm shaft	shims
Cross shaft	screw
Gear mesh	screw
Lubricate summer and Winter	SAE 90 EP

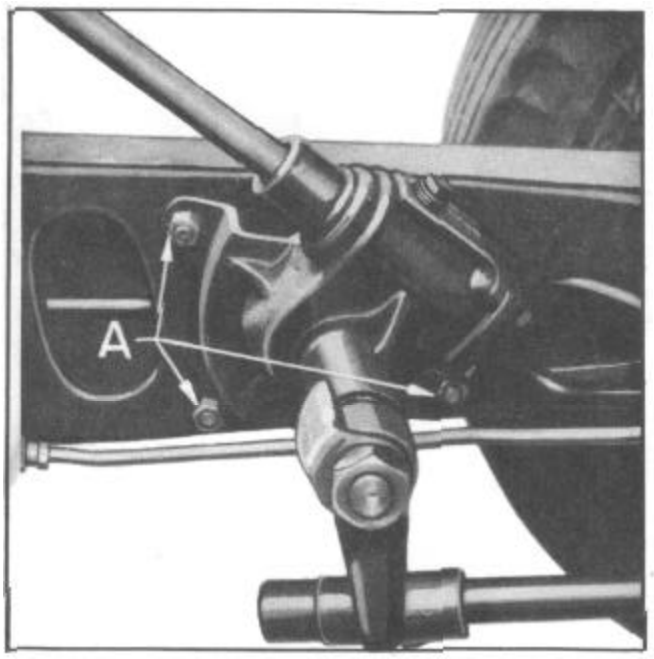


Figure 1--Steering Gear Mounting

STEERING GEAR

STEERING GEAR ATTACHMENT

The steering gear bolts to the frame side member front reinforcement on the inside of the frame with the gear shaft on which the ball arm assembles pointing to the inside. Three serrated neck bolts (A)-Figure 1 attach the gear to frame.

STEERING WHEEL

17" Wheel Standard on Models 40, 41, 44, 43, 47 7Sed, 48.

18" Wheel Standard on Models 43, 47 5Sed, 45. 18" Wheel Optional on Models 40, 41, 44, 48 except 7Sed.

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) Figure 2, is mounted in two roller bearings (14 and 15) which run in hardened steel races (13 and 16) adjustable by means of shims (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.

Due to the type and thinness 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

Adjustment for closer mesh of the shaft roller with the worm for the elimination of excessive play is by means of slotted adjusting screw the head of which extends out thru the housing cover on the left hand side (Figure 3). The inner end of the screw is fitted with a hardened steel thrust washer set in a groove in the roller shaft, see (6), Figure 2.

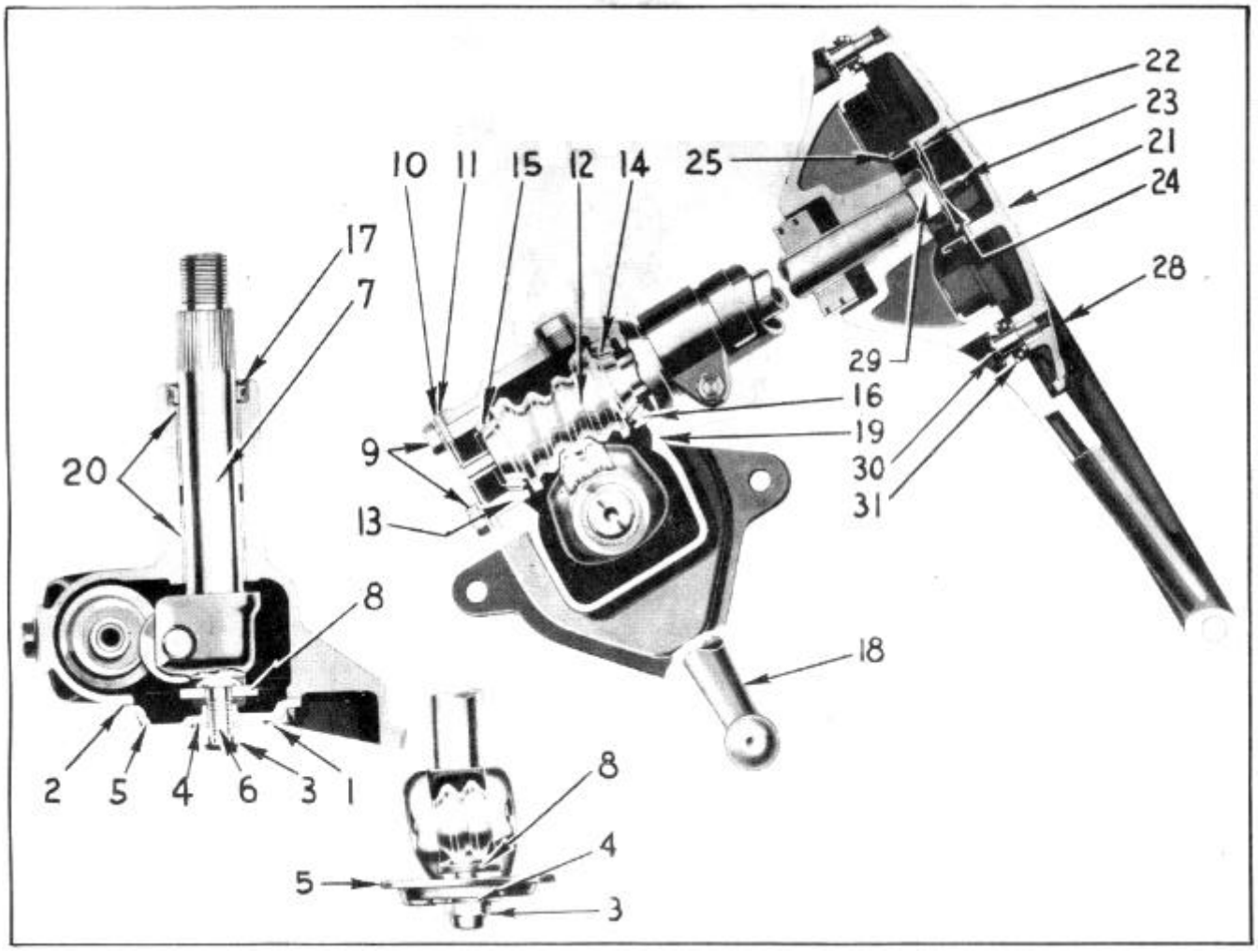


Figure 2--Steering Gear Details

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 Assembly
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

HORN BUTTON PARTS

21. Horn Button
22. Contact Spring
23. Horn Wire
24. Insulating Washer
25. Contact Cup
28. Steering Wheel
29. Steering Wheel Nut
30. Horn Button Screw
31. Horn Button Screw Spring

The position of the roller contact with the worm is offset from the center line of the worm, hence when the screw is tightened the roller is moved into closer mesh with the worm.

1. Remove the roller shaft adjustment screw lock nut (D), Figure 3, which is accessible thru a hole in the left frame side rail.

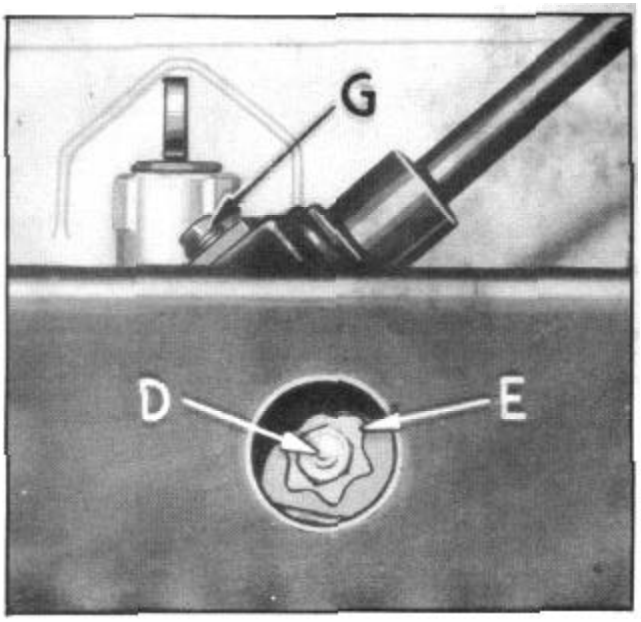


Figure 3--Steering Gear Adjustment and Lubrication

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), Figure 2, 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.

NOTE: 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, serious results will occur that are a detriment to continued good steering gear results.

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. See "Steering Gear Assembling" for check.

WORM BEARING INSPECTION

It is advisable to check the condition of the worm bearings as follows before starting any adjustment.

1. Jack 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.

6. If any end play exists the worm bearings need adjusting.

CAUTION: 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 screws (9), Figure 2, about l/8".

3. Use a knife and separate the top shim passing the knife blade all the way around between the shins (11), Figure 2, 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 ALIGNMENT

Loosen the frame bracket bolts (A), Figure l, 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), Figure 3, and the vent hole cover.

Fill with SAE 90 E.P. until it comes out of the oil vent.

Replace the oil filler plug and vent hole cover. 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 is as follows:

Disconnect drag link and place roller plates under the front wheels. Use a spring scale as described above.

Models 40, 41, 43, 48 should require 26 lbs maximum pull.

Models 44, 45, 47 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.

STEERING GEAR REMOVAL

1. Disconnect battery cable at negative battery post and remove cable clip bolt and nut on fender.
2. Disconnect horn wire at lower end of steering gear.
3. Remove steering gear jacket tube clamp bolt and nut.
4. Disconnect handy shift control wire by removing anchor clip and wire casing anchor bracket.
5. Disconnect handy shift control tube rod at tube lever by removing two nuts, washers and grommets.
6. Remove control tube lower bracket clamp bolt with Allen wrench.
7. Disconnect drag link at pitman arm end.
8. Remove pitman arm with puller 3-1374, Fig. 5. Do not drive or pry off as damage will result.
9. Remove horn button and wire.
10. Remove steering wheel nut and steering wheel with puller J 739 and adapter J 739-7.

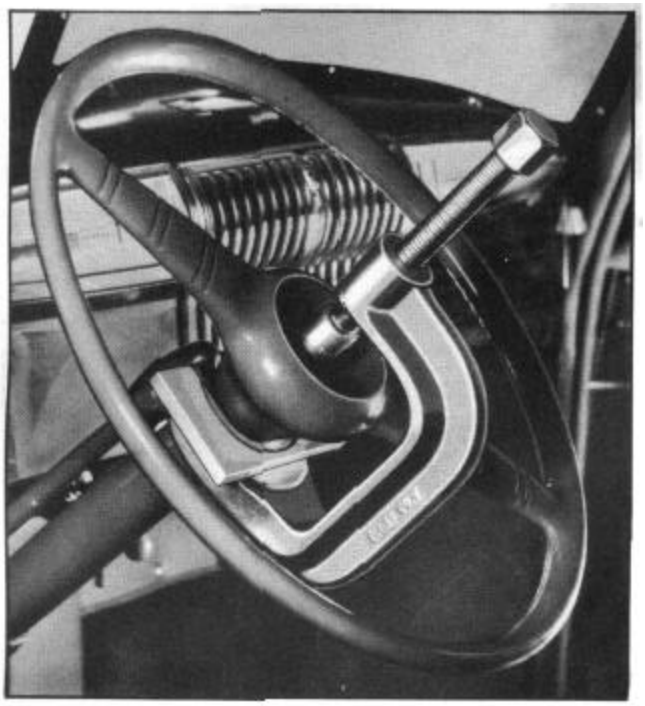


Figure 4--Removing Steering Wheel

11. Remove jacket tube bracket cap and bolts using a Phillips screw driver.
12. Remove handy shift control tube upper bracket clamp bolt bracket and ring using a Phillips screw driver.
13. Slide the jacket tube off the steering gear main column tube and out of the jacket tube clamp and control tube lower bracket.
14. Remove the handy shift control tube by working the lower lever up thru the hole in the toe board.
15. Disconnect the radiator stay rods at the dash and push up out of the way.
16. Disconnect bonnet hinge at the bonnet on the right hand side.
17. Remove the steering gear housing mounting stud nuts and washers.
18. Remove the steering gear by raising the lower end up over the engine and out of the right hand side. This can be done by turning the lower end frequently to obtain clearance.

STEERING GEAR INSTALLING

1. Lay the steering gear across the engine and the right hand fender.
2. Slide the jacket tube clamp and handy shift control tube lower bracket over the main column tube.
3. Insert the steering column main tube through the hole in the toe board and work the steering gear up through the toe board.
4. Insert the rollershaft through its hole in the frame side member.
5. Install the plain washer, lockwashers and nuts on the steering gear housing mounting studs and turn the nuts up until they just start compressing the lockwashers.
6. Insert the lower end of the handy shift control tube and lever through the hole in the toe board.
7. Install the jacket tube over the main column tube and through the hole cover, handy shift control tube lower bracket and jacket tube clamp.
8. Install the jacket tube clamp bolt and parking brake cable and tighten the nut.
9. Place handy shift control tube in position and install the control tube upper bracket and ring on the upper end of the control tube. Tighten the clamp bolt securely so that the upper face of the bracket is 25/32" below the top of the jacket tube.
10. Install the compression spring and washer on the lower end of the control tube. Slide the control tube lower bracket in place and secure in place approximately 7-1/2" above the lower end of the jacket tube. Secure the jacket tube and handy shift control tube to the jacket tube bracket with the cap and its screws.
12. Slide the steering gear hole cover in place.
13. Install the steering wheel, horn wire and horn button. 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.
14. Install the pitman arm, washer and nut and tighten.
15. 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.
16. Insert the end of the control wire in the control tube push rod end and secure with the anchor clip.
17. Attach the control wire casing to control tube lower bracket and adjust so that the clearance below and above the anchor clip is equal with the control lever in up position. Tighten bracket bolt.
18. Install control tube rod to lever with grommets, washers and nuts.
19. Attach battery cable to negative battery post. Fasten battery cable clip to fender. Connect horn wire. Fasten radiator tie rod and bonnet hinge.
20. Fill steering gear with SAE 90 E.P. lubricant. See "Lubrication"-section.
21. 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. If adjustment is necessary proceed as instructed under Drag Link, Page 5.

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.

The steering wheel should be installed with the two spokes in a horizontal position.

PITMAN ARM REMOVING

1. Remove pitman arm nut and lockwasher.
2. Remove pitman arm with tool J 1374.

NOTE: Do not remove by driving or prying as damage will result.

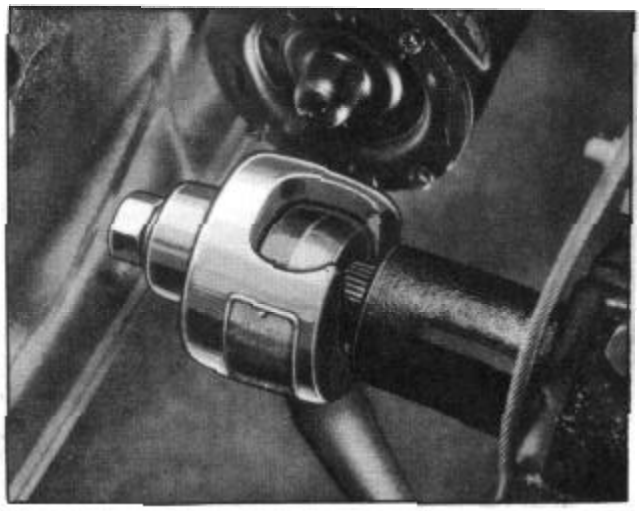


Figure 5--Pitman Arm Puller Tool J 1374

STEERING GEAR DISASSEMBLING

1. Remove the four housing cover screws (l), Figure 2, 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--ASSEMBLING

Dip all wearing parts in SAE 90 EP gear oil.

1. Press upper bearing race (16), Figure 2, in housing.
2. Install the upper worm bearing (14) on the worm and install worm and column (12).
3. Install lower worm bearing (15) and lower bearing thrust race (13) in the housing.
4. Install worm cover (10) shims (11) and the four cover screws (9).

NOTE: When the cover screws are drawn up tight there should be no perceptible end play in the column and not more than a three quarter pound pull at the 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.

5. Engage the cross shaft thrust washer (8) in the groove in the cross shaft and install the cover (5) and gaskets (2) as an assembly. Install oil seal (17) on the worm shaft (7) and press into place.
6. Install the four housing cover screws (l).
7. 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.
8. If the pitman arm can be moved more than 1/32 of an inch without the main column tube turning the roller shaft lock screw nut and lock plate should be taken off and the adjusting screw turned in with a screw driver until the movement is reduced to 1/32".
9. If more than 2 pounds pull (using tool J 544) is required at the steering wheel rim to move it from its mid position the roller shaft adjusting screw should be turned out.
10. After adjustment replace the lock plate (4) and lock nut (3) and recheck the pitman arm and the pull required to turn the wheel from the mid position.
11. Fill the housing with lubricant--see "Lubrication" section.

DRAG LINK

The drag link on all models is of the same construction on the front and rear ends. The rear end having the shim adjustment for setting wheels in a straight ahead position.

The Model 41,43,44,45 and 47 drag link is 26 11/16" long and the Model 40 and 48 is 21 15/16" long.

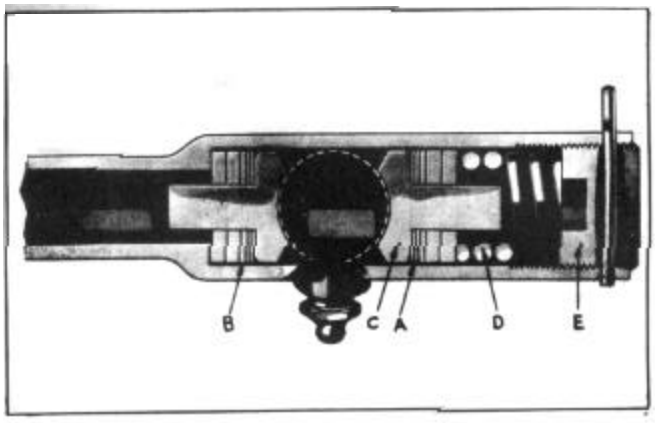


Figure 6--Drag Link Rear End
Showing Shim Adjustment

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).
3. Remove spring (D), Figure 6, shim pack (A), ball seat (C) and remove Pitman arm ball from drag link.
4. If steering wheel spoke (see Setting Front Wheels in Straight Ahead Position) is more than 2" (measured on the rim of steering wheel) to the left of horizontal remove the front ball seat and add part of the shims from the front pack (B) to the rear pack 01) and replace the front ball seat (C).

If steering wheel spoke is more than 2" (measured on the rim of the steering wheel) to the right of horizontal shims should be removed from the rear pack (A) and added at the front pack (B).

Each l/32 inch of shim that is changed will effect the movement of the steering wheel by approximately 3/4 of an inch.

5. Attach drag link to pitman arm ball; install ball seat (C); all of the remaining shims (A); spring (D); and rear plug (E).
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 - REMOVING

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.

INDEX

FRAME

FRAME CONSTRUCTION

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 fenders.

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, gives 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 Figure 1 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.

UNIVERSAL JOINTS

PROPELLER SHAFT AND UNIVERSAL JOINTS

The propeller shaft is of tubular construction with needle roller bearing type universal joints, see Figure 2.

UNIVERSAL JOINT REPAIR KIT

A repair job on a universal joint usually requires the replacement of the journal; journal bearing assemblies; and snap rings.

A service repair kit is available thru the Parts Department which contains--

1 Journal
4 Journal Bearing Assemblies
4 Journal Bearing Snap Rings
Part Number of the kit is 157734.

LUBRICATION

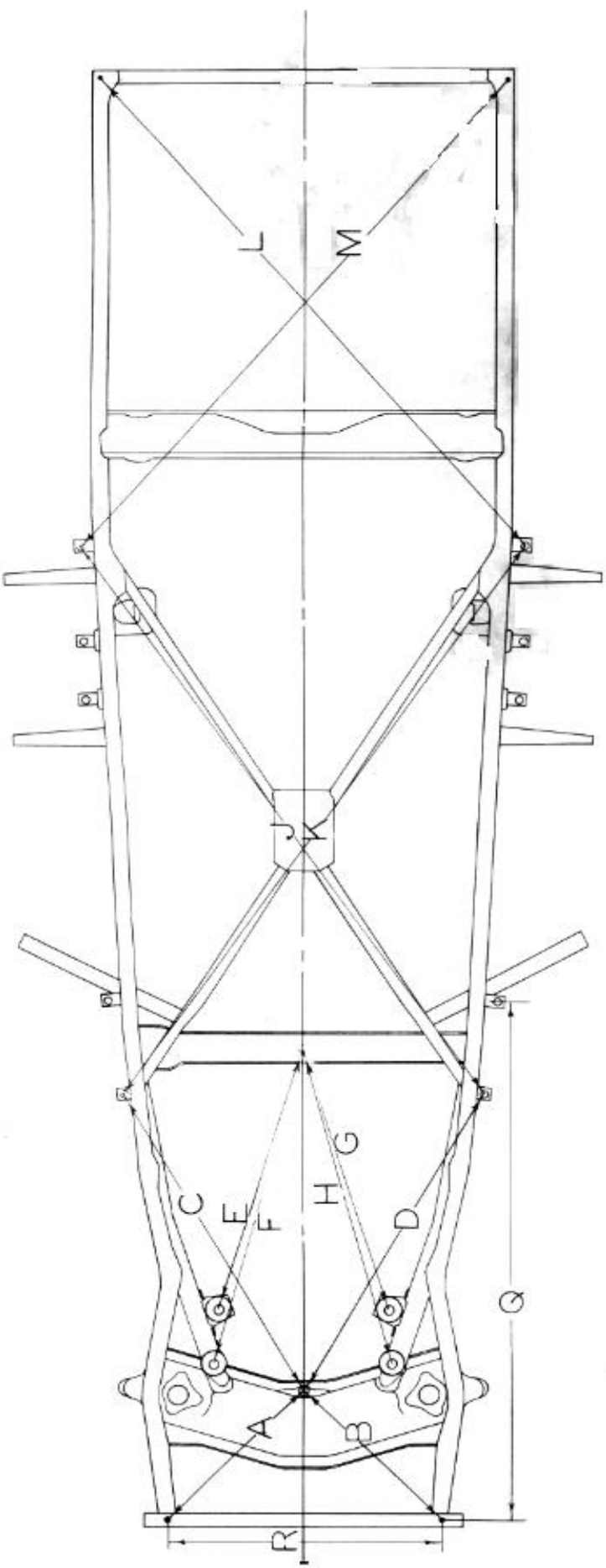
Every 10,000 miles the universal joint bearings should be disassembled, cleaned and re-packed with viscous chassis grease.

The splined end of the propeller shaft should be lubricated every 1000 miles by removing the plug in the universal joint sleeve and inserting a grease fitting.

CAUTION: The fitting should be removed and the plug replaced because the propeller shaft balance may be disturbed if it is not.

PROPELLER SHAFT AND UNIVERSAL JOINT REMOVAL

l. 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



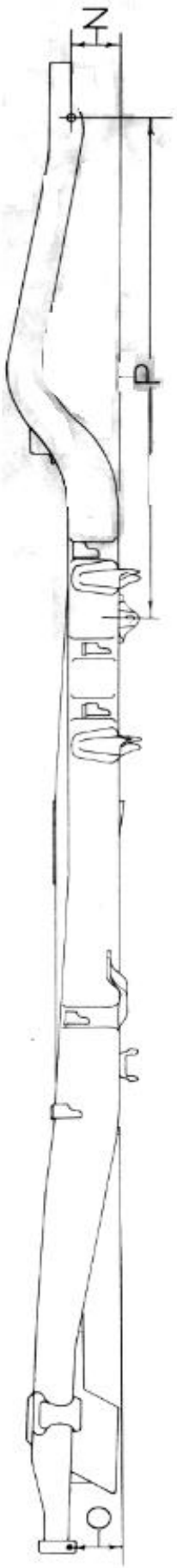


Figure 1 - 1940 FRAME DIMENSIONS

MODELS	W.B.	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R
40	113"	21 3/16	21 3/16	35 9/16	35 9/16	30 31/32	-	30 31/32	-	78 3/4	78 3/4	72 3/8	72 3/8	4 29/32	5 45/64	57 5/64	54 15/16	30 1/2
41	118"	21 3/16	21 3/16	39 25/32	29 25/32	30 31/32	-	30 31/32	-	78 3/4	78 3/4	72 3/8	72 3/8	4 15/16	5 49/64	57 5/64	59 15/16	30 1/2
43	125"	21 3/16	21 3/16	39 25/32	39 25/32	30 31/32	-	30 31/32		84 17/32	84 17/32	72 3/8	72 3/8	4 61/64	5 51/64	57 5/64	59 15/16	30 1/2
44,45	118"	21 3/16	21 3/16	39 25/32	29 25/32	-	37 5/8	-	37 5/8	78 3/4	78 3/4	72 3/8	72 3/8	4 15/16	5 49/64	57 5/64	59 15/16	30 1/2
47,48	125"	21 3/16	21 3/16	39 25/32	39 25/32	-	37 5/8	-	37 5/8	84 17 32	84 17 32	72 3/8	72 3/8	4 61/64	5 51/64	57 5/64	59 15/16	30 1/2

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.

NOTE: The bearing surfaces on the journal should be free of grooves or ridges. The bearing cups should be checked for grooves and chipped edges.

journal.

3. Hold the yoke and journal so that one bearing assembly can be inserted from the bottom.

4. Hold the yoke and journal so that the other bearing assembly can be inserted from the bottom. The rollers in their race will not fall out if installed from the bottom.

5. Install the journal bearing race snap ring.

6. Install the other two bearing assemblies on the journal and compress them with the universal joint assembling tool J 881 (Figure 3).

7. Install the U bolts, lock plates and nuts.

NOTE: The ears on the lock plates must be turned over 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 propller

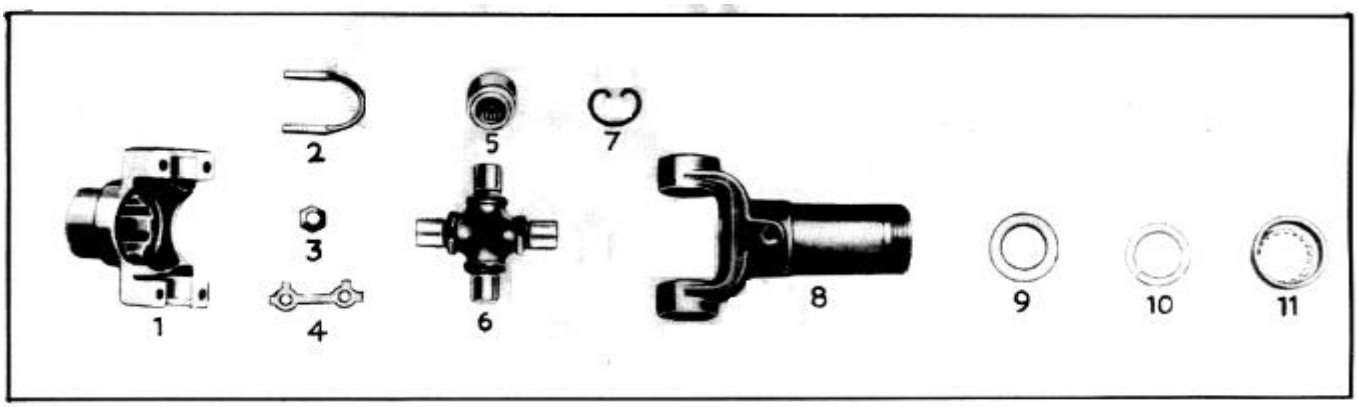


Figure 2 - -Universal Joint Construction

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 RE-ASSEMBLY

1. Pack all bearing assemblies with viscous chassis lubricant.

2. Use new oil seals on the inner end of the

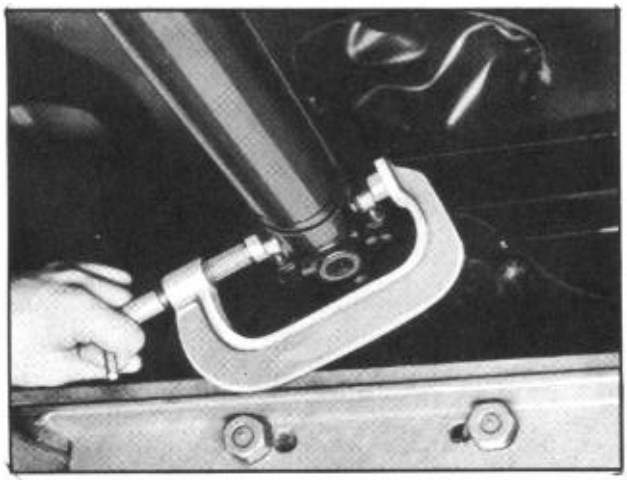


Figure 3--Universal Joint Bearing Tool J 881

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.

EXHAUST

MUFFLERS AND PIPES

The 6 cylinder models use a straight thru muffler with the intermediate shell within the muffler at the rear end. Noise and back pressure are reduced to a minimum. The inlet end diameter is 2".

The 8 cylinder models use a double chamber muffler. A sheet steel muffler heat deflector is used on all 8 cylinder models. This is assembled between the body floor and muffler and serves to insulate the body from the muffler heat. The stream of air passing on both sides of the deflector carries away the heat.

Exhaust pipes pass behind the front engine support and run completely under the engine splash guards. The pipe on the Model 40 cars is 1 3/4" at the exhaust manifold end and is flared out to 2" at the muffler end. One muffler and front muffler clamp is used on all 6 cylinder cars.

Two 2" pipes of different lengths are used on the other models - one on Models 41, 43 and 48 and the other on Models 44, 45 and 47.

Exhaust pipe covers of asbestos are used on all models.

Tail pipes are 1-1/2" diameter on Models 40, 41 and of the same length. Model 43 and 48 also uses an 1-1/2" pipe but of greater length. Models 44, 45 and 47 use a 1 7/8" pipe

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.
Models 40 and 48 with single carburetors are fitted with a manual heat control valve mounted at the center of the exhaust manifold. This valve should be set to the "W" position, that is with the pointer sloping to the rear and should remain
in this position for all seasons operation. Models 41, 43, 44, 45 and 47 equipped with duplex carburetors are fitted witn 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 - Models 40 and 48

1. Remove carburetor.
2. Remove two heat control valve retainer nuts.
3. Remove heat control valve retainer.
4. Remove heat control valve.
5. To replace, reverse order of removal.

HEAT CONTROL VALVE REMOVAL - Models 41 and 43

1. Remove carburetor.
2. Remove valve rod springs.
3. Remove retainer pins.
4. Remove stud nuts.
5. Remove heat control valve assembly.
6. To replace, reverse order of removal.

HEAT CONTROL VALVE REMOVAL - Models 44, 45 and 47

1. Remove carburetor connections.
2. Remove exhaust manifold.
3. Remove damper springs.
4. Remove retainer pins.
5. Remove stud nuts.
6. Remove damper assembly.
7. To replace, reverse order of removal.

EXHAUST PIPE - REMOVAL

1. Disconnect pipe at manifold.
2. Disconnect pipe at muffler.
3. Remove pipe.
4. To replace, reverse order of removal.

EXHAUST PIPE FLANGE OR FLANGE GASKET - REMOVAL

1. Disconnect exhaust pipe at muffler.
2. Remove pipe to manifold bolts and slide off flange and remove gasket.
3. To replace, reverse order of removal.

MUFFLER ASSEMBLY - REMOVAL

1. Disconnect exhaust pipe at muffler.
2. Disconnect tail pipe at muffler.
3. Remove muffler.
4. To replace, reverse order of removal.

MUFFLER AND EXHAUST PIPE - REMOVAL

1. Disconnect exhaust pipe at manifold.
2. Disconnect tail pipe at muffler.
3. Remove muffler and exhaust pipe.
4. To replace, reverse order of removal.

MUFFLER TAIL PIPE - REMOVAL

1. Disconnect tail pipe at muffler.
2. Disconnect tail pipe at tail pipe clamp.
3. Remove tail pipe.
4. To replace, reverse order of removal.

TIRES AND WHEELS

REMOVAL OF TIRE

To remove a tire, deflate the tube. 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 the 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.)

PROCEDURE FOR INSTALLING TIRE ON RIM

To install a tire, inflate the tube until just rounded out and insert into the casing, with the valve in line with the red dot on the tire side wall. Place one bead over 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 head onto its rim seat and insert valve stem througn 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 more 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 fronts.

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" chart below.

TIRE WEAR

The wear, although actually more rapid on rear tires, is usually more uniform than on front tires. The rear tire treads are flexed (distorted) in one direction while the engine is driving the car and in the opposite direction when the brakes are applied which accounts for their even wear.

The front tire treads are flexed in the same direction when the car is being driven as when the brakes are applied. This tends to cause spotty wear particularly if there are any 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 3,000 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 condition 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 or 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: It is important that the recommended pressure be maintained. Tire pressures must be checked at least weekly in the summer.
2. Mileage of tire in its present position: 10,000 miles of reasonably.hard driving will cause a very spotty wear on front tires. In severe cases put front wheel and tire assemblies on opposite side at rear.
3. Wheel Balance: An unbalanced condition will cause spotty wear and in extreme cases will cause tramp at certain speeds. (See "Wheel Balance" in this section.)
4. Wheel Bearings: Loose or worn wheel bearings permitting the wheel to wobble will cause scuffing of tires or even permit brakes to drag intermittently.
5. Brakes: Dragging brakes and particularly with eccentric drums will cause spotty wear. Be sure the brake backing plates are mounted securely on the spindles.
6. 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 11."

WHEEL BALANCE

The wheel and tire balance as previously pointed out is very important both for preventing uneven tire

WHEELS AND TIRES

Models	STANDARD		Optional		
			16 x 5.50		16 x 6.00 4-ply
			15 x 7.00		15 x 7.00 6-ply
40 T, 40 Utility Coupe, 40 Utility Sedan	16 x 5.50	4-ply			
			16 x 6.00		15 x 7.00 4-ply
					15 x 7.00 6-ply
40 P, 41, 44, 45	16 x 6.00	4-ply			
			16 x 6.25		15 x 7.00 4-ply
43	16 x 6.25	4-ply			15 x 7.00 6-ply
47	16 x 6.50	4-ply	16 x 6.50		15 x 7.00 4-ply
					15 x 7.00 6-ply
40 C, 48 C	16 x 6.00	4-ply	16 x 6.00	Truck Air Wheel	
			16 x 6.50	Truck Air Wheel	
			15 x 7.00	Truck Air Wheel	
			16 x 6.00	6-Ply	15 x 7.00 6-ply
			15 x 7.00	4-Ply	18 x 6.00 4-ply
					18 x 6.00 6-ply

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

1. After every front tire change.
2. After every front tire or tube repair.
3. After every front wheel change.

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. Loosen the nut sufficiently to allow the wheel to turn freely.
4. Insert cotter key and clinch it.
5. Install inner and outer hub caps and lower car to the floor.

WHEEL AND TIRE RUN-OUT

Lateral run-out 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". More than this should be corrected.

Mark the spot on the wheel or tire where the most run-out occurs and if it is found necessary to check caster 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.

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--

1. Statically
2. Dynamically

Wheel unbalance is the principal cause of tramp and contributes to other steering difficulties.

TIRE BALANCE SPECIFICATIONS AND MARKINGS

Tires installed at the Hudson factory are marked so that the light weight portion of the casing is counter balanced by the heavy weight portion of the tube.

A red triangle balance mark is placed on the tire and the valve stem should always be located at this mark.

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.

The balance of wheels and tires is maintained within 10 inch ounces.

STATIC BALANCE

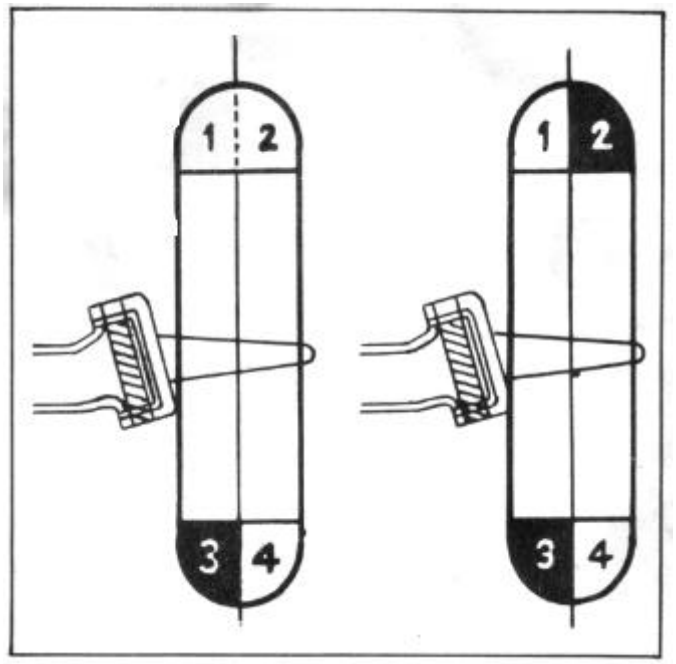
Static or still balance is the equal distribution of the weight of the wheel and tire assembly about the axis of rotation in such a manner that it has no tendency to rotate by itself regardless of the position of the wheel and tire.

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 Figure 4 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 as shown in Figures 8 and 9 will statically balance a wheel and tire assembly so as to give equal weight distribution.

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 Figure 5. The putty can then be weighed and balance weight or weights attached permanently to the rim to correspond to the weight of the putty. The sum of the weights of



Figures 4 and 5--Static balancing

section (1) and (2) is equal to the sum of the weights of section (3) and (4) Figure 5, the weight, therefore, is equally distributed about the axis of rotation. The weight at (2) being balanced by the weight at (3). However this wheel is not in dynamic balance because section (1), Figure 5 is lighter than section (2) and section (4) is lighter than section (3).

DYNAMIC BALANCE

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 Figure 5, 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 Figure 6, which exerts

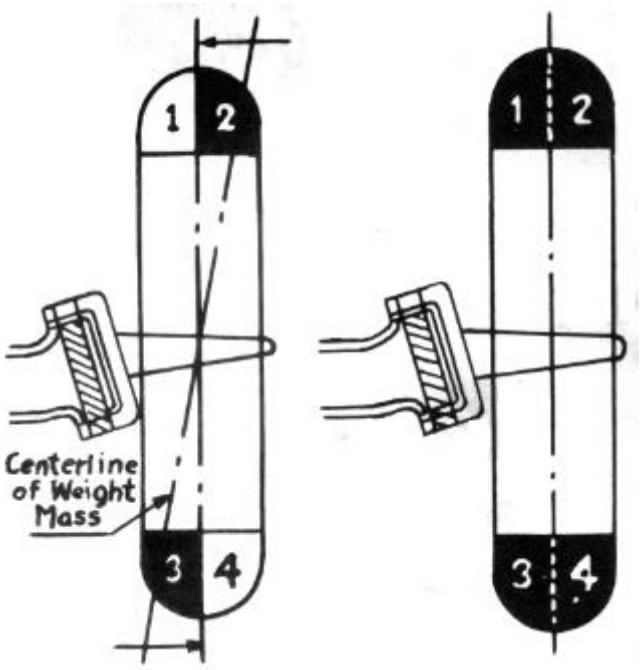


Figure 6, which exerts a force on the wheel to try to obtain a new center line and thus change the axis of rotation. The wheel in spinning, therefore, rim and are tapped in place with a hammer. tries to equalize the weight at (2) and (3) by moving the center line first in one direction and then in another, 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 (l) and (4), Figure 5, to equal the weight in sections (2) and (3), and in Figure 7 the weight is evenly distributed about both the axis of rotation and the center line of the wheel. This wheel is statically and dynamically balanced.

NOTE: 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.

BALANCING MACHINE

The Combination Static and Dynamic Wheel Balancer KMO 55 J as shown in Figures 8 and 9 is available through the Hinckley-Myers Co., Jackson, Mich., and uses one mounting for both static and dynamic balancing.

The vertical position of the wheel permits balance weights being applied from either side of the wheel.

BALANCING WEIGHTS

Balancing weights clip over the edge of the wheel rim and are tapped in place with a hammer.

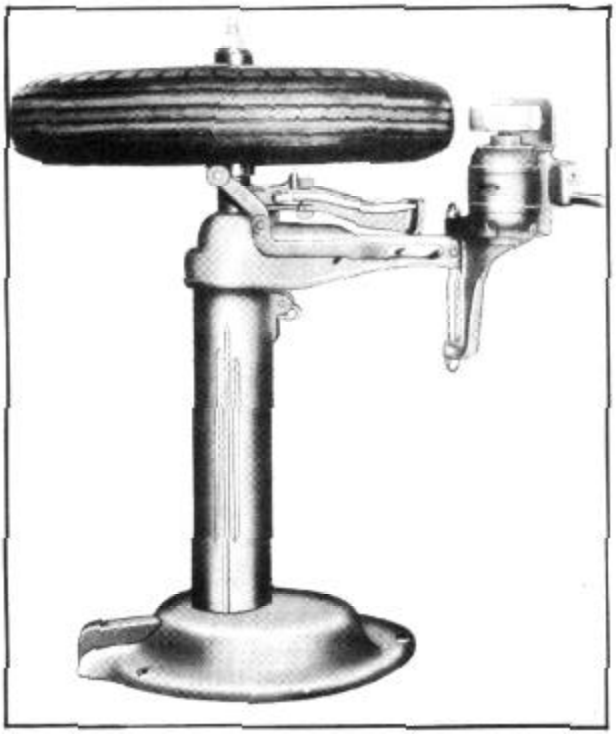


Figure 7 - Static Wheel Balance on KMO 55-J

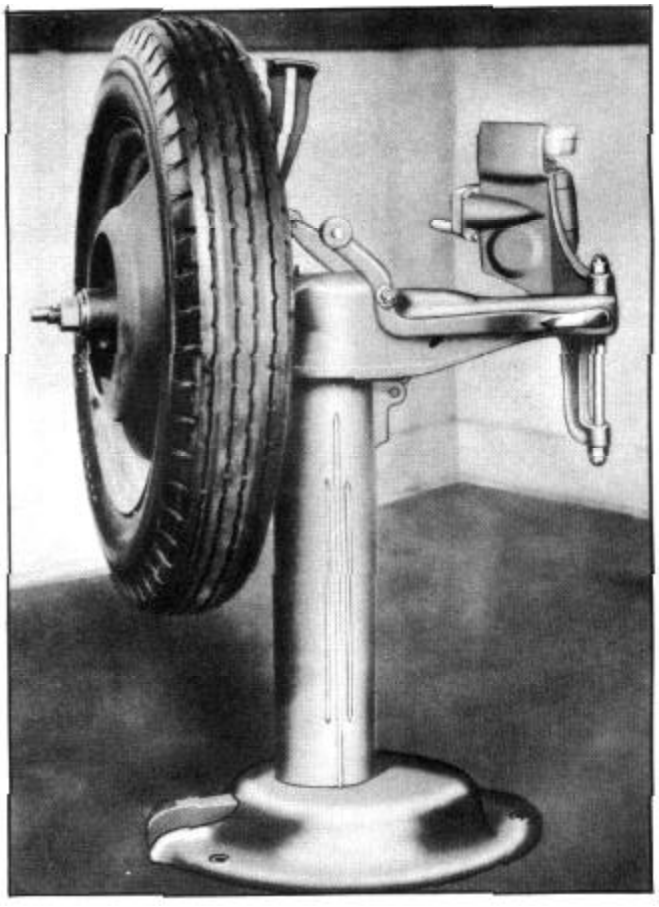


Figure 9--Dynamic Wheel Balance on KMO 55-J

SHIPPING BRACKETS

All cars shipped by freight have an extra bracket assembled to the right and left sides of the frame on the outside of the front bumper support bars, to which hold-down chains are attached for the purpose of securing the car against movement during transit.

These brackets are held in place by the same bolts which are used for the attachment of the bumper mounting bars and must be removed upon arrival of the car at its destination.

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BONNET

The centering of the bonnet between the fenders and at the cowl is taken care of by adjustments as shown in Figure 1.

The bonnet hinge is U shaped and composed of arms (4) with cross bar U (14). The cross bar has a loose fitting bracket (7) which has a serrated face and is fastened to the frame bracket (5) which also has a serrated face by screws (6). The frame bracket (5) is fastened to the frame by bolts (17). The end of the cross bar (14) has thick and thin washers held on it by a large cotter pin for positioning the hinge assembly.

Loosening the bonnet hinge adjusting bolts (6) allows the bonnet to be shifted forward or backward for the fullest possible adjustment.

Loosening the bonnet hinge frame bracket bolts (17) allows a slight shifting of the bonnet sidewise or lengthwise.

The fender brace (8) is fastened to the frame at one end and to the fender by bracket (20). It has a lock nut (9) and a holding nut (10).

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.

Determine what places are out of adjustment and depending.upon the amount of correction needed proceed as follows:

Hinge frame bracket (17)	will allow	Slight lengthwise and slight sidewise adjustment.
Hinge adjusting bolts (6)	will allow	Slight sidewise and a full lengthwise adjustment.
Fender adjusting brace rods (8)	will allow	Full sidewise adjustment of fender at the front end.
Louvre panel bolts (2)	will allow	Line up of louvre panel--always push entire panel forward as far as possible.
Hinge adjusting thick and thin washer	will allow	Control sidewise movement of cross bar shaft assembly (14).

BONNET REMOVAL

1. Unlock and raise bonnet.
2. Remove the bolts holding bonnet support to bonnet.
3. Remove bonnet light wire terminals from their connectors.
4. Remove bonnet to bonnet hinge bolts (21), Figure l.
5. Remove bonnet by lifting straight up.

BONNET MOULDINGS AND ORNAMENTS

The various mouldings and ornaments are different on some models and they 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.

The ornament extension moulding front on some models overlaps the ornament and it will be necessary to slide these together.

BONNET HINGE ASSEMBLY - REMOVE AND REPLACE

1. Remove bonnet.
2. Remove bolts (6), Figure 1, holding adjusting bracket (7) to frame bracket (5).

To replace reverse procedure of removal. Align bonnet as outlined under “Bonnet Alignment”.

BONNET SUPPORT ARM REMOVAL

Remove 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 LAMP, BULB OR LENS - REMOVE AND REPLACE

The bonnet lamp is held in place by four nuts attaching to studs in belt moulding and the side long moulding (the top or upper one of the two long side mouldings).

The standard bulb is 1 l/2 C.P.-6 to 8 V-No. 55 and for direction signal indicator 21-3 C.P.-DC6 to 8 V-No. 1154.

REMOVE RADIATOR LOUVRE PANEL ASSEMBLY

1. Remove bolts (2), Figure 1, and washers from underneath the fender.
2. Remove the center front screw from underneath.
3. Remove the front bolt fastening the bumper assembly and loosen the rear bolt thus allowing the bumper assembly to drop down.
4. Remove louvre panel assembly and lay it carefully to one side to avoid scratching.

REMOVING RADIATOR LOUVRES FROM PANEL

1. Remove louvre panel assembly as shown above and the 12 louvres and center moulding can be removed by taking out screws and washers.

NOTE: There are 6 right and 6 left hand and center mouldings on the Radiator Louvre Panel. The top louvre is on the bonnet.

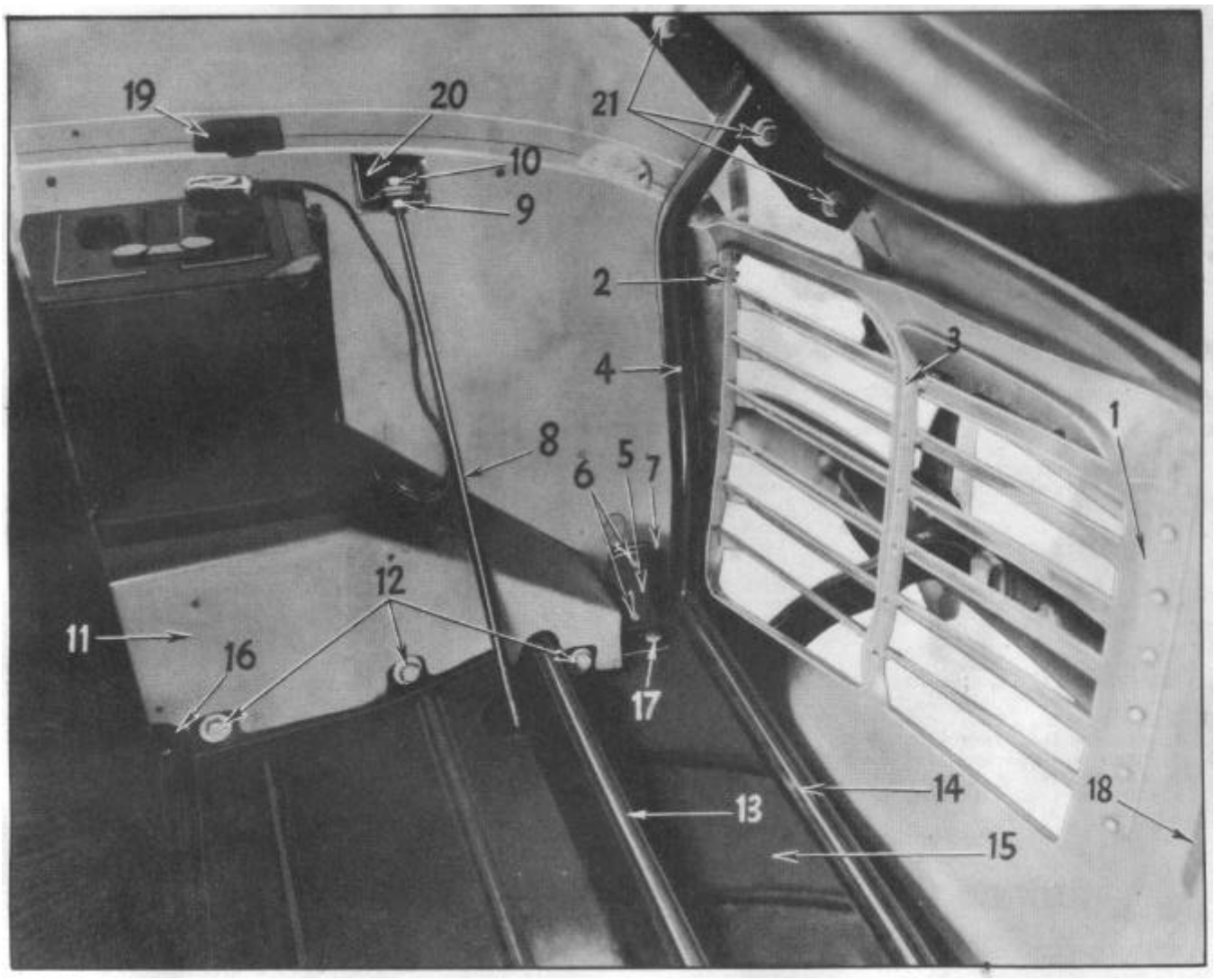

Figure 1--Bonnet and Front End Sheet Metal

1. Radiator louvre panel assembly.
2. Radiator louvre panel to fender bolt.
3. Radiator louvre screw.
4. Bonnet hinge arm and cross shaft assembly.
5. Bonnet hinge cross shaft frame bracket.
6. Bonnet hinge cross shaft adjusting bracket screw.
7. Bonnet hinge cross shaft adjusting bracket. rod.
8. Front fender to frame cross member brace nut.
9. Front fender to frame cross member brace rod
10. Front fender to frame cross member brace rod lock nut.
11. Front fender.
12. Radiator lower tank shield to fender bolt.
13. Auto-poise bar.
14. Bonnet hinge arm and cross shaft assembly.
15. Radiator lower tank shield.
16. Radiator lower tank shield to fender screw.
17. Bonnet hinge cross shaft frame bracket to frame bolt.
18. Radiator louvre center moulding.
19. Bonnet to fender rubber bumper.
20. Front fender brace rod bracket.
21. Bonnet to hinge bolt.

REMOVE RADIATOR LOWER TANK SHIELD

1. Remove radiator louvre panel assembly (1), Figure 1.
2. Remove fender brace rods (8).
3. Remove cap screws holding fender brace rod to frame.
4. Remove screws holding radiator lower tank shield to fender (12).
5. Remove center screw holding radiator lower tank shield to fender support.

FENDERS

FRONT FENDER - REMOVE AND REPLACE

1. Unlock and raise bonnet.
2. Disconnect head lamp wires at junction block. The white wire is for right lamp and the black wire is for left lamp.
3. Release wires from fender and dash clips.
4. Push headlamp cables through the cable hole in fender.
5. Remove fender to running board bolts.
6. Remove fender brace rod top nut (10), Figure 1.
7. Remove louvre panel to fender bolts (2).
8. Remove fender to fender cross member bolts and spacers.
9. Remove fender brace to fender cross member screw.
10. Remove radiator core baffle to fender screws (right fender only).
11. Remove radiator lower tank shield to fender screws.
12. Remove bonnet support to fender screws.
13. Remove fender apron support to inspection cover screw.
14. Remove horn bracket to frame screws. 15. Remove fender.

NOTE: The battery which is on the left front fender must be removed when removing or replacing the left front fender.

REAR FENDER - REMOVE AND REPLACE

1. Remove tail lamp.
2. Remove wheel and tire assembly.
3. Remove fender brace to body bolt.
4. Remove fender to body bolts.
5. Remove fender.
6. To install reverse order of removal.

RUNNING BOARDS

RUNNING BOARD ASSEMBLY - REMOVAL

1. Remove running board to front fender bolts.
2. Remove running board to frame bolts.
3. Remove running board to running board bracket bolts.
4. Remove running board.
5. To install reverse order of removal.

RUNNING BOARD REMOVAL

On cars where a change over from running boards to a car without running boards is made the service kit should be ordered stating the model of car.
The service kits are as follows -
142366 Service Kit - Models 40T, 40P and 40 Utility Coach
142367 Service Kit - Models 41, 44 and 45
142368 Service Kit - Models 43, 47 and 48P

The kit consists of

2. Underbody extension finish mouldings 16 Underbody extension moulding bolts
16 Underbody extension moulding bolt nuts 16 Underbody extension moulding washers
16 Underbody extension moulding lock washers
1 Rear fender stone protector - right
1 Rear fender stone protector - left 14 Rear fender stone protector wedges 4 Rear fender stone protector screws
4 Rear fender stone protector screw washers
4 Rear fender stone protector screw lock washers
4 Rear fender stone protector screw nuts
2 Front fender splash apron assemblies
2 Front fender trim mouldings
6 Front fender trim moulding bolts
6 Front fender trim moulding bolt washers
6 Front fender trim moulding bolt lock washers
6 Front fender trim moulding bolt nuts
1 Template for cutting rear fender for stone protector installation

RUNNING BOARD REMOVAL FOR CHANGE OVER

1. Remove running board to front fender bolts.
2. Remove running board to frame bolts.
3. Remove running board to running board bracket bolts.
4. Remove running board brackets.
5. Lay out and drill holes for stone protector on rear fenders, using template supplied in kit.
6. Install stone protectors on rear fenders.
7. Install underbody extension finish moulding.
8. Install front fender finish moulding.
9. Install front fender splash apron assemblies.

RUNNING BOARD INSTALLATION

On cars where a change over of a car without running boards to a car with running boards is made the proper running board kit should be ordered.

The running board kits are as follows -

140604 Running Board Kit - Model 40
140605 Running Board Kit - Models 41, 44, 45
140606 Running Board Kit - Models 43, 47, 48

The kit consists of -

Running board assembly - right Running board assembly - left Running board attaching bolt Running board attaching bolt lock washer
Running board attaching bolt washer Running board bolt
Running board bolt lock washer Running board bolt nut
Running board bolt washer
Running board bracket - front
Running board bracket - center and rear Instruction sheet for cutting stone protector

INSTALLING RUNNING BOARDS ON CARS NOT SO EQUIPPED

1. Remove underbody extension finish moulding.
2. Remove front fender trim moulding
3. Remove rear fender stone guard and cut as indicated below.
4. Install running board brackets.
5. Install running board.
6. Install stone protector and cut to conform to curvature of running board.

Cut fender stone protector along the top of the vertical beads on the lower end of the stone guard to the eighth bead from the outside or 3 1/2" measured from the outside edge. At the sixth vertical bead or 2 1/211 from outside of the guard cut up 1 1/211 from the bottom and then blend to fit curvature of the running board.

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BODIES

Hudson built bodies, Figure l, are of welded all-steel construction. The body floor panel is a single steel stamping to which all side panels and welded or riveted. This forms the foundation for the body and also acts as a cover panel for the frame to which it is attached with numerous bolts. In effect the body and frame become a single unit with all parts

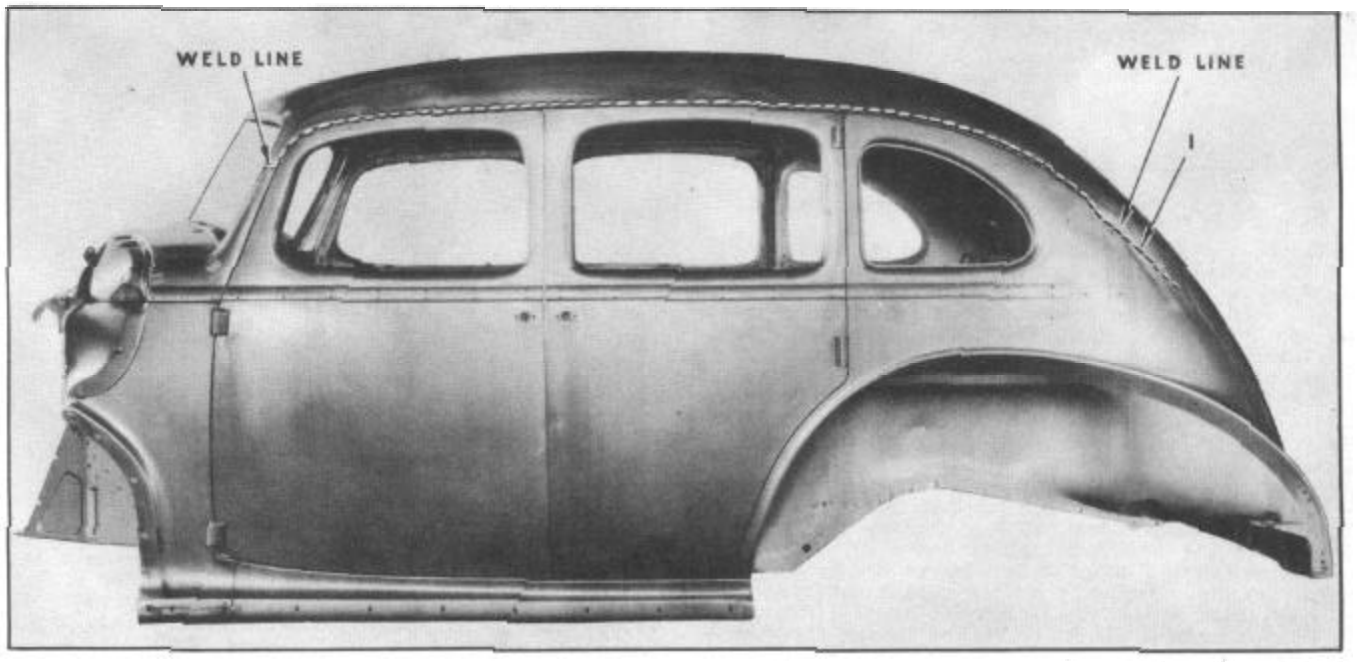


Figure 1--Four Door Sedan Body

come a single unit with all parts of both giving structural strength instead of the body being simply a load which the frame must carry.

The body is scientifically insulated against cold, heat, noise and vibration through the use of jute pads cemented to the floor panel and cowl.

Large panels and joints are sprayed with a composition which effectively deadens noise and prevents entrance of drafts.

The roof panel is insulated against vibration through the use of insulating board cemented to the panel.

All doors and windows are weatherstripped to seal against entrance of drafts.

FRONT END ASSEMBLY

This assembly consists of the front end panel (A), Figure 2; dash panel (B); front pillar to dash bracket and toe board riser (C), Figure 3; instrument panel (D) and windshield header (E).

The front end panel is welded to the top panel at (1), Figure 2. These joints are soldered after welding and can be located by running the solder out of the joint with a torch.

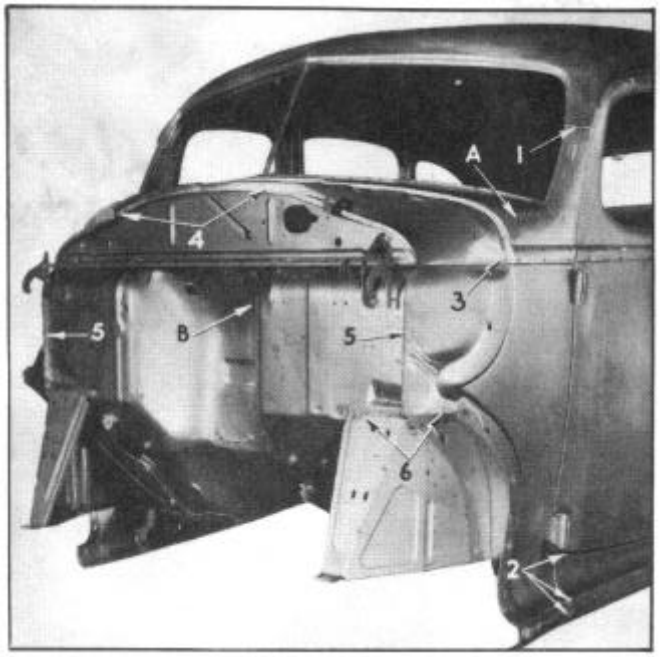


Figure 2--Front End Assembly Front View

The cowl side panel is welded to the underbody panel extension at (2), Figure 2, and to the front end panel at (3).

The dash panel is welded to the front end panel at (4), Figure 2; to the cowl side panels at (5); to the front pillar to dash bracket and toe board riser at (6).

The front pillars are welded to the body header at (l), Figure 3; 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 (6).

The front pillar to dash bracket and toe board riser is welded to the front pillar at (5), Figure 3, and to the dash panel at (7 and 8).

The instrument panel is welded to the front end panel at (9), Figure 3, and is welded and riveted to the front pillar reinforcement at (l), Figure 7.

The windshield header is welded to the front pillars at (2), Figure 3, and to the front end panel at (10).

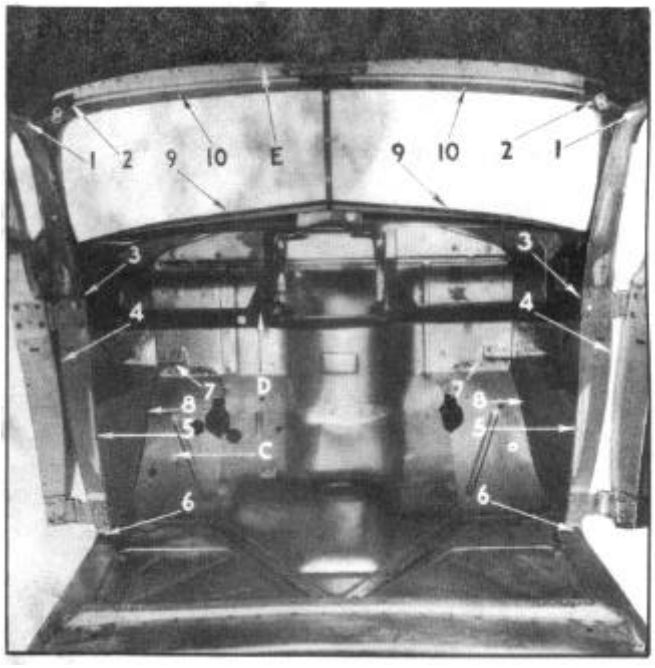


Figure 3- -Front End Assembly - Rear View

ROOF PANEL

The roof panel extends from the windshield opening to the rear compartment opening, see Figure 1.

It is welded to the front end panel at (1), Figure 4; to the body header at (2); to the body header along (3) and to the quarter panel along (4).

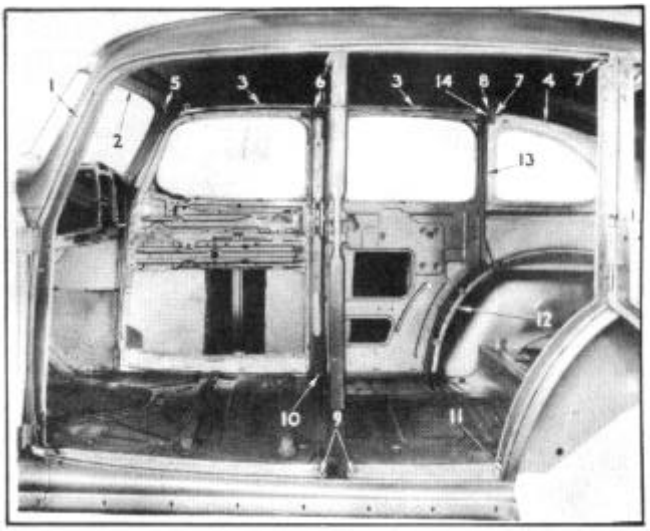


Figure 4--Four Door Sedan - Inside View

The rear window frame (l), Figure 5, 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), Figure 5, 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.

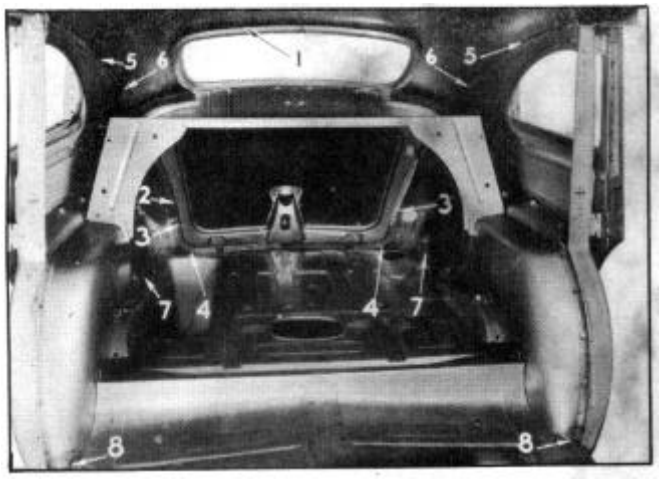


Figure 5--Four Door Sedan - Rear Inside View

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 Figure l.

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 Figure 6. 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.

CAUTION: 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.

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

The body header is welded to the front pillar at (5), Figure 4. 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), Figure 4, and is 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), Figure 4; to the wheelhouse at (12); to the quarter panel at (13) and to body header (14).

QUARTER PANELS

The rear quarter panels on four door sedans are supplied as an assembly only and consist of the following: Quarter panel, window flange bracket assembly, window frame upper fastening plate, window rear corner plate assembly, window to wheelhouse bracket and rear pillar assembly. 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),' Figure 5, along the body line, which is a continuation of the drip moulding joint and 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

The 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 and these spot welds are located under the door opening rubber weatherstrip, see Figure 6.

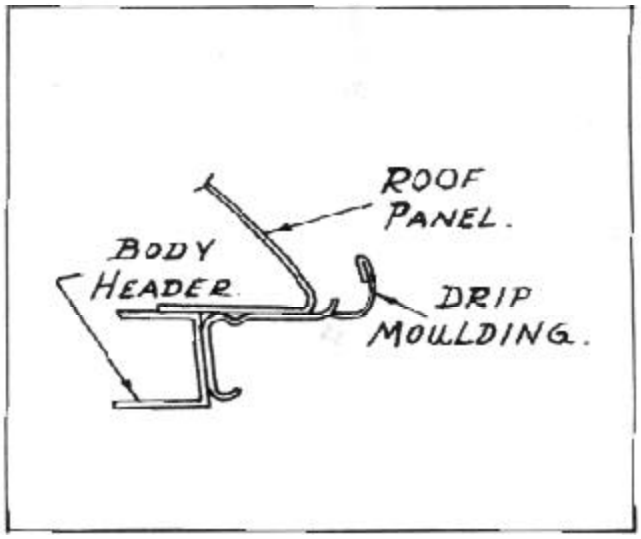


Figure 6--Section View of Drip Moulding and Top Panel

The drip moulding has two functions - one to carry off the water from over the doors and the other to act as a retainer for the rubber weatherstrip.

The drip moulding is easily removed by drilling through the spot welds or using a thin sharp Chisel to break them loose.

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), Figure 5. 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.

REAR PANEL - LOWER

The 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 REPLACEMENT

The instrument panel is spot welded to the front end panel at (1), Figure 7, and welded and riveted to the front body pillar reinforcement at (2).

To remove old panel drill out spot welds and cut off rivets with a thin sharp cold chisel.

When installing new panel take proper precautions to prevent heat from welding, burning graining on panel and finish on cowl.

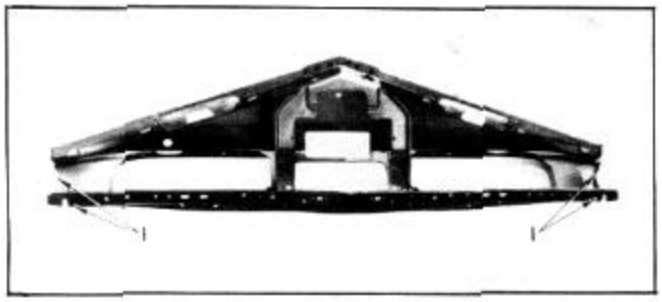


Figure 7--Instrument Panel - Bottom View

BODY SEALING

All joints between underbody panel and body side panels are sealed with a plastic compound to prevent entrance of water, drafts and dust. This compound remains flexible and does not completely harden in service.

When checking dust, water or draft complaints these points should be carefully examined and additional compound applied.

BODY OUTSIDE MOULDINGS

The body outside mouldings on the cowl, doors, and quarter panel are held on with clips except at the extreme rear ends on the quarter panel where all mouldings are held to the body by a moulding bolt whose head slips into the moulding slot the same as the clips.

The nuts on these moulding bolts are accessible from the rear (trunk) compartment.

The mouldings can be pried loose from the clips with a screw driver.

NOTE: All moulding holes in the body should be sealed against water with a water cement and this particularly applies to the bolt holes at the rear quarter panel. Water will enter the rear trunk compartment unless these holes are sealed.

WINDSHIELD

The windshields on all models are of the two piece type. The individual pieces are held in a moulded weatherstrip cemented in the body opening.

All models except 40 Traveler and Commercial cars have stainless steel reveal mouldings cemented in place between the body flange and glass weatherstrip.

WINDSHIELD GLASS REMOVAL - Model 40 Traveler and Commercial

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.

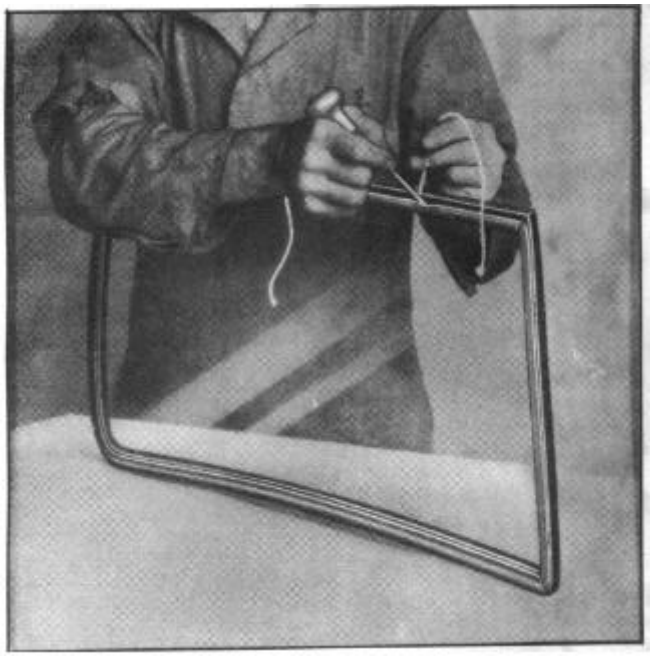
WINDSHIELD GLASS REMOVAL - All Models except Model 40 Traveler and Commercial

1. Remove the rear view mirror.
2. Remove the screws in the upper and lower finish mouldings including the center moulding and remove the mouldings.
3. Remove the outside center bar. This is held on by the same screws that hold the inside center finish moulding.
4. 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.
5. 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.
2. Apply a coating of FS-621 windshield sealer, available through Hinckley-Myers Company, 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 very 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 onto the glass.

5. Place a piece of strong twine about 60" long, see Figure 8, in the outside moulding groove, bringing the ends together at the top and allow them



to hang down on the outside of the glass.

Figure 8--Installing Windshield Glass Weatherstrip

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 weather-strip over the flange of the opening.

Figure 9--Installing Windshield Glass

7. Cement the outside lip of the weatherstrip to the flange by putting the nozzle of a tube of FS-621 windshield sealer under the flange and depositing the cement all around the opening.

A force feed gun B-182, available through Minckley-Myers Company, can be used to deposit a small bead of cement around the weatherstrip flange.

8. 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.

9. 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 model 40 Traveler is cemented to the windshield opening under the rubber weatherstrip.

It is necessary to remove the windshield glass to remove or replace these mouldings.

REPLACING REAR QUARTER WINDOW - SOLID TYPE

TO REMOVE:

1. Release rubber lip at outside - using a screw driver or another blunt instrument - breaking loose cement seal.
2. Insert two screw drivers behind rubber weatherstrip at top of seal catching screw driver under flange of window opening.
3. Pry down on screw driver and with rubber hammer tap out window.

TO INSTALL:

1. Clean cement from window opening flange.
2. Place coat of cement around window opening flange.
3. Apply a coating of sealer FS-621 in glass groove in weatherstrip.
4. Place a piece of strong twine around weatherstrip in groove of outer lip.
5. From inside of body press glass into place.
6. Hold in place and pull twine apart, pulling lip of rubber moulding over flange of window opening.
7. With rubber hammer lightly tap around edge from outside to securely seat glass.

REPLACING REAR WINDOW GLASS - SEDANS

TO REMOVE:

1. 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 40 Traveler 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.
2. Disassemble the glass, weatherstrip, and moulding. Be careful not to scratch glass.
3. Clean off the old cement from body flange.
4. Check flange for straightness.

TO INSTALL:

1. Apply a coating of Windshield Sealer FS-621 with Force Feed Gun B-182, both available through Hinckley-Myers Company, or use a tube of sealer with a nozzle, in the groove of the weatherstrip where the glass sets in.
2. Deposit a small amount of sealer on flange of body opening.
3. Install weatherstrip on glass.
4. 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.
5. 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.

6. 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.

7. 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, both of which are available through Hinckley-Myers Company, Jackson, Michigan. 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 naptha. Test with a water hose.

DOOR ALIGNMENT

A properly hung door should set so that the door closes easily and completely at the top and bottom.

The door striker should be set as given on page 7 and the door bumpers adjusted.

Figure 10--Aligning Door

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 as shown in Figure 10.

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 towards its closed position.

Hudson all steel, welded doors are a single unit and can be sprung without danger of loosening joints.

The door straightener tool U-10 will fit any size or shape of door and can be moved up and down between the channel uprights and then locked at the exact point where pressure is desired.

DOOR HINGE ALIGNMENT

A 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 hammer between the pillar and the door. The hammer to be in line with the upper hinge, as shown in Figure 11. Close the door on the hammer and spread the hinge. Repeat this operation at the lower hinge.

Figure 11--Spreading Door Hinge

A door that has the lock edge too high can be adjusted by spreading the upper hinge and if the lock edge is too low by spreading the lower hinge.

A door that sets too close to the lock pillar can be aligned by removing the hinge pins with B 170 hinge pin remover tool and removing the door. Spring the body half of the door hinge by using a fiber block and hammer.

DOOR STRIKER AND BUMPER

The cushion action door striker used on Hudson cars represents a new development in door lock design and is radically different in operation from the type heretofore employed in our cars. The features incorporated in the construction of this new striker permit of easy, quiet closing of the door with a light pressure and when the door and striker ARE PROPERLY ADJUSTED the door will remain securely closed.

DOOR STRIKER OPERATION

In the new lock the bolt (D), Figure 12, 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. This is accomplished by the use

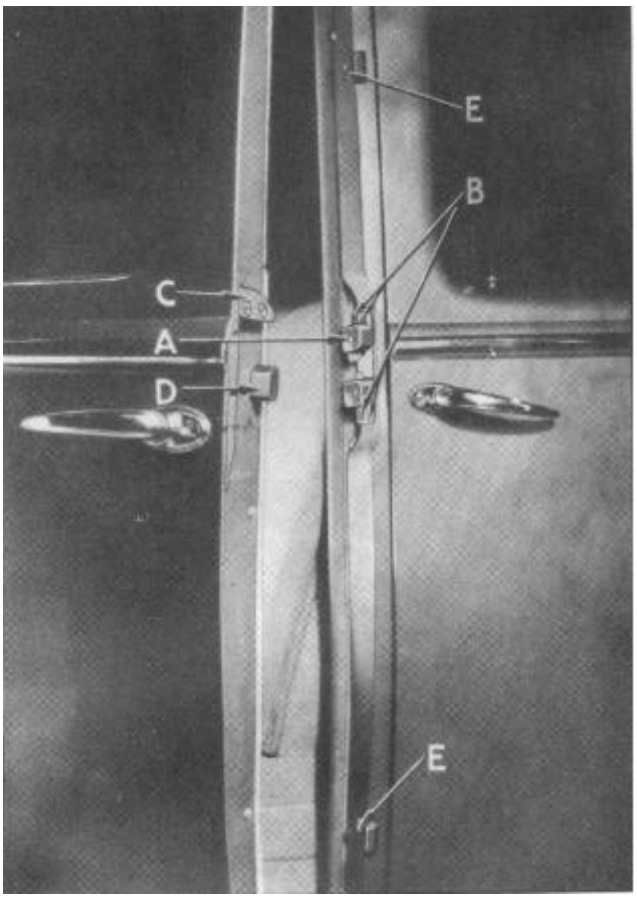


Figure 12--Door Striker Operation

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), Figure 13, 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 Figure the door tightly closed. In 13, the bolt is shown in three positions, at (C with the door open, at (D) with the door part y 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.

DOOR STRIKER ALSO ACTS AS DOVETAIL

The complete striker assembly as a unit is attached to the pillar post by means of four screws (B), Figure 12, which enter into tapping plates, permitting of a considerable range of adjustment both up and down and sideways. 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 dovetail since it carries the weight of the door through the dovetail (F), Figure 13, which is securely fastened to the door and is not adjustable. When properly adjusted the upper face of the striker will be approximately l/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.

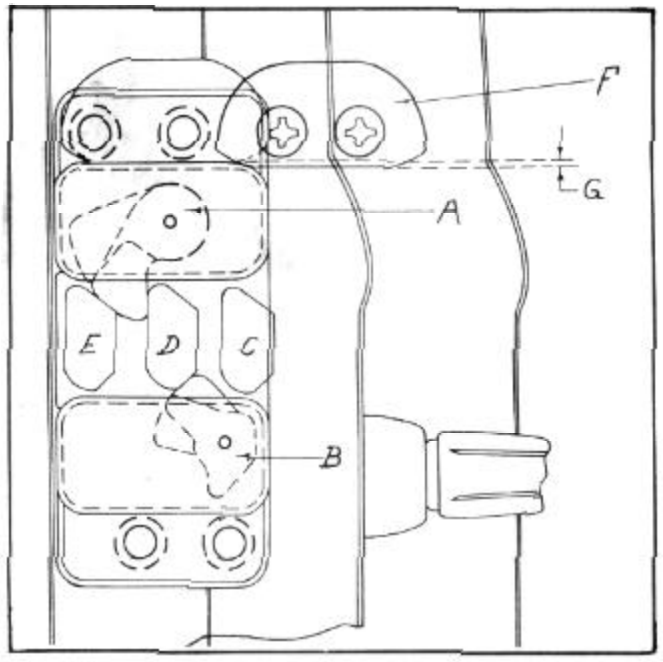


Figure 13--Door Striker Operation

ADJUSTMENT INSTRUCTIONS

1. Set door rubber bumpers (E), Figure 12, all the way in.
2. 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.
3. When making above adjustment, be sure that the striker assembly (C) is set at such a height that the dovetail on the door will interfere by about 1/32". 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.

4. 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.

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 Figure 13.

DOOR CYLINDER LOCK TO REMOVE:

l. Loosen the set screw in the edge of the door (see Figure 14).

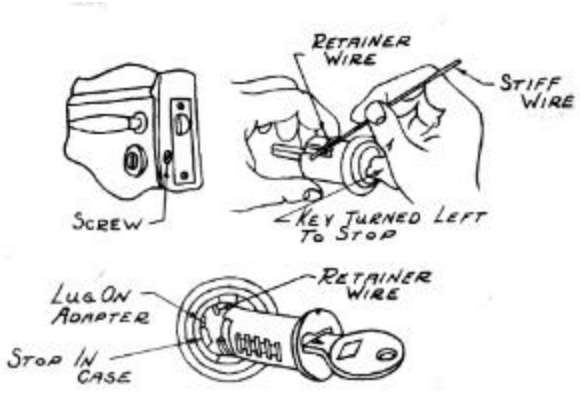


Figure 14--Door Safety Lock Details

2. With a stiff wire pry up the retainer wire and turn the key to the left to stop, and pull the cylinder out of the case.
3. Release the wire retainer.

TO REPLACE:

1. Put the stop in the case and the lug on the adapter in the position shown in Figure 14.
2. Insert lock cylinder with key as shown. The cam on the cylinder must engage the slot in the adapter.
3. Turn the key to the right until the wire retainer snaps into the groove of the cylinder. '
4. Replace the lock in the door. Tighten the set screw securely.

IGNITION LOCK CYLINDER

To remove and replace see Electrical Section.

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 l/2" and l/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 reinstall a cylinder in an ignition lock, insert the key in the cylinder and the cylinder in the housing and turn in the direction of locking.

NOTE: 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:

1. Remove screws and cups holding the lock.
2. Hold lock as shown in Figure 15. Lift up the hook and turn the key to the right. Pull out the cylinder.

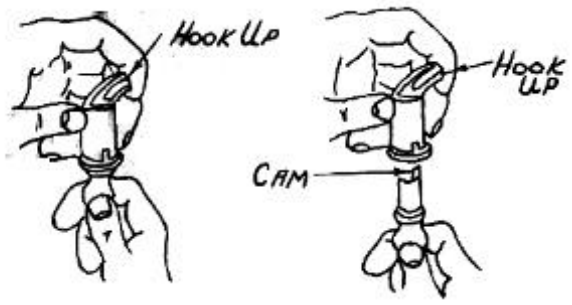


Figure 15--Locker Box Lock Details

TO REPLACE:

1. Hold the lock in the same manner as shown in Figure 15. With the key in the cylinder, line up the cam with the front of the hook.
2. Insert the cylinder and turn to the left until the stop is reached.

TRUNK AND REAR COMPARTMENT LOCK

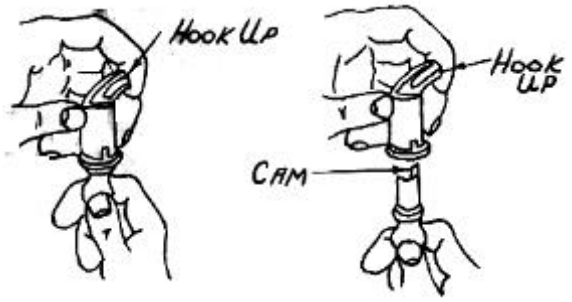


Figure 16--Rear Compartment Lock Details

TO REMOVE:

1. Open the trunk or rear compartment door.
2. Remove the screws holding the shield, see Figure 16. Take out the cotter pin and washer to release the link.
3. Take out screw holding the lock bolt and pull out the cylinder being careful not to lose the spring washer.

NOTE: The large nut holds the case in the trunk lid.

To replace the trunk or rear compartment lock, assemble the parts as shown in Figure 16.

FINISH MOULDINGS - WINDSHIELD AND WINDOW

All windshield and window finish mouldings are attached

by means of Phillips head screws passing through the mouldings and into holes in the windshield open and door frames. Use Phillips Screw Driver B-206 to remove these screws.

INSIDE HANDLES

Inside door lock, window regulator, and crank type wing handles are held in place by straight pins passing through the handles and shafts.

To remove the handles, press inward on the escutcheon plate to expose the pin and with a sharp instrument, push out the pin.

UPHOLSTERED TRIM PANELS AND WINDLACE

All upholstered door and quarter panel trim panels and windlace assemblies are attached by means of sheet metal screws passing through the door and pillars and into steel clips riveted to the trim panel foundation. The clips pass through slots cut in the door frames and pillars.

REPLACING 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 screws (A), Figure 17.
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.

REPLACING WING WEATHERSTRIP RETAINER ASSEMBLY - All Models

TO REMOVE:

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) Figure 17, 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.

TO REPLACE:

CAUTION: When replacing new assembly be careful not to bend channel.

1. Install wing and retainer assembly and secure with screw at (0).
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.
8. Install inside door lock handle and regulator handle.

REPLACING FRONT DOOR WINDOW REGULATOR - All Models except 40 Traveler and Commercial

TO REMOVE:

l. Remove inside door lock handle and regulator handle.
2. Remove garnish moulding.
3. Remove trim panel and regulator handle spring.
4. Remove screws (J), (K) and (L), Figure 17, and remove regulator track (0) and window roller guide (N).
5. Remove screws (M and C) and remove regulator.

TO INSTALL:

1. Install regulator and secure with screws (M and C).
2. Install regulator track (0) and roller guide (N), connecting regulator arm to roller guide.
3. Install screws (J), (K) and (L).
4. Install regulator handle spring and trim panel.
5. Install garnish moulding.
6. Install inside door lock handle and regulator handle.

REMOVING FRONT DOOR GLASS - All Models except 40 Traveler and Commercial

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. Remove screws (J), (K) and (L), Figure 17, and remove window regulator track (0) and window roller guide (N).
5. Remove window regulator arm (P).
6. Loosen screws (B) and (C) and remove window by lowering.

REPLACING FRONT DOOR GLASS

1. Replace window glass in the glass run channel (R).
2. Tighten screws (B) and (C), Figure 17.
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.

REPLACING FRONT DOOR REMOTE CONTROL - All Models

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. Remove remote control screws (F), Figure 17. 5. Raise lever up and remove from lock at (G).

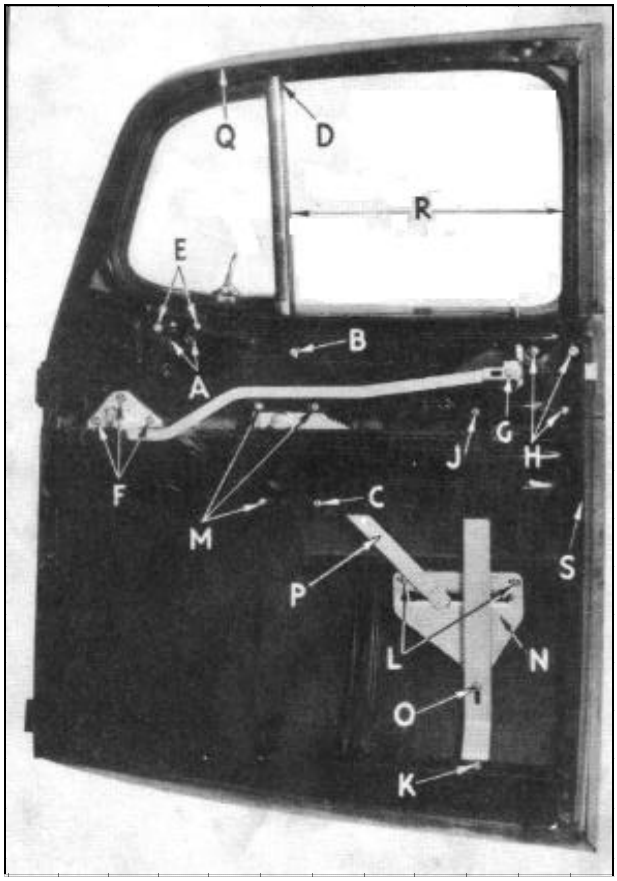
TO REPLACE:

1. Place remote control lever over door lock at (G).
2. Place remote control in position and install screws (F).
3. Replace regulator handle spring and install door trim panel.
4. Install garnish moulding.
5. Install inside door lock handle and regulator handle.

REPLACING FRONT DOOR LOCK - All Models TO REMOVE:

1. Remove inside door lock handle and regulator handle.
2. Remove garnish moulding.

3. Remove trim moulding 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), Figure 17.
9. Remove lower channel retaining screw (S), see Figure 17, located inside door frame.



10. Remove door lock by dropping down.

Figure 17--Front Door

TO INSTALL:

1. Replace door lock in position.
2. Install screws (H).
3. Install lower channel retaining screw (S).
4. Install remote control.
5. Install door dovetail.
6. Install outside door lock handle.
7. Install safety lock cylinder and replace set screw.
8. Install regulator handle spring and trim panel.
9. Install garnish moulding.
10. Install inside door lock handle and regulator handle.

REPLACING DOOR WING - CRANK 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.

Figure 18--Front Door

4. Remove screws (B), Figure 18.
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.

REPLACING DOOR WING AND REGULATOR - CRANK TYPE

TO REMOVE:

1. Remove inside door lock handle and window regulator handle.
2. Remove garnish moulding.
3. Remove door trim panel and remove window regulator handle spring.
4. Remove two screws (A), Figure 18, attaching regulator to door panel. 5. Remove regulator (B) and wing assembly.

To reinstall reverse procedure of removal.

REPLACING REAR DOOR WINDOW REGULATOR TO REMOVE:

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 spring.
4. Lower the window glass.
5. Remove screws (A), Figure 19.
6. Release regulator arm (S) from lower glass run channel (T) at (C).

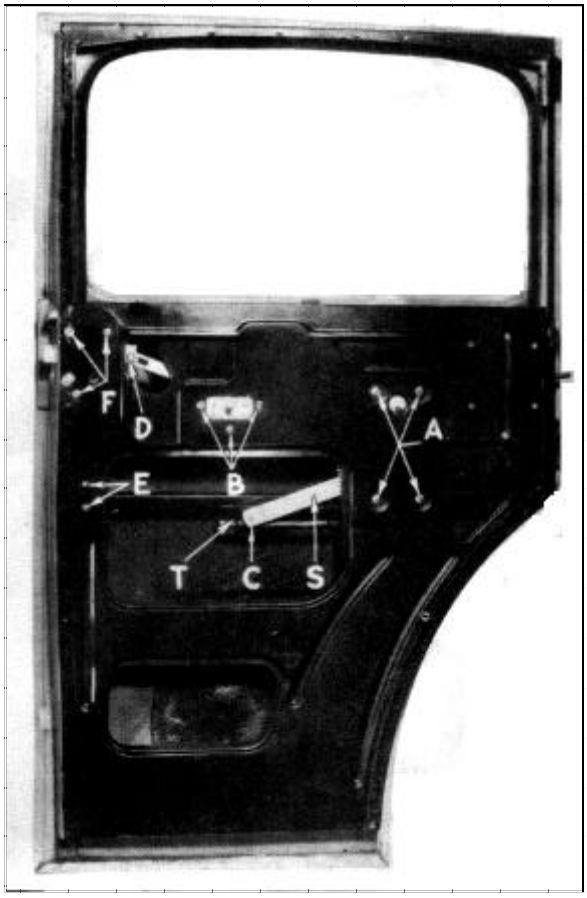


Figure 19--Rear Door

TO REPLACE:

1. Install regulator installing arm (S) in channel (T).
2. Install four regulator screws and washer (A)
3. Replace regulator handle spring and install trim panel.
4. Install garnish moulding.
5. Replace inside door lock handle and window regulator handle.

REMOVING REAR DOOR GLASS

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), Figure 19.

To replace reverse order of removal.

REPLACING REAR DOOR LOCK REMOTE CONTROL

TO REMOVE:

1. Remove inside door lock handles and regulator handles.
2. Remove garnish moulding.
3. Remove door trim panel and regulator handle spring.
4. Remove screws and nuts (B), Figure 19.
5. Disconnect remote control from door lock at (D) and remove remote control.

TO REPLACE:

1. Place remote control on door lock at (D).
2. Install screws and nuts (B).
3. Replace regulator handle spring and install door trim panel.
4. Install garnish moulding.
5. Install inside door lock handle and regulator handle.

REPLACING REAR DOOR LOCK TO REMOVE:

1. Remove inside door lock handle and regulator handle.
2. Remove garnish moulding.
3. Remove trim panel and regulator spring.
4. Remove outside door lock handle.
5. Remove remote control.
6. Remove door dovetail.
7. Remove screws and nuts (E), Figure 19.
8. Remove screws (F).
9. Remove door lock.

TO INSTALL:

1. Install door lock and replace screws (F).
2. Install screws and nuts (E).
3. Install remote control.
4. Install door dovetail.
5. Install outside handle.
6. Install regulator handle spring and trim panel.
7. Install garnish moulding.
8. Install inside door lock handle and regulator handle.

REPLACING FRONT DOOR WINDOW REGULATOR - SLIDING TYPE

TO REMOVE:

1. Remove inside door handle and regulator handle.
2. Remove garnish moulding.
3. Remove trim panel and regulator handle spring.
4. Remove four screws attaching regulator to door panel brace.
5. Raise window and remove regulator from door brace.
6. Lower window and slide arms out of window channel track.

TO INSTALL:

1. Place regulator arms in window channel track.
2. Raise window and assemble regulator to door brace with four screws.
3. Replace regulator handle spring and trim panel.
4. Install garnish moulding.
5. Install inside door handle and regulator handle.

REPLACING FRONT DOOR WINDOW - SLIDING TYPE

TO REMOVE:

1. Proceed as outlined in operations 1 through

6 inclusive under "Replacing Front Door Window Regulator - Sliding Type".
2. Remove screw attaching glass run channel to brace at front edge.
3. Lower window and tilt inward to remove.

TO INSTALL:

1. Place window in glass run channel.
2. Install screw securing glass run channel to door brace.
3. Proceed as outlined in operations 1 through 5 inclusive under "Replacing Front Door Window Regulator - Sliding Type".

REPLACING QUARTER WINDOW REGULATOR - TWO DOOR SEDAN

TO REMOVE:

1. Remove rear seat cushion and back.
2. Remove regulator handle.
3. Remove garnish moulding.
4. Remove trim panel and regulator handle spring.
5. Remove two screws from underneath fender attaching arm rest and remove arm rest.
6. Remove two screws at each end of regulator support.
7. Lower window and remove regulator arms from window and remove regulator.

TO INSTALL:

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.
6. Install regulator handle.
7. Install rear seat back and cushion.

REPLACING QUARTER WINDOW - FOUR DOOR SEDAN

TO REMOVE (SLIDING TYPE):

1. Remove rear seat cushion and seat riser.
2. Remove four rear seat back retaining screws and remove seat back.
3. Remove regulator handle.
4. Remove garnish moulding.
5. Remove assist strap.
6. Remove trim panel retainer screws from door frame.
7. Remove two screws underneath fender attaching arm rest and remove arm rest.
8. Untack trim panel at top and bottom of window frame.
9. Remove trim panel, first disconnecting cigar lighter.
10. Untack headlining at top of window frame.
11. Untack drain trough from beneath window.
12. Remove bolt holding bracket at rear lower edge of frame to rear seat back tray reinforcement.
13. Remove five bolts holding frame assembly and remove assembly towards inside of body and place assembly on bench.

TO REMOVE WINDOW:

14. Remove drain trough from outside of window frame.
15. Remove two retainer screws holding bottom of glass channel to regulator and remove glass.

TO REMOVE REGULATOR:

16. Remove two screws holding regulator to frame assembly and remove regulator.

INSTALL:

1. Install regulator on glass channel and secure with two screws.
2. Install window and attach to regulator with two screws.
3. Install drain trough to window frame. NOTE: Be sure to retack in same holes.
4. Place window frame assembly in position from inside and fasten with five bolts.
5. Install bolt retaining rear of frame to seat back tray reinforcement.
6. Retack headlining to top of window frame.
7. Place regulator handle spring and trim panel in position and reconnect cigar lighter.
8. Install trim panel retainer screws.
9. Retack trim panel at top and bottom of window.
10. Install arm rest and fasten with two bolts underneath fender.
11. Install garnish moulding.
12. Install regulator handle.
13. Install assist strap.
14. Install seat back and secure to floor with four screws.
15. Install seat riser and seat cushion.

REPLACING QUARTER WINDOW - TWO DOOR SEDAN TO REMOVE:

1. Remove regulator handle.
2. Remove garnish moulding.
3. Remove trim panel and regulator handle spring.
4. Remove wood blk at rear lower corner of window frame.
5. Raise window as high as possible and release from channel opening.
6. Disconnect regulator arms from glass channel tracks and remove window from inside.

TO INSTALL:

1. Install glass in channel opening.
2. Raise regulator arms and assemble in glass channel tracks.
3. Lower window into place.
4. Install wood block at rear lower corner of glass frame.
5. Replace regulator handle spring and trim panel.
6. Install garnish moulding.
7. Install regulator handle.

QUARTER WINDOW DRAIN TROUGHS - SEDANS - All Models except 40 and 48.

The drain troughs are of rubberized sheeting and are tacked to the quarter window frame. The rear end of the trough is closed by folding and tacking to the rear end of the frame. 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 the trough at the front of the wheelhouse.

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.

REPLACING HEADLINING TO REMOVE:

1. Remove dome lamp.
2. Remove inside visor.
3. Remove rear view mirror.
4. Remove windshield finish mouldings.
5. Untack headlining at windshield header.
6. Remove body header trim retainer attaching screws from body headers and front pillars.
7. On all four door sedans except model 40, and all two door sedans remove quarter window finish mouldings and loosen quarter trim panels at top edge. On model 40 four door sedans remove quarter window glass and weatherstrip.
8. Remove rear window and weatherstrip.
9. Remove rear seat back tray trim panel.
10. Lift windlace and. headlining and header trim retainers off header flange.
Loosen headlining from cement at window openings.
11. Loosen top bows on one side only.
12. Slide headlining off top bows.

TO INSTALL:

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. Install quarter windows on model 40 four door sedans. On all other models tack 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. Tack 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.
12. Install inside visor.
13. Install dome lamp.

FRONT SEAT ADJUSTING

The front seat can be moved forward an additional 1-l/2 inches by removing the seat track screws and reassembling them in the alternate set of holes.

AIR FOAM SEAT CUSHION PAD

An air foam seat cushion pad can be installed on any model 40 not factory equipped with it by removing the cushion trim which is held on by wire ring clips.

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 the 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.

NOTE: The air foam pad is optional equipment on the model 40. All other models have the air foam pad as standard equipment and it is sewed directly to the cushion cover.

ARM REST

The arm rest on all models can be moved or a new one installed on any door. It is held onto the door trim panel by bolts that are installed from inside and pass through a Masonite reinforcement, then through the trim panel and into the arm rest.

To install an arm rest on a right hand door--
1. Remove the inside door hardware.
2. Remove garnish moulding.
3. Remove door trim panel.
4. Lay out the location desired and punch 5/16" holes.
5. Install Masonite reinforcement bolt head washers, lockwashers and bolts. Fasten the bolts into the arm rest firmly.

Parts necessary to install an arm rest are--
1 Arm rest assembly--either plain or pull to type.
2 Part 18455 bolt
1 Part 143632 Masonite reinforcement
2 Part 86272 bolt washers
2 Part 18475 bolt lockwashers

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 a few practical suggestions. Avoid the use of gasoline as most brands use 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. 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

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 wit Hudson Upholstery Cleaner.

ICE CREAM

These stains should be removed by sponging with lukewarm soapsuds (neutral soap). Rinse with cold water and allow to dry. If an oil spot remains, sponge it with Hudson Upholstery 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 hot water directly to the stain. Rub the spot lightly with a cloth moistened in hot water. Allow it to dry, then sponge lightly with Hudson Upholstery Cleaner.

CAUTION: Soap or 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 Upholstery 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 soapsuds (neutral soap).

The appearance of the cleaned area can be greatly improved by brushing it briskly with a whisk broom.

MOHAIR UPHOLSTERY

Matted pile on mohair upholstery can be renovated by applying a damp cloth and steaming with a hot iron.

LEATHER AND IMITATION LEATHER

To clean leather and imitation leather, use lukewarm water. Neutral soapsuds 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

Chromium-plated parts require 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 Wax Base Polish to restore the luster. However, if a more lasting high luster is ' desired, it may be obtained by applying a film of Hudson Wax Polish.

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 car if it has been standing in the sun. It is better to apply the polish when the body has cooled.