# Hudson

# Mechanical Procedure Manual

## 500 SERIES

# FOREWORD

This Mechanical Procedure Manual is to be used as a reference and a guide for servicing the 500 Series Hudson cars.

Arrangement of this manual follows the section arrangement of the 480-490 Manual as far as possible.

Where no major change in procedure is found necessary, reference is made to the 480-490 Manual covering that corresponding section.

If major unit changes have been made, the complete section has been re-written and is included in this manual.

A numerical group index and an alphabetical index is placed in the front of the manual for easy reference, and each revised section is preceded by a table of contents.

Wherever possible a reference page has been included at the end of each section. This space should be used for making notes of important service in-formation pertaining to that particular section.

| | |
|---|---|
| Hudson Pacemaker Six | Model 500 |
| Hudson Super Six | Model 501 |
| Hudson Commodore | Model 502 |
| Hudson Super Eight | Model 503 |
| Hudson Commodore Eight | Model 504 |

Where reference is made to the 500 Series, it pertains to all of the above models. If the 500 model is referred to, it applies to the Pacemaker six only.

# GROUP INDEX





LITHOGRAPHED IN U.S.A.

# ALPHABETICAL INDEX

# ALPHABETICAL INDEX—— CONTINUED

# ALPHABETICAL INDEX—— CONTINUED



# SECTION 1
# LUBRICATION

The lubrication instructions for the 500, 501, 502, 503, 504 are the same as those for the 480-490 series with the following exceptions:

A. The starting motor for the 500 model is equipped with oilite bearings and does not require any lubrication.

B. Perch type rear springs (less dust-covers) are equipped with rubber separators between the leaves and do not require lubrication. These springs are readily recognized by the spacing between leaves.

# SECTION 2

# ENGINE TUNE-UP

## CONTENTS



## SPECIFICATIONS

| | |
|---|---|
| Cylinder Compression . | 100 lbs. |
| Vacuum, Intake Manifold | 17-18" Hg. |
| Valve Tappet Clearance (Hot): | |
| 6 cylinder: | |
| Intake | .008" |
| Exhaust | .010" |
| 8 cylinder: | |
| Intake | .006" |
| Exhaust | .008" |
| Battery Specific Gravity | 1.285 |
| Starter Motor: | |
| Cranking voltage | 4.5 Volts |
| Cranking Amperage (Approximately) | 160 amps. at 120 RPM |
| Stall test | |
| Volts | 4.0 Volts |

| | |
|---|---|
| Amperes | 540 Amps. |
| Torque | 12.3 Ft. Pounds |
| Stall test, 501-2-3-4: | |
| Volts | 4.0 Volts |
| Amperes | 880 Amps. |
| Torque | 25 Ft. Lbs. |
| Condenser Capacity, 6-cyl | 25-.28 mfd. |
| Condenser Capacity, 8-cyl | 20-.25 mfd. |
| Coil Amperage Draw, 500: | |
| Engine stopped | 5.0 Amps. |
| Engine idling | 1.5-2.0 Amps. |
| Coil Amperage Draw, 501-2-3-4: | |
| Engine stopped | 4.5 Amps. |
| Engine idling | 2.5 Amps. |
| Distributor, 6-cylinder: | |
| Point Gap | 020" |
| Cam angle (Dwell) | 38° |
| Spring Tension | 17-20 Oz. |
| Vacuum Advance: | |
| Model 500 | 5° at 12" Hg. |
| Model 501-2 | 3.25° at 16.25 Hg. |
| Mechanical Advance: | |
| Model 500 | 10° at 1200 RPM |
| Model 501-2 | 8° at 2000 RPM |
| Distributor 8-cylinder: | |
| Point Gap | .017" |
| Cam angle (Dwell) | 27° |
| Spring tension | 17-20 oz. |
| Vacuum Advance (Min.) | 3.25° at 16.25" Hg. |
| Mechanical Advance (Min.) | 16.5° at 1700 Dist. RPM |
| Generator Output: | |
| RPM: Cold, 970; Hot, 1050 | 6.4 Volts 0 Amps. |
| RPM: Cold, 2000; Hot, 2350 | 8.0 Volts 35 Amps. |
| Voltage Regulator: | |
| Cutout Relay points open | 6.4-7.8 Volts |
| Cutout Relay points close | 4.1-4.8 Volts (after 15 amp. charge) or 4.0-6.0 Amps. Reverse Current |
| Voltage Regulator Operates | 7.2-7.5 Volts at 70° F |
| Current Regulator Operates | 34.0-36.0 Amps. |
| Spark Plug Gap | 032" |
| Ignition Timing | TDC |
| Fuel Pump Pressure: | |
| Carter | 4 to 5 lbs. |
| AC | 3 to 4 lbs. |
| Fuel Pump Vacuum | 6" Hg. |
| Fuel Pump Volume | 1 Pint in 45 seconds |
| Carburetor Float Setting: | |
| Model 500 | 1/2" |
| Model 501-502 | 3/16" |
| Model 503 - 504 | 13/64" |
| Carburetor Pump Travel: | |
| Model 500 | 16/64" |
| Model 501-502 | 18/64" |
| Model 503 - 504 | 14/64" |
| Idle Adjustment: | |
| Model 500 | 1/2 to 1-1/2 turns open |
| Model 501-502 | 1-1/4 to 1-3/4 turns open |
| Model 503-504 | 1 to 1-1/2 turns open |

# ENGINE TUNE-UP

Engine tune-up is important in maintaining engine performance, fuel economy, dependability, and complete owner satisfaction. Modern high compression, high speed engines demand accurate diagnosis and adjustment.

Performance of the gasoline engine depends upon:

1. Compression
2. Ignition
3. Carburetion

A master type engine tester is desirable for accurate diagnosis. If the complete engine tester is not available, the following individual units are essential:

1. Compression gauge
2. Vacuum gauge
3. Carburetor float and metering rod gauges
4. Neon timing light
5. Voltmeter (1/10 volt divisions)
6. Ammeter
7. Hydrometer
8. Feeler gauge stock
9. Spring scale

The following additional units are desirable:

1. Cylinder balance tester
2. Fuel pump tester
3. Coil tester
4. Condenser tester
5. Distributor tester
6. Rheostat (3 amp. 50 ohm)
7. Combustion tester
8. B a t t e r y cell tester or Battery-Starter Tester

Accurate testing equipment in good condition is essential to proper diagnosis. If a master tester is used, the battery of the tester should be maintained in a fully charged condition. All connections should be clean, tight. Test leads and clips should be of proper size with soldered connections.

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

## BATTERY

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

### BATTERY SPECIFIC GRAVITY

Check the battery specific gravity with a hydrometer, Figure 1. A uniform hydrometer reading below 1.225 at 70° F. indicates a low battery that should be recharged.

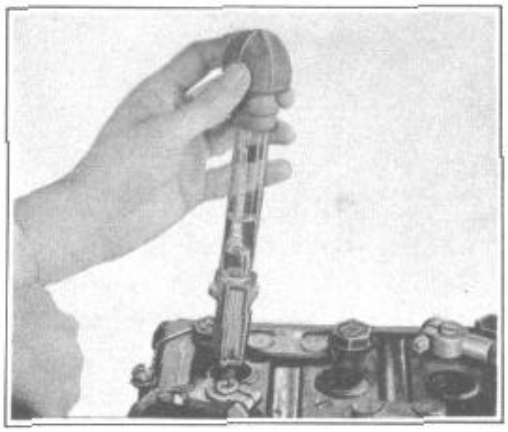


FIGURE 1

If gravity varies more than 25 points between cells, battery should be recharged and tested under load

### BATTERY LOAD TEST

Battery may be tested under load by connecting a voltmeter across the battery terminals and cranking the engine. Battery is satisfactory if it will crank the engine at a good speed for 1/2 minute and the voltage does not fall below 4-1/2 volts. Slow cranking speed or lower voltage may be due to high resistance in the starter circuit. Check cables and retest.
(DO NOT CRANK MORE THAN 1/2 MINUTE AT A TIME).

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

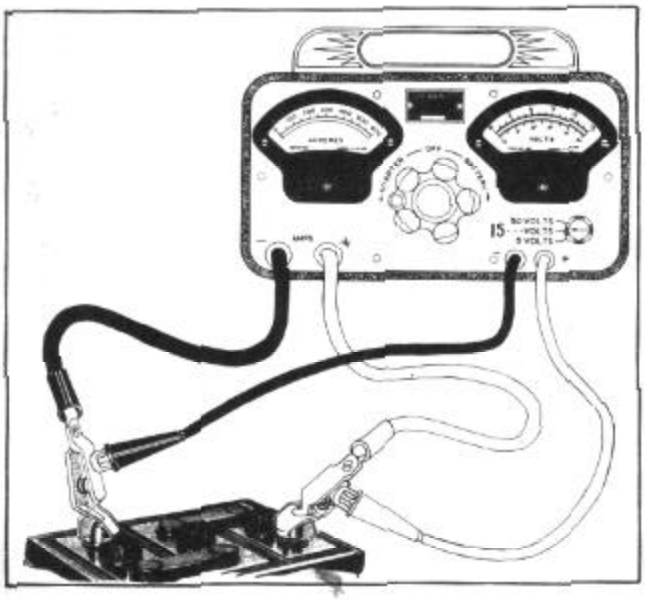


FIGURE 2

If a starter-battery tester, Figure 2, is available, make the load test as follows:

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

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

3. Turn voltmeter knob to the 15 volt position.

4. Turn tester knob to the battery position until ammeter shows a 300 ampere discharge. Quickly read voltmeter and reduce discharge. At 300 ampere discharge the voltage should be 4 volts or more.

5. Recharge or replace battery if voltage is lower than 4 volts.

6. Turn knob to "off" position and disconnect leads.

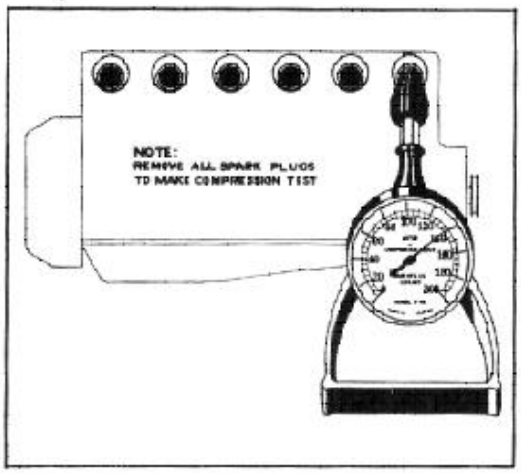



Figure 3

## ENGINE

### COMPRESSION

An engine that fails to develop proper compression cannot be tuned to satisfaction. Compression should be checked with the engine at operating temperature with a reliable compression gauge, Figure 3.

1. Remove carburetor air cleaner and open throttle.

2. Remove all spark plugs.

3. Insert compression gauge in each spark plug hole in turn and crank engine with starter.

4. Compression at each cylinder should be at least 100 pounds. Compression between cylinders should not vary more than 10 pounds.

**NOTE: If gauge moves up in jerky steps of 10 or 20 pounds at a time, it generally indicates a sticky or leaking valve. If two adjacent cylinders show low compression reading, a leaking head gasket or loose cylinder head bolts are indicated.**

5. If compression is low, inject a small quantity of oil in the cylinder to seal the rings and retest.

6. If compression is higher on second test, worn piston rings are indicated.

7. If compression remains low on second test, valve operation is faulty or piston may be cracked or damaged.

Correct any unsatisfactory conditions found on the compression test before continuing the tune-up.

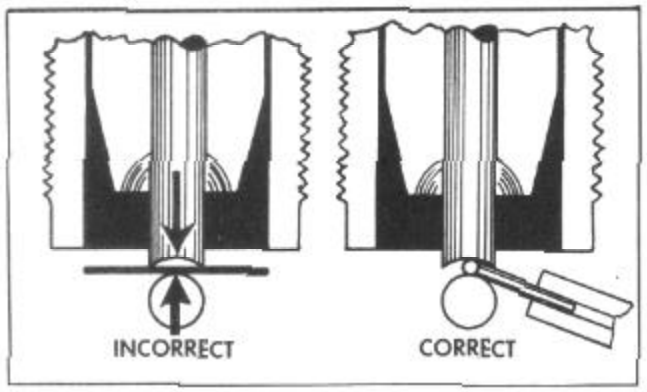



FIGURE 4

**SPARK PLUGS**

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

1. Spark plugs with burned, blistered, or cracked porcelains, or with pitted or burned electrodes, should be replaced with new plugs of the same type. For cast iron cylinder heads, use Champion J-7; for Aluminum cylinder heads, use Champion H-10.

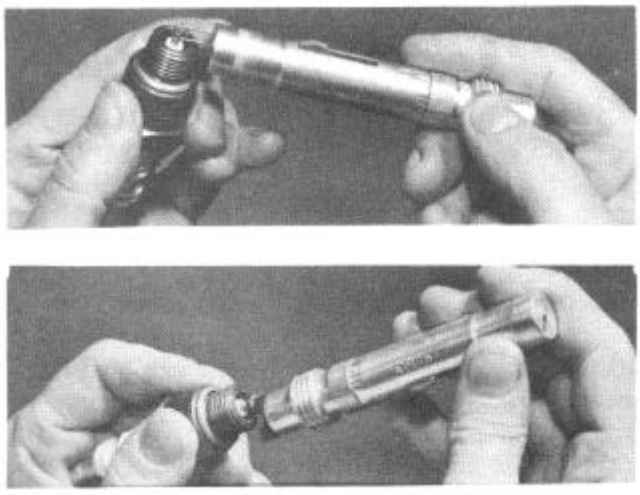


FIGURE 5

2. Clean the plugs with an approved spark plug cleaner.

3. Adjust spark plug gaps to .032" using a bending tool and wire loop gauge, Figures 4 and 5.

4. Install NEW gaskets on the plugs and replace plugs in cylinder head.

5. Tighten plugs finger tight then tighten with a torque wrench, to 25 to 30 foot pounds. (If torque wrench is not available, tighten 3/4 of a turn).

6. Examine spark plug wires for loose terminals, cracked or broken insulation. Replace defective wires.

**NOTE: Spark plug condition often indicates other engine troubles. See page 6-24.**

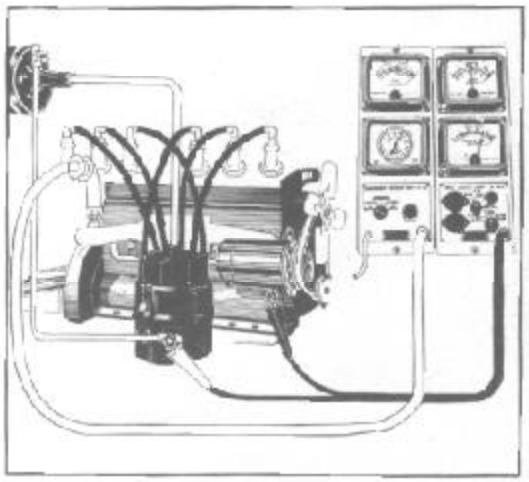


FIGURE 6

**VACUUM TEST**

An engine in good condition will show a s t e a d y, or slightly fluctuating, high vacuum reading of from 17" to 18". Vacuum readings are affected by altitude. Over 2000 feet the vacuum gauge will show about one inch lower for each thousand feet elevation.

1. Attach vacuum gauge to wiper hose connection, Figure 6. (If engine has a combination fuel and vacuum pump, disconnect the booster line and plug manifold connection opening.)

2. Check to see that carburetor and intake manifold nuts are tight.

3. Adjust carburetor to obtain smooth idle at 540 to 560 RPM. (If engine is equipped with Drive-Master, set idle at 580 to 600 RPM.) Vacuum readings may be interpreted generally as follows:

17--18" Steady or with slight fluctuation: Engine in good condition.
15" Steady: Incorrect ignition timing.
10" Steady: Incorrect Valve timing or burned valves.
15--21" Fluctuating: Sticking valves or compression leak.
12--16" Drifting: Carburetor too rich or too lean.

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

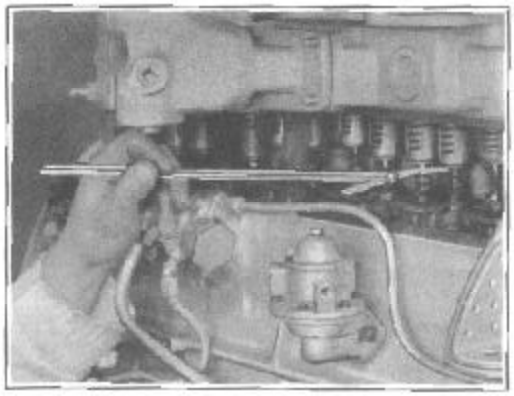


FIGURE 7

**VALVES AND TAPPETS**

C h e c k the valve tappet clearance when engine is at normal operating temperature, Figure 7.

The intake and exhaust valve clearances are as follows:

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

**TAPPET ADJUSTMENT**

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

1. Raise front end of car and place stand jacks under frame cross-member.

2. Remove the right front wheel.

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

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

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

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

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

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

9. Adjust tappets.

After tappet adjustment has been completed reinstall parts.

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

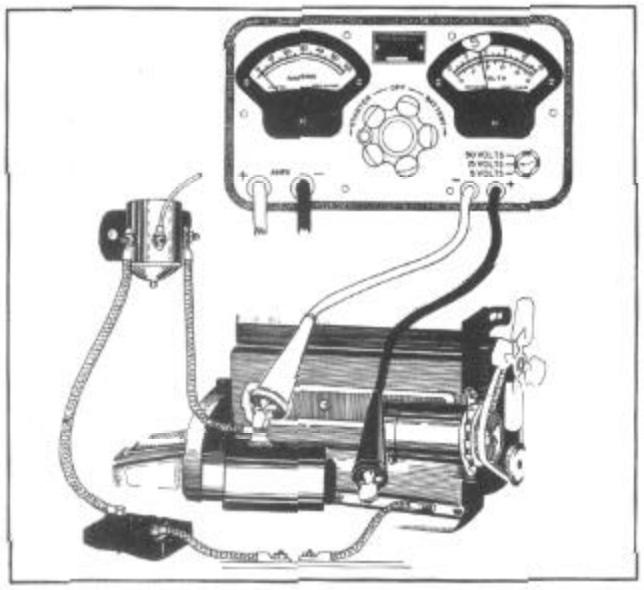


FIGURE 8

## STARTER MOTOR

**CRANKING VOLTAGE:**

1. Connect the negative voltmeter lead of the starter motor tester to the starter switch terminal, Figure 8.

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

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

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

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

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

**BATTERY AND ENGINE GROUND STRAPS:**

1. Connect the voltmeter positive lead to the battery.

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

3. Crank the engine (ignition off) and note voltmeter reading which should not be more than 1/2 volt.

4. If voltmeter reading is more than .5, check ground strap cable connections from battery to frame and from engine to frame. Replace defective straps.

**NOTE: Use a plain washer under the locking nut of the left side engine mounting bolt when attaching the engine to ground connector at engine front mounting to prevent damage to ground connection when tightening lock nut.**

**STARTER CABLE:**

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

2. Crank engine again (ignition off) and check voltmeter reading. If reading is more than 0.25, check for loose connections or frayed cables.

3. Replace defective cables.

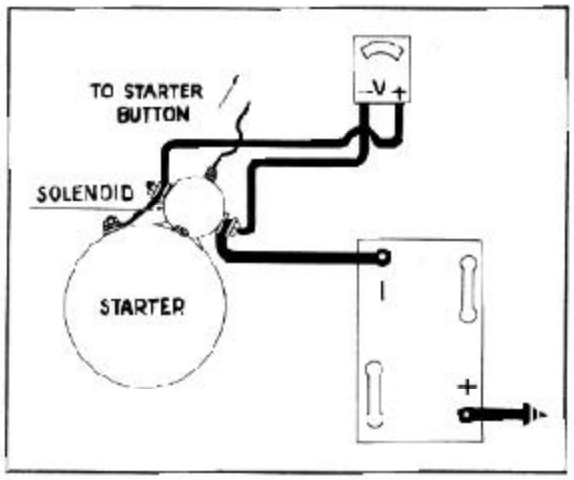



FIGURE 9

**SOLENOID:**

1. Connect negative voltmeter t e r m i n al of starter solenoid switch and positive lead to motor terminal of the solenoid switch, Figure 9.

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

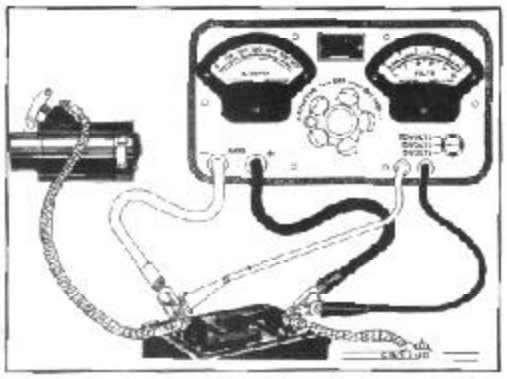


FIGURE 10

**AMPERAGE DRAW TEST:**

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

2. Turn the voltmeter "selector switch" to the 15 volt position and connect test leads, Figure 10.

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

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

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

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

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

The reading should be approximately 160 amperes at 150 RPM.

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

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

## DISTRIBUTOR

**DISTRIBUTOR CAP AND ROTOR:**

1. Remove wires from cap and remove cap.

2. Inspect cap and rotor for cracks and burned or corroded contacts. Replace any defective part.

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

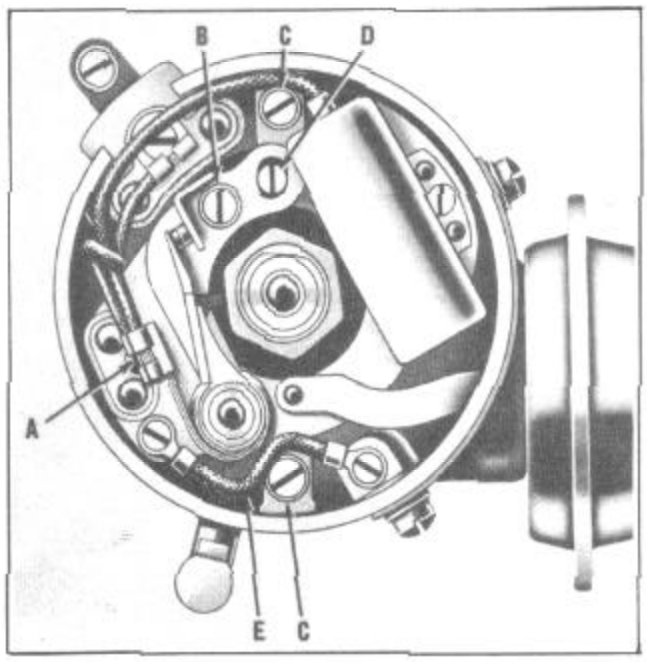



FIGURE 11

**CONTACT POINTS:**

1. Inspect distributor contact points for alignment, corrosion, burning or pitting.

2. Clean points with carbon tetrachloride.

3. Replace burned. or corroded points. If points are badly pitted, check condenser for over or under capacity. DO NOT try to hone badly pitted contact points.

4. With a feeler gauge set the points for proper gap. Correct gap for 6 cylinder distributors is .017"; for 8 cylinder distributor, .020".

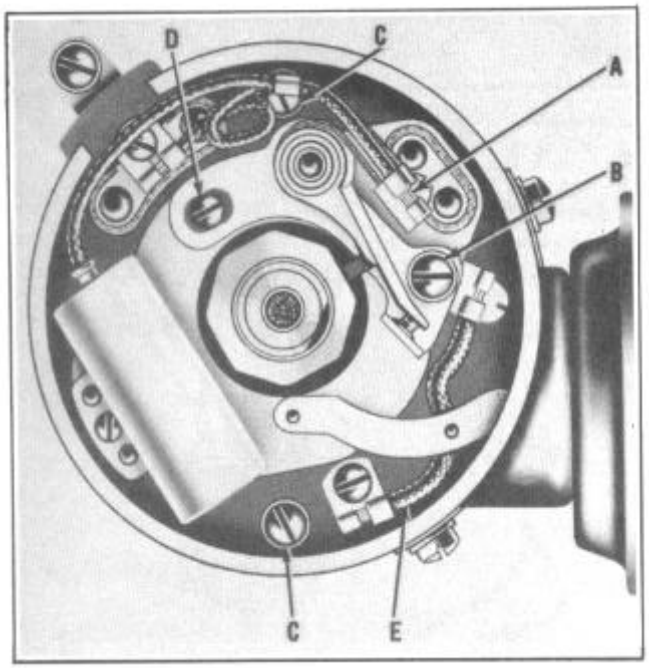



FIGURE 12

**NOTE: Contact point adjustment is made by first loosening the clamp screw (B) Figures 11 and 12, holding the stationary contact plate, then turn the eccentric adjusting screw (D) to move the stationary contact point. Tighten clamp screw when correct gap is secured.**

5. Bend stationary contact if necessary to secure correct alignment.

**BREAKER ARM SPRING TENSION:**

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

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

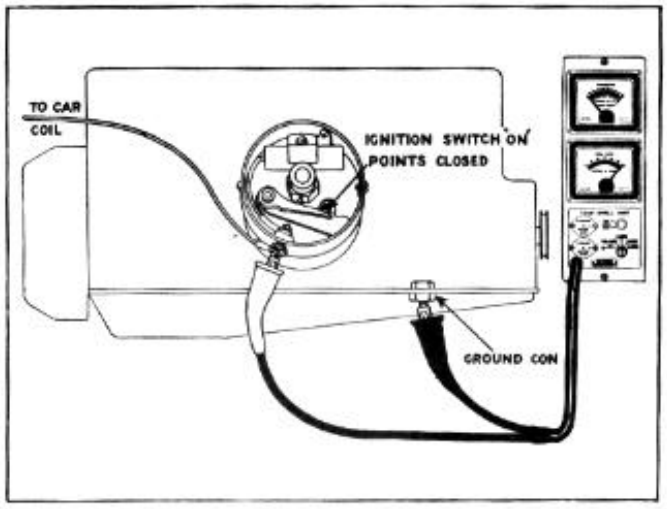



FIGURE 13

**POINT RESISTANCE TEST:**

1. Connect the negative lead (Sun Tach-Dwell Unit) to the distributor primary terminal, Figure 13. Connect the positive lead to ground until the distributor contact

2. Crank engine points close.

3. Turn the dwell control knob to 6-lobe position on Sun Unit No. 10, or to "Calibrate" on Unit No. 10-A or 150-A.

4. Turn ignition key on. The meter should read in the band marked "point resistance" on the right hand side of the dwell scale for normal distributor resistance.

5. Clean or replace points as necessary.

## CONDENSER TEST

1. Block distributor points open with a piece of fibre. Disconnect the primary lead wire at the distributor.

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

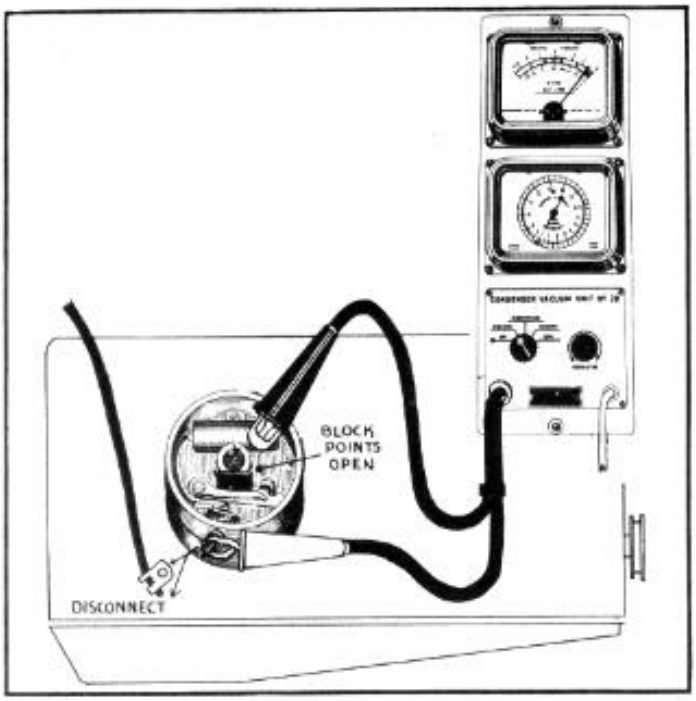



FIGURE 14

3. Connect the two condenser test leads together.

4. Turn the condenser control knob to the "Microhm" position and allow the tester to w a r m up for one minute. Then turn the control knob to read on the set line.

5. Connect the red lead to the distributor primary terminal and connect the black lead to the condenser shell, Figure 14. With the control knob turned to the "Microhm" position, the meter should read in the blue bar marked "MIC" at the right side for satisfactory condenser circuit resistance.

7. Turn the condenser switch to the "Microfarad" position. The meter should read 25 to 28 microfarad for the Hudson Six and 20 to 25 for the Hudson Eight.

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

**NOTE : W hen making the above checks, the condenser should be at operating temperatures.**

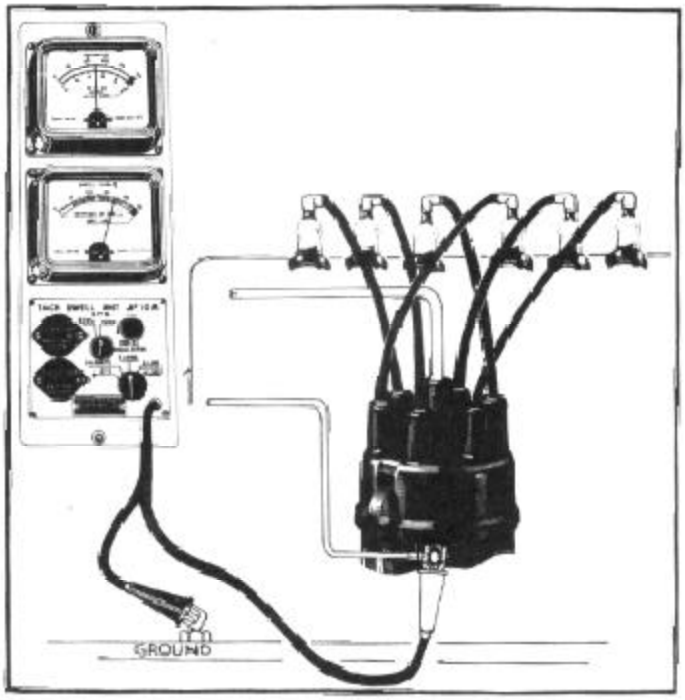



FIGURE 15

**DISTRIBUTOR CAM ANGLE (DWELL):**

1. With Sun Unit connected as for point resistance, Figure 15, replace distributor cap and spark plug wires, and replace distributor primary wire.

2. Turn switch to "Calibrate" position and adjust Dwell Regulator until meter reads to "Set Line". Turn the dwell switch knob to the 6-lobe position for the Hudson Six and the 8-lobe position for the Hudson Eight.

3. Turn on ignition and start engine. Note the reading on the Dwell Meter. The dwell, angle on the Hudson Six is 38 degrees, breaker points set at .020" , and the dwell angle on the Hudson Eight is 27 degrees, breaker points set at .017" .

This test will indicate:

(1) The breaker contact opening.

(2) The condition of the breaker cam.

(3) The condition of the distributor shaft and bearings.

(4) The condition of the breaker plate bearing and support.

If the dwell angle is too great, the contact point gap is set too close. If the dwell angle is too small, the contact gap is too wide.

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

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

**VACUUM ADVANCE ADJUSTMENT:**

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

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

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

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

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

5. Attach vacuum pump connection.

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

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

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

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

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

11. Adjust the speed control crank until the Tachometer reads 200 RPM.

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

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

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

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

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

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

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

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

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

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

**AUTOMATIC ADVANCE CURVE:**

1. Adjust speed control so that distributor will rotate at the lowest RPM.

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

3. Increase distributor RPM to correspond with specifications marked "Start".

4. Check the RPM required to advance the arrow flash to the specifications given.

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

6. Continue to check the advance curve RPM against degree of advance and compare this with specifications.

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

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

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

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

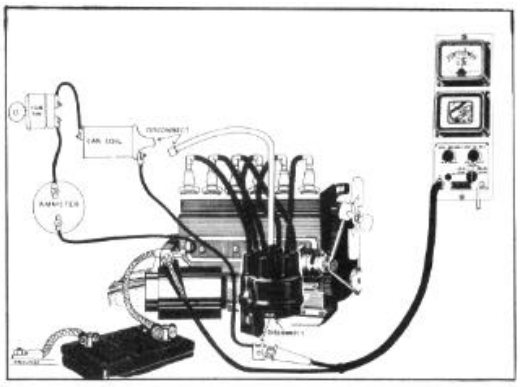


FIGURE 16

## COIL

**COIL TEST:**

1. Connect leads of coil breaker unit as shown in Figure 16.

2. Turn on ignition switch.

3. Turn on master control switch on Sun Tester.

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

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

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

6. Turn ignition switch off.

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

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

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

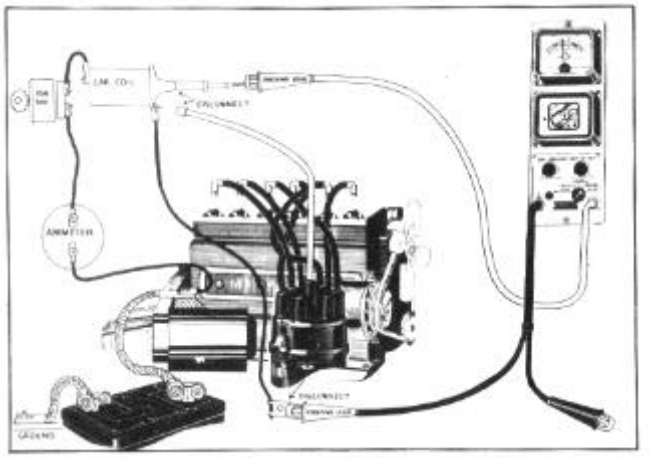


FIGURE 17

**COIL SECONDARY RESISTANCE CHECK:**

1. Connect ground (Blue) and positive primary (red insulator) test leads together.

2. Turn master switch "On".

3. Turn tester switch to Dwell-Ohm position, and adjust Dwell-Ohm Regulator until meter reads on "Set" line.

4. Separate the positive primary and ground test leads, connect the positive primary lead to the primary ignition wire which was removed from the distributor, Figure 17.

5. Insert the short test lead into the high tension post of the coil and connect the ground lead directly to the short test lead.

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

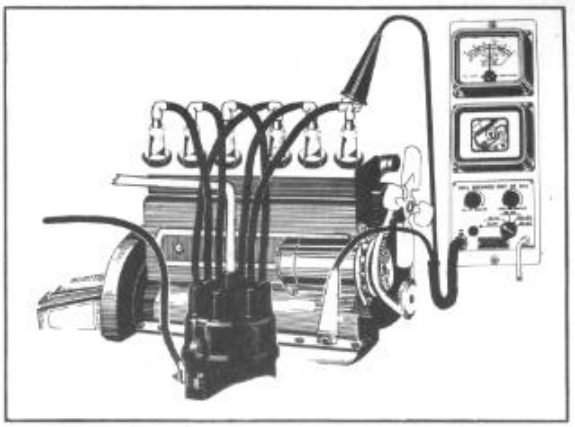


FIGURE 18

**SPARK PLUG MILLIAMPERE TEST:**

1. Connect test leads of the coil breaker unit shown in Figure 18.

2. Run engine at idle speed.

3. Turn switch to MILLIAMP position.

4. Read the coil meter Milliampere scale.

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

**IGNITION TIMING:**

The following procedure and timing applies to both the six and eight cylinder engines:

1. C o n n e c t the power timing light to No. 1 spark plug and battery as shown in Figure 19.

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

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

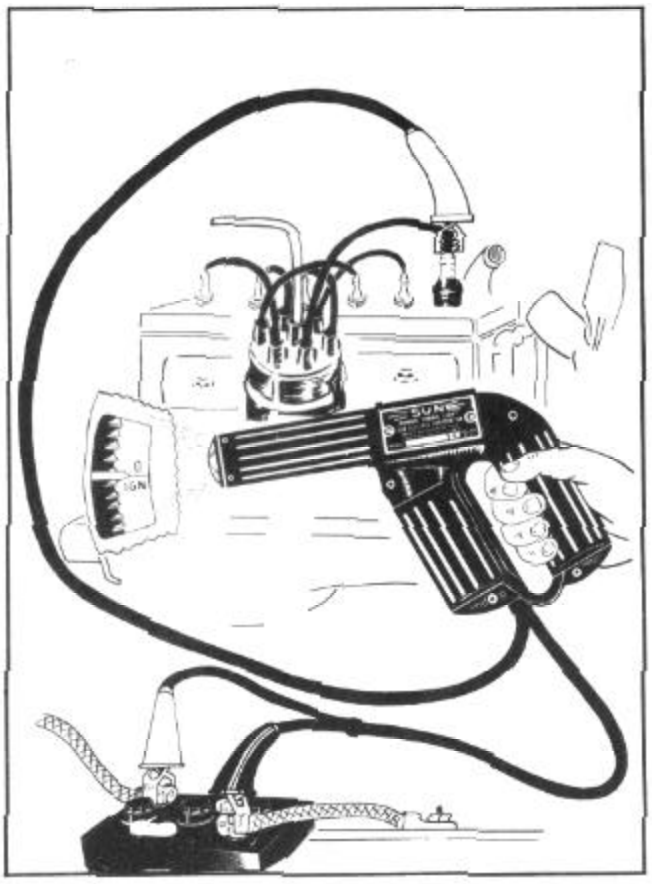


FIGURE 19

2. Increase engine speed.

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

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

Maximum performance is attained only with the proper spark setting.

**FAN BELT ADJUSTMENT:**

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

This movement increases or decreases the tension on the fan belt. The proper adjustment is 3/4" slack, Figure 20.

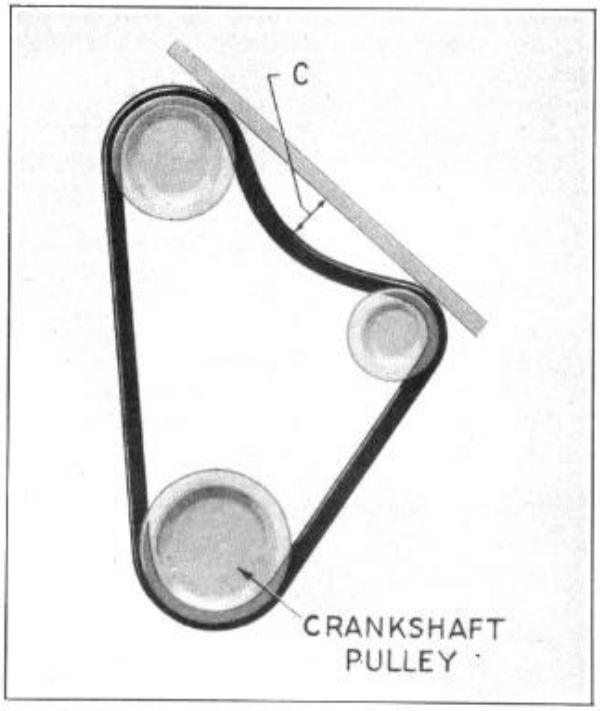



FIGURE 20

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

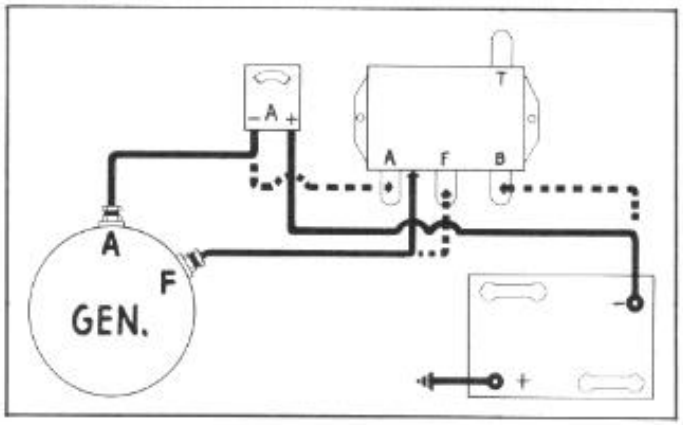



FIGURE 21

**GENERATOR OUTPUT TEST:**

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

2. Disconnect generator armature lead from voltage regulator and connect to ammeter negative lead.

3. Disconnect generator field lead from voltage regulator and ground field lead to base of regulator.

4. Operate the generator and allow it to warm up. Increase speed slowly. At 2,000 to 2,350 generator RPM, output should be 35 amperes. DO NOT INCREASE OUTPUT ABOVE 35 AMPERES.

5. If specified output cannot be obtained, generator requires repair or replacement.

## VOLTAGE REGULATOR

**CUTOUT RELAY CHECK:**

1. Disconnect wires from the "B" terminal of the voltage regulator and connect a reliable ammeter between the terminal and the battery lead, Figure 22.

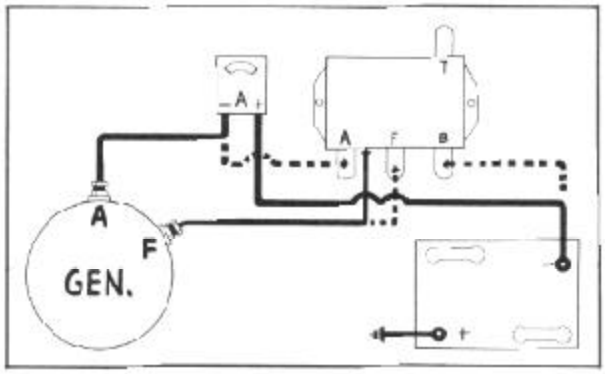



FIGURE 22

2. Connect an accurate voltmeter between the regulator armature terminal and the regulator base.

3. Disconnect the field lead from the regulator "F" terminal and connect a variable resistance (3 amp, 50 ohm rheostat) between the lead and the terminal. (Check may be made without rheostat by controlling generator output with the engine throttle.)

4. Turn the rheostat on to insert all the resistance in the field circuit and run the generator at medium speed (about 1000 RPM).

5. Slowly reduce the resistance. Ammeter should read ZERO until voltage has reached 6.4 to 7.0 volts and the contact points close.

6. Increase the charging rate to 15 amperes, then slowly turn resistance back in the field circuit. When the voltage is reduced to 4.1 to 4.8 volts or ammeter indicates 4 to 6 amperes reverse current, the contact points should open and the ammeter should drop to ZERO.

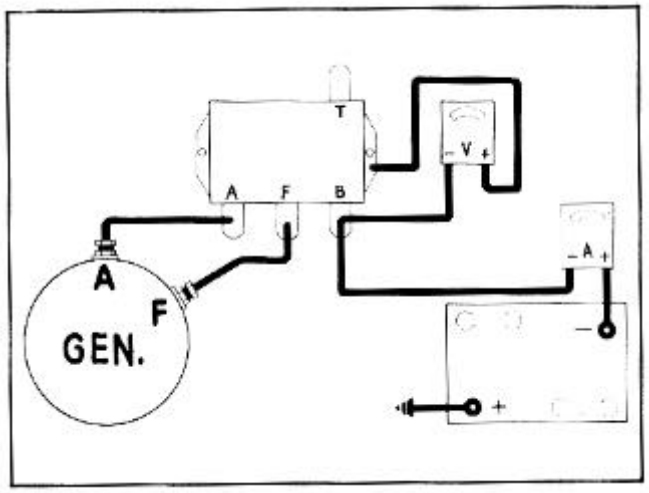



FIGURE 23

VOLTAGE REGULATOR CHECK:

1. Remove wires from regulator "B" terminal and connect ammeter between this terminal and the battery lead, Figure 23.

2. Connect voltmeter from "B" terminal to base of regulator.

3. Place a reliable thermometer about 2" from the regulator cover, but not touching the cover.

4. Operate the generator at about 15 ampere charge for 15 minutes or until the regulator is at normal operating temperature (70° F).

5. Stop the engine and then bring it back to about 2500 generator RPM (about 30 MPH).

6. Adjust output to a 10 to 15 ampere charge by turning on lights or accessories. Voltage should be within the limits shown in the specifications.

**NOTE: C he c k must be made with a fully charged battery, or sufficient resistance inserted in the charging circuit to produce required voltage.**

**CURRENT REGULATOR CHECK:**

1. Connect ammeter and voltmeter as for voltage regulator check, Figure 23.

2. Run the generator at approximately 3000 RPM (35 MPH).

3. Turn on lights and accessories to get maximum charging rate. Load must be in excess of 36 amperes, to prevent operation of voltage regulator unit. If necessary, remove regulator cover and place a jumper across the voltage regulator points (left unit) or place a bank of standard head lamps or a carbon pile rheostat across battery.

4. Ammeter should read between 34.0 and 36.0 amperes with cover in place.

**REGULATOR ADJUSTMENT:**

If regulator fails to meet above specifications, make adjustments in accordance with instructions under "Electrical", Section 6, of this Manual.

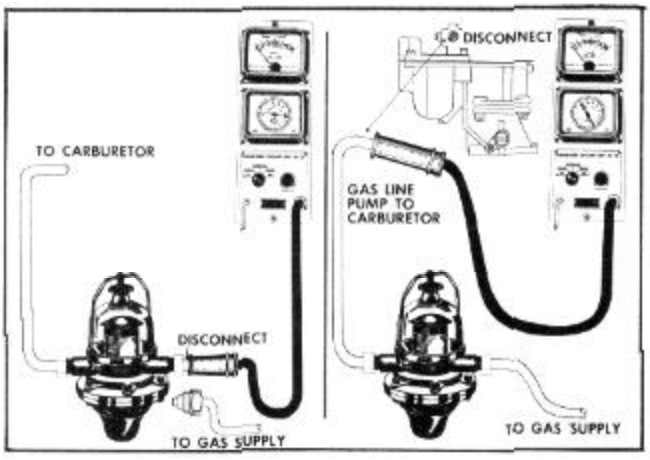



FIGURE 24

**FUEL PUMP**

**FUEL PUMP TEST:**

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

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

2. Replace the screen if damaged.

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

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

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

5. Start the engine and run at 1800 RPM. Normal pressure should be 3 to 4 pounds with AC combination fuel and vacuum pump and 4 to 5 pounds with Carter M-729SZ. Stop engine and watch pressure gauge. Pressure should not fall perceptible after engine is stopped.

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

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

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

9. I f pump pressure and vacuum are both low, pump should be repaired or replaced.

**VACUUM BOOSTER CHECK:**

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

**MANIFOLD HEAT CONTROL:**

Check the manifold heat control valve to see that spring is in good condition and valve is free.

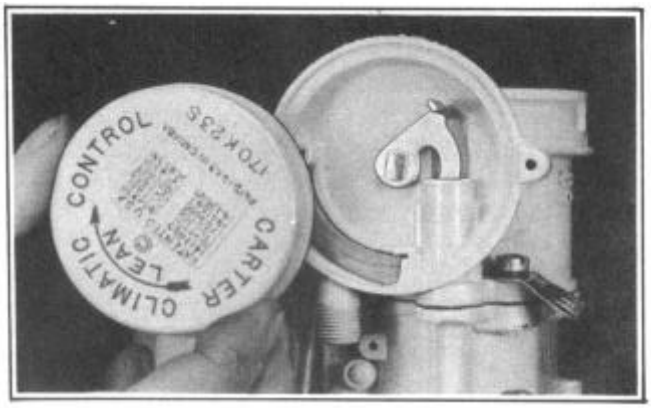



FIGURE 25

## CARBURETOR

### CLIMATIC CONTROL

:

1. Remove the carburetor Climatic Control cover, Figure 25.

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

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

4. Reinstall the cover with graduations down and rotate counter clockwise to center graduation.

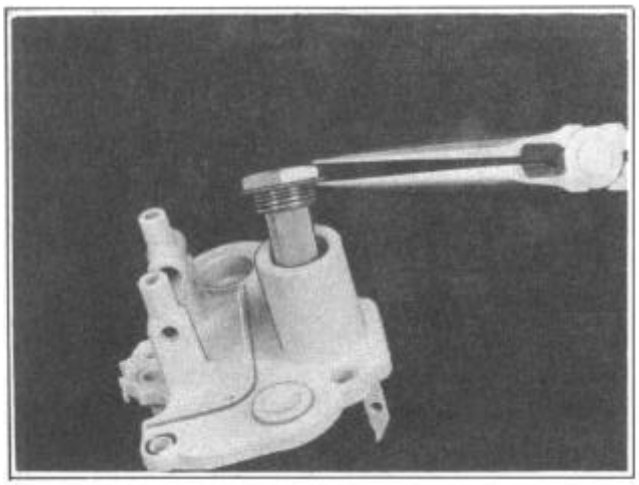


FIGURE 26

### CARBURETOR INLET STRAINER

:

1. Remove bowl cover strainer nut, gasket, and strainer screen, Figure 26.

2. Clean screen and examine for breaks or corrosion. Replace defective screen.

3. Replace strainer screen, gasket and nut.

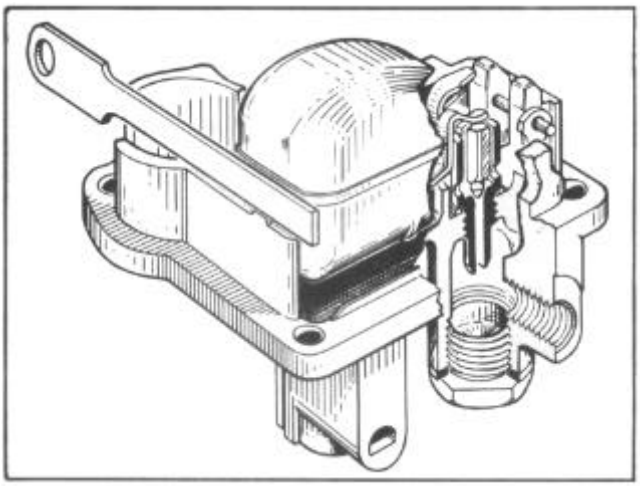


FIGURE 27

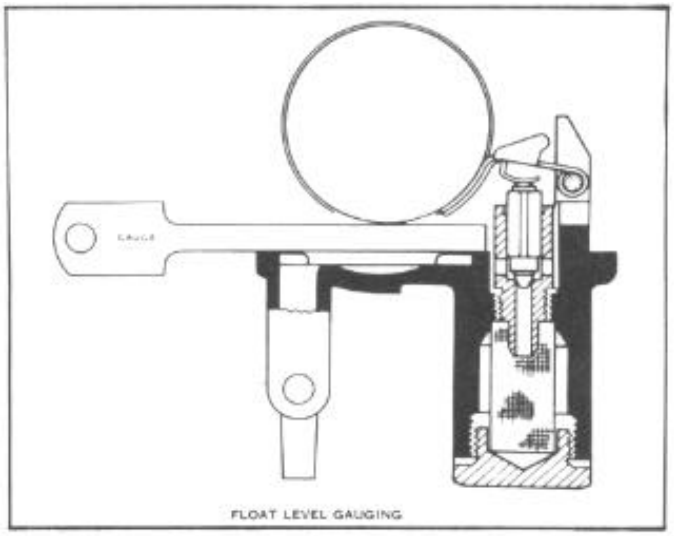
### CARBURETOR FLOAT CHECK:

1. Remove air cleaner.

2. Remove carburetor dust cover.

3. Remove screws attaching carburetor air horn, and on WDO carburetor carefully loosen screw below choke valve and lift off air horn; then remove screw from below choke valve.

4. Disconnect throttle connector rod and remove bowl cover.



5. Insert bowl cover and measure float setting. Float setting should be measured as in Figure 27 for Model 500 and Figure 28 for 501,2,3 and 4.

| Float Carburetor | Gauge Setting | Number |
|---|---|---|
| Carter 648S (WDO) | 13/64" | J-818-4 |
| Carter 647S (WDO) | 3/16" | 1-818-3 |
| Carter 7495 (WA-1) | 1/2" | 1-818-1 |

Gauge both ends of float on the dual carburetor, making sure needle is seated.

6. To adjust, raise float and press down on float lever lip with a screwdriver. Bend only a small amount at a time and do not disturb curvature of the lip.

7. Replace float cover.

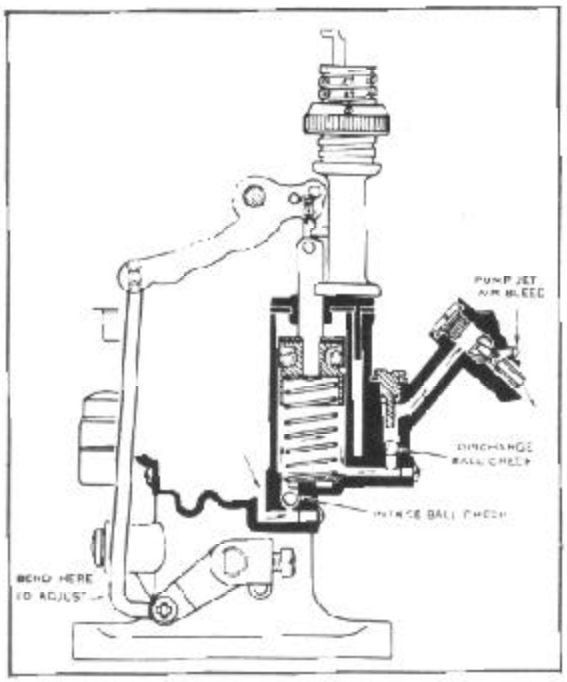



FIGURE 29

**PUMP TRAVEL:**

1. Back out throttle adjusting screw to seat throttle valve.

2. Pump connector link should be in outer hole in pump arm (long stroke) on dual carburetor and in the lower hole (short stroke) on the single carburetor.

3. Pump travel should be as follows:

| | | |
|---|---|---|
| 8 Cyl. Carter 648S | (WDO) | 14/64" |
| 6 Cyl. Carter 647S | (WDO) | 18/64" |
| 6 Cyl. Carter 749S | (WA-1) | 16/64" |

Use Carter Universal Pump Stroke Gauge T-109-117S, Figure 29, if available.

4. Adjust pump travel by bending the throttle connecting link at lower angle.

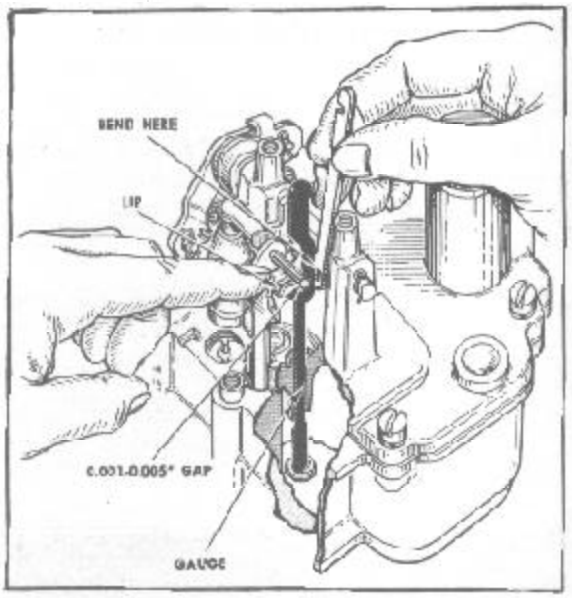



FIGURE 30

**METERING ROD SETTING (WDO)**

1. Remove hairpin clip from metering rod pin and remove pin, spring and one metering rod and disk.

2. Insert metering rod gauge, J-1305 (Carter No. T-109-113) in place of rod. Be sure gauge seats in metering rod jet, Figure 30.

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

4. Press lightly on vacuum piston link until lip contacts tongue on anti-percolator arm. Clearance between metering rod pin and shoulder of gauge should be less than .005" with throttle valve seated.

5. Adjust by bending tongue on anti-percolator arm. (Do not disturb pump adjustment.)

6. Remove gauge and replace metering rod disk, metering rod, spring, pin and clip. Be sure metering rod is in jet.

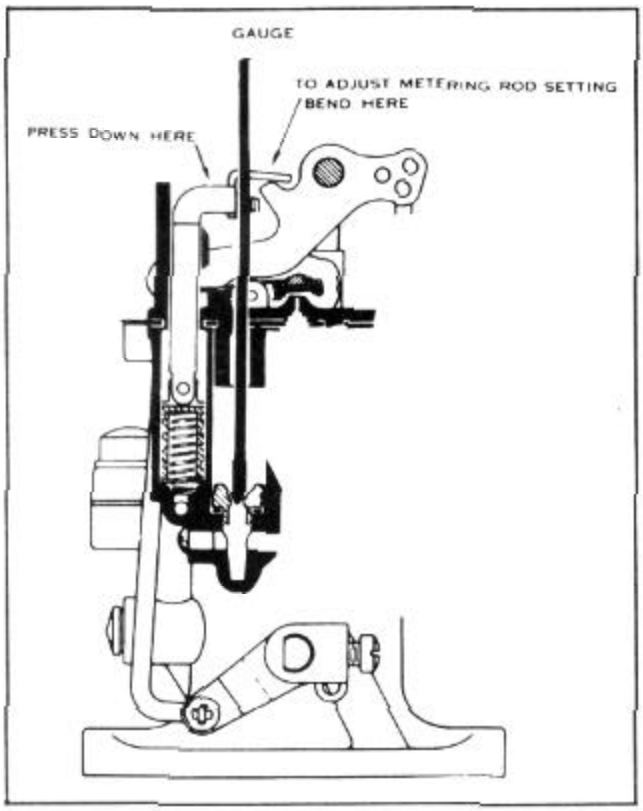



FIGURE 31

**METERING ROD SETTING (WA-1):**

1. Remove metering rod and disk.

2. Insert metering rod gauge, J-1265 (Carter No. T-109-102). Hold gauge vertical and be sure gauge is seated in metering rod jet, Figure 31.

3. Press down on vacuum piston link directly over piston until it contacts the pump arm. Clearance between metering rod pin and shoulder of gauge should be less than .005", with throttle valve seated. Gauge must not drag on pin.

4. Adjust by bending lip on piston link.

5. Remove gauge and install metering rod and disk and connect spring.

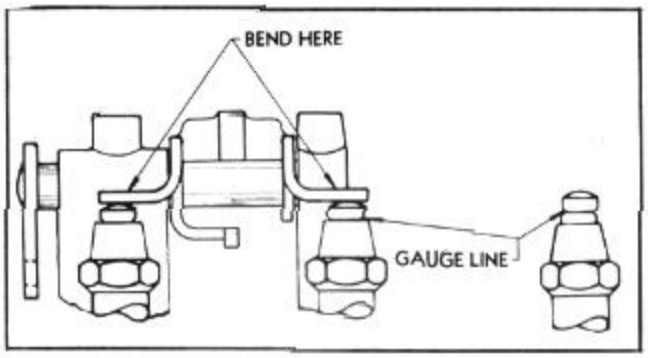



FIGURE 32

**ANTI-PERCOLATOR ADJUSTMENT (WDO):**

1. Bend lips on anti-percolator arm so that center of indicator line on anti-percolator valves is flush with top of anti-percolator plugs when throttle valve is closed, Figure 32.

2. Be sure both valves are adjusted evenly.

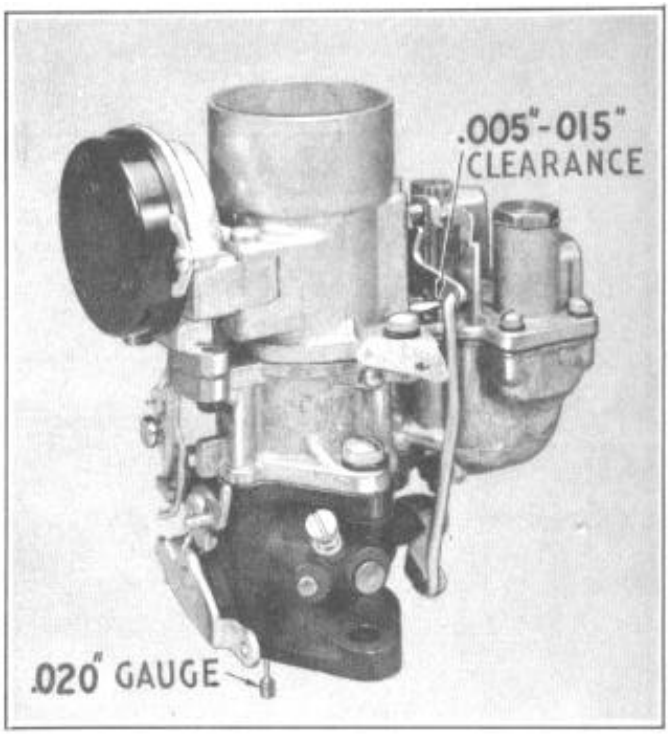



FIGURE 33

**ANTI-PERCOLATOR ADJUSTMENT (WA-1):**

1. Crack throttle valve .020" by placing Carter gauge No. T-109-29 between throttle valve and bore of carburetor on side opposite the idle port, Figure 33.

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

3. Adjust by bending rocker arm, Figure 34.

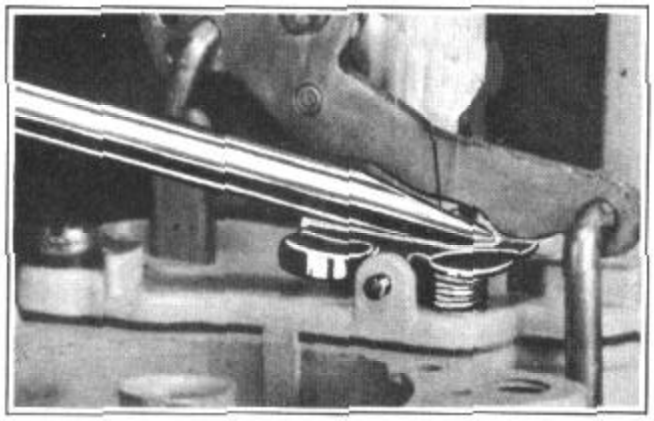


FIGURE 34

FAST IDLE ADJUSTMENT (WDO):

1. Replace air horn and connect pump link.

2. Start engine and allow to warm up.

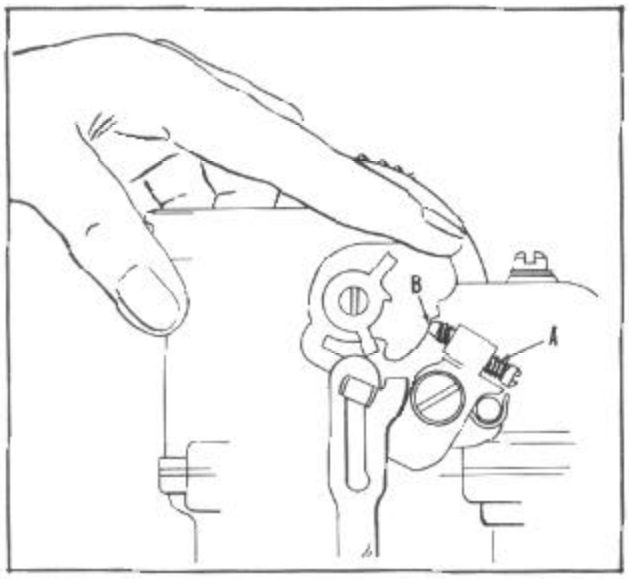



FIGURE 35

3. Hold choke valve open and press down on fast idle cam until idle adjusting screw (A) is seated on the lower step of cam (B), Figure 35.

4. Turn idle adjusting screw (on low step of cam) until engine RPM reaches 700 for warm climate and 800 for cold climate.

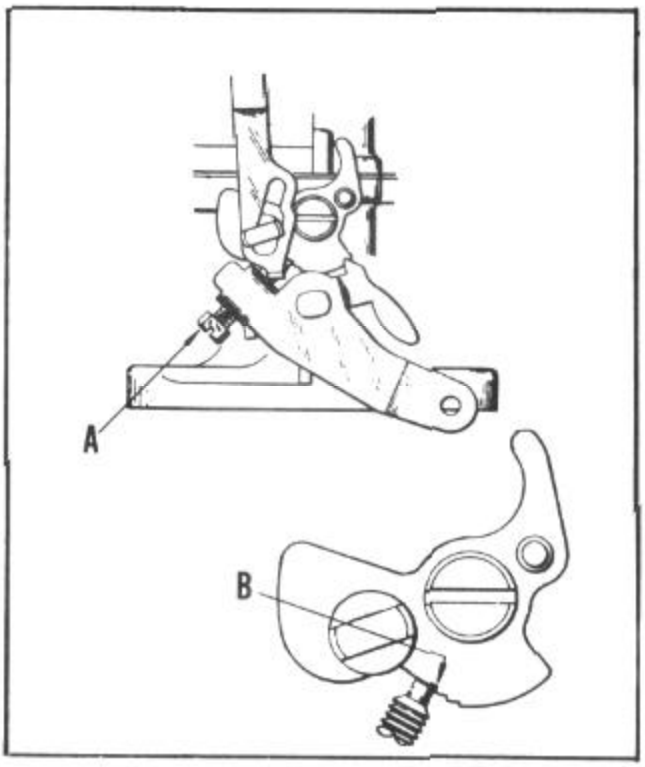



FIGURE 36

**FAST IDLE ADJUSTMENT (WA-1):**

1. With fast idle cam in normal idle position, tighten throttle lever adjusting screw (A), Figure 36, until it just seats against the cam.

2. Hold throttle lever closed and pull cam back until low step is against but not on set screw (B), Figure 36.

3. Clearance between lower edge of choke valve and air horn should be 5/8.

4. Adjust by bending fast idle link at offset portion.

**UNLOADER ADJUSTMENT (WDO):**

1. Open throttle wide open and check clearance between upper edge of choke valve and air horn. Clearance should be 1/4", Figure 37.

2. Adjust by bending lip on fast idle connector link

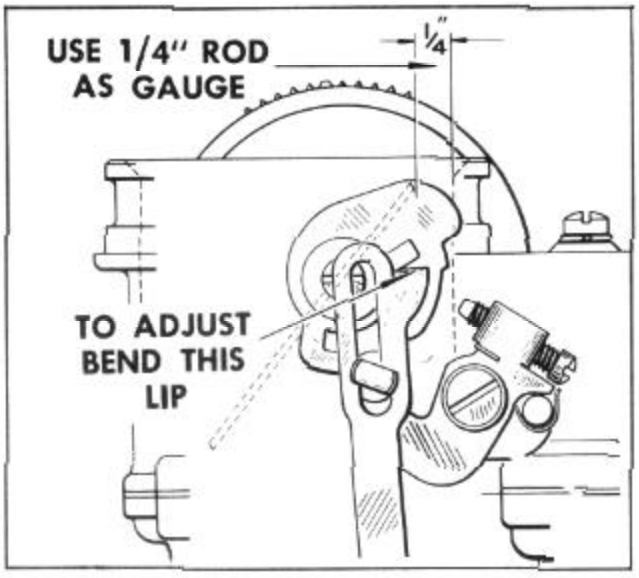



FIGURE 37

(When unloader is adjusted properly and throttle is wide open, choke valve will lock in open position).

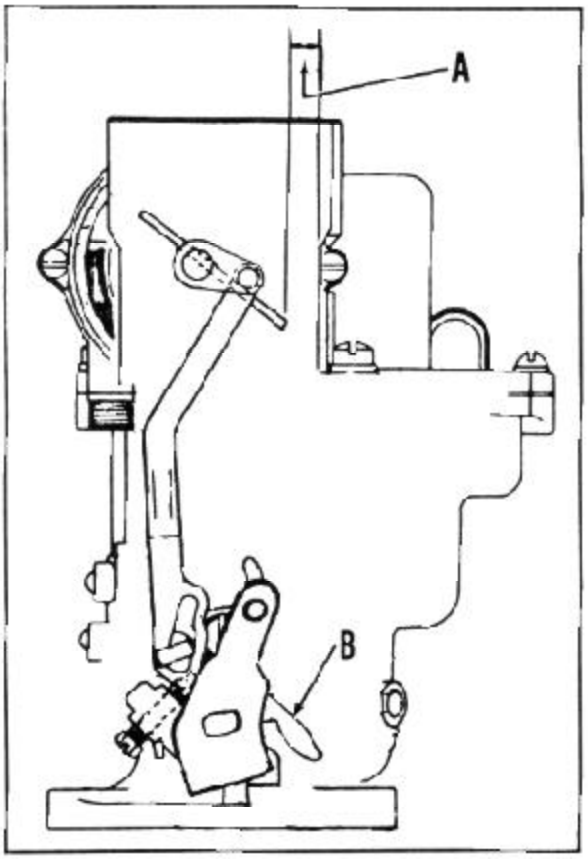



FIGURE 38

**UNLOADER ADJUSTMENT (WA-1):**

1. Open throttle wide open and check clearance between lower edge of choke valve and air horn. Clearance should be 7/16" (A), Figure 38.

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

**IDLE ADJUSTMENT (WDO):**

1. Start engine and allow to warm up.

2. See that choke valve is wide open.

3. Set idle adjustment screws to obtain smooth idle at 540 to 560 RPM. (If car is equipped with Drive-Master, set idle at 580 to 600 RPM.)

4. On eight cylinder engines the normal setting is 1 to 1-1/2 turns open, on six cylinder engines, 1-1/4 to 1-3/4 turns open.

**IDLE ADJUSTMENT (WA-1):**

1. Start engine and allow to warm up.

2. See that choke valve is wide open.

3. Set idle adjustment screw to obtain smooth idle at 540 to 560 RPM.

4. Normal setting is 1/2 to 1-1/2 turns open.

**AIR CLEANER, GAUZE TYPE:**

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

2. Wash air filter in kerosene and blow dry.

3. Re-oil with engine oil and allow to drain and reinstall.

**OIL BATH AIR CLEANER:**

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

2. Remove cover and filter unit.

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

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

5. Refill to oil level line with 50 SAE engine oil for temperatures above 32° F and 20 SAE for lower temperatures and reinstall, reversing procedure of removal.

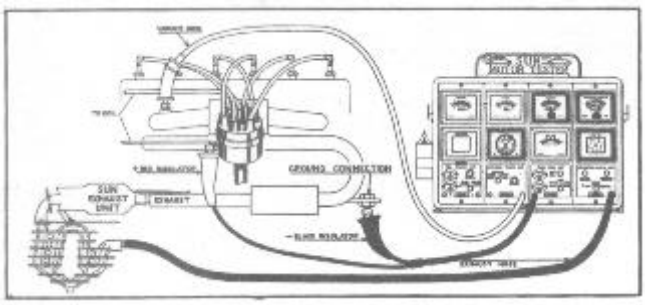


FIGURE 39

COMBUSTION ANALYSIS:

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

2. Connect tachometer cables to the distributor and ground one cable, Figure 39.

3. Insert exhaust hose from tester into exhaust pipe.

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

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

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

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

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

## REFERENCE

| Source of Information | Date | Subject |
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# SECTION 3
# ENGINE
## SPECIFICATIONS

| | 500<br>6 cylinder | 501-502<br>6 cylinder | 503-504<br>8 cylinder |
|---|---|---|---|
| **ENGINE:** | | | |
| Type | L-Head | L-Head | L-Head |
| Bore and Stroke | 3-9/16" x 3-7/8" | 3-9/16" x 4-3/8" | 3" x 4-1/2" |
| Piston Displacement | 232 Cu. in. | 262 Cu. in. | 254 cu. in. |
| Horsepower-Actual | 112 @ 4200 rpm | 112 @ 4200 rpm | 128 @ 4200 RPM |
| Taxable | 30.4 | 30.4 | 28.8 |
| Compression Ratio- | | | |
| Cast Iron Head (Std.) | 6.7:1 | | 6.7:1 |
| Aluminum Head (Opt.) | 7.2:1 | | 7.2:1 |
| Compression Pressure | | 119 lbs. @ 125 RPM | 119 lbs. @ 125 RPM |
| Firing Order | 1-5-3-6-2-4 | 1-5-3-6-2-4 | 1-6-2-5-8-3-7-4 |
| Mounting | 3 Points - Rubber | 3 Points - Rubber | 3 Points - Rubber |
| Number Location | Right Hand Front Side | Right Hand Front Side | Front of Block |
| Vibration Dampener | Yes (in rubber) | Yes (in rubber) | Yes (in rubber) |
| **CAMSHAFT:** | | | |
| Material | Cast Iron Alloy | Cast Iron Alloy | Cast Iron Alloy |
| Drive | Chain | Chain | Gears |
| Bearings | | | |
| Type | Steel-Back Babbit | Steel-Back Babbit | Steel-Back Babbit |
| Number | 4 | 4 | 5 |
| Diameter & Length | | | |
| No. 1 | 2.375" x 1-3/16" | 2.375" x 1-3/16" | 2.029" x 1-3/8" |
| No. 2 | 1.997" x 1-5/16" | 1.997" x 15/16" | 1.998" x 1-1/16" |
| No. 3 | 1.965" x 1-5/16" | 1.965" x 15/16" | 1.966" x 1-1/4" |
| No. 4 | 1.497" x 1-5/16" | 1.497" x 1-5/16" | 1.9355" x 1-1/16" |
| No. 5 | None | None | 1.498"x 1-5/16" |
| Radial Clearance | .0015" to .002" | .0015" to .002" | .0015" to .002" |
| End Play | .003" to .005" | .003" to .005" | Spring loaded thrust button |
| Timing Marks | On sprockets and chain | On sprockets and chain | On gears |
| Timing Chain | 60 links 3/8" pitch | 60 links 3/8" pitch | None |
| Timing Chain width | 1-1/4" | 1-1/4" | None |
| **CRANKSHAFT:** | | | |
| Type | Compensated | Compensated | Compensated |
| Journal Size | | | |
| No. 1 | 2.4988 to 2.4998 | 2.4988 to 2.4998 | 2.279 to 2.280 |
| No. 2 | 2.4988 to 2.4998 | 2.4988 to 2.4998 | 2.311 to 2.312 |
| No. 3 | 2.4988 to 2.4998 | 2.4988 to 2.4998 | 2.341 to 2.342 |
| No. 4 | 2.4988 to 2.4998 | 2.4988 to 2.4998 | 2.373 to 2.374 |
| No. 5 | None | None | 2.404 to 2.405 |
| Crankpins | 2.1244 to 2.1254 | 2.1244 to 2.1254 | 1.935 to 1.936 |
| Main Bearing Size | | | |
| No. 1 | 2.4993 to 2.5013 | 2.4993 to 2.5013 | 2.2805 to 2.2815 |
| No. 2 | 2.4993 to 2.5013 | 2.4993 to 2.5013 | 2.3125 to 2.3135 |
| No. 3 | 2.4993 to 2.5013 | 2.4993 to 2.5013 | 23425 to 2.3435 |

| | 500<br>6 cylinder | 501-502<br>6 cylinder | 503-504<br>8 cylinder |
|---|---|---|---|
| Main Bearing Size (Continued) | | | |
| No. 4 | 2.4993 to 2.5013 | 2.4993 to 2.5013 | 2.3745 to 2.3755 |
| No. 5 | None | None | 2.4055 to 2.4065 |
| Radial Clearance | .0005" to .0015" | .0005 " to .0015" | .001 |
| Adjusting Shims | None | None | None |
| End Play | 003" to .009" | 003" to .009" | .006 1 to .012" |
| Thrust | On No. 3 Bearing | On No. 3 Bearing | On No. 3 Bearing |
| **CONNECTING RODS:** | | | |
| Material | Drop-Forged Steel | Drop-Forged Steel | Drop-Forged Steel |
| Weight | 34.24 oz. No Bearing | 34.24 oz. No Bearing | 31.36 oz. with babbit |
| Length-center to center | 8-1/8" | 8-1/8" | 8-3/16" |
| Bearing-Lower end | Replaceable shells | Replaceable shells | Integral |
| Type | Babbit steel back | Babbit steel back | Spun Babbit |
| Diameter & Length | 2-1/8" x 1-5/8" | 2-1/8" x 1-5/8" | 1-15/16" x 1-3/8 |
| End Play | .007" to .013" | .007" to .013" | .007" to .013" |
| Diametral clearance | .0005" to .0015" | .0005" to .0015" | .003" to .0006" |
| Shims | None | None | None |
| Bushing-Upper End | | | |
| Material | Steel-back babbit | Steel-back babbit | Bronze |
| Diameter & Length | .96875" x 1-1/8" | .96875" x 1-1/8" | .750 x 29/32" |
| Diametral Clearance | 0 to .0003" at 70° F | 0 to .0003" at 70° F | 0 to .0003" at 70° F |
| **PISTON:** | | | |
| Type | Cam Ground | Cam Ground | Cam Ground |
| Material | Aluminum Alloy | Aluminum Alloy | Aluminum Alloy |
| Weight and Length | 18-1/8 oz.; 3-3/4" | 18-1/8 oz.; 3-3/4" | 10-1/2-1/4 oz.; 3-3/16" |
| Pin center to top | 2.310" to 2.314 | 2.060" to 2.064 | 1.6875 |
| Clearance (Piston to bore) | .0015" to .002" | .0015" to .002" | .002" to .0025" |
| Ring groove depth | 0.195" | 0.195" | 0.148" |
| **PISTON PIN:** | | | |
| Type | Floating | Floating | Floating |
| Length | 2.9375" | 2.9375" | 2.4375" |
| Diameter | .9684" to .9687" | .9684" to .9687" | .7497" to .750" |
| Fit in Piston | 0 to .0003" tight at 70° F | 0 to .0003" tight at 70° F | 0 to .0003" tight at 70° F |
| Fit in Rod | Hand push fit at 70° F | Hand push fit at 70° F | Hand push fit at 70° F |
| **PISTON RINGS:** | | | |
| Material | Cast Iron | Cast Iron | Cast Iron |
| Compression Rings | Two (Pinned) | Two (Pinned) | Two (Pinned) |
| Width | 5/64" | 5/64" | 3/32" |
| Oil Rings | Two (Pinned) (1-Below piston pin) | Two (Pinned) (1-Below piston pin) | Two (Pinned) (1-Below piston pin) |
| Width Upper | 3/16" | 3/16" | 3/16" |
| Width Lower | 5/32" | 5/32" | 5/32" |
| Gap Clearance | .006" to .014" | .007" to .012" | .004" to .009" |
| Ring Expanders | None | None | None |
| **VALVES:** | | | |
| Intake | | | |
| Angle of seat | 45º | 45º | 45º |
| Seat outside Diameter | 1.831” | 1.831 | 1.500” |

| | 500<br>6 cylinder | 501-502<br>6 cylinder | 503-504<br>8 cylinder |
|---|---|---|---|
| VALVES: (Continued) | | | |
| Port Diameter | 1-11/16" | 1-11/16" | 1-3/8' |
| Lift | 11/32" | 11/32" | 11/32" |
| Length | 5.730" | 5.730" | 5.094" |
| Stem Diameter . | 3402" to .3412" | 3402" to .3412" | .3402' to .3412 |
| Stem to Guide clearance | .0015" to .003" | .0015" to .003" | .0015" to .003" |
| Operating clearance hot | .010" | .010" | .006 " |
| Inserts | No | No | No |
| Exhaust | | | |
| Angle of Seat | 45º | 45º | 450 |
| Head outside diameter | 1.556" | 1.561" | 1.380" |
| Port Diameter | 1.375" | 1.375" | 1.21875" |
| Lift | .346" | .346" | .346" |
| Length | 5.730" | 5.730" | 5.094" |
| Stem diameter | 3402" to .3412" | 3402" to .3412" | .3402" to .3412" |
| Stem to guide clearance | .002” to .004" | .002” to .004" | .003" to .005" |
| Operating clearance hot | .010" | .010" | .008" |
| Valve angle | 7 degrees | 7 degrees | Vertical |
| Inserts | No | No | No |
| **VALVE GUIDES:** | | | |
| Type | Removable | Removable | Removable |
| Length | | | |
| Intake | 2-29/32" | 2-29/32" | 2-9/16" |
| Exhaust | 3-5/32" | 3-5/32" | 2-15/16" |
| Inside Diameter | .3437" | .3437" | .3437" |
| **VALVE SPRINGS:** | | | |
| Free Length | 2.500" | 2.500" | 2.343" |
| With valve closed | 2.188" | 2.188" | 2.000" |
| With valve open | 1.842" | 1.842" | 1.656 |
| Total coils | 9-1/2" | 9-1/2" | 9 |
| Spring pressure | 77 lbs. at 2-3/16" | 77 lbs. at 2-3/16" | 46 lbs. at 2" |
| **VALVE TAPPETS:** | | | |
| Type | Mushroom | Mushroom | Roller Cam |
| Guides | Integral with block | Integral with block | Removable |
| Guide Size | .6245" to .6250" | .6245" to .6250" | .7495" to .7505" |
| Tappet Size | .62325" to .62375" | .62325" to .62375" | .749" |
| Fitting Clearance | .00075" to .0015" | .00075" to .0015" | .0005" to .0015" |
| Length | 2.310 | 2.310 | 1.78125 |
| **VALVE TIMING**: | | | |
| Inlet Opens | 7º 18' BUDC | 7º 18' BUDC | 10º 40’ BUDC |
| Inlet Closes | 53º-42' ALDC | 53º-42' ALDC | 60° - ALDC |
| Exhaust Opens | 53°-18' BLDC | 53°-18' BLDC | 50° - BLDC |
| Exhaust Closes | 7º-42' AUDC | 7º-42' AUDC | 18º-44' AUDC |
| Timing Marks | On Flywheel | On Flywheel | On Flywheel |
| **LUBRICATION:** | | | |
| Engine Lubricating Method | Pressure | Pressure | Duo-Flo |
| Normal Pressure | 40 lbs. at 30 MPH. | 40 lbs. at 30 MPH. | 3 lbs. |
| Oil Pump Type | Rotor | Rotor | Oscillating Plunger |
| Oil Pump Drive | Worm on Camshaft | Worm on Camshaft | Worm on Camshaft |
| Oil Capacity | Dry, 7-1/2 qts.<br>Refill, 7 qts. | Dry, 7-1/2 qts.<br>Refill, 7 qts. | Dry, 8 qts.<br>Refill. 7 qts. |

# ENGINE

Engine mechanical instructions and repair procedures for the 500, 501, 502, 503 and 504 are the same as the 480-490 series with the following exceptions:

## CYLINDER HEAD

The cylinder head combustion cavities for the 500 series cylinder head are smaller than those in the 481, 482, 491, 492, 501 and 502 cylinder heads and the cylinder heads cannot be interchanged.

The 500 series cylinder heads are identified by the large No. 500 on the top of the cylinder head to the right of the water outlet. The cylinder heads for 501 and 502 have the words "Power Dome" on top of the cylinder head.

Cylinder head nut torque for both 6 cylinder engines is 70-75 foot pounds.

## CRANKSHAFT

The crankshaft stroke for Model 500 is 3-7/8"; the crankshaft stroke for Models 501 and 502 is 4-3/8". THESE CRANKSHAFTS ARE NOT INTERCHANGEABLE. For dimensions and clearances refer to "Engine Specifications".

## PISTON

The pistons for Model 500 cannot be interchanged with pistons of Model 501 and 502

The pistons for Model 500 differ from Models 501 and 502 due to the change in crankshaft stroke as follows:

The overall dimensions of the pistons are the same. The distance from the centerline of the piston pin hole to the top of the piston is 2.310" to 2.314" for Model 500, Figure 1, and
2.060" to 2.064" for Model 501 and 502, Figure 2.

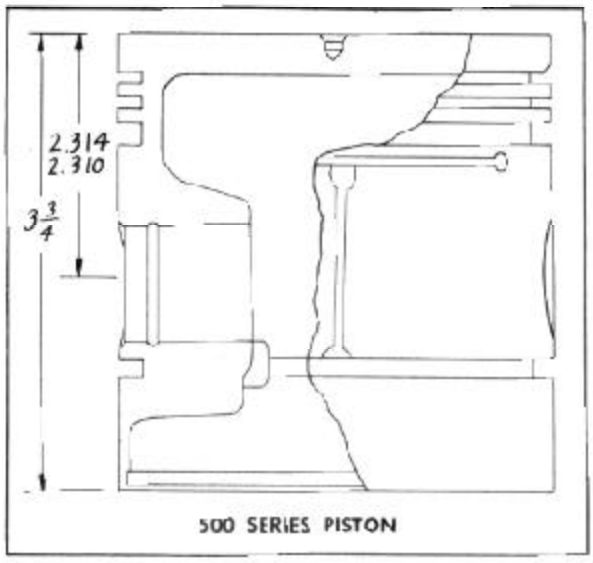


FIGURE 1

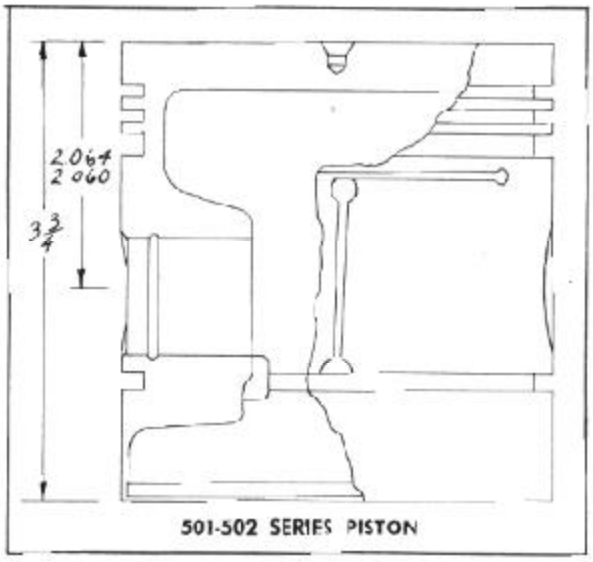


FIGURE 2

The 500, 501 and 502 (6 cylinder) piston and connecting rods must be removed through the top of the cylinder block. The 503 and 504 (8 cylinder) piston and rod can be removed from either the top or bottom.

**NOTE : Before removing rods and pistons remove the ridge from the top of the cylinder walls.**

## CONNECTING ROD

The connecting rods for Model 500 are the same as the rods for Models 501 and 502 and are interchangeable. Connecting rods and pistons must be assembled with the oil hole in the connecting rod on the opposite side of the slot in the piston. See Figure 3.

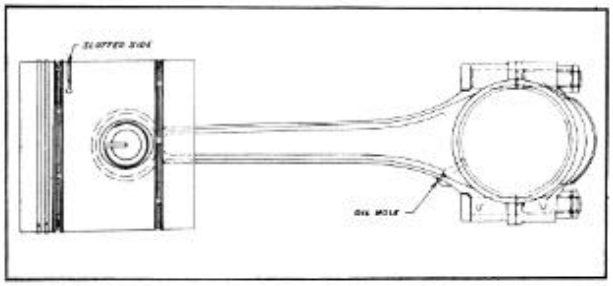


FIGURE 3

Piston and connecting rod assembly must be installed in engine with the oil hole in the connecting rod on the valve side.

Total weight variation between the heaviest and lightest piston and rod assembly must not exceed 1/2 oz.

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# SECTION 4
# FUEL SYSTEM & EXHAUST

## CONTENTS



## SPECIFICATIONS

| **CARBURETOR** | **500** | **501-502** | **503-504** |
|---|---|---|---|
| **Car Model** | **6 cylinder** | **6 cylinder** | **8 cylinder** |
| Make | Carter | Carter | Carter |
| Model | WA1-749S | WDO-647SA | WDO-648S |
| Type | Single Throat - Down Draft | Dual Throat - Down Draft | Dual Throat - Down Draft |
| Float Level | 1/2" | 3/16" | 13/64" |
| Pump Travel | 16/64" | 18/64" | 14/64" |
| Idle Adjustment | 1/2 to 1-1/2 Turns Open | 1/42 to 1-3/4" Turns open | 1 to 1-1/2 Turns open |
| Metering Rod | Vacuumeter | Vacumeter | Vacumeter |
| Metering Rod Gauge | J-1265 (2.468") | J-1305 (2.280") | J-1305 (2.280# |
| Choke | Climatic control | Climatic Control | Climatic Control |
| Anti-percolator Valve | Saxophone key | Poppet | Poppet |

| FUEL PUMP | STANDARD | OPTIONAL |
|---|---|---|
| Make | Carter | AC |
| Model | M729SZ | AJ |
| Pressure | 4 to 5 pounds | 3-4 pounds |
| Vacuum: | | |
| 120 RPM | --- | 8-1/2" Hg |
| 1800 RPM | --- | 12" Hg |

## CARBURETOR

Carburetors used on 500 series Hudson's are designed to furnish the proper air-fuel ratio at all speeds on the particular engine for which the carburetor is specified. All models use Carter Climatic Control Vacumeter carburetors. Model 500 uses a single throat down d r a f t carburetor, Carter WA1-749S. Other models use a dual throat down draft carburetor; on eight cylinder engines Carter WDO-648S is used; and Carter WDO-647SA is used on six cylinder engines other than model 500.

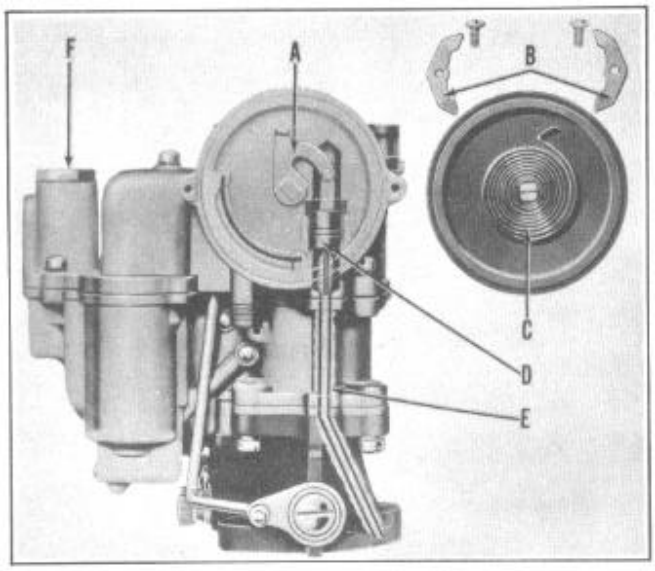




FIGURE 1

**CHOKE:**

All models are equipped with Climatic Control, Figure 1, which serves as an automatic choke. The Climatic Control closes the choke valve when the engine is cold. The Climatic Control is connected to the exhaust manifold by a tube which allows exhaust gases to warm the thermostatic spring (C) and decreases the spring tension. A vacuum piston (D) is connected to the choke valve and operates from the vacuum of the intake manifold. The pull of the piston against the thermostatic spring opens the choke valve as the engine becomes warm.

To prevent the thermostatic spring from closing the choke valve if the throttle is opened on a cold engine, a lockout is provided in the choke linkage to hold the choke open on all wide open throttle operations.

A cam on the choke valve shaft is brought against an adjusting screw when the choke is c l o s e d. The screw is adjusted to hold the throttle open sufficiently to provide necessary engine speed (fast idle) during the warm-up period. As the choke valve opens, the fast idle cam moves away from the screw allowing the engine to run at normal idle speed.

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

**ANTI-PERCOLATOR VALVE:**

When the car stands in extremely hot weather or after a hard run, fuel in the carburetor bowl may vaporize and set up pressure in the bowl. To prevent this pressure forcing the fuel out the high speed nozzle (percolating), an anti-percolator device vents the carburetor bowl to the atmosphere when the throttle is closed, relieving the pressure in the bowl.

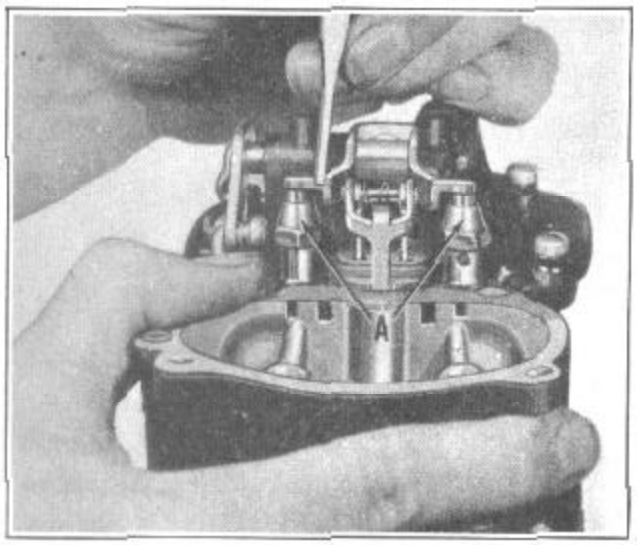


FIGURE 2

An anti-percolator valve that opens too early will allow excess air to be drawn into the high speed circuit. If the valve fails to open, it will cause difficult starting when the engine is hot.

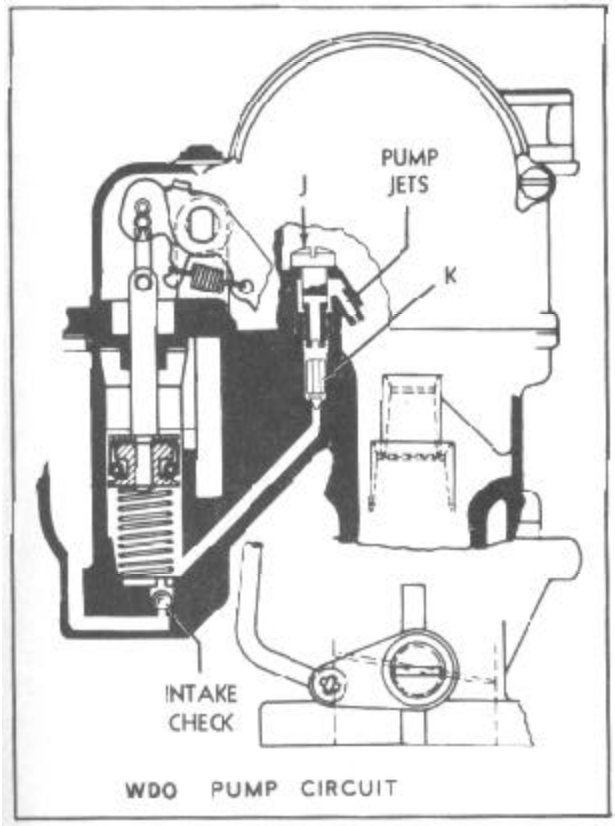


FIGURE 3

The WDO carburetors are equipped with two anti-percolator valves of the poppet type (A), Figure 2.The WA1 carburetor has one saxophone key type anti-percolator valve, Figure 6.

**ACCELERATING PUMP:**

Both the WDO, Figure 3, and WA1, Figure 4, carburetors incorporate a throttle operated accelerating pump which discharges additional fuel into the carburetor throat when the throttle is opened. The discharge is prolonged by the pressure of the pump and the restriction of the pump jet. This discharge allows time for the high speed circuit to furnish necessary fuel.

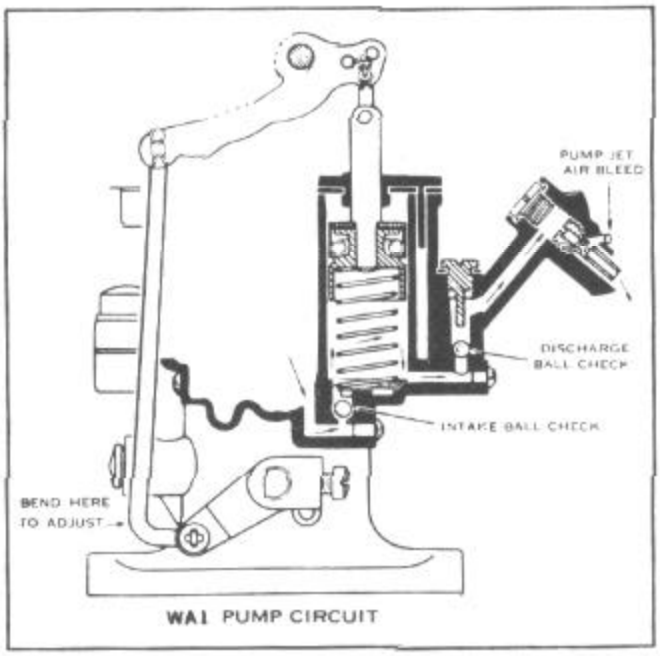


FIGURE 4

**FAST IDLE:**

Provision is made on both carburetors for a faster idle speed during the Warm-up period. This is accomplished by a cam on the choke valve shaft which holds the throttle open slightly when the choke valve is closed. As soon as the engine becomes warm, the choke valve is opened and the fast idle cam moves away from the adjusting screw, allowing the throttle to close and engine to idle at normal speed.

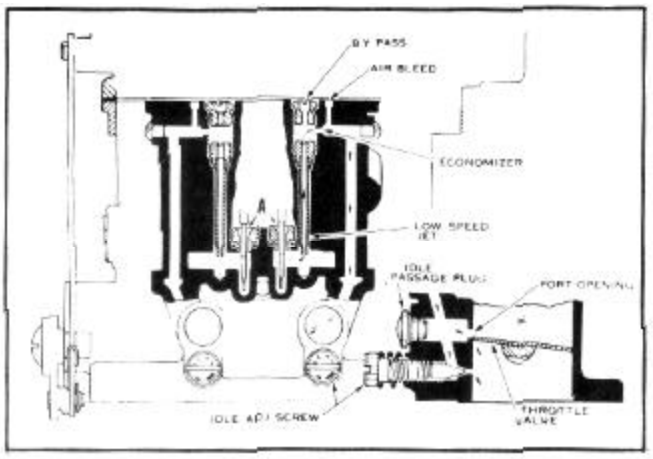


FIGURE 5

**METERING RODS:**

The amount of fuel admitted to the carburetor throat through the high speed circuit is controlled by stepped and tapered metering rods. Two metering rods are used on the WDO (A), Figure 5, and one on the WA1 carburetor, Figure 6.

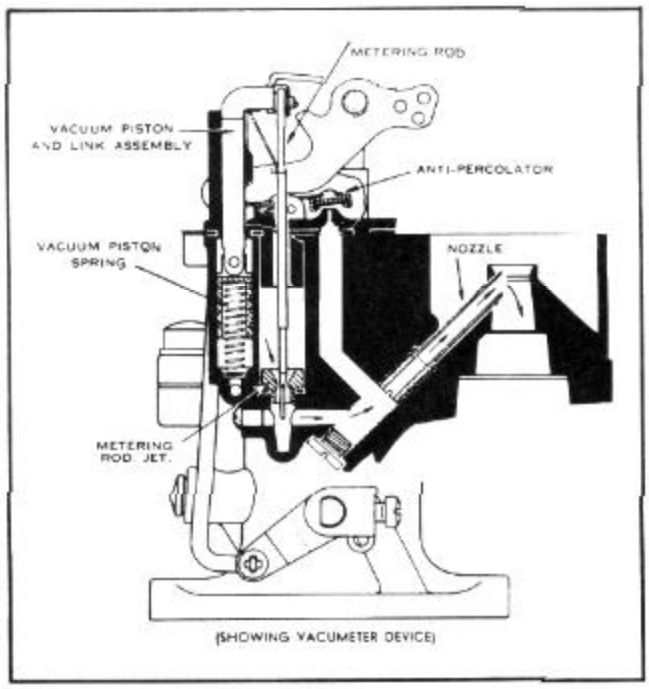


FIGURE 6

Opening the throttle raises the metering rod allowing more fuel to pass through the jet.

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

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

## WA-1 CARBURETOR ADJUSTMENT

**PUMP TRAVEL:**

1. Remove carburetor dust cover
2. Back out throttle adjusting screw to seat throttle valve.
3. Pump connector link should be in the lower hole (short stroke).
4. Pump travel should be 16/64". Use Carter Universal Pump Stroke Gauge T-109-117S if available.
5. Adjust pump travel by bending throttle connecting link at lower angle, Figure 4.

**METERING ROD SETTING:**

1. Remove air cleaner and dust cover.
2. Remove hairpin clip and disconnect spring from metering rod.
3. Remove metering rod and disk.
4. Insert metering rod gauge, J-1265 (Carter No. T-109-102). Hold gauge vertical and be sure gauge is seated in metering rod jet, Figure 7.
5. Press down on vacuum piston link directly over piston until it contacts the pump arm

Clearance between metering rod pin and shoulder of gauge should be less than .005" with throttle valve seated. Gauge must not drag on pin.

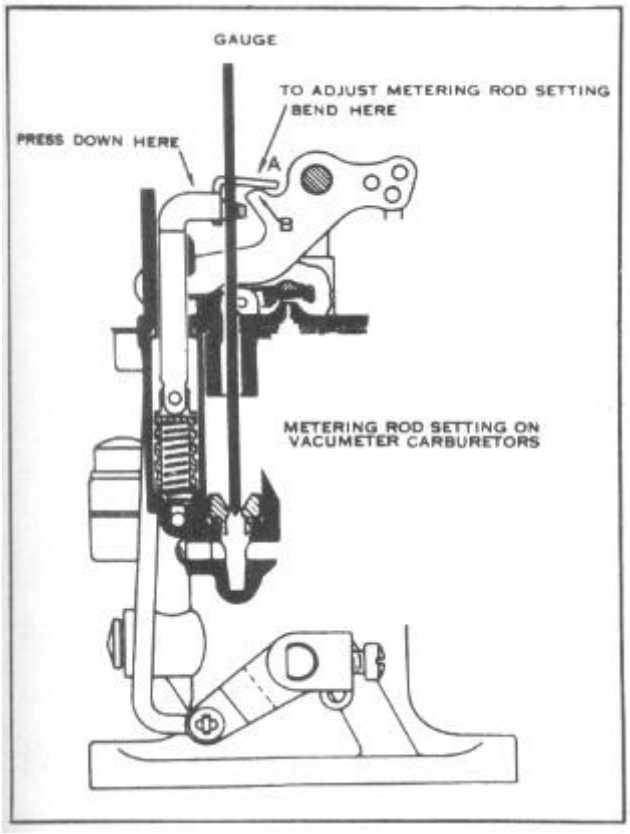


FIGURE 7

6. Adjust by bending lip on piston link

7. Remove gauge and install metering rod, disk and connect spring.

**ANTI-PERCOLATOR ADJUSTMENT:**

(Carburetor must be removed from engine.)

1. Crack throttle valve .020" by placing Carter gauge No. T-109-29 between throttle valve and bore of carburetor on side opposite the idle port, Figure 8.

2. Clearance between rocker arm lip and pump arm should be .005" to .015'1.

3. Adjust by bending rocker arm, Figure 9.

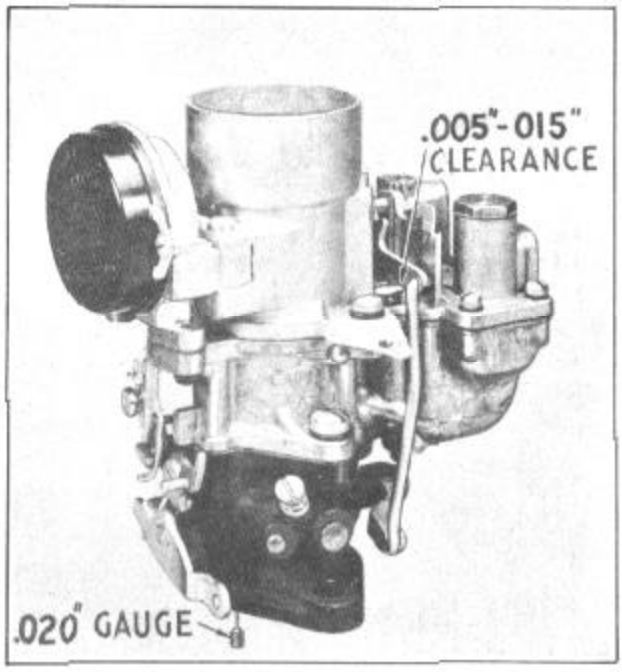


FIGURE 8

**UNLOADER ADJUSTMENT**:

1. Remove air cleaner

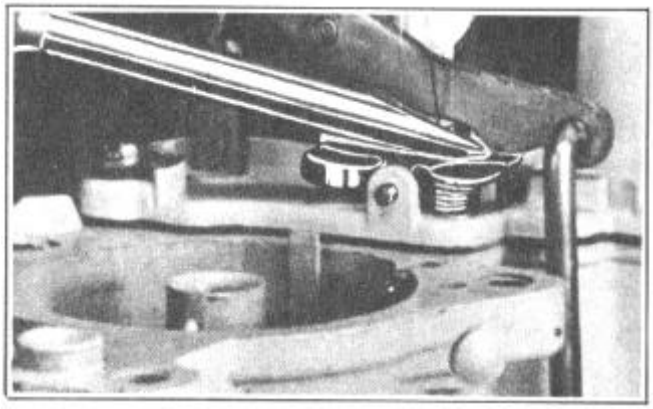

FIGURE 9

2. Open throttle wide open and check between lower edge of choke valve and air horn Figure 10. Clearance should be 7/16"

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

**FAST IDLE ADJUSTMENT:**

1. Remove air cleaner.

2. With fast idle cam in normal idle position, tighten

throttle lever adjusting screw (A), Figure 11, until it just seats against the cam.

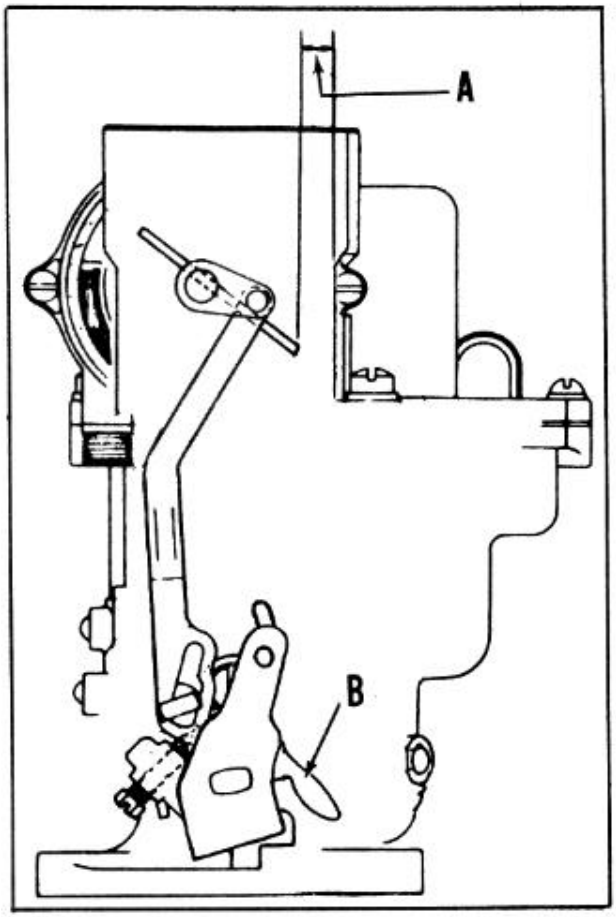


FIGURE 10

3. Hold throttle lever closed and pull cam back until low step is against but not on set screw (B), Figure 11.

4. Clearance between lower edge of choke valve and air horn should be 5/8", (A), Figure 10.

5. Adjust by bending fast idle link at offset portion.

**IDLE ADJUSTMENT:** .

1. Start engine and allow to warm up.

2. See that choke valve is wide open.

3. Set idle adjustment screw to obtain smooth idle at 540 to 560 RPM.

4. Normal setting is 1/2 to 1-1/2 turns open.

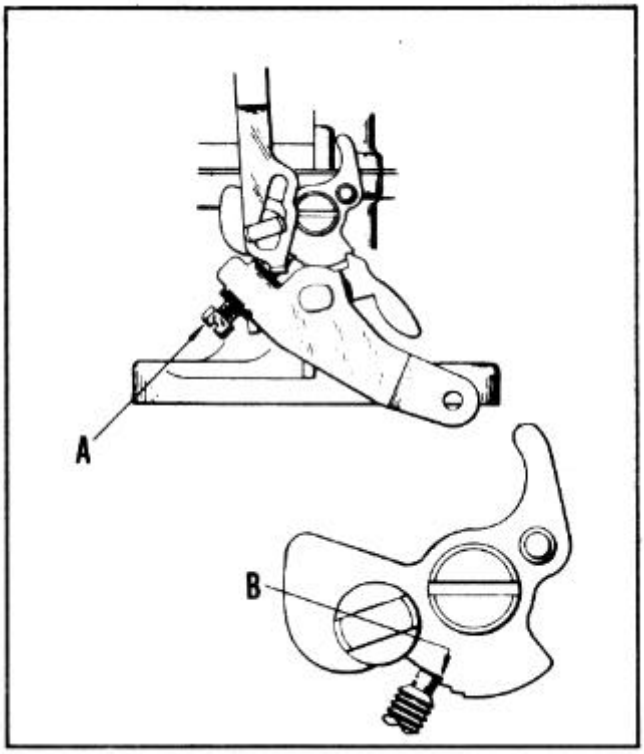


FIGURE 11

## WDO CARBURETOR ADJUSTMENT

**PUMP TRAVEL:**

1. Remove carburetor dust cover.

2. Back out throttle adjusting screw to seat

3. Pump connector link should be in outer hole

4. Pump travel should be as follows:

8 cyl. Carter 648S (WDO) 14/64"
6 cyl. Carter 647SA (WDO) 18/64:

Use Carter Universal Pump Stroke Gauge (T-109-117S), if available.

5. Adjust pump travel by bending throttle connecting link at lower angle

**METERING ROD SETTING:**

1. Remove air cleaner, dust cover, and air horn.

2. Remove hairpin clip from metering rod pin and remove pin, spring, and one metering rod and disk.

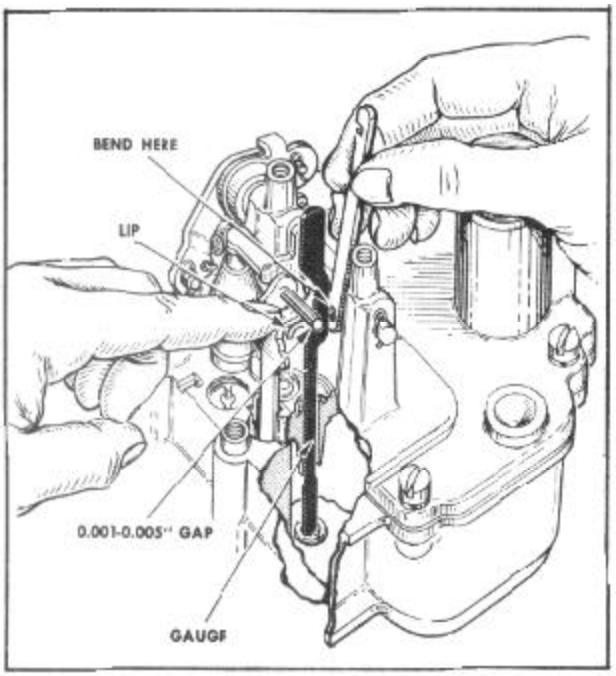


FIGURE 12

3. Insert metering rod gauge, J-1305 (Carter No. T-109-113) in place of rod. Be sure gauge seats in metering rod jet, Figure 12.

4. Install metering rod pin and spring in vacuum piston link.

5. Press lightly on vacuum piston link until lip contacts tongue on anti-percolator arm. Clearance between metering rod pin and shoulder of gauge should be less than .005" with throttle valve seated.

6. Adjust by bending tongue on anti-percolator arm. (Do not disturb pump adjustment).

7. Remove gauge and replace metering rod disk, metering rod, spring, pin and clip. Be sure metering rod is in jet.

**ANTI-PERCOLATOR ADJUSTMENT**:

1. Remove carburetor dust cover.

2. Bend lips on anti-percolator arm so that center of indicator line on anti-percolator valve is flush with top of anti-percolator plugs when throttle valve is closed, Figure 13.

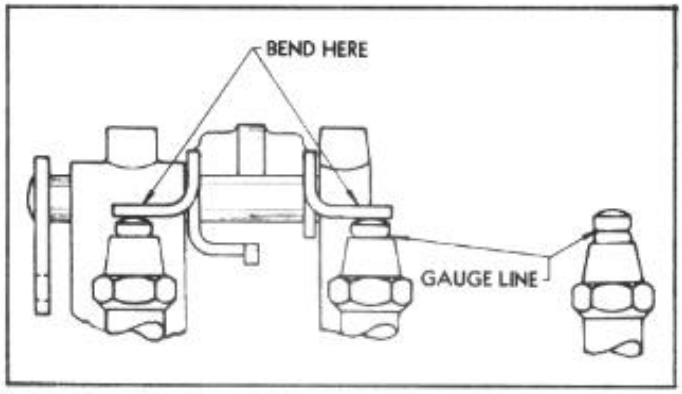


FIGURE 13

3. Be sure both valves are adjusted evenly.

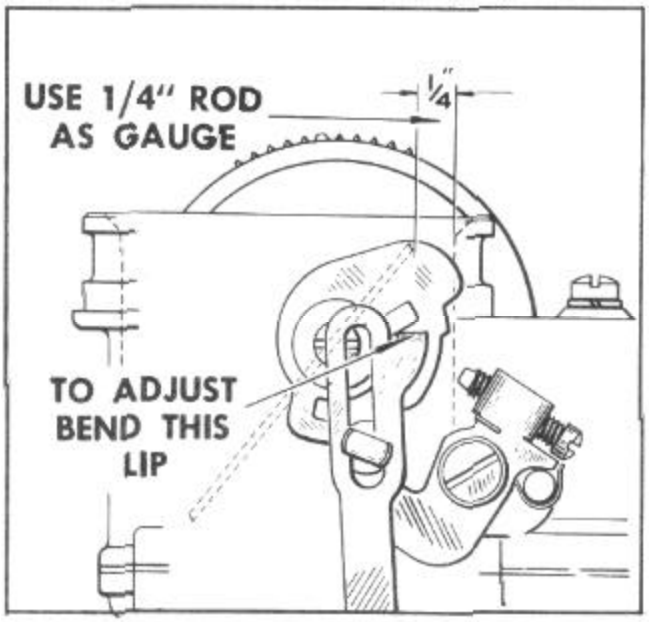




FIGURE 14

**UNLOADER ADJUSTMENT**:

1. Remove air cleaner.

2. Open throttle wide open and check clearance between upper edge of choke valve and air horn. Clearance should be 1/4" , Figure 14.

3. Adjust by bending lip on fast idle connector link. (When unloader is adjusted properly and throttle is wide open, choke valve will lock in open position.)

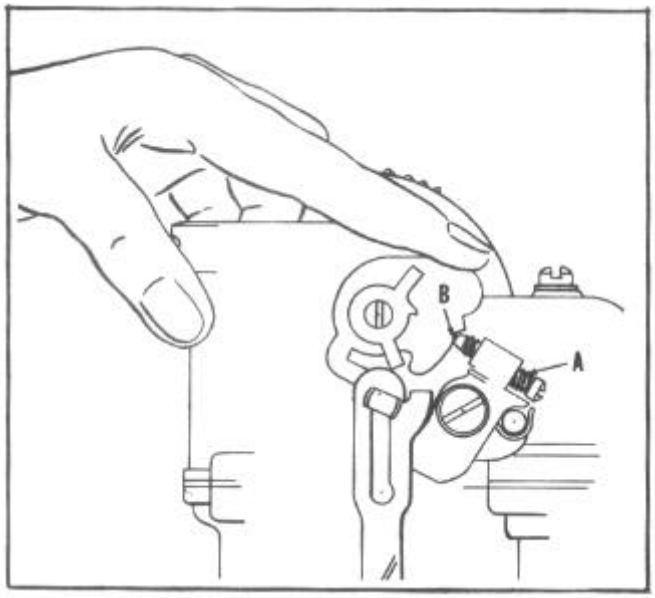


FIGURE 15

**FAST IDLE ADJUSTMENT:**

1. Remove air cleaner and connect tachometer to engine.

2. Start engine and allow to warm up.

3. Hold choke valve open and press down fast idle cam until idle adjusting screw is seated on the lower step of cam (B), Figure 15.

4. Turn idle adjusting screw (A), (on low step of cam), until engine RPM reaches 700 for warm climate and 800 for cold climate.

With carburetor removed from engine, set fast idle with choke valve closed and adjusting screw on high step of cam. Turn screw until clearance between throttle valve and carburetor bore is .054" on the side opposite the idle port

**IDLE ADJUSTMENT:**

1. Start engine and allow to warm up.

2. See that choke valve is wide open.

3. Set idle adjustment screws to obtain smooth idle at 540 to 560 RPM. (If car is equipped with Drive-Master, set idle at 580 to 600 RPM.)

4. On eight cylinder engines the normal setting is 1 to 1-1/2 turns open, on six cylinder engines, 1-1/4 to 1-3/4 turns open.

## WA-1 CARBURETOR OVERHAUL

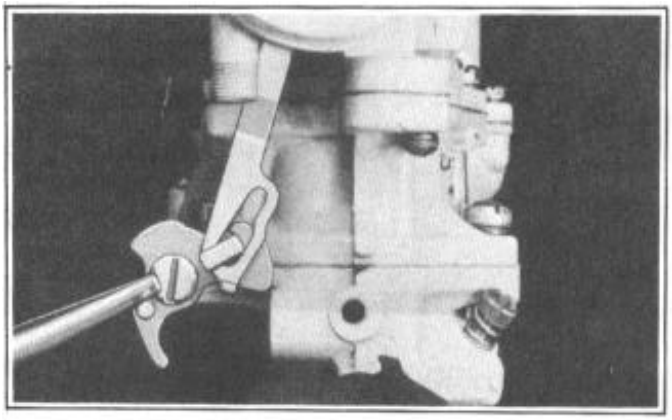

FIGURE 16

**DISASSEMBLY:**

1. Remove fast idle cam and pin assembly, Figure 16.

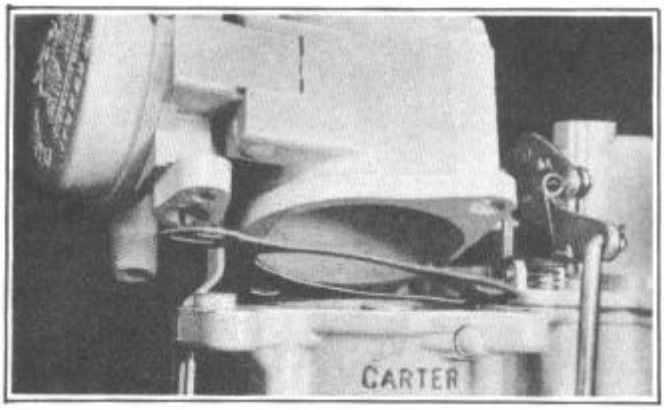


FIGURE 17

2. Remove air horn and climatic control assembly, Figure 17, and lift off air horn gasket.

3. Disconnect throttle connector rod; then remove bowl cover with all parts attached. Remove throttle shaft arm assembly, Figure 18.

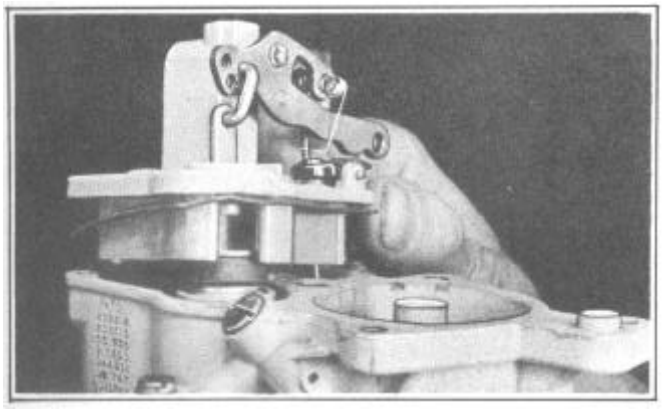

FIGURE 18

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

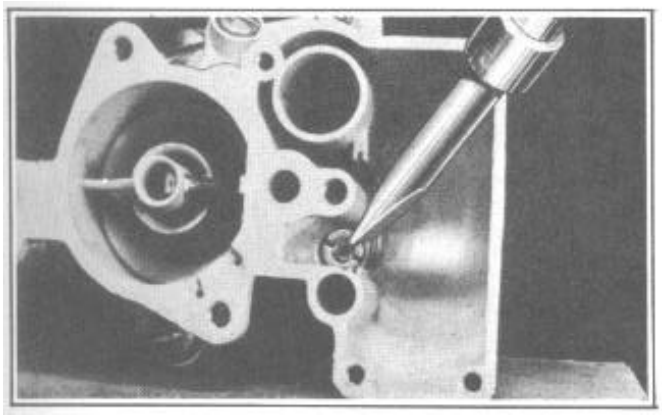

FIGURE 19

5. Remove metering rod jet and gasket assembly, Figure 19.

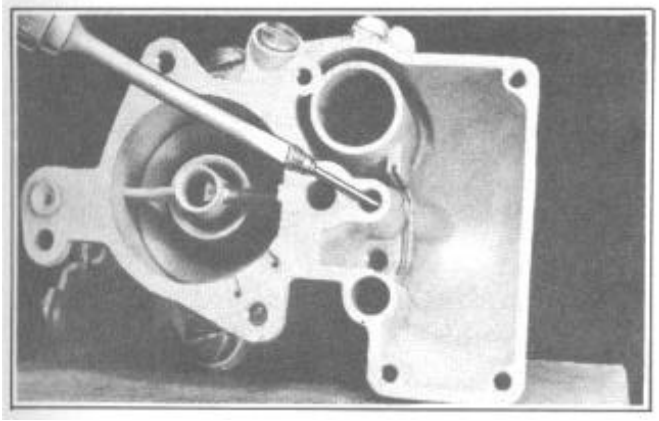

FIGURE 20

6. Remove low speed jet assembly, Figure 20.

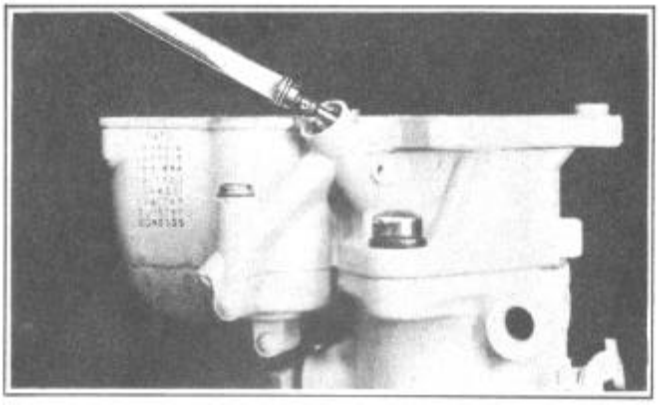

FIGURE 21

7. Remove pump jet plug and gasket assembly and pump jet, Figure 21.

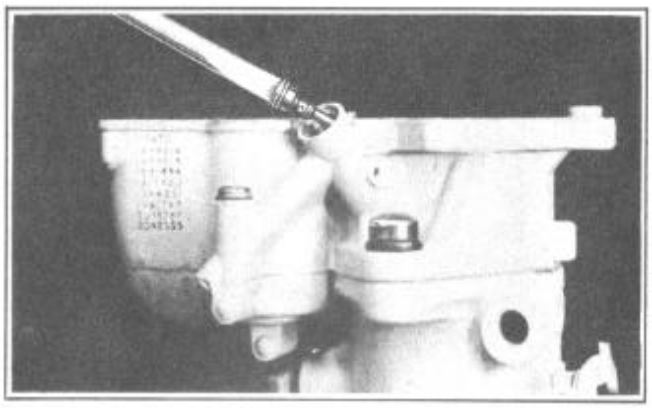

FIGURE 22

8. Remove pump discharge ball retainer and gasket, and check ball, Figure 22.

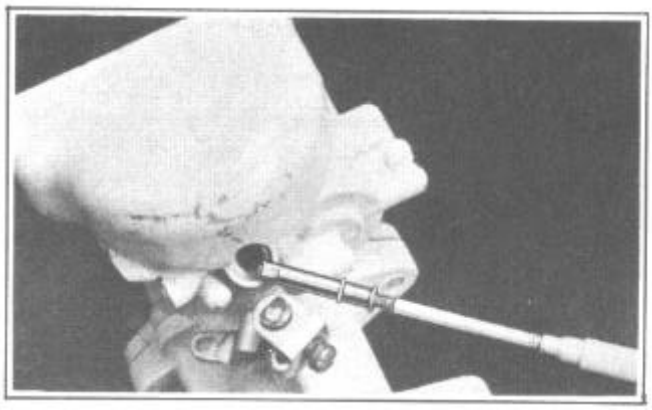

FIGURE 23

9. Remove nozzle passage plug, nozzle retainer plug and nozzle, Figure 23. (Be sure to remove small nozzle

gasket from casting.)

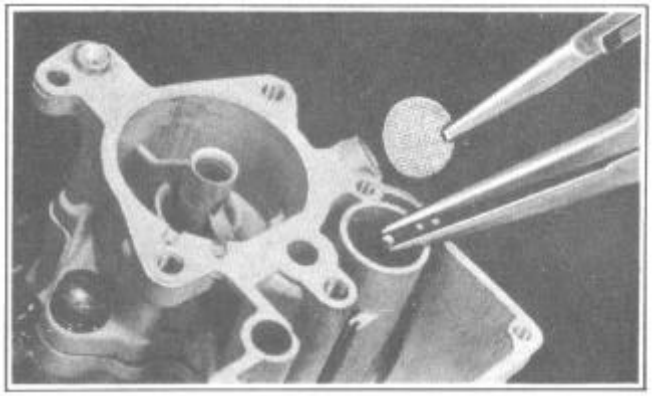

FIGURE 24

10. Remove pump strainer, and pump intake check ball, Figure 24.

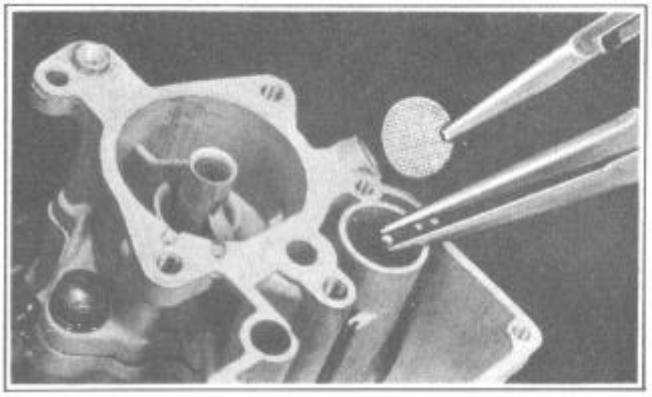

FIGURE 25

11. Separate body from flange assembly, Figure 25, and remove body flange gasket.

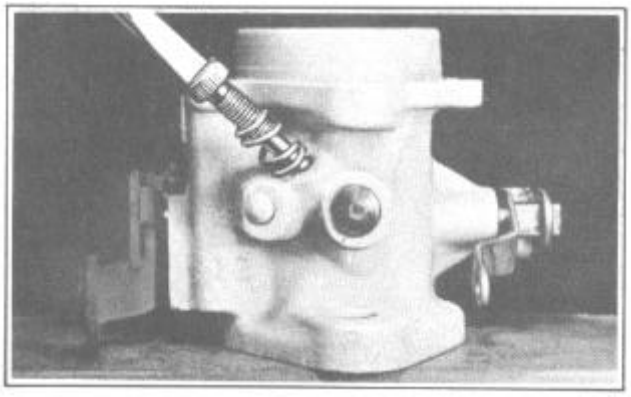

FIGURE 26

12. Remove idle adjustment screw and spring, Figure 26. Check for groove on seating surface.

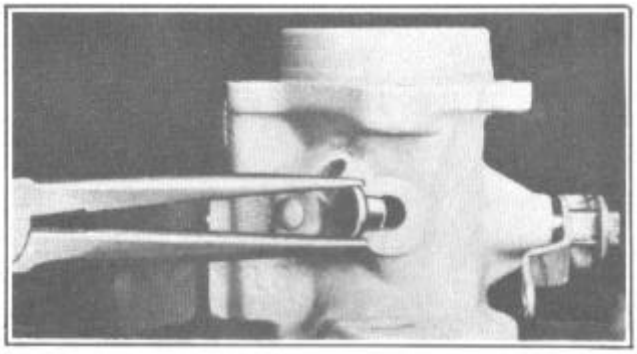

FIGURE 27

13. Remove idle port rivet plug, Figure 27.

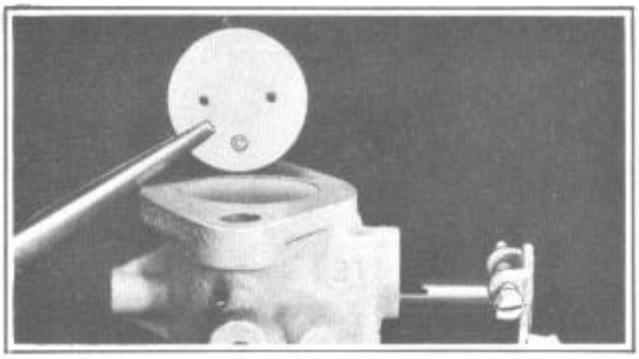

FIGURE 28

14. Remove throttle valve screws, valve and throttle shaft and lever assembly, Figure 28. Check shaft for wear or loose lever and throttle rod hole in lever for wear.

15. Remove choke valve screws, choke valve, shaft and piston assembly from air horn. Do not remove piston housing attached to air horn with rivets.

16. Remove all parts from bowl cover.

**ASSEMBLY:**

1. Clean casting and all parts thoroughly, except cork pieces and coil and housing assembly, with a good commercial carburetor cleaning compound.

2. Examine each part and replace any part that shows wear, or does not meet specifications. Use all new gaskets and new screws on throttle and choke valve.

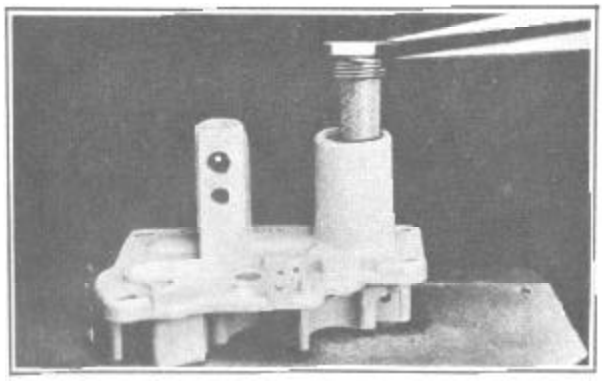

FIGURE 29

3. Install strainer and strainer nut and gasket assembly, Figure 29.

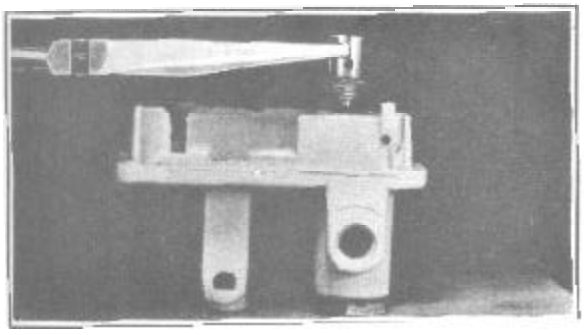

FIGURE 30

4. Install needle seat and gasket assembly, Figure 30. Check for wear. If either needle or seat shows wear, replace both.

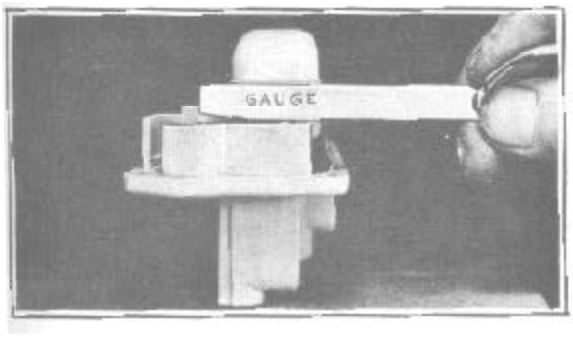


FIGURE 31

5. Install needle, float and lever assembly, float lever pin. Check float for dents and wear on lip, and float pin for wear. Check bowl cover for wear in counter-shaft hole. Set float level to 1/2" by bending lip, not float, Figure 31. Measure distance from projection on bowl cover to soldered seam of float, as shown.

6. Install throttle shaft and lever assembly and throttle valve. Small "C" in circle should be toward idle port facing manifold side of flange, Figure 32. Center valve by tapping lightly

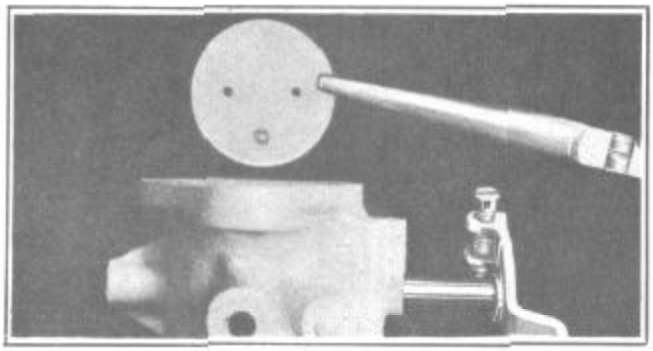

FIGURE 32

screws. Back out throttle lever adjusting screw before installing.

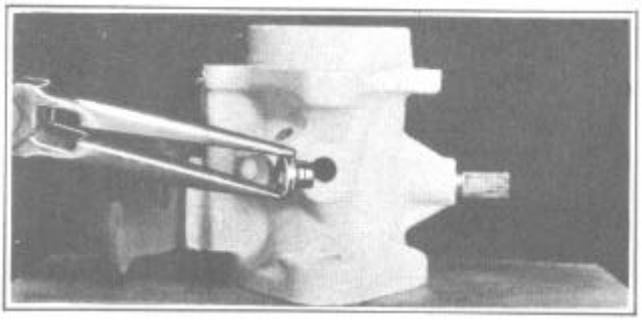

FIGURE 33

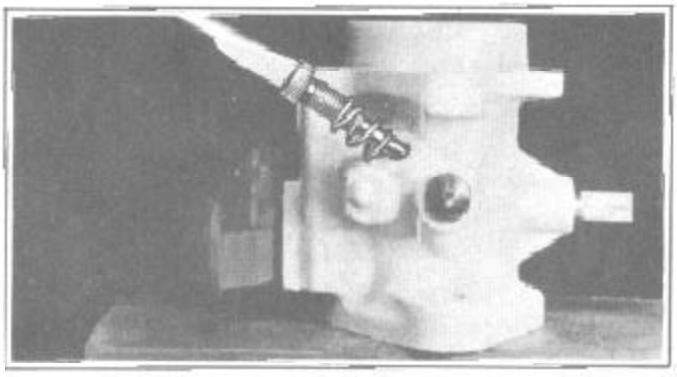

FIGURE 34

8. Install idle adjustment screw and spring, Figure 34. Back out from seated position 1/2 to 1-1/2 turns. (Make final adjustment after installation.)

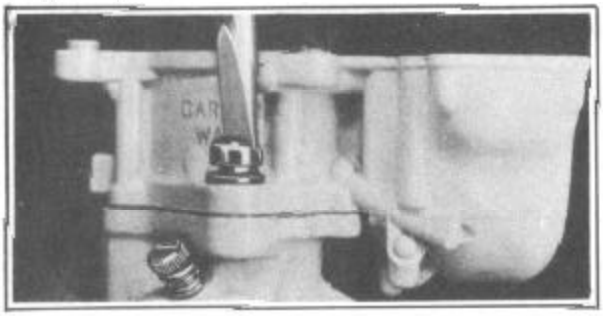

FIGURE 35

9. Assemble body and body flange assembly, Figure 35. Install screws and lock-washers. Pull screws down evenly.

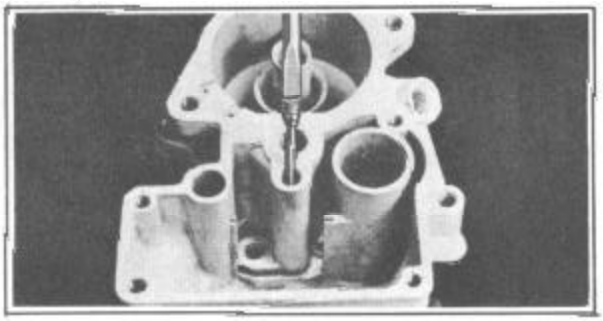

FIGURE 36

10. Install low speed jet assembly, Figure 36. (Be sure jet seats firmly in casting.)

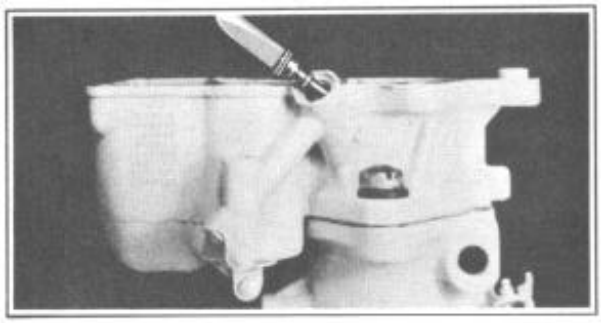

FIGURE 37

11. Install pump jet and pump jet passage plug and gasket assembly, Figure 37. (Be sure jet is clear of all restrictions and seats properly.)

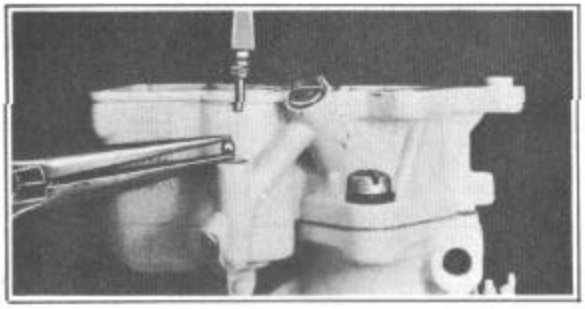

FIGURE 38

12. Install pump check ball and pump discharge ball retainer and gasket, Figure 38.

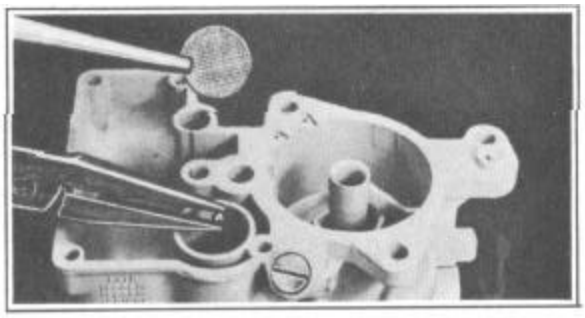

FIGURE 39

13. Install pump intake check ball and pump strainer, Figure 39.

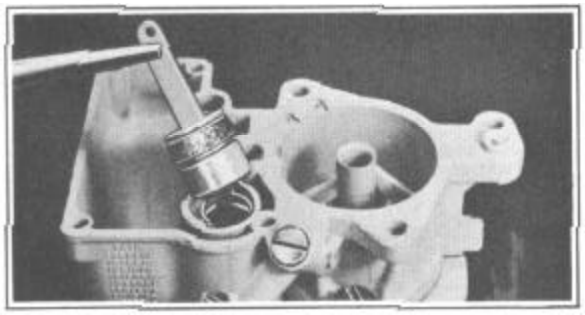

FIGURE 40

14. Install pump spring and pump plunger and rod assembly, Figure 40. Examine leather for damage. If not in good condition, replace entire assembly.

15. Install metering rod jet and gasket assembly, Figure 41. Examine for wear.

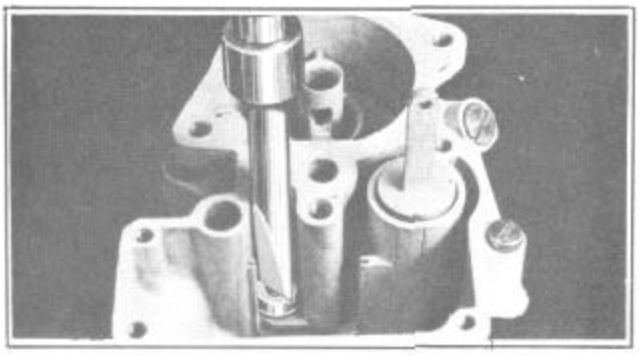

FIGURE 41

If jet is worn, replace both metering rod and jet.

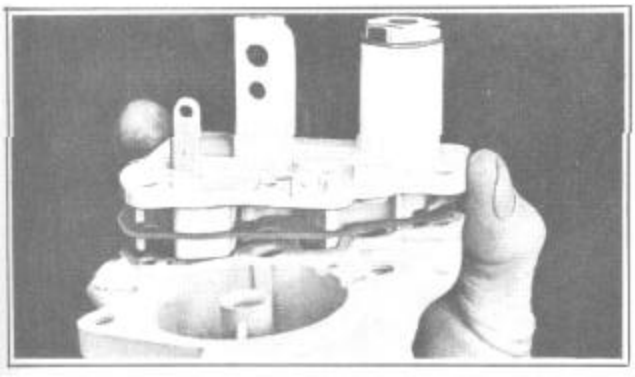

FIGURE 42

16. Install bowl cover assembly, Figure 42. Pull screws down evenly. Install idle passage plug and gasket assembly (center of bowl cover.)

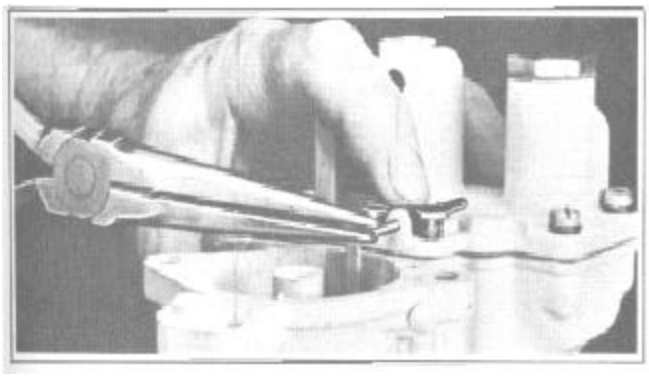

FIGURE 43

17. Install anti-percolator cap and rocker arm assembly and spring, Figure 43. (Make certain that leather is in good condition and that pin is not worn.)

18. Install pump arm and countershaft assembly, Figure 44. Install connector link on pump shaft in lower hole in pump arm.

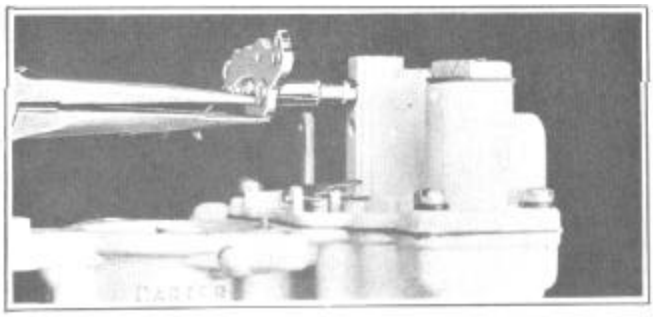

FIGURE 44

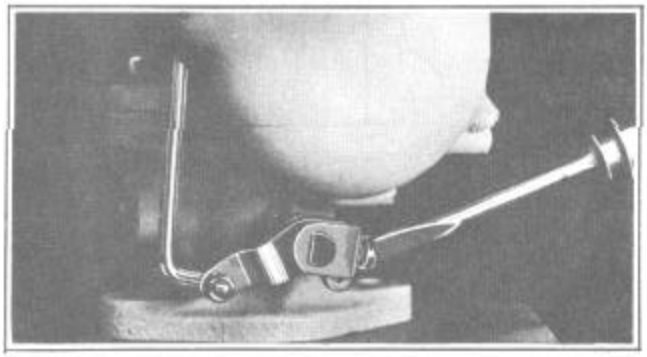

FIGURE 45

19. Install throttle shaft arm and screw assembly and throttle connector rod. Figure 45. Check throttle shaft arm for wear.

20. With throttle connector rod in place, adjust pump stroke. Use Carter universal pump travel gauge T-109-117S or machinist's scale and set pump travel to 16/64". Adjust by bending throttle connector rod at lower angle. (See Figure 4.)

21. Adjust metering rod after pump adjustment is made. (See Figure 7). Insert metering rod gauge in place of metering rod, seating tapered end in jet. With throttle valve seated, press down lightly on piston link directly over piston. There should be less than .005" clearance between metering rod pin and shoulder of notch in gauge. Gauge must not drag on pin. Adjustment can be made by bending lip on piston link so that it contacts hump on pump arm. Remove gauge, install rod and disc, and connect spring.

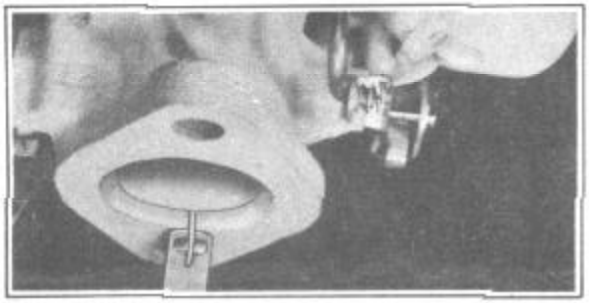

FIGURE 46

22. Adjust anti-percolator, Figure 46. Crack throttle valve .020" by placing gauge between valve and bore of carburetor (side opposite port). Bend anti-percolator rocker arm until there is a clearance of .005" to .015" between rocker arm and pump arm. (See Figure 9.)

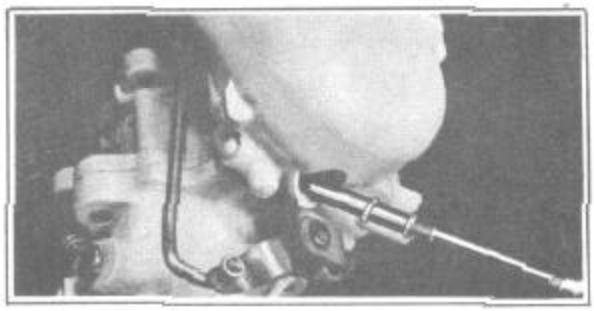

FIGURE 47

23. Install nozzle, nozzle retainer plug and nozzle passage plug and gasket assembly, Figure 47.

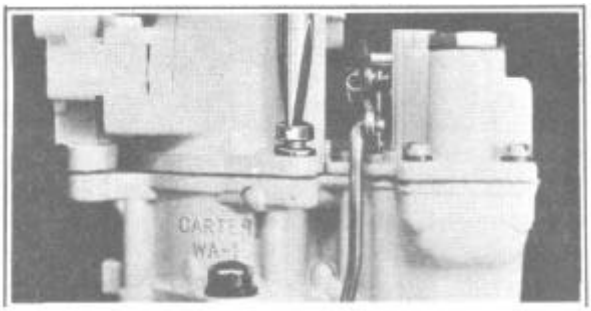

FIGURE 48

24. Install air horn and piston housing assembly, Figure 48. Install screws and lock-washers. Tighten screws evenly.

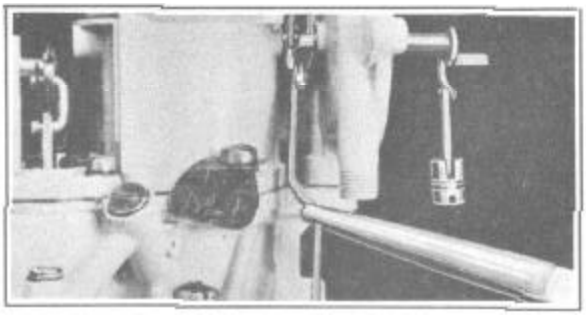

FIGURE 49

25. With choke lever, screw and link assembly in place, install choke shaft and piston assembly, Figure 49. Check for loose lever on shaft.

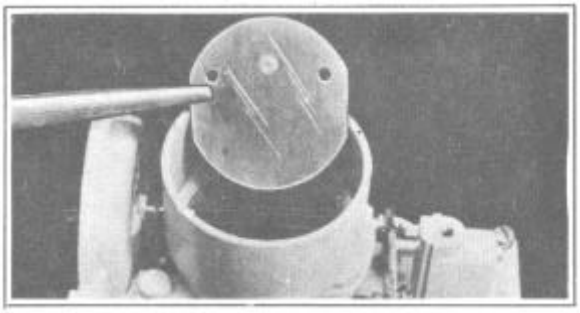

FIGURE 50

26. Install choke valve, Figure 50. Center choke valve by tapping lightly. Hold in place with finger before tightening screws.


FIGURE 51

27. Install piston housing and thermostatic coil assembly, Figure 51. Install coil housing assembly with indicator marks at bottom and rotate counter clockwise to center graduation.

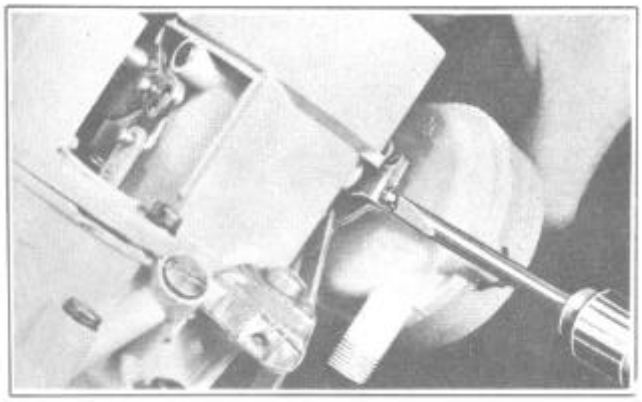

FIGURE 52

28. Hold choke valve wide open, then tighten choke lever screw as shown in Figure 52. Be sure that linkage does not bind in any position. Fast idle, unloader and lockout adjustments should be made as specified under "Carburetor Adjustments.

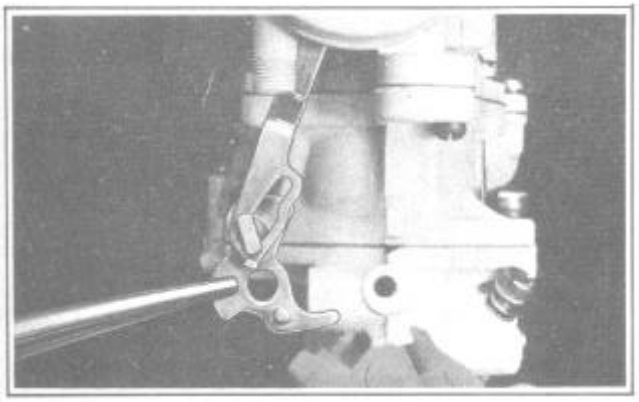

FIGURE 53

29. Install fast idle cam and pin assembly, Figure 53.

## WDO CARBURETOR OVERHAUL

**DISASSEMBLY:**

1. Remove throttle shaft arm and screw assembly and fast idle connector link, Figure 54.
2. Remove air horn attaching screws and remove air horn with all parts attached.

**NOTE: The drilled screw inside air horn beneath the choke valve must be removed. (See J, Figure 3). Pump discharge needle (K, Figure 3) is located in this hole.**

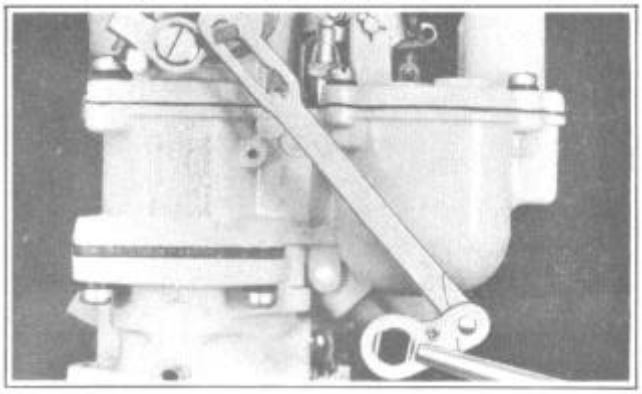

FIGURE 54

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

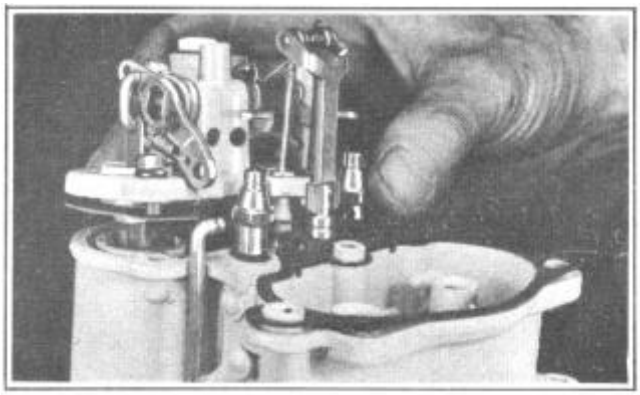

FIGURE 55

Figure 55.

4. Remove metering rods and vacuum piston assembly intact. Carefully remove metering rod discs. Lift out vacuum piston spring.

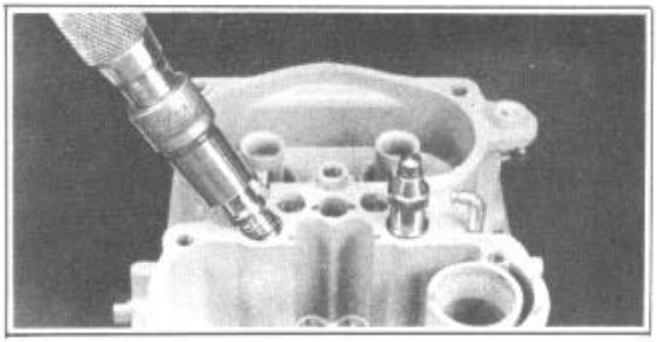

FIGURE 56

5. Remove anti-percolator valve assembly's, Figure 56.

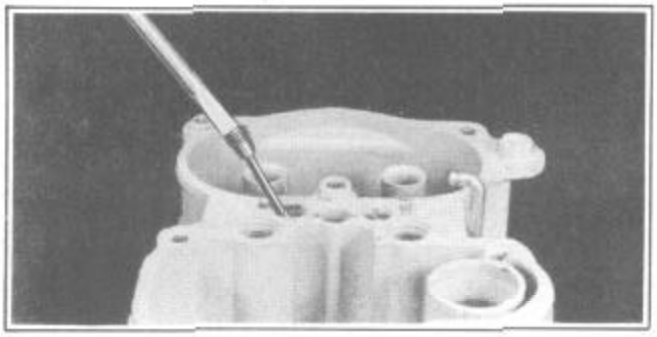

FIGURE 57

6. Remove both by-pass bleeder plugs and low speed jets, Figure 57.

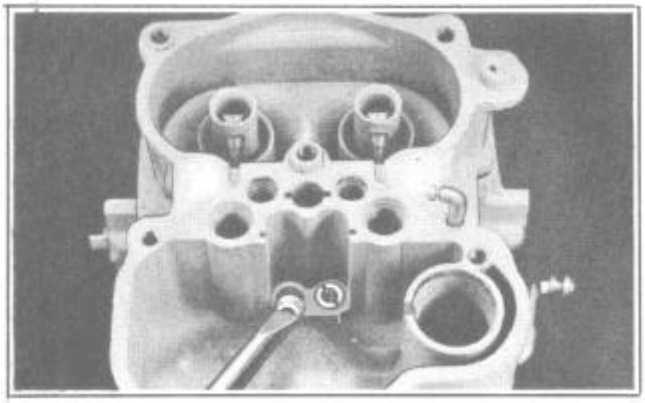

FIGURE 58

7. Remove both metering rod jet assemblies and fibre gaskets, Figure 58.

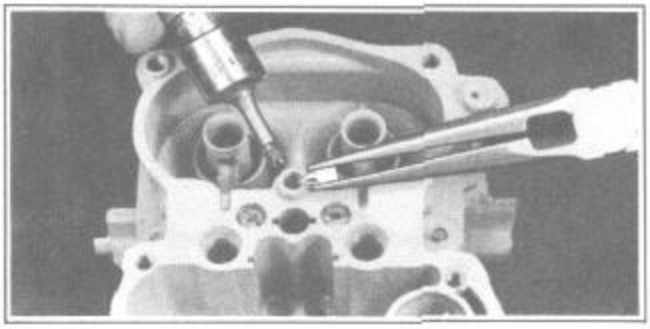

FIGURE 59

8. Remove pump discharge valve retainer plug and check valve, Figure 59.

9. Remove pump strainer, pump check ball retainer ring and check ball, Figure 60.

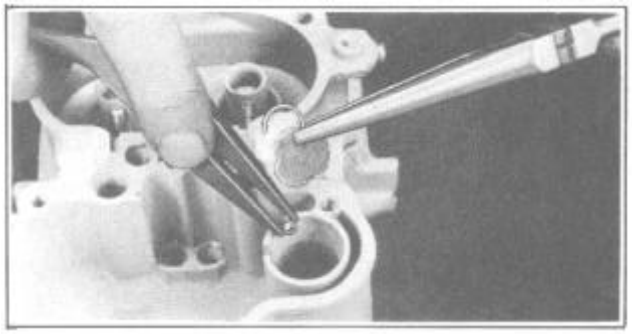

FIGURE 60

10. Remove both nozzle passage plugs, retainer plugs, nozzles and gaskets from body below float bowl.

11. Remove body flange assembly from body, also flange and idle passage sealing gaskets.

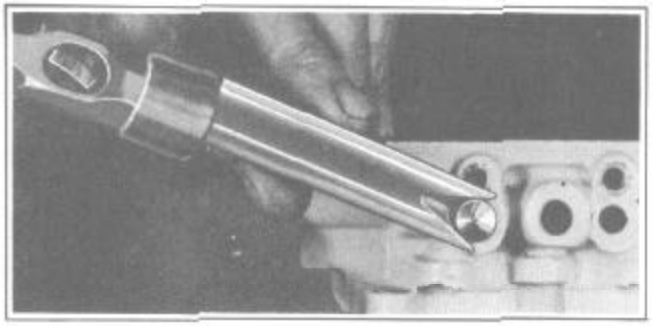

FIGURE 61

12. Remove both idle adjusting screws from flange assembly and idle port rivet plugs, Figure 61.

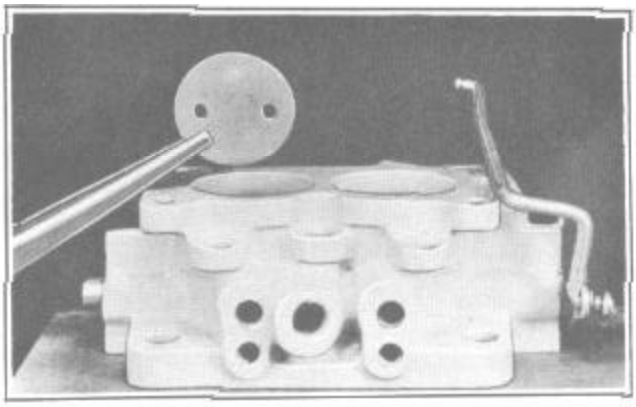

FIGURE 62

13. Remove throttle valve screws and throttle valves, Figure 62.

14. Remove throttle shaft retaining ring, throttle shaft and lever assembly.

15. Remove all parts from bowl cover.

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

17. Wash all parts (except cork pieces) with a good commercial carburetor cleaning compound. Clean throttle bores and blow out all passages with compressed air and scrape carbon from flange.

**NOTE: All relief passages to outside must be clean**.

## CARBURETOR REPAIR NOTES

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

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

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

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

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

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

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

4. Clean carbon deposits from carburetor throat.

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

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

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

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

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

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

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

**ASSEMBLY:**

**NOTE: Use all new gaskets when reassembling carburetor.**

1. Install bowl cover strainer gauze strainer nut , and

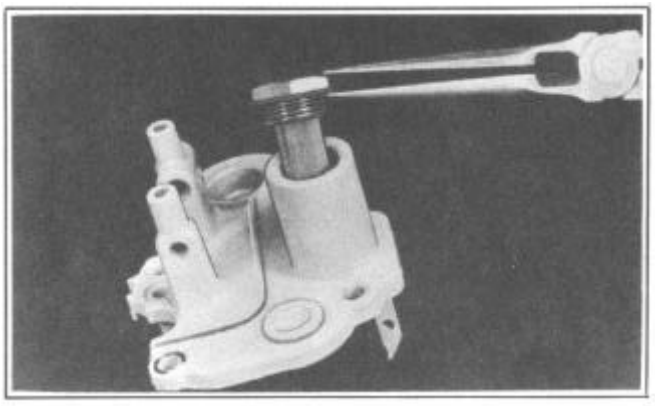



FIGURE 63

gasket assembly, Figure 63.

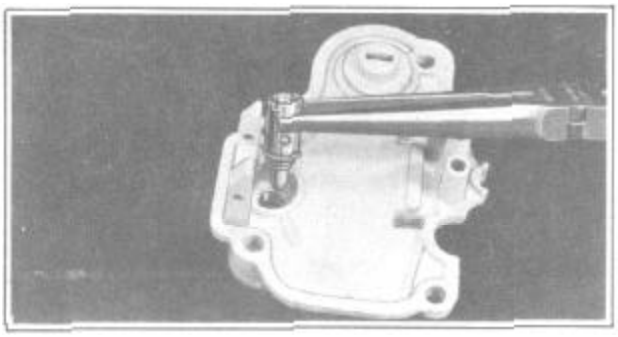

FIGURE 64

2. Install needle seat and gasket assembly, Figure 64.

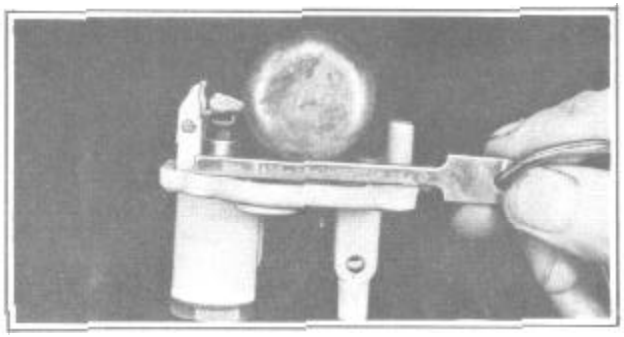

FIGURE 65

3. Install needle float pin and float and lever assembly. Set float level to 3/16" for 6 cylinder, using gauge J-818-3; and 13/64" for 8 cylinder, using gauge J-818-4, Figure 65. Gauge both ends of float from machined surface of casting.

**NOTE: Make adjustments by bending float lip, NOT FLOAT.**

4. Install throttle shaft and lever assembly. Back out throttle lever adjusting screw. Place retaining ring firmly on shaft with prongs out. Remove end play by pressing ring on shaft as far as possible.

5. Install throttle valves from lower side of flange casting. Use new screws. Trade mark ("C" in circle) on valves should be toward manifold and on idle port side of bores. Hold valves with fingers and tap lightly with a screw driver on high side of valves. DO NOT release this grip until all four screws are tightened.

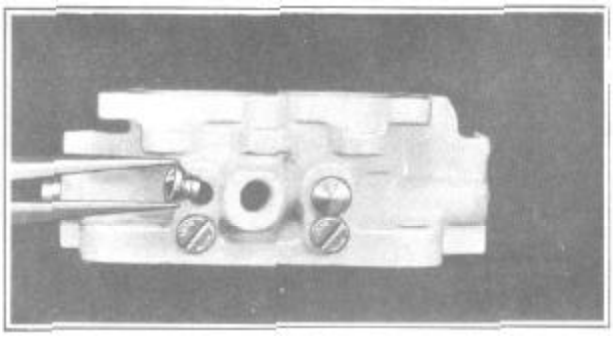

FIGURE 66

6. Install idle adjusting screws and NEW idle port plugs, Figure 66.

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

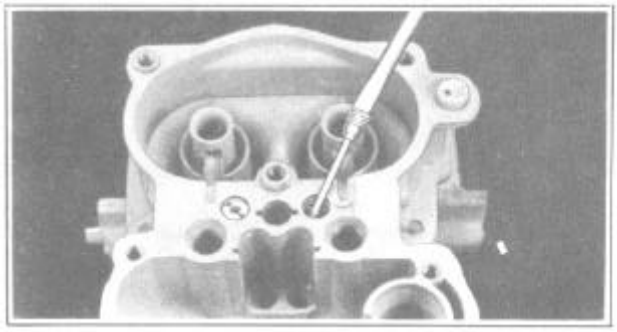

FIGURE 67

8. Install low speed jet assemblies and low speed jet bleeder plugs into bowl in casting, Figure 67. Work jets well into casting to insure good seat.

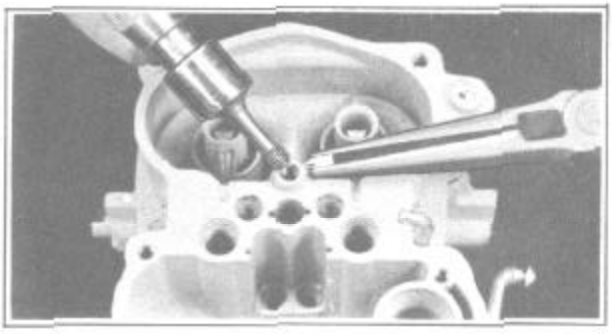

FIGURE 68

9. Install pump check needle, Figure 68.

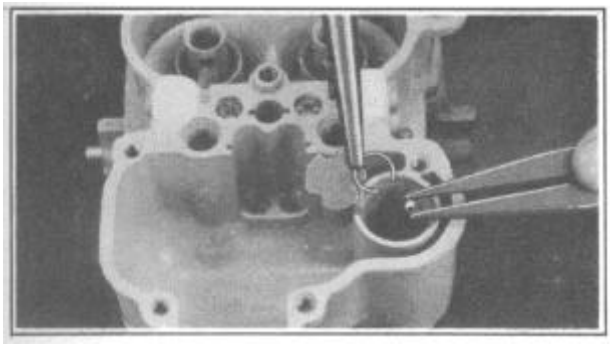

FIGURE 69

10. Install intake check ball, pump check ball retainer ring, and pump strainer, Figure 69.

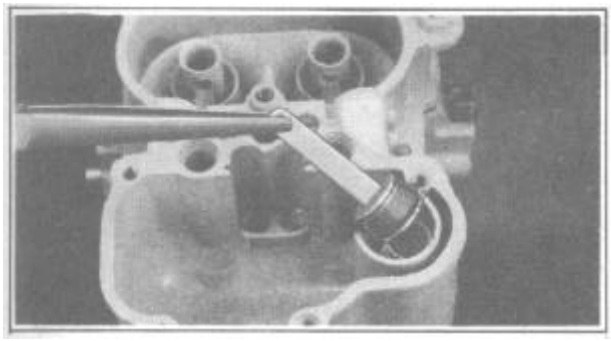

FIGURE 70

11. Install pump spring, pump plunger, and rod assembly, Figure 70.

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

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

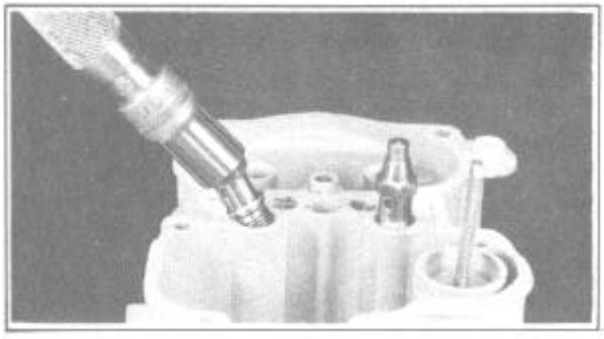

FIGURE 71

13. Install anti-percolator valves, Figure 71.

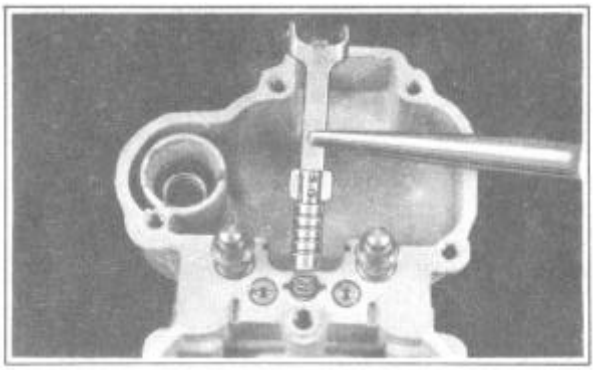

FIGURE 72

14. Install vacuum piston spring and vacuum piston assembly. It is advisable to use a NEW vacuum piston spring each time the unit is serviced, Figure 72.

**NOTE: If piston is loose on shaft, replace piston and**

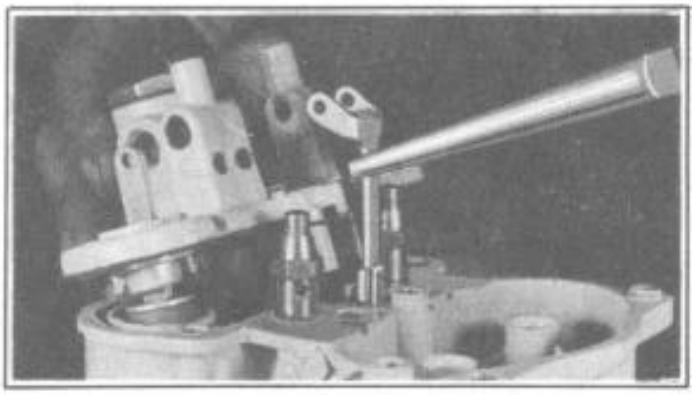

FIGURE 73

15. Raise vacuum piston and link assembly and install bowl cover with parts attached, Figure 73. **NOTE: Use new gasket and tighten screws evenly.**

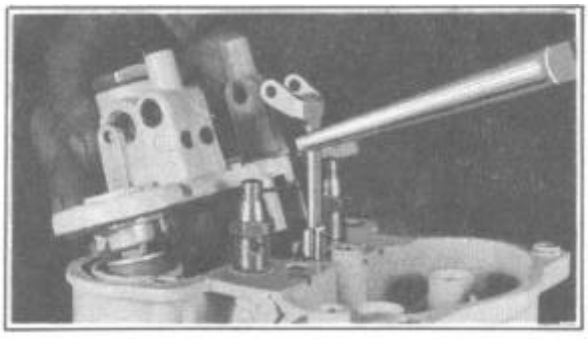

FIGURE 74

16. Install anti-percolator arm and screw assembly, pump operating lever, counter-shaft assembly and pump arm and collar assembly, Figure 74.

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

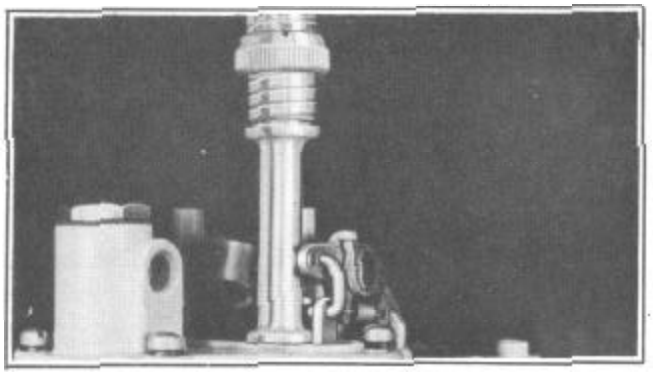

FIGURE 75

17. Install throttle connector rod, and gauge pump stroke, Figure 75. Set stroke 18/64" for 6 cylinder engines and 14/64" for 8 cylinder engines.

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

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

19. Adjust metering rods and anti-percolator valves as outlined under "Carburetor Adjustment," pages 6 and 7.

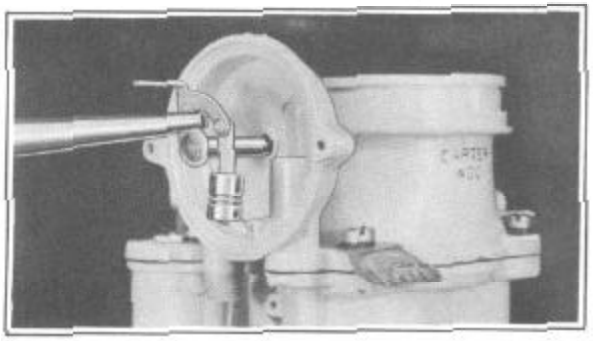

FIGURE 76

20. Install air horn, and piston housing on body. Then install choke piston lever, link, and shaft assembly, Figure 76. (Use new air horn gasket).

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

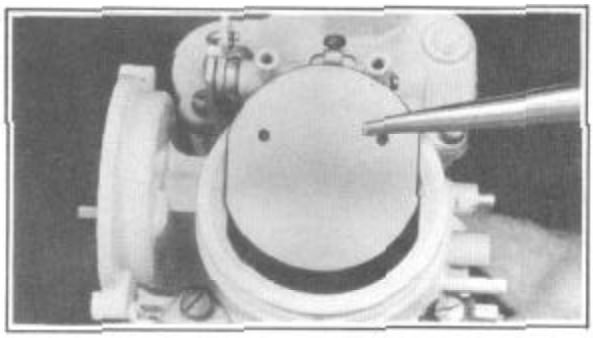

FIGURE 77

21. Install choke valve, Figure 77, using new screws. Center valve before tightening screws. Valve must fall open of its own weight after installation.


22. Install thermostatic coil and housing assemblies, Figure 78. Coil housing should be set one mark lean from index for 6 cylinder, and on index for 8 cylinder.

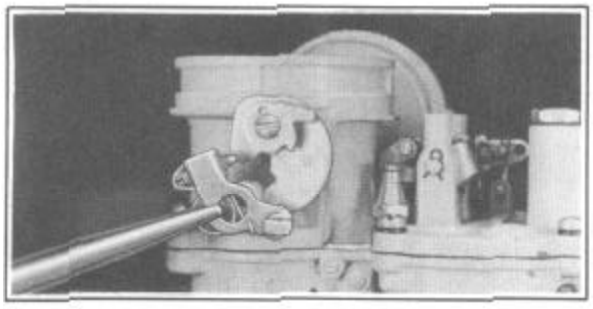

FIGURE 79

23. Install fast idle cam, washer, and choke trip lever on choke shaft. Then install fast idle arm, pin and screw assembly and fast idle arm spring, Figure 79.

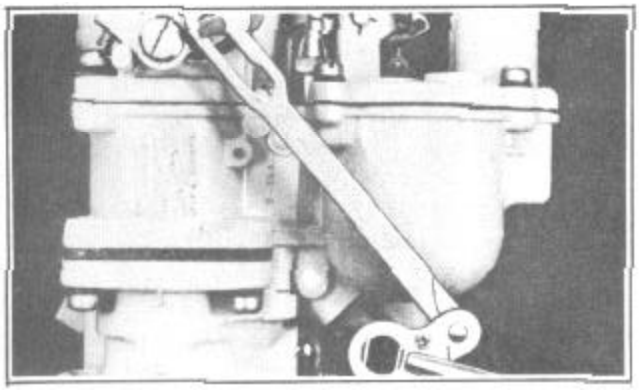



FIGURE 80

24. Install fast idle connector link, throttle shaft arm and pin assembly, washer and spring, Figure 80.

25. Adjust fast idle, choke unloader, and lock-out as outlined under "Carburetor Adjustment".

**CARBURETOR REMOVAL:**

1. Remove air cleaner. Loosen clamp at air horn and on 8 cylinder engines, loosen brace opposite side.

2. Disconnect throttle linkage from carburetor.

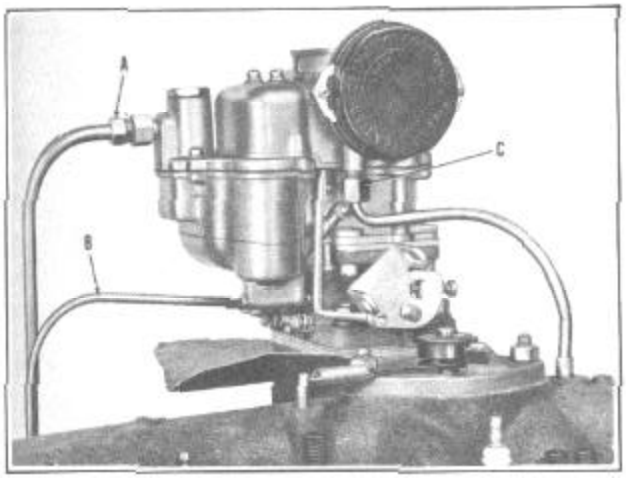


FIGURE 81

3. Disconnect gas line (A), Figure 81, from carburetor to fuel pump.

4. Disconnect vacuum line from carburetor to distributor (B).

5. Disconnect heat riser line (C) from exhaust manifold to carburetor.

6. Remove nuts and lock-washers from the carburetor mounting studs and remove carburetor assembly

.

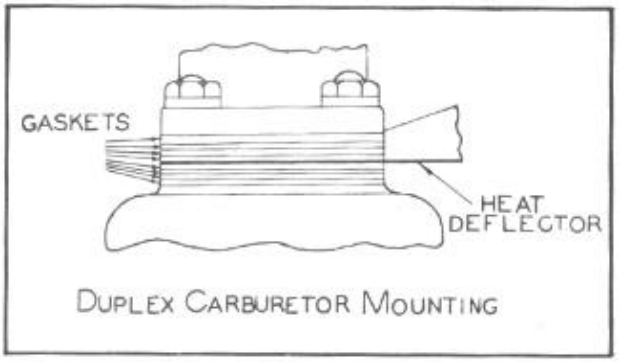


FIGURE 82

**CARBURETOR INSTALLATION:**

**NOTE: Place four gaskets on each side of heat deflector as shown in Figure 82**

1. Install carburetor and install nuts and lock-washers on the carburetor mounting studs.

2. Connect vacuum line from distributor to carburetor.

3. Connect gas line from fuel pump to carburetor.

4. Connect heat riser line from exhaust manifold to carburetor.

5. Connect throttle linkage to carburetor; install clamp.

6. Adjust and test carburetor for maximum performance.

7. Install air cleaner.

## AIR CLEANER, DRY
(Oil Wetted Type)

The oil wetted type of air cleaner is used as standard equipment on all models. In this type cleaner the wire gauze is oil soaked. As the air passes through it, foreign particles are removed, permitting only clean air to enter the carburetor.

The air cleaner section should be cleaned at least every 2,000 miles, oftener if local conditions warrant.

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

## OIL BATH AIR CLEANER

The oil bath air cleaner is available as an option. In this unit, dirt is precipitated from the air into the oil as the incoming air strikes the oil in the sump.

The oil bath type air cleaner should be serviced at 2,000 mile intervals, or more frequently during severe dust conditions, as follows:

1. Unscrew and remove wing bolt at top of cleaner.

2. Lift out filter element; clean in gasoline and drain.

3. Remove old oil, wash out base, and refill to level indicated with 50 S.A.E. oil for temperatures above 32° F and 20 S.A.E. for lower temperatures.

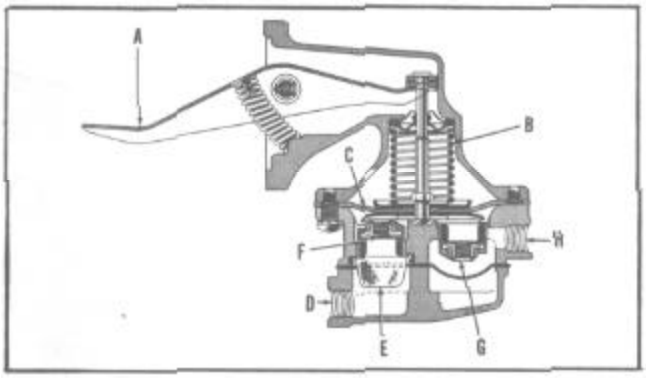




FIGURE 83

## FUEL PUMP

Carter mechanical fuel pump M-729SZ. Figure 83 is used as standard on all 500 series Hudson's. A combination fuel and vacuum pump, AC Type AJ, Figure 84 is available as an option.

Operation of the fuel pumps is similar. The pump cam lever (A) fits under an eccentric on the camshaft. Rotation of the camshaft forces the cam lever down against the diaphragm spring (B) pressure, raising the diaphragm (C). Fuel is drawn into the fuel chamber through the inlet port (D), screen (E), and inlet valve (F). When the low side of the eccentric is against the cam lever, the diaphragm spring forces the diaphragm down, expelling fuel through the outlet valve (G) and outlet port (H) to the carburetor bowl.

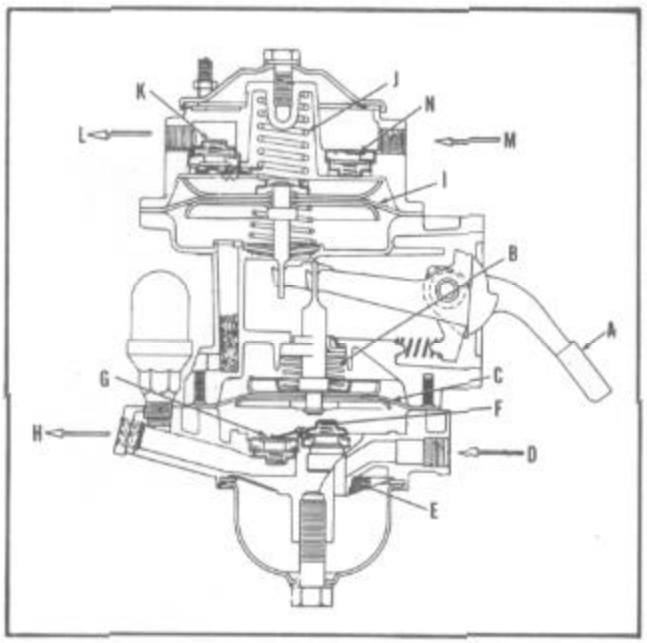


FIGURE 84

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

The vacuum section of the combination fuel and vacuum pump acts as a vacuum booster for the windshield wiper. The same eccentric and cam lever that operates the fuel pump operates the vacuum pump. The cam lever forces the diaphragm (I) up against the

diaphragm (I) up against the diaphragm spring (J), expelling air through the outlet valve (K) and port (L) into the manifold.

With the cam lever on the low side of the eccentric, spring pressure forces the diaphragm down, drawing air from the windshield wiper through the inlet port (M) and valve (N). When the manifold vacuum increases, the diaphragm is drawn up against the spring and ceases to operate. The diaphragm operates only when manifold vacuum is insufficient for wiper operation.

**FUEL PUMP TEST:**

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

2. Replace the screen if damaged.

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

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

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

5. Start the engine and run at 1800 RPM. Pressure should be 3 to 4 pounds with AC combination fuel and vacuum pump and 4 to 5 pounds with Carter M-729SZ. Stop engine and watch pressure gauge. Pressure should not fall perceptibly.

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

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

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

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

**VACUUM BOOSTER TEST:**

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

**REMOVAL (8 Cylinder):**

1. Remove right front wheel.

2. Remove rear portion of fender dust shield.

3. Disconnect fuel lines from pump.

4. On combination pump, disconnect vacuum lines.

5. Remove cap screws, pump, and gasket pack.

**REMOVAL (6 Cylinder):**

1. Disconnect fuel lines from pump.

2. On combination pump disconnect vacuum lines.

3. Remove cap screws, pump, and gasket pack.

**INSTALLATION:**

Install in reverse of removal. Make sure flange gasket (A), Figure 85, mounting stud insulator bushings (C) and washers (E) are placed as indicated in exploded view.

## FUEL PUMP OVERHAUL

**NOTE : New diaphragms should be dipped in kerosene to soften them before assembly.**

**DISASSEMBLY (CARTER):**

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

2. Remove cam lever return spring (F), Figure 85.

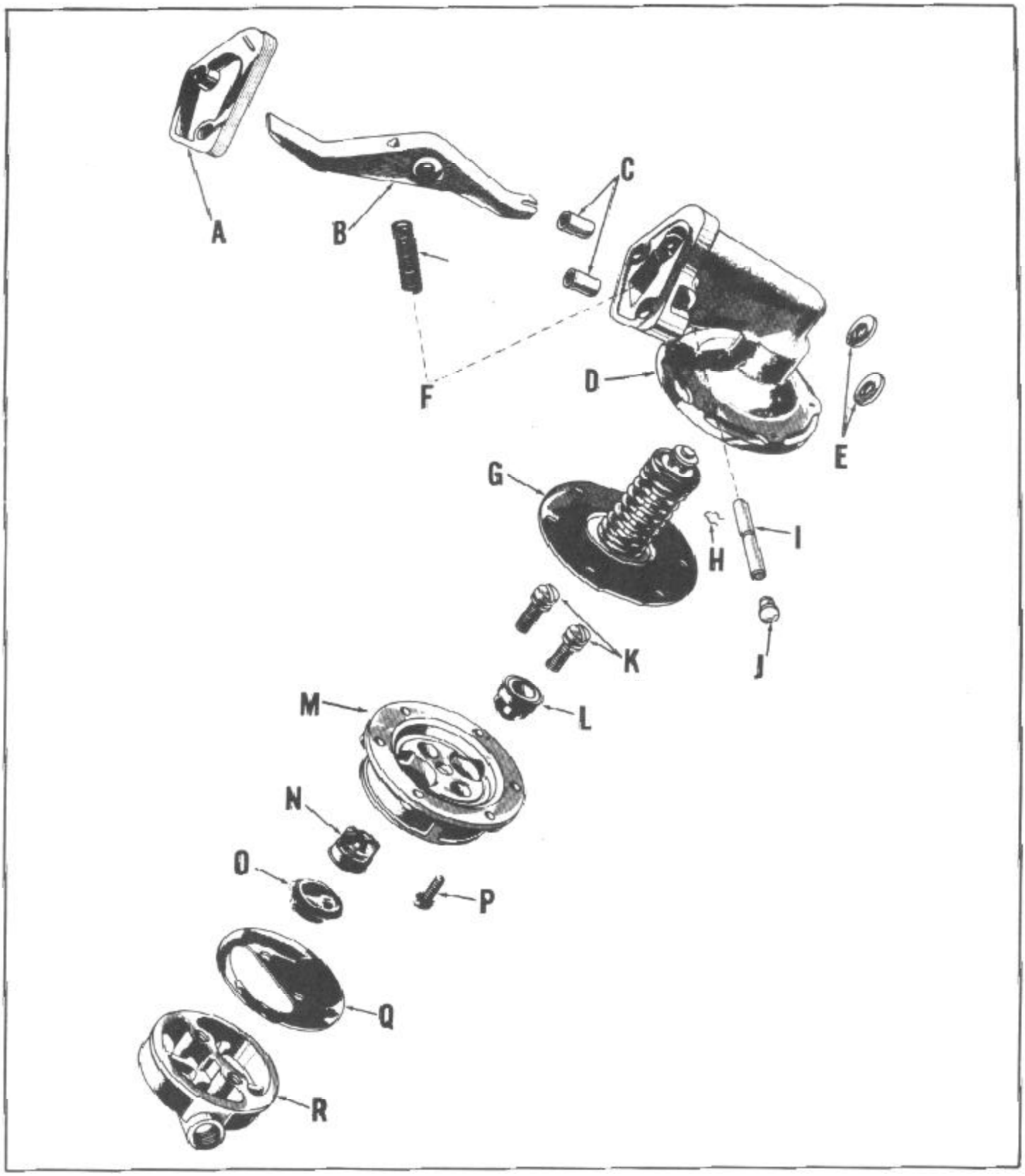


FIGURE 85

3. Remove cam lever pin rivet plug (J) retainer (H), and pin (I)

4. Remove cam lever (B).

5. Remove six valve housing screws (P) and valve housing (M).

6. Remove two valve housing cover attaching screws (K), valve housing cover (R), outlet air dome diaphragm (Q) and strainer (O) .

7. Remove diaphragm assembly (G).

8. Do not remove valve cage assemblies (L and N) unless they are to be replaced.

9. Clean all parts in gasoline. (Do not use strong solvent or cleaner on valve housing unless the valve cage assemblies have been removed.)

10. Inspect parts for wear and select repair kit. (One rebuilding kit is a gasket and diaphragm kit; the other contains all parts which are subject to wear.)

**ASSEMBLY (CARTER):**

1. Install new valve cage assemblies (L and N) if they have been removed.

2. Assemble strainer (0), outlet air dome diaphragm (Q), valve housing cover (R) and attach to valve housing.

3. Install diaphragm assembly (G) in pump body with flat spaces on sides toward ports.

4. Align mark on pump body with mark on valve housing (M) and install housing, but DO NOT tighten screws.

5. Install cam lever, pin, and pin retainer.

6. Install new rivet plug (J).

7. Flex diaphragm and hold in maximum down position and tighten valve housing attaching screws.

8. Install cam lever return spring.

**DISASSEMBLY (AC):**

**CAUTION: Before taking a combination pump apart, read assembly instructions paragraphs No. 2, 13 and 15 for special equipment needed. These are AC tools No. Pt-8, and two 10-32 x 1-1/2" screws. If you do not have these tools, or equivalent, do not attempt to overhaul the pump.**

1. Mark edges of fuel cover (25), Figure 86, and body diaphragm flanges with a file. The parts may then be reassembled in the same relative position.

2. Remove fuel cover screws (23) and lock-washers. Separate cover from body by jarring cover loose with a screwdriver handle. Remove diaphragm spring (28) and retainer (29). Remove valve cage retainer screw and remove retainer and cage assemblies (27) and gaskets (26).

3. Mark edges of vacuum cover (6) and body diaphragm flanges. The parts may then be reassembled in the same relative position.

4. Remove two screws from opposite sides of the vacuum cover, and substitute for them two No. 10-32 x 1-1/2 inch fillister head screws. Turn the two long screws all the way down, and then remove the balance of the regular cover screws. Alternately back off the two long screws, a few turns at a time, until the force of the heavy vacuum diaphragm spring is no longer effective. Remove the two long screws, the cover assembly, diaphragm spring (1), and spring retainer (12).

5. File riveted end of rocker arm pin (33) flush with steel washer, or drill of end with 3/8" drill. Drive out rocker arm pin with a drift punch. Wiggle rocker arm (42) until links unhook from both diaphragms. Then remove rocker arm spring (40), rocker arm, and the link assembly.

6. Remove bushings (38) from rocker arm before removing rocker arm (42), two vacuum links (35 and 37), one fuel link (36), link spacer (41), and link washer (43).

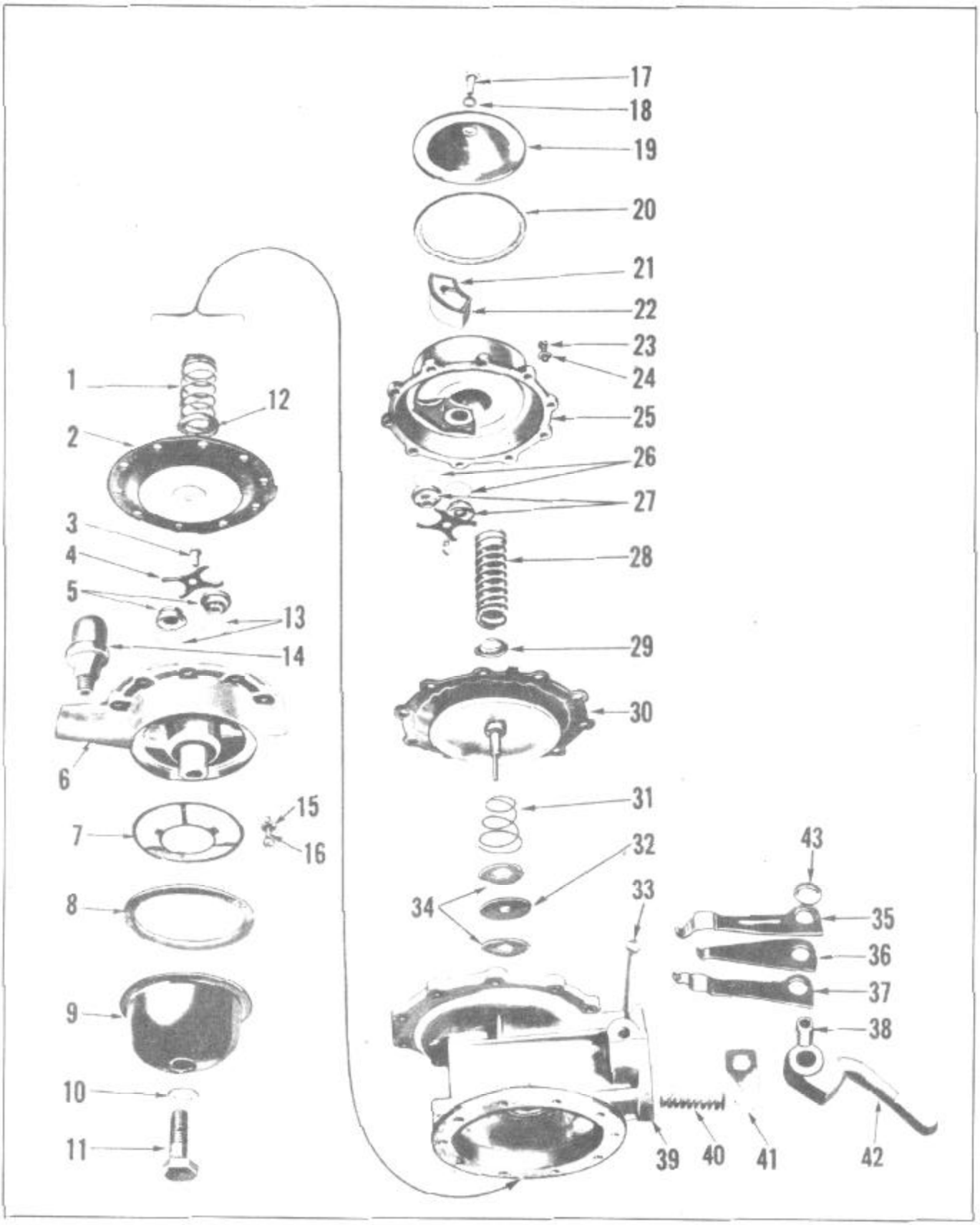
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FIGURE 86

7. Lift vacuum diaphragm (30) out of body, and remove lower oil seal retainer (34), by turning until slot lines up with flat of pull rod. Remove oil seal washer (32), upper oil seal retainer, and oil seal spring (31).

8. Remove fuel diaphragm (2) by pulling straight out. **CAUTION: DO NOT TILT EXCESSIVELY OR STAKED-IN OIL SEAL WILL BE DAMAGED**.

9. Remove valve cage retainer screw (3), and lift out retainer (4), two valve and cage assemblies (5) and two gaskets (13).

10. Remove bowl screw (11) and gasket (10). Then remove bowl (9), bowl gasket (8) and screen (7).

11. Remove cover plate screw (17) with gasket (18). Lift off the cover (19), cover gasket (20), screen retainer, (21), and screen (22).

12. Blow out all passages with compressed air.

**INSPECTION:**

Inspect pump parts as follows:

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

2. Valve and Cage Assemblies - Replace. Extent of wear cannot be determined visually.

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

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

5. Rocker Arm Pin and Washer - Replace bullet type pin with head type pin and washer.

6. Link - Replace because amount of wear cannot be determined visually.

7. Rocker Arm Spring - Replace. Spring may be weak from distortion or corrosion.

8. Diaphragm - Always replace.

9. Gaskets and Oil Seal - Always replace gaskets and oil seal to assure tight seals.

**ASSEMBLY (AC):**

1. Assemble link spacer (41) over fuel link (36). Place one vacuum link (35 and 37) on each side of the fuel link. The hook ends of the vacuum link should come together so that they surround the fuel link. All link hooks should point in the same direction. Place assembly of links and spacer between lobes of rocker arm with one spacer washer (43) on the outer side of each vacuum link. Slide rocker arm bushing (38) through holes in rocker arm, spacer washers, and links.

2. Stand the pump body (39) on the bench, fuel flange down. Set rocker arm spring in position with one end over cone cast into body. Slide rocker arm and link assembly into body. Outer end of all link hooks must point toward vacuum flange. Temporarily retain rocker arm and link assembly with AC tool PT-6 or a long straight pin or punch.

3. Turn the pump body over so the fuel diaphragm flange is up. Set the diaphragm spring (1) on the staked-in oil seal. Push diaphragm pull rod through retainer (12), spring and oil seal. Flat of pull rod must be at right angles to link. Hook diaphragm pull rod to fuel link. FUEL LINK IS THE SHORT, CENTER LINK DO NOT TILT DIAPHRAGM PULL ROD EXCESSIVELY AS THIS MAY DAMAGE THE OIL SEAL.

4. Drive tool PT-6 out with permanent rocker arm pin (33). Place washer over small end of pin and spread pin end with ball peen hammer or round nose punch.

5. Place valve and cage gaskets (13) in recesses provided in fuel cover (6). Inlet valves must have three-legged spider facing out of cover, and outlet valve must have three-legged spider facing into cover. Secure valve assemblies with retainer (14), and screw (3).

6. Install strainer screen (7), bowl gasket (8), bowl (9), bowl screw gasket (10) and bowl screw (11) in the order named. Install air dome (14) in threaded hole in projection of casting for outlet.

7. Install fuel cover on body, making sure that file marks on cover and body line up. Push on rocker arm until diaphragm is flat across body flange. Install cover screws and lock-washers loosely until screws (16) just engage lock-washers. Pump the rocker arm three or four full strokes and tighten cover screws alternately until secure.

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

9. Place two gaskets (26) and two valve and cage assemblies (27) in cover (25). Inlet valve must have three-legged spider face-out of cover, and outlet valve must have three-legged spider facing into cover. Secure valve and cages with retainer and screw.

10. Turn cover over and set screen (22) in recess over valve hole. Set screen retainer (21) on screen. Place cover gasket (20), cover (19), cover screw gasket (18), and cover screw (17) in position in the order named and tighten cover screw.

11. Assemble oil seal on vacuum diaphragm pull rod in the following sequence: oil seal spring (31), upper retainer (34), oil seal washer (32), and lower retainer. Turn lower retainer 90 degrees to lock in position.

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

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

14. Place spring retainer (29) on riveted end of diaphragm pull rod, and place spring (28) on the retainer. Place vacuum cover and valve assembly over spring and align the file marks.

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

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

17. Combination fuel and vacuum pump cannot be bench tested because of the heavy vacuum spring. The only adequate test for this type pump is with a

vacuum gauge such as the KMO-144 when the pump is mounted on the engine.

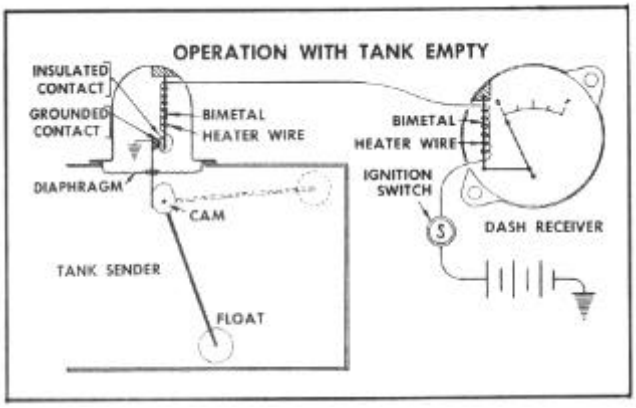


FIGURE 87

## FUEL LEVEL GAUGE

This electrical device consists of a sending unit mounted in the fuel tank and a receiving unit mounted on the instrument panel. Each unit incorporates a bi-metal element over which a heating coil is wound. Refer to Figure 87.

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

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

When the tank contacts are closed, a cur-rent flows through the heating coils of both the tank and the dash units. This causes the bimetal arm in the dash unit to bend, moving the needle and showing a reading on the dash unit. At the same time the heating coil in the tank unit causes its bi-metal arm to bend, opening the contacts and interrupting the current flow. When this occurs the heating action stops and the cooling of the bi-metal arm causes it to flex in the opposite direction and again close

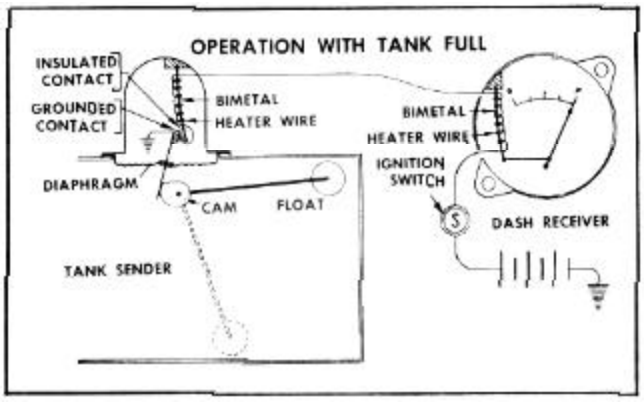


FIGURE 88

the contacts. In operation this cycle takes place very rapidly and a steady reading is obtained on the dash unit.

### GAUGE TROUBLE SHOOTING:

If the fuel level gauge becomes inoperative, it is recommended that an extra tank unit be used for testing. If there is any question about the tank test unit being correct, then hook it up in series with a receiver known to be correct and 6 volts of battery current. Operate the tank unit by hand and see if 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 checking by one person in front of the dash unit.

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

1. Disconnect the lead of the tank unit on the car and connect this lead to the tank test unit and ground same to the car frame. Turn on ignition switch and operate tank test unit float by hand. With the float of the test unit at the bottom position the car dash unit should

register at the bottom mark on the dial as in Figure 87. Move float rod up to top position and car dash unit should move to top mark on the dial, as shown in Figure 88. Allow one minute for dash unit pointer to come to rest.

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

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

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

2. 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.

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

**CAUTION: Do not attempt the repair or calibration of any dash unit or tank unit.**

Install new unit whenever the old one is found inoperative.

**RENEWAL OF DASH UNIT:**

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

**RENEWAL OF TANK UNIT:**

1. Raise car and drain gas tank.
2. Disconnect gas line and remove nuts attaching support straps.
3. Lower tank carefully until tank gauge unit is accessible.
4. Disconnect wire and remove gauge tank unit.

## GASOLINE TANK

**REMOVAL:**

1. Raise car and place stand jacks under frame.
2. Drain the gasoline tank and disconnect the fuel gauge wire and the fuel line.
3. Remove three phillip head screws in rear compartment and remove the sponge rubber retainer.
4. Remove the rubber grommet and overflow drain hose at gas tank filler door.
5. Remove the two nuts and spacers attaching gas tank straps to body cross-member and remove the gas tank.
6. Remove the gas tank gauge unit.
7. Remove rubber shield from gas tank inlet pipe.
8. Remove gas tank outlet pipe.

**INSTALLATION:**

1. Install gas tank gauge unit (use new gasket).
2. Install gas tank outlet.
3. Install rubber shield to gas tank inlet elbow (use new clamps).

5. Install gas tank, use care when entering inlet pipe through floor and fender opening.

6. Install gas tank straps and draw tank up into position.

7. Install grommet and overflow drain hose at gas tank filler door opening.

8. Push sponge rubber against underbody panel and attach 3 retainer plates with phillip screws and speed nuts.

9. Release jacks and lower car.

10. Connect gauge wire and fuel line.

## INTAKE MANIFOLD
**(8 Cylinder)**

**REMOVAL:**

1. Remove air cleaner, loosen clamp at carburetor intake, loosen bracket from air cleaner to cylinder head.

2. Remove the distributor to spark plug wires and bracket from the intake manifold.

3. Remove distributor cap; remove coil wire to cap and fold up spark plug wires to top of cylinder head out of the way.

4. Remove the four nuts and lock-washers from the carburetor riser to the intake manifold.

5. Remove the eight nuts attaching intake manifold to block and remove coil, bracket, and manifold.

6. Remove all traces of old gasket material.

**INSTALLATION**:

Use new manifold gaskets and reverse procedure of removal.

## EXHAUST MANIFOLD
**(8 Cylinder)**

**REMOVAL:**

1. Remove air cleaner, loosen clamp at intake, and loosen air cleaner bracket at opposite side of engine.

2. Disconnect throttle linkage at carburetor.

3. Disconnect gas line from carburetor to fuel pump.

4. Disconnect vacuum line from carburetor to distributor and heater tube from Climatic Control.

5. Remove the four nuts and lock-washers from the carburetor mounting studs and remove carburetor.

6. Remove locks and nuts from exhaust pipe to manifold flange.

7. Remove the ten nuts from the exhaust manifold outlet flanges.

8. Remove four bolts from the carburetor riser, connecting outlet and inlet manifolds.

**NOTE: Use an air hose to blow away dirt particles before removing exhaust manifolds.**

9. Remove weather control drain tube from clip and move to opposite side of engine.

10. Remove distributor cap, and spark plug wire bracket from cylinder head.

11. Remove exhaust manifold.

**NOTE: Clean all old gasket material from manifold outlet ports.**

## MANIFOLD HEAT CONTROL
### (8 Cylinder)

Exhaust and intake manifolds are separate castings bolted to the cylinder block and also to each other as there are interconnecting passages through which the exhaust gases flow to heat the fuel mixture. The amount of exhaust gases directed on to the walls of the inlet manifold and the duration of time during which these gases are so directed is controlled by a heat resistant valve set into the exhaust manifold. This valve is controlled according to the under hood temperature by a thermostatic coil spring.

## HEAT CONTROL VALVE
### (8 Cylinder)

**REMOVAL:**

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

1. Disconnect spring from lever.
2. Remove cotter key from shaft and remove washer.
3. Remove heat control spring.
4. Remove the two nuts holding cover to manifold, and remove cover.
5. Remove springs from lower pin and shaft.
6. Use a drift to remove the tapered pin. This will allow removal of the shaft butterfly.

**INSTALLATION:**

Reverse procedure of removal.

## EXHAUST AND INTAKE MANIFOLDS
### (6 Cylinder)

Remove both manifolds as a single unit as follows:

**REMOVAL:**

1. Remove air cleaner by loosening the attaching screw at the carburetor air horn.
2. Remove the throttle connection from carburetor.
3. Remove the fuel line and vacuum line from carburetor.
4. Remove heat riser tube from the carburetor.
5. Remove the fourteen nuts and retainers attaching manifolds to block and remove manifolds with carburetor attached.
6. Clean off all traces of old gasket material.

**INSTALLATION:**

Reverse the procedure of removal.

## HEAT CONTROL VALVE
### (6 Cylinder)

**REMOVAL:**

For removal, follow same procedure as exhaust and intake manifold removal and, in addition, perform the following operations:

1. Remove exhaust manifold elbow from exhaust manifold.
2. Remove spring, retainer, cotter pin, and heat control spring.
3. Remove heat riser shaft. Use a hack saw blade to cut shaft at each side of butterfly. This will allow removal of shaft and butterfly as an assembly.

**NOTE: Counterweight can be salvaged by driving out retaining pin (weight to shaft).**

**INSTALLATION:**

1. Assemble new shaft with counterweight and butterfly.

**NOTE: The butterfly should be centrally spaced on the shaft to eliminate any binding. After determining that fly is in the open position, securely weld the butterfly to shaft.**

2. Install heat control spring, retainer, anti-rattle spring and retainer and cotter pin.
3. Install exhaust manifold elbow to manifold.

4. Install both manifolds and carburetor on engine.

## FRONT EXHAUST PIPE
### (8 Cylinder)

**REMOVAL:**

1. Raise car and place stand jacks under the front and rear.
2. Spread the locks and remove the two nuts attaching exhaust pipe flange to exhaust manifold.
3. Remove exhaust pipe bracket at clutch bell housing.
4. Remove oil pump heat shield attached to oil pan to gain more clearance for removal of pipe.
5. Remove oil check light wire and bakelite plug from oil check valve.
6. Remove gas line from carburetor to fuel pump.
7. Remove vacuum line from carburetor to distributor.
8. Remove distributor cap and wire to coil. Remove distributor.
9. Remove exhaust pipe clamp at junction of front and rear exhaust pipes and disconnect from rear pipe.
10. Remove the front exhaust pipe by pulling forward and up over the radiator.

**INSTALLATION:**

1. Install the new front exhaust pipe and install clamp at junction with rear pipe. (Do not tighten bolts at this time.)
2. Install the two bolts, nuts, and locks, through exhaust pipe flange to exhaust man if old. (Do not tighten bolts at this time.)
3. Install exhaust pipe bracket at clutch bell housing.
4. Now tighten bolts at connection to exhaust manifold and in clamp connecting front and rear pipes.
5. Install the oil pump heat shield and insert the two cap screws in oil pan.
6. Install oil check valve bakelite plug and connect oil check light wire.
7. Install the distributor, distributor cap, and coil wires.
8. Connect vacuum line from carburetor to distributor and check timing.
9. Connect gas line from carburetor to fuel pump.
10. Remove stand jacks and lower car.

## FRONT EXHAUST PIPE
### (6 Cylinder)

**REMOVAL**:

1. Raise car and place stand jacks under front and rear.
2. Remove the two bolts attaching exhaust pipe flange to exhaust manifold.
3. Remove bolt from bracket attaching exhaust pipe to engine support plate.
4. Remove bolt and clamp at junction of front and rear exhaust pipes.
5. Disconnect exhaust pipe and remove from under car.

**INSTALLATION:**

1. Install new front exhaust pipe from under car and connect at rear exhaust pipe, but do not tighten clamp.
2. Install clamp at engine support plate but do not tighten.
3. Connect exhaust pipe flange to exhaust manifold and tighten securely.
4. Tighten clamp at junction of front and rear exhaust pipes, also at engine support plate.

5. Remove stand jacks and lower car.

## REAR EXHAUST PIPE
**(6 and 8 Cylinder)**

**REMOVAL**:

1. Remove bolt and clamp at junction of front and rear exhaust pipes.

2. Remove the bolt and clamp at No. 6 frame cross-member.

3. Remove bolt and clamp attaching rear exhaust pipe to muffler assembly and remove rear exhaust pipe.

**INSTALLATION:**

Reverse procedure of removal.

## MUFFLER ASSEMBLY
**(6 and 8 Cylinder)**

**REMOVAL:**

1. Raise car.

2. Remove bolt from exhaust muffler rear bracket.

3, Remove two bolts from exhaust muffler bracket to frame and remove bracket.

4. Remove muffler from rear exhaust pipe.

**INSTALLATION:**

Reverse procedure of removal.

## REFERENCE

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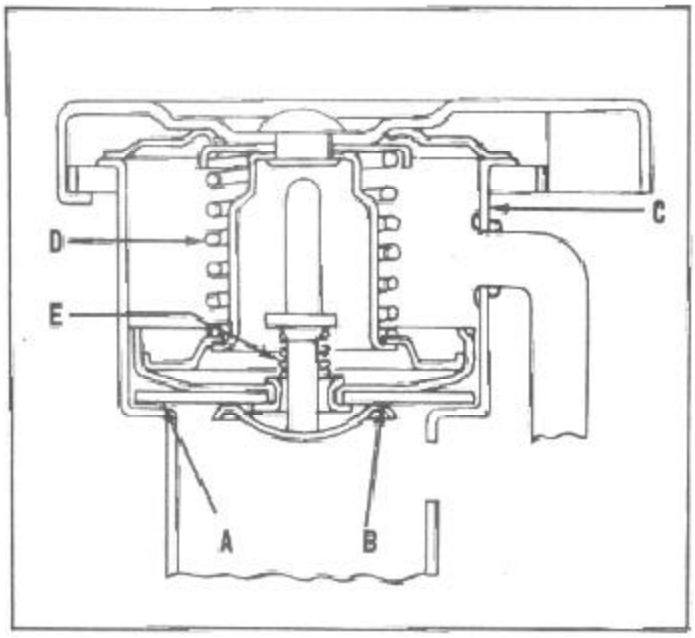
# SECTION 5

# COOLING SYSTEM

The cooling system of the 500 series Hudson's is essentially the same as 480-490 series with the exception of pressure type radiator filler cap which has been made standard for models 501, 502, 503 and 504. This pressure cap is also available as a service accessory for model 500. Both AC No. 850005 and Stant No. AAX-0417 pressure caps are used.




The pressure type filler cap provides ad-vantages of a sealed cooling system and protection against loss of coolant and anti-freeze solution through evaporation. The increased pressure raises the boiling point of water from a normal of 212° F at sea level to approximately 230° F. The pressure valve (A), Figure 1, seals the cooling system until the pressure exceeds 6-1/4 pounds per square inch. To prevent formation of a vacuum in the system after loss at coolant at pressures over the limit of the cap and subsequent cooling, a vacuum breaker valve is incorporated in the cap. The vacuum breaker valve (B), Figure 1, opens when pressure in the system drops from 0 to 1/4 pounds per square inch below atmospheric pressure. A defective pressure cap may allow excessive pressure to build up and cause serious damage to the radiator and hose connections. Check both the pressure and vacuum relief valves and springs (D and E) frequently to see that they work freely with-out sticking. Replace defective caps.

**CAUTION: Do not attempt to remove pressure cap when temperature of coolant is high. Always remove cap slowly.**

## ANTI-FREEZE CHART

| PROTECTION FOR TEMPERATURE | DENATURED ETHYL ALCOHOL | | | ETHYLENE GYLCOL (PRESTON OR EQUIV.) | | | METHY ALCOHOL (METHANOL) | | |
|---|---|---|---|---|---|---|---|---|---|
| DEGREES FAHRENHEIT | PERCENT BY VOL. | QUARTS REQD. | | PERCENT BY VOL. | QUARTS REQD. | | PER-CENT BY VOL. | QUARTS REQD. | |
| | | 6 cyl. | 8 cyl. | | 6 cyl. | 8 cyl. | | 6 cyl. | 8 cyl. |
| +20 | 18.0 | 3.50 | 3.00 | 16.0 | 3.25 | 2.75 | 12.5 | 2.50 | 2.25 |
| +10 | 27.5 | 5.25 | 4.75 | 25.0 | 4.50 | 4.25 | 20.0 | 4.00 | 2.50 |
| 0 | 35.0 | 6.50 | 6.00 | 33.0 | 6.25 | 5.75 | 26.5 | 5.00 | 4.50 |
| -10 | 42.5 | 8.00 | 7.25 | 39.0 | 7.25 | 6.75 | 32.0 | 6.00 | 5.50 |
| -20 | 49.0 | 9.25 | 8.50 | 44.0 | 8.25 | 7.50 | 37.0 | 7.00 | 6.25 |
| -30 | 55.5 | 10.25 | 9.50 | 48.0 | 9.00 | 8.25 | 41.5 | 7.75 | 7.00 |

## CAPACITY OF COOLING SYSTEM

| | 500 | 501-502 | 503-504 |
|---|---|---|---|
| With Weather Control | 19 QTS. | 20 QTS. | 18 QTS. |
| Without Weather Control | 18 QTS. | 19 QTS. | 17 QTS. |

# REFERENCE

| Source of Information | Date | Subject |
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# SECTION 6
# ELECTRICAL SYSTEM

CONTENTS



## SPECIFICATIONS

| | |
|---|---|
| **GENERATOR** | |
| Make | Auto-Lite |
| Model | GDZ-6001B |
| Type | Shunt |
| Volts | 6 |
| Control | Vibrating Type 3-unit regulator |

| | |
|---|---|
| Controlled Output | 35 amperes |
| Poles | 2 |
| Brushes | 2 |
| Brush Spring Tension | 35-53 ounces (with new brushes) |
| Bearings: | |
| Commutator End | Bronze |
| Drive End | Ball |
| Lubrication: | |
| At Lube periods | 3 to 5 drops engine oil at each oiler. |
| At overhaul | Pack ball bearing 1/2 full of high temperature, non-fiber grease.Soak bronze bearing in engine oil and pack grease pocket with high temperature grease. |
| Armature Shaft End Play | 003" to .010" |
| Ground Polarity | Positive |
| Field Coil Draw | 1.6 to 1.8 amperes at 6.0 volts |
| Motorizing Draw | 4.2 to 4.6 amperes at 6.0 volts .. 6.4 volts, 0 amps. at 970 Max. RPM. |
| Output Test: | |
| Cold | 8.0 volts, 35 amps. at 2000 Max. RPM. |
| Hot | 6.4 volts, 0 amps. at 1050 Max. RPM.<br>8.0 volts, 35 amps. at 2350 Max. RPM. |

| **STARTER MOTOR** | **500** | **501-2-3-4** |
|---|---|---|
| Make | Auto-Lite | Auto -Lite |
| Model | MZ-4159 | MCL-6006 |
| Volts | 6 | 6 |
| Poles | 4 | 4 |
| Brushes | 4 | 4 |
| Brush-Spring Tension | 42-53 oz. | 42-53 oz. |
| Armature Shaft End Play | .005" to 1/16" | .005" to 1/16" |
| Cranking Voltage | 5 volts | 5 volts |
| Cranking Amperage (Approx.) | 160 amps. at 150 RPM | 160 amps. at 150 RPM. |
| Free Running Test: | | |
| Volts | 5.5 | 5.5 |
| Amperes | 70 | 58 |
| RPM | 4300 | 5600 |
| Stall Test: | | |
| Volts | 4.0 | 4.0 |
| Amperes | 540 | 880 |
| Min. Ft. Lbs | 12.3 | 25 |
| Lubrication | None required | 3 to 5 drops engine oil in each oiler |

| **VOLTAGE REGULATOR** | |
|---|---|
| Make | Auto-Lite |
| Type | VRP-6002-A |
| Volts | 6 |
| Ground Polarity | Positive |
| Resistors: | |
| R1 | 34.5 to 42 ohms (Marked 38) |
| R2 | 6.5 to 8.0 ohms (Marked 7) |
| Cutout Relay: | |
| Armature Air Gap | 031" to .034" |
| Contact Point Gap | 015" Minimum |
| Contacts Close | 6.4 to 7.0 volts |
| Contacts Open: | |
| Volts | 4.1 to 4.8 volts after 15 ampere charge |
| Amperes reverse current | 4 to 6 amps. |
| Current Regulator: | |
| Armature Air Gap | 048" to .052" |
| Operating Amperage | 34.0 to 36.0 amperes |

Voltage Regulator
Armature Air Gap .048" to .052"

Operating Voltage (at 10 ampere charging rate):

| Temp. F | 50º | 60º | 70º | 80º | 90º | 100º | 110º | 120º |
|---|---|---|---|---|---|---|---|---|
| Volts | 7.41 | 7.38 | 7.35 | 7.32 | 7.29 | 7.26 | 7.2 | 7.20 |

(Allowable variation: plus or minus 0.15 volts.)

Winding Resistance:
Two Shunt Coils in Parallel 7.9 to 8.8 ohms
Cutout Relay Voltage Winding 29.8 to 33.0 ohms
Voltage Regulator 10.4 to 12.0 ohms

| **DISTRIBUTOR** | **500** | **501-502** | **503-504** |
|---|---|---|---|
| Make | Auto-Lite | Auto-Lite | Auto-Lite |
| Model | IAT-4002 | IGS-4213A-1 | IGT-4204B-1 |
| Rotation | Clockwise | Clockwise | Clockwise |
| Drive | Oil pump | Oil pump | Camshaft |
| Point Gap | .020" | .020" | .017" |
| Points Open | TDC | TDC | TDC |
| Cam Dwell | 38° | 38° | 27° |
| Breaker Arm Spring Tension | 17-20. oz. | 17-20 oz. | 17 oz. |
| Condenser Capacity | .20 - .25 mfd. | .25 - .28 mfd. | .20 - .25 mfd. |
| Firing Order | 1-5-3-6-2-4 | 1-5-3-6-2-4 | 1-6-2-5-8-3-7-4 |
| Bearings: | | | |
| Breaker Plate | None | Ball | Ball |
| Shaft | Bronze | Bronze | Bronze |
| Shaft side play, Max | .005" | .005" | .005" |
| Shaft end play: | | | |
| Minimum | .003" | .003" | .003" |
| Maximum | .010" | .010" | .010" |
| Timing Mark | Flywheel | Flywheel | Flywheel |
| Centrifugal Governor Advance: | 300 RPM 0°<br>330 RPM 1°<br>400 RPM 2-1/2°<br>750 RPM 6°<br>1200 RPM 10° | 500 RPM 0°<br>660 RPM 1°<br>1200 RPM 4°<br>1850 RPM 8°<br>2000 RPM 8.5º | 300 RPM 0º<br>335 RPM 1°<br>400 RPM 3°<br>1025 RPM 10°<br>1700 RPM 17.5° |

Advance must follow on a smooth curve within 1° of above at all points

| Vacuum Advance: | | | |
|---|---|---|---|
| | 9.2" Hg. | 13.25 Hg. 0° | 13.25" Hg. 0° |
| | 10" Hg. 1° | 14" Hg. 1° | 14" Hg. 1° |
| | 10.5" Hg. 2° | 14.50" Hg. 2° | 14.50" Hg. 2° |
| | 11" Hg. 3° | 15.25" Hg. 3° | 15.25" Hg. 3° |
| | 12" Hg. 5° | 16" Hg. 3.5° | 16" Hg. 3.5° |

Allowable variation from curve, plus or minus 1º.

| **COIL** | | | |
|---|---|---|---|
| Make | Auto-Lite | Auto-Lite | Auto-Lite |
| Model | CR-6012-A | CE-6006-A | CE-6006-A |
| Amperage Draw: | | | |
| Engine Stopped | 5.0 Amps. | 4.5 Amps. | 4.5 Amps. |
| Engine Idling | 1.5-2.0 Amps. | 2.5 Amps. | 2.5 Amps. |

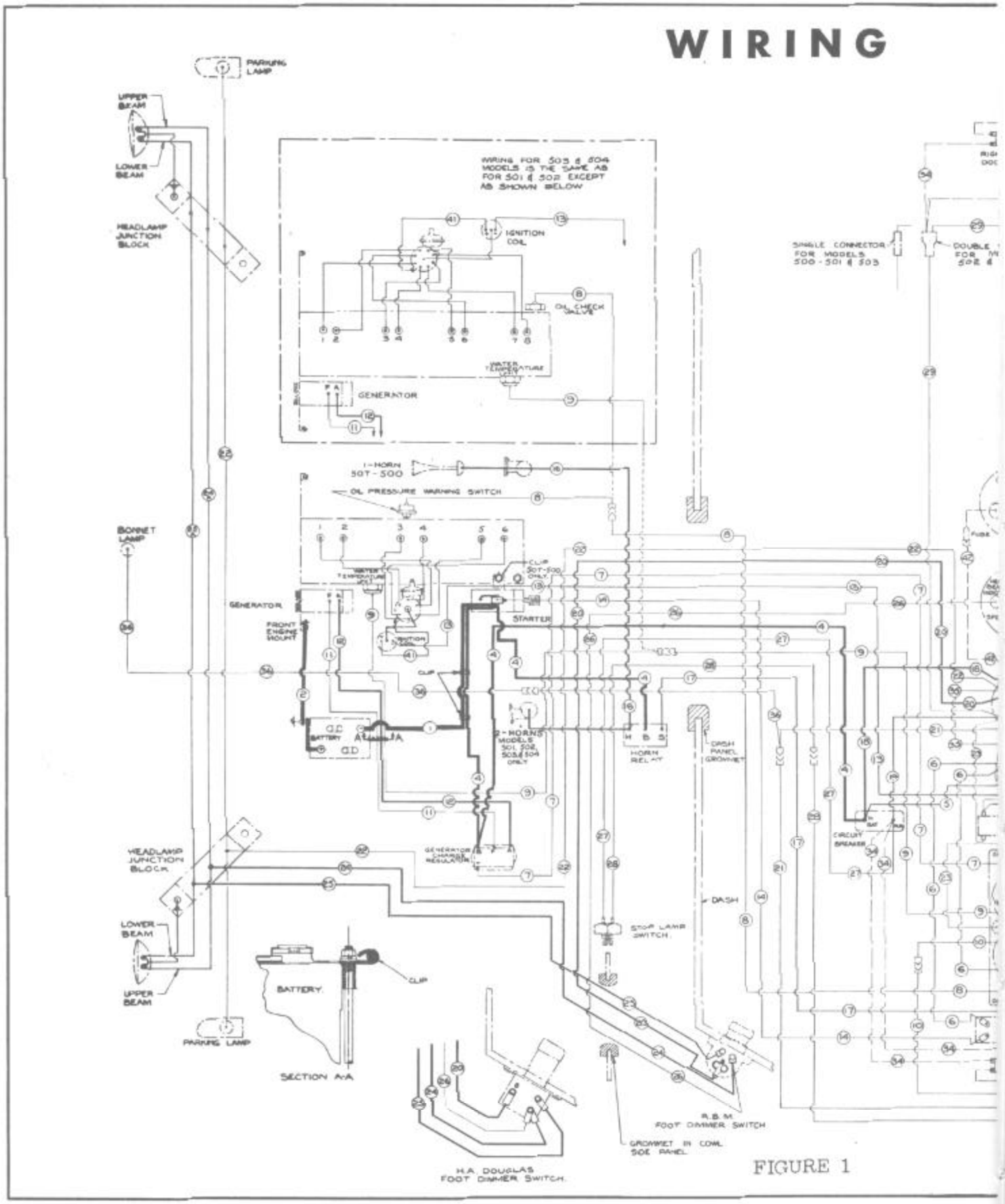
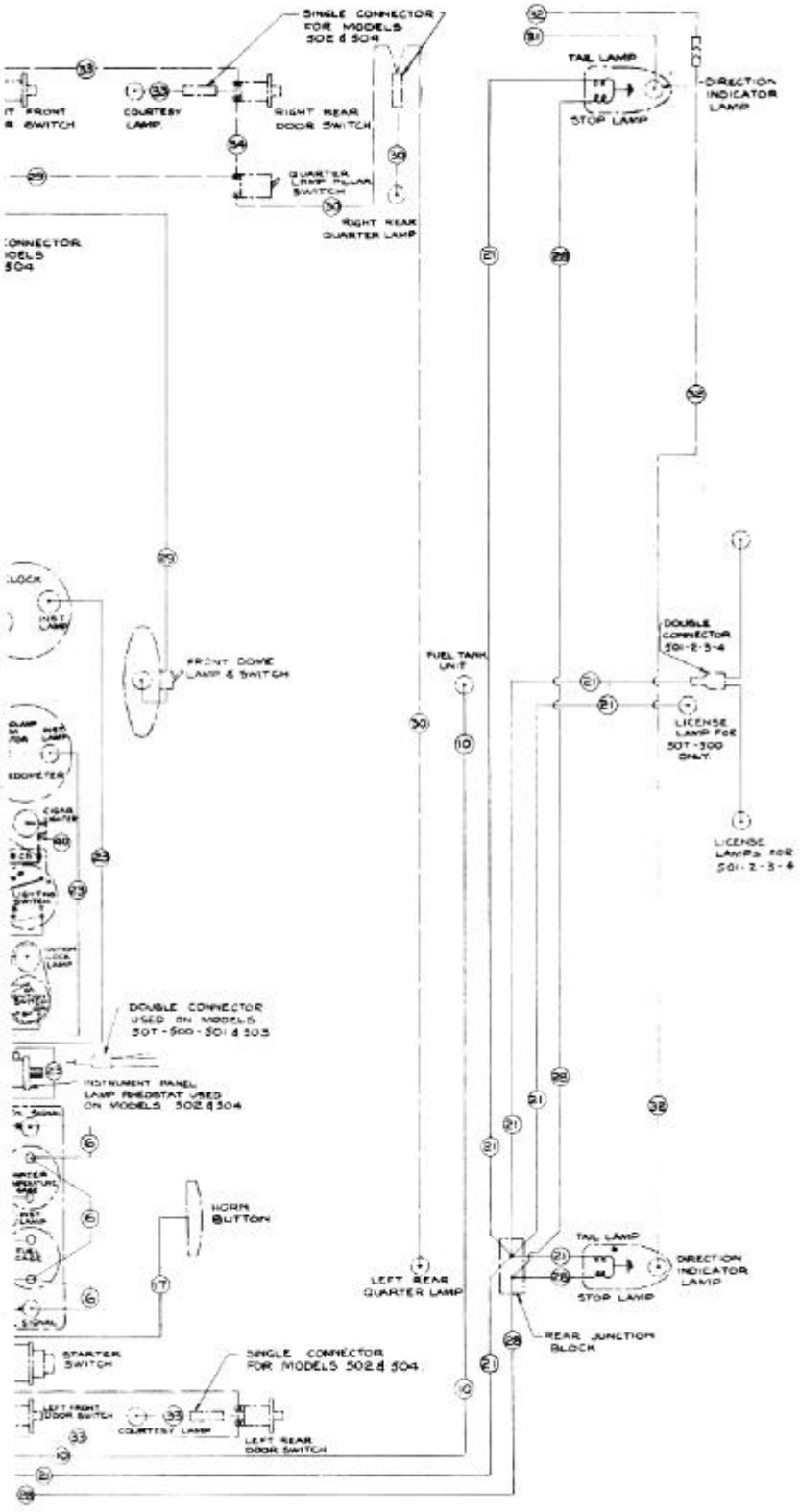

WIRING
PARKING LAMP
UPPER BEAM
LOWER BEAM
HEADLAMP JUNCTION BLOCK
WIRING FOR 503 & 504 MODELS IS THE SAME AS FOR 501 & 502 EXCEPT AS SHOWN BELOW
IGNITION COIL
OIL CHECK VALVE
WATER TEMPERATURE
GENERATOR
1-HORN 501-502
OIL PRESSURE WARNING SWITCH
BONNET LAMP
CLIP 501-502 ONLY
STARTER
FRONT ENGINE MOUNT
BATTERY
2-HORNS MODELS 501, 502, 503 & 504 ONLY
HORN RELAY
DASH PANEL GROMMET
CIRCUIT BREAKER
DASH
STOP LAMP SWITCH
GENERATOR CHARGE REGULATOR
HEADLAMP JUNCTION BLOCK
LOWER BEAM
UPPER BEAM
PARKING LAMP
BATTERY
CLIP
SECTION A-A
H.A. DOUGLAS FOOT DIMMER SWITCH
R.B.M. FOOT DIMMER SWITCH
GROMMET IN COWL SIDE PANEL
SINGLE CONNECTOR FOR MODELS 500-501 & 503
DOUBLE FOR 502 &

FIGURE 1

# DIAGRAM




| CIRCUIT NAME | WIRE SIZE | COLOR | CIRCUIT NAME |
|---|---|---|---|
| 1 | 1 | BLACK | BATTERY TO STARTER SOLENOID CABLE |
| 2 | | BRAIDED STRAP | BATTERY GROUND |
| 4 | 10 | BLACK | STARTER SOL. TO CHARGE REG. "B" TERMINAL, MAIN CIRCUIT BREAKER & HORN RELAY FEED. |
| 5 | 14 | BLACK | IGNITION SWITCH FEED |
| 6 | 16 | BLACK & RED | SIGNAL LAMPS, GAGES & STARTER SW. FEED |
| 7 | 16 | GREEN | GENERATOR SIGNAL |
| 8 | 16 | BLACK | OIL PRESSURE SIGNAL |
| 9 | 16 | ORANGE | WATER TEMPERATURE GAGE |
| 10 | 16 | BROWN | FUEL GAGE TO TANK UNIT |
| 11 | 16 | WHITE | GEN. "F" TERM. TO CHARGE REG. "F" TERMINAL |
| 12 | 12 | BLACK | GEN. "A" TERM. TO CHARGE REG. "A" TERMINAL |
| 13 | 14 | BLACK | IGNITION SWITCH TO COIL |
| 14 | 16 | BLACK | STARTER SWITCH TO STARTER SOLENOID |
| | | | |
| 16 | 12 | YELLOW | HORN FEED |
| 17 | 14 | BLACK | HORN BUTTON WIRE |
| 18 | 12 | BLACK | LIGHT SWITCH FEED |
| 19 | 14 | WHITE | LIGHT SWITCH FEED TO AUX. CIRCUIT BREAKER |
| 20 | 12 | YELLOW | FOOT DIMMER SWITCH FEED |
| 21 | 16 | RED | TAIL AND LICENSE LAMP |
| 22 | 16 | WHITE | PARKING LAMP |
| 23 | 16 | RED | INSTRUMENT PANEL LAMPS |
| 24 | 12 | GREEN | HEADLAMP FEED, UPPER BEAM |
| 24A | 14 | GREEN | HEADLAMP CONNECTOR, UPPER BEAM |
| 25 | 12 | RED | HEADLAMP FEED, LOWER BEAM |
| 25A | 14 | RED | HEADLAMP CONNECTOR, LOWER BEAM |
| 26 | 16 | BLUE | HEADLAMP BEAM INDICATOR |
| 27 | 16 | GREEN | STOP LIGHT SWITCH FEED |
| 28 | 16 | GREEN | STOP LAMP |
| 29 | 16 | WHITE | DOME AND QUARTER LIGHT SWITCH FEED |
| 30 | 16 | BLACK | QUARTER LAMP |
| 31 | 16 | YELLOW | DIRECTION INDICATOR (RIGHT SIDE) |
| 32 | 16 | BLUE | DIRECTION INDICATOR (LEFT SIDE) |
| 33 | 16 | BLACK | COURTESY LAMP |
| 34 | 16 | WHITE | COURTESY LIGHT SWITCH FEED |
| 35 | 16 | WHITE | IGNITION SWITCH LAMP |
| 36 | 16 | RED | BONNET LAMP |
| 40 | 12 | GREEN | CIGAR LIGHTER (FURNISH WITH CIGAR LIGHTER) |
| 41 | 14 | BLACK | IGNITION COIL + TO DISTRIBUTOR (PRIMARY) |
| 42 | 16 | BLACK | CLOCK WIRE FURNISHED WITH CLOCK |

FULL LINES _____ INDICATE WIRES FOR ALL MODELS, EXCEPT AS NOTED.

LONG DASH LINES — — — — INDICATE WIRES FOR 502 & 504 MODELS.

DOT AND DASH LINES · — · — · — · INDICATE OUTLINE OF PARTS

# ELECTRICAL SYSTEM

The 500 series Hudson's use a positive grounded 6 volt electrical system employing a 6 volt, 120 ampere hour storage battery, an externally regulated shunt wound generator, and a three unit voltage regulator.

The starting system uses a 6 volt starter motor and inboard type Bendix drive. The starter motor is energized by the battery through a solenoid switch mounted on the starter housing. A dash mounted push button activates the solenoid.

The lighting system uses sealed beam headlamps and is protected by a circuit breaker on the light switch. A foot operated dimmer switch controls the headlamp beam.

Complete wiring diagram is shown in Figure 1.

## BATTERY

The battery used on 500 series Hudson's is a National, Model OE -2L-100, 51 plate 6 volt, 100 ampere hour capacity storage battery.

Electrolyte level in the battery should be at the bottom of the square in filler cap opening. Only pure distilled water should be added to the battery. Electrolyte level should be checked at chassis lube periods and oftener during hot weather. Battery terminals should be kept free from corrosion and tight.

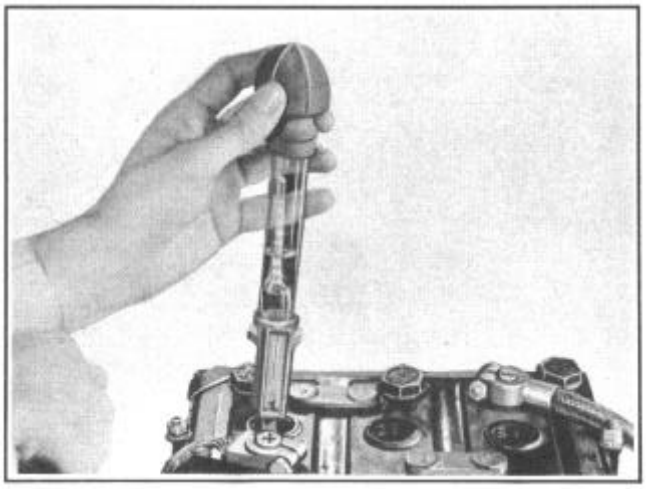


FIGURE 2

## BATTERY TEST

**HYDROMETER:**

Under normal conditions a hydrometer reading of the specific gravity of each cell will determine the state of charge, Figure 2. A specific gravity of 1280 indicates a fully charged battery. A specific gravity of 1130 indicates a fully discharged battery. If specific gravity varies more than 25 points between cells, recharge and retest or test under load.

**VOLTMETER:**

If a battery fails to perform properly after charging, it should be tested with a volt-meter. Each cell should show two volts or over under no load, and the voltage across the posts should be 6 volts or over.

If these values cannot be obtained, battery should be replaced.

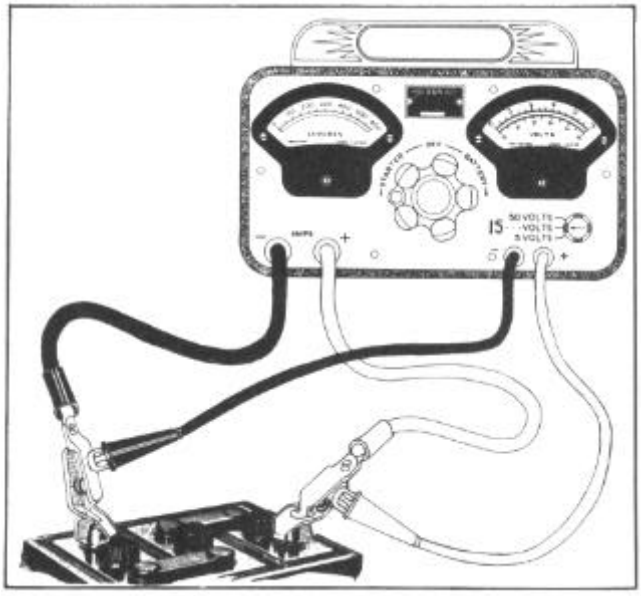


FIGURE 3

**LOAD TEST:**

A load test should be made to eliminate possibility of a weak cell. Use Battery-Starter tester, Figure 3, or a standard cell tester with a heavy shunt across the

terminals. With the cell tester the difference between cells should not be more than .15 volts, and each cell should test at least 1.5 volts. With the Battery-Starter tester, meter should show at least 4 volts at 300 amperes discharge.

If tester is not available, a voltmeter may be connected across the battery terminals while engine is cranked with the starter motor. Battery is serviceable if the starter cranks the engine at a good speed for 1/2 minute and the voltage does not fall below 4-1/2 volts.
DO NOT CRANK MORE THAN 1/2 MINUTE WITHOUT ALLOWING STARTER MOTOR TO COOL.

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

**BATTERY CABLE CHECK:**

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

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

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

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

**STARTING MOTOR**

The starting motor is activated through a solenoid switch mounted on top of the starting motor case. The solenoid is controlled by a push button on the instrument panel. Operation of the solenoid closes the circuit from the battery to the starting motor. The solenoid may be manually operated by removing the threaded cap on the rear of the solenoid cover and pushing the exposed plunger. The instrument panel push button will operate the solenoid only when the ignition switch is turned on.

Bearings on the starting motor used on the 500 models are lifetime lubricated and require no oiling. Bearings on the 501-2-3 and 4 models starter motor should be lubricated with 3 to 5 drops of engine oil in each oiler every 5,000 miles.

The starting motor cranks the engine through an inboard type Bendix drive mounted on the armature shaft.

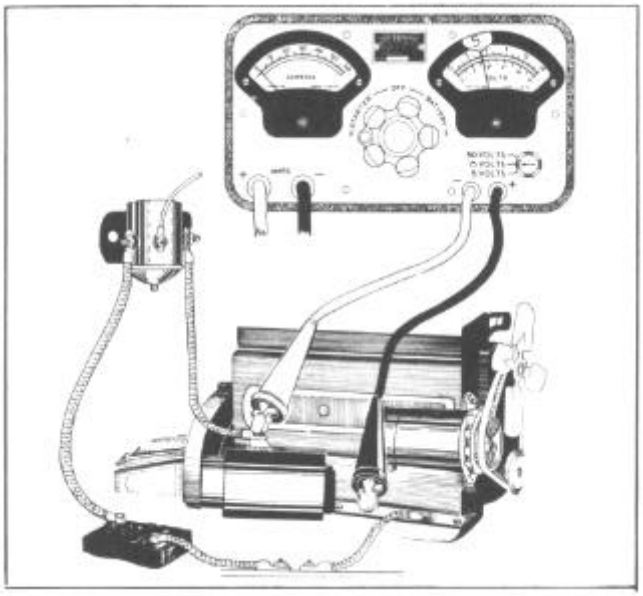


FIGURE 4

**CRANKING VOLTAGE TEST:**

1. Connect the negative voltmeter lead of the starter motor tester to the starter switch terminal, Figure 4.

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

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

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

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

5. If the voltmeter reading is less than 5 volts check the battery cables and starter solenoid.

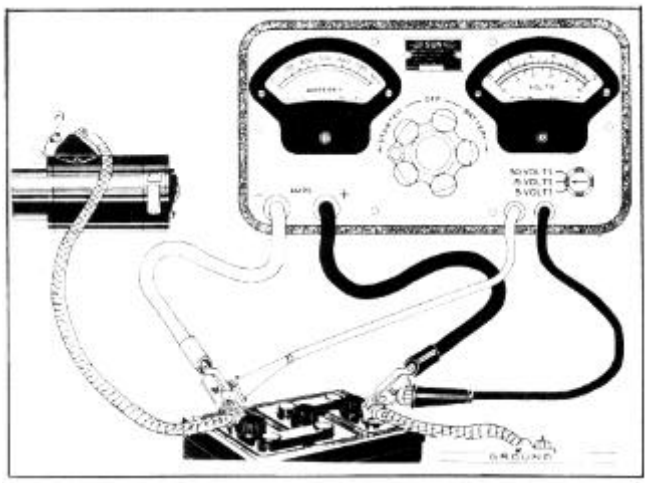


FIGURE 5

**AMPERAGE DRAW TEST:**

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

2. Turn the voltmeter "selector switch" to the 15 volt position and connect test leads, Figure 5.

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

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

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

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

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

The reading should be approximately 160 amperes at 150 RPM.

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

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

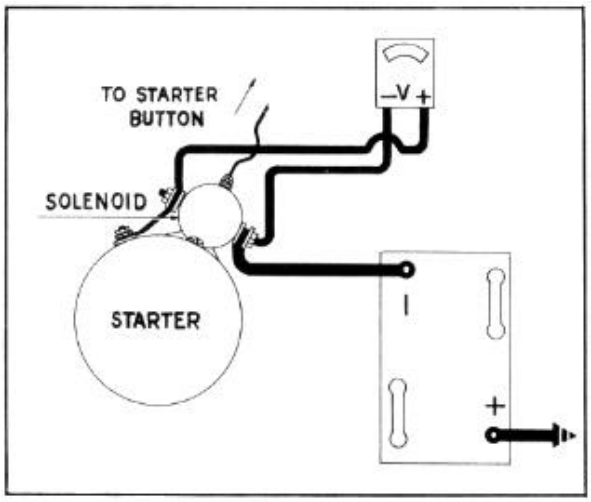



FIGURE 6

**STARTER SOLENOID TEST**:

1. Connect negative lead to "BAT" terminal of starter solenoid switch and positive lead to starting motor terminal of starter solenoid switch, Figure 6.

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

**STARTER REMOVAL**:

1. On Drivemaster equipped cars it is necessary to remove

Drivemaster mounting bracket bolts, disconnect linkage, and pull bracket out and forward to allow removal of the starter motor.

2. Disconnect cables from solenoid switch. (Protect end of battery cable from accidental shorts or remove cable from battery.)

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

**DISASSEMBLY:**

1. Remove strap from solenoid to starter motor.

2. Remove two screws attaching solenoid and remove solenoid.

3. Remove lock spring from end of Bendix drive and remove spring and retainers.

4. Drive out pin attaching adapter to shaft and remove adapter, sleeve and pinion.

5. Remove two countersunk screws attaching drive end head and remove head.

6. Remove commutator cover band and remove brushes from holders.

7. Remove nuts from through bolts and remove commutator end head and through bolts.

8. Remove armature.

## STARTER OVERHAUL

**ARMATURE:**

1. Check armature for grounds with a set of test probes in series with a lamp and a source of electricity.

2. Touch one probe to the armature core and touch the other to the end or shoulder of each commutator segment in turn.

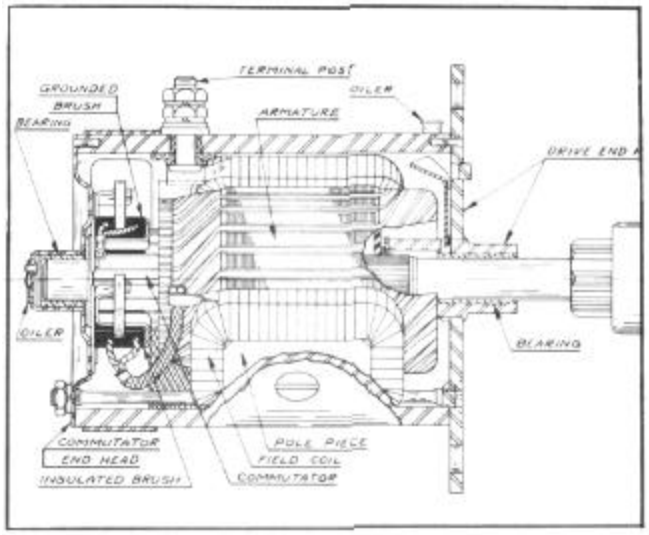



FIGURE 7

3. If the lamp lights, the armature is grounded and should be replaced.

4. Place armature on a growler and hold a steel strip on the armature.

5. Rotate the armature, and if steel strip vibrates, armature is shorted and should be replaced.

6. If commutator is rough, it should be turned down on a lathe and finished with 2/0 sandpaper. DO NOT UNDERCUT THE MICA.

7. If bearing clearance exceeds .005", bearings should be replaced. (Soak bearings in engine oil and use correct arbor to install bearings.)

**FIELD COILS:**

1. Check field coils for grounds by touching one test probe to the frame and the other to each of the field coil terminals.

2. If the lamp lights, coil is shorted and should be replaced.

3. Check coils for open circuit by placing the test probes across each coil separately.

4. If lamp does not light, coil is open and should be replaced.

1. Brushes should slide freely in their holders and make full contact with the commutator. Worn brushes should be replaced.

2. To replace brushes, unsolder the brush pigtail from the field or brush holder and open the loop. Insert new pigtail the full depth of loop and clinch and solder pigtail in loop.

3. Seat new brushes with sandpaper or brush seating stone. Wrap a strip of 2/0 sandpaper around the armature with sand side up and turn armature slowly in the direction of rotation. Blow sand and dust from commutator.

4. Check brush spring tension with a spring scale hooked on the brush end of the spring. Pull on a line parallel to the side of the brush and read scale just as spring leaves the brush. Tension should be 42 to 53
ounces.

5. Change spring tension by twisting the spring holder with long nosed pliers.

6. Check the two insulated brush holders for ground. Place one test probe on holder and one on end head. If lamp lights holder is grounded and end head should be replaced.

**ASSEMBLY:**

1. Replace armature in frame.

2. Install drive end head and attaching screws.

3. Install commutator end head and through bolts.

4. Pry up brush springs and insert brushes in holders.

5. Replace cover band.

6. Replace Bendix sleeve, pinion, spring retainers, spring; stop nut, pin and lock ring.

7. Replace solenoid switch and strap from switch to starter.

**INSTALLATION:**

Reverse procedure of removal.

## BENDIX DRIVE

The Bendix drive is exposed and may be serviced without removal from the engine. On cars equipped with Drivemaster, the Bendix drive spring may be replaced with starting motor on the engine. On other cars it is more convenient to remove starter.

Failure of Bendix drive pinion to mesh with the flywheel may be caused by gum, dirt or frost on the screw threads. Clean the Bendix drive with a brush dipped in kerosene. Operate the unit several times to loosen gum and dirt and remove excess kerosene. Lubricate the exposed portion of armature shaft with S.A.E. 10 engine oil. (DO NOT LUBRICATE SCREW THREADS). If proper operation cannot be secured by cleaning and lubrication, starter should be removed and checked for bent or damaged parts.

## GENERATOR

The 500 series Hudson's employ a shunt wound, externally controlled generator. The generator is mounted on the left side of the engine and is operated by the fan belt. Generator output is controlled by a three unit vibrating type current voltage regulator. A signal system incorporated in the regulator operates the signal light on the dash. The signal lights when the ignition switch is turned on and remains on until the generator starts to charge the battery.

The voltage regulator holds the generator output at 35 amperes or below, depending on the load requirements. The generator should not be operated at over 35 amperes for any length of time.

The generator armature is carried on a bronze bearing at the commutator end and on a roller bearing at the drive end. The bearing should be lubricated with 3 to 5 drops of engine oil at each chassis lubrication. At generator overhaul the ball bearing should be packed 1/2 full of high temperature, non-fibre grease; the bronze bearing should be soaked in engine oil and the commutator end grease pocket filled with high temperature grease.

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

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

Failure of charging system to maintain the battery charge under normal operating conditions may be caused by a faulty condition of the generator, the voltage regulator or connecting wires.

**WIRING CHECK:**

Before removing either the generator or voltage regulator for overhaul or replacement wiring of the charging circuit should be checked for high resistance connections, short or open circuits. These circuits can be tested by checking the voltage drop between the connections.

1. Remove the battery lead from the "B" terminal of the voltage regulator and connect a reliable ammeter between the terminal and the lead.

2. Run the engine and turn on lights or accessories until a 10 ampere charge shows on the ammeter.

3. With a 10 volt voltmeter check the voltage reading between the following points:

| | MAX. VOLTS |
|---|---|
| a. Generator frame to battery ground post | .03 |
| b. Battery ground post to regulator base | .03 |
| c. Battery negative post to regulator "B" terminal | .10 |
| d. Generator armature terminal to regulator "A" terminal | .10 |
| e. Generator field terminal to regulator "F" terminal | .05 |
| f. Regulator base to generator frame | .03 |

4. Higher readings indicate frayed or broken wires or poor connections.

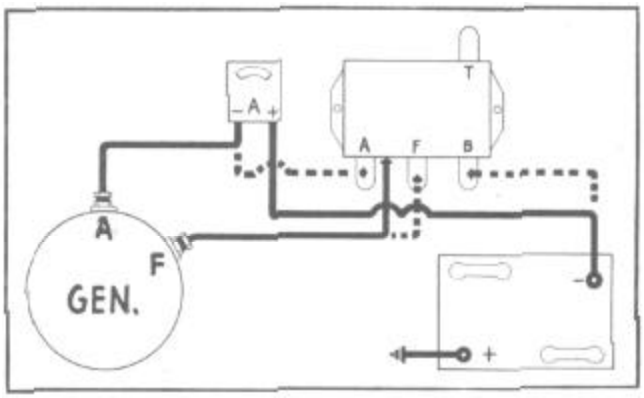



FIGURE 8

**GENERATOR CHECK:**

1. Disconnect the armature (A) lead and the battery (B) lead from the regulator and connect a reliable ammeter between these leads, Figure 8.

2. Remove generator field (F) lead from the regulator.

3. Operate the generator at idle speed and ground the field lead to the regulator base.

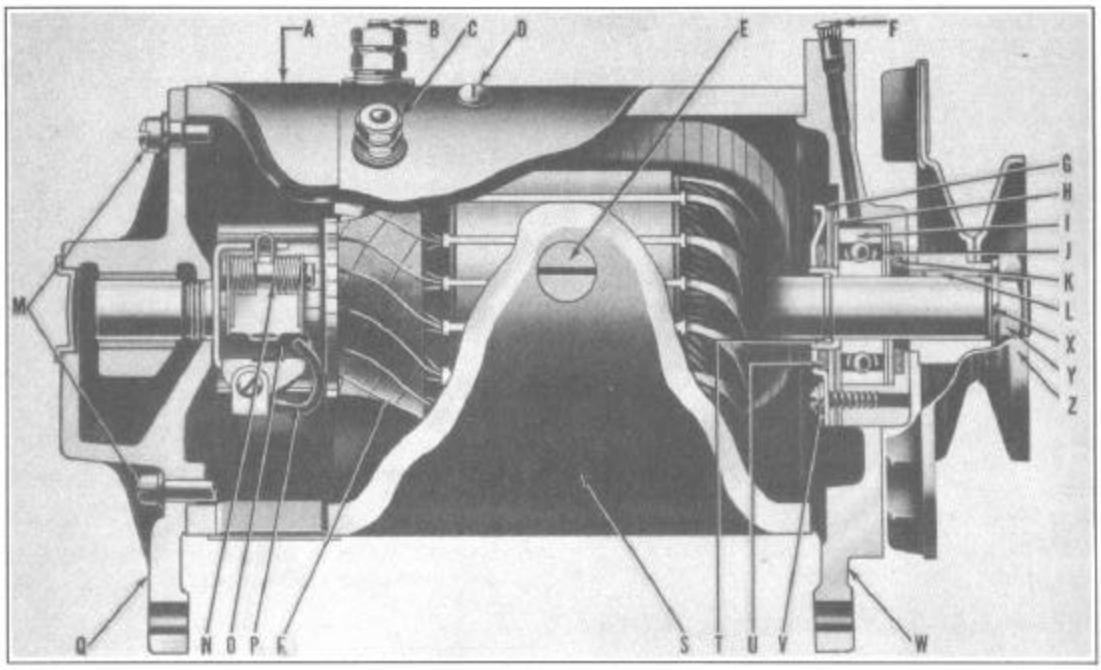



FIGURE 9

A. Cover Band
B. Armature Terminal Stud
C. Field Terminal Stud
D. Ground Screw
E. Pole Shoe Screw
F. Oiler
G. Bearing Retainer
H. Bearing Retainer Gasket
I. Bearing
J. Washer Retainer
K. Felt Washer
L. Woodruff Key
M. Through Bolts
N. Brush Spring
O. Brush
P. Brush Lead
Q. Commutator End Head
R. Armature
S. Frame
T. Snap Ring
U. Felt Washer
V. Bearing Retainer Screw
W. Drive End Head
X. Lockwasher
Y. Armature Shaft Nut
Z. Drive Pulley

4. Watch the ammeter and increase the speed slowly. At 2,000 to 2350 generator RPM, output should be 35 amp. DO NOT INCREASE GENERATOR OUTPUT ABOVE 35 AMPERES.

5. If generator fails to build up, remove generator for overhaul.

**DISASSEMBLY:**

1. Remove cover band.

2. Disconnect brush leads and remove brushes.

3. Remove through bolts and remove commutator end head.

4. Remove armature and drive end head. (If necessary, tap drive head end lightly with a soft hammer.)

5. Remove shaft nut and lockwasher.

6. Remove drive pulley and Woodruff key.

7. Remove armature from drive head end.

8. Remove bearing retainer screws and remove retainer, felt washers, gasket and bearing.

**FIELD COIL GROUND TESTS:**

1. Make sure no leads are touching frame.

2. Using a set of test probes in series with a lamp and a source of electricity, touch one probe to the field terminal stud and ground the other probe to the generator frame.

3. If lamp lights, coils are grounded.

4. If ground is present, remove nuts and washers from armature and field terminals and press terminals from frame.

5. Repeat ground test. If lamp does not light on this test, faulty terminal post insulation is indicated.

6. If coils still test grounded, unsolder connection between coils.

7. Test each coil separately and replace grounded coil.

**FIELD COIL OPEN CIRCUIT TEST:**

1. Touch one test probe to armature terminal stud and one to field terminal stud.

2. If lamp does not light, an open circuit is present.

3. To determine which coil is open, hold one test probe on the connection between the coils and touch the field coil terminal and then the armature terminal with the other probe. If lamp lights, coil on that side is good.

4. Replace open circuited coil.

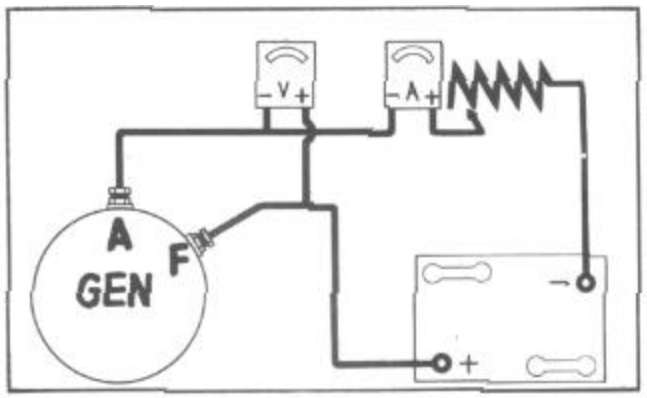



FIGURE 10

**FIELD COIL SHORT CIRCUIT TEST:**

1. Connect ammeter, battery and variable resistor in series with the field coil terminals. (Figure 10).

2. Connect a voltmeter across the terminals.

3. Adjust voltage to 6 volts and read ammeter.

4. If current is not 1.6 to 1.8 amperes, a short exists in the field coil.

5. If a short is present, check each coil separately. Field coil draw for a single coil at 6 volts should be from 2.2 to 3.6 amperes.

6. Replace shorted coil.

**FIELD COIL REMOVAL:**

1. If a field coil tests open, short or grounded, unsolder connection between the coils and disconnect faulty coil from terminal post.

2. Mark pole shoe position in frame to assure replacement in correct position.

3. Remove pole shoe screw. (Use a pole shoe removing tool if available.)

4. Remove pole shoe and remove coil.

**FIELD COIL REPLACEMENT:**

1. Solder terminal post to new coil. (Use rosin core solder.)

2. Assemble coil on pole shoe and install in frame. (Make sure pole shoe is in position marked before removing from frame.)

3. Coat pole shoe screw with boiled linseed oil and install in frame.

4. As screw is tightened, strike the frame several sharp blows with a soft hammer to align shoe.

5. Twist and solder connection between the two field coils and assemble terminal stud in frame.

6. Test field coil draw (short circuit test).

**ARMATURE GROUND TEST:**

1. Place armature on V-block or growler and touch one test probe to armature core,

2. Touch other test probe to each commutator segment in turn. (Touch probes to ends or shoulders of segment - not to brush or bearing surfaces.)

3. If lamp lights, armature is grounded and should be replaced.

**ARMATURE OPEN CIRCUIT TEST:**

1. With armature on V-block or growler, touch test probes to each pair of adjacent commutator segments. (Do not touch brush surfaces.)

2. If lamp does not light at any pair of segments, an open circuit exists, and armature should be replaced.

**ARMATURE SHORT CIRCUIT TEST:**

1. Place armature on a growler and hold a thin strip of steel or hack saw blade on the armature core.

2. Rotate armature slowly.

3. Steel strip will vibrate if armature is shorted.

4. If short is present, replace armature.

**ARMATURE COMMUTATOR REPAIR:**

1. Place armature on V-blocks and check commutator run-out with dial indicator.

2. If total run-out exceeds .003", commutator should be turned down.

3. If commutator diameter after turning is less than 1.60 inches, replace armature.

4. Remove burrs from commutator with 2/0 sandpaper.

5. Undercut mica between armature segments to a depth of 1/32" . (Mica may be undercut with a hack saw blade if set of teeth is ground to the exact width of the cut.)

**BRUSH HOLDERS:**

1. Touch one test probe to insulated brush holder and ground the other probe to the end head. If lamp lights, brush holder is grounded.

2. Place armature in soft jawed vise and install commutator end head and brushes. Brushes should slide freely in the holders and be in perfect alignment with commutator segments.

3. Hook a spring scale in the hole in the end of the brush arm. Pull the scale on a line parrallel to the face of the brush. Scale should indicate 35 to 53 ounces (with new brushes) just as the arm leaves the brush.

4. Adjust spring tension by bending springs.

**BRUSH REPLACEMENT:**

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

1. Remove cover band.
2. Disconnect brush leads.
3. Lift brush arms and remove brushes.
4. Install new brushes in holders and connect brush leads.
5. Cut a strip of 2/0 sandpaper the exact width of commutator.
6. Lift brush and slide sandpaper under brush with sanded side against brush.
7. Pull sandpaper so that brush is forced against holder. Once or twice is sufficient. (Brush seating stone may be used to seat new brushes.)
8. Blow sand and carbon dust out of generator.
9. Run generator under load to obtain perfect brush seating.
10. Reinstall cover.

**GENERATOR ASSEMBLY:**

1. Pack ball bearing one-half full of high temperature, non-fiber grease.
2. Soak felt washers in engine oil before assembly.
3. Install felt washer, retainers and bearing in drive head end.
4. Install bearing retainer gasket, felt washer, and bearing retainer.
5. Install snap ring on armature and assemble on drive head end.
6. Install armature in frame so that dowel pin enters hole in head.
7. Soak bronze bearing in commutator end head in engine oil and pack grease pocket with high temperature grease.
8. Assembly commutator end head on armature.
9. Install through bolts - make sure lower bolt passes under field connection insulation.
10. As through bolts are tightened, strike the gener ator frame a sharp blow with a fiber hammer to align armature shaft and bearing.
11. Install brushes and attach brush leads. (Brushes should be seated on commutator with 2/0 sandpaper or brush seating stone.)
12. Install Woodruff key, drive pulley, lockwasher and shaft nut.

**ARMATURE SHAFT END PLAY:**

1. Mount dial indicator on drive head end with plunger in line with and touching end of shaft.
2. Move to both extreme positions and read end play.
3. If end play is not within .003 to .010 inches, improper assembly is indicated.

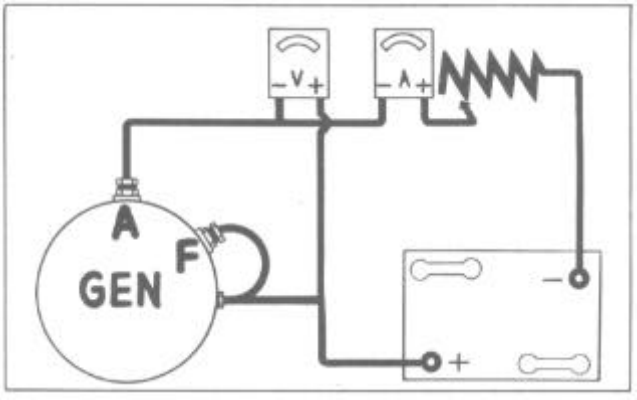
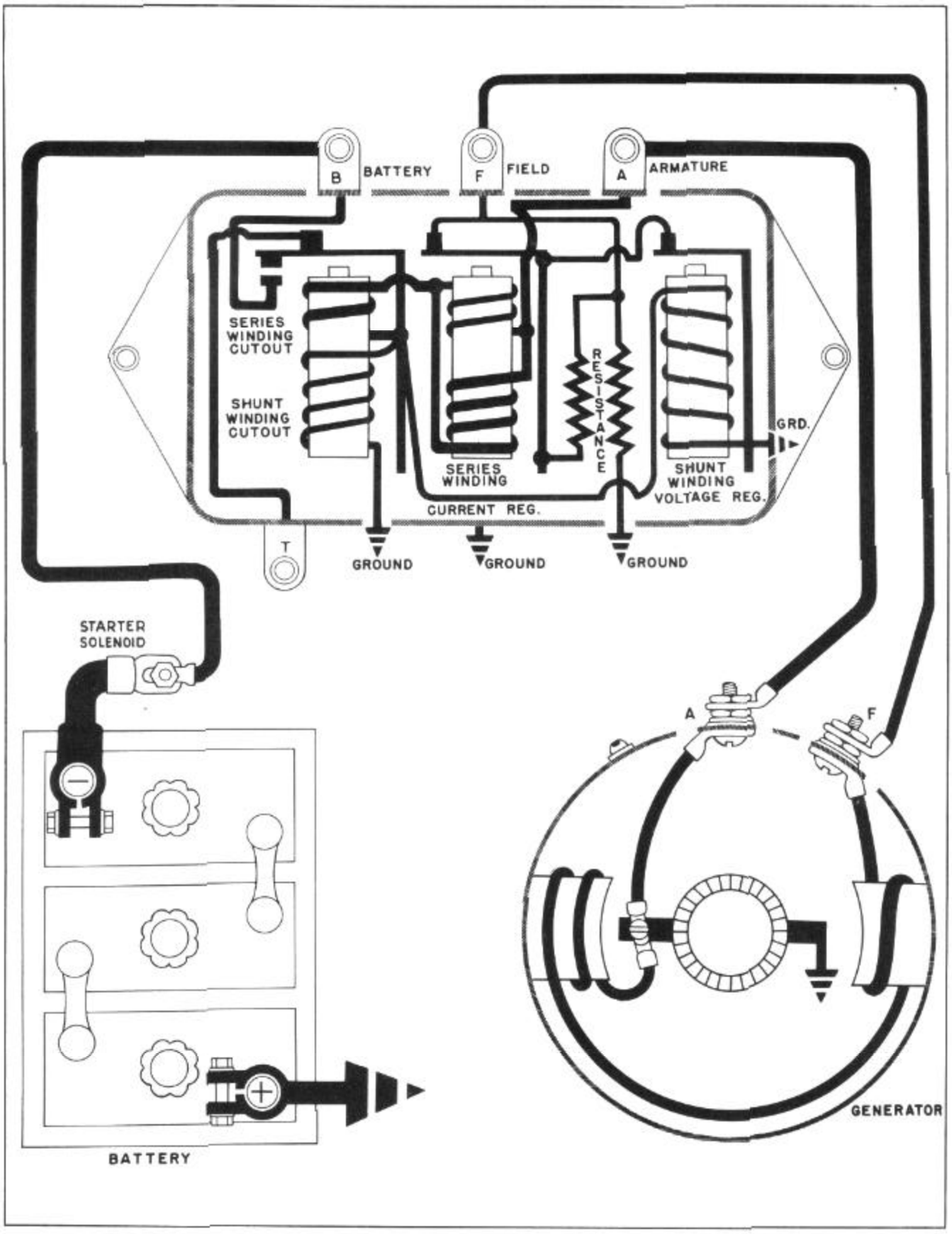



FIGURE 11


B
BATTERY
F
FIELD
A
ARMATURE
SERIES WINDING CUTOUT
SHUNT WINDING CUTOUT
RESISTANCE
GRD.
SERIES WINDING
CURRENT REG.
SHUNT WINDING VOLTAGE REG.
T
GROUND
GROUND
GROUND
STARTER SOLENOID
A
F
BATTERY
GENERATOR

**GENERATOR MOTORIZING DRAW:**

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

1. Connect an ammeter and battery in series with the armature terminal and frame, Figure 11.

2. Ground the field terminal to the frame.

3. Connect a variable resistor in series with the battery and generator.

4. Connect a voltmeter from the armature to the frame.

5. Generator should operate as a motor with the armature turning slowly.

6. Adjust voltage to 6 volts and read ammeter.

7. Motorizing draw should be 4.2 to 4.6 amperes. If motorizing draw is higher, or armature does not turn, worn bearings, incorrect bearing alignment, short circuits, or improper assembly is indicated.

**GENERATOR OUTPUT TEST:**

1. Mount the generator in a test stand, or on the engine if none is available.

2. With the field terminal grounded to the frame, polarize the generator by touching the armature lead briefly to the negative battery post.

3. Connect generator same as for motorizing draw test (Figure 11) and drive the generator on the test bench or on the engine.

4. Increase speed slowly, keeping the voltage at 8 volts. If voltage increases, place a load across battery. Use a carbon pile rheostat or turn on car lights and accessories.

5. Note ammeter readings as speed is increased. Following output should be outlined.

| VOLTS | AMPERES | RPM |
|---|---|---|
| 6.4 | 0 | 970 |
| 8 | 35.0 | 2000 |

**NOTE: New brushes should be run in on generator at or near 35 amperes output for 15 to 30 minutes before checking generator output. If necessary to check generator hot, speed will be 100 to 350 RPM higher.**

6. If specified output cannot be obtained or if speed is above maximum it indicates a faulty generator which should be over-hauled or replaced.

**VOLTAGE REGULATOR**

The generator regulator is a three unit, vibrating type current-voltage regulator consisting of a cutout relay, a current limiting regulator, and a voltage regulator.

The cutout relay closes the circuit from the generator to the battery when the generator voltage reaches 6.4 to 7.0 volts. It opens the circuit when the generator voltage falls below 4.1 to 4.8 volts. A set of contact points on the armature of the cutout relay closes the circuit to the generator signal light on the instrument panel when the circuit to the battery is opened.

The voltage regulator unit operates when the generated voltage rises above the value for which it is set. (See "Specifications".) The voltage regulator controls the generator output by inserting resistance in the field circuit. The voltage regulator contact points open and close at high frequencies and hold the voltage at a constant value as long as the resistance of the circuit is high enough to keep it operating.

The current limiting regulator operates in the same manner as the voltage regulator and holds the generator output to the maximum safe value.

The voltage regulator should be removed for overhaul or replacement only after other possible causes of the trouble have been eliminated.

1. Inspect wiring between voltage regulator and generator. (See "Wiring Check", page 11).

2. Make sure generator operates correctly without the regulator in the circuit. (See "Generator Check," Page 11.)

3. Check battery specific gravity and terminal voltage. If battery is not up to specifications, substitute a fully charged battery of the same type and capacity for test purposes.

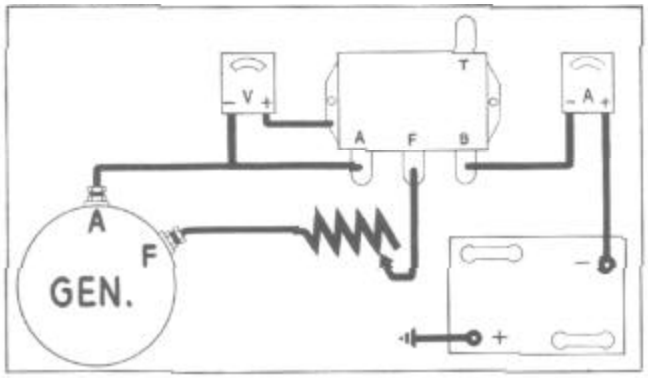



FIGURE 13

**CUTOUT RELAY CHECK:**

1. Disconnect wires from the “B” terminal of the voltage regulator and connect a reliable ammeter between the terminal and the battery lead, Figure 13.

2. Connect an accurate voltmeter between the regulator armature terminal and the regulator base.

3. Disconnect the field lead from the regulator "F" terminal and connect a variable resistance (3 amp, 50 ohm rheostat) between the load and the terminal. (Check may be made without the rheostat by controlling generator output with the engine throttle.)

4. Turn the rheostat on to insert all the resistance in the field circuit and run the generator at medium speed (about 1000 rpm).

5. Slowly reduce the resistance. Ammeter should read ZERO until voltage has reached 6.4 to 7.0 volts and the contact points close.

6. Increase the charging rate to 15 amperes, then slowly turn resistance back in the field circuit. When the voltage is reduced to 4.1 to 4.8 volts, or ammeter indicates 4.6 amps. reverse current, the contact points should open and the ammeter drop to ZERO.

**NOTE: For an exact check of the opening and closing of the cutout relay points, connect a headphone (2000 ohms or higher) between the battery and armature terminals of the voltage regulator. When the contacts open or close, the headphone will click**

**CUTOUT RELAY ADJUSTMENT:**

1. To adjust the closing voltage, remove cover and change the armature spring tension by bending the lower spring hanger. Increasing the tension raises the opening voltage; decreasing the tension lowers the opening voltage.

2. To adjust the opening voltage, raise or lower the stationary contact by expanding or contracting the bracket, keeping the points perfectly aligned. Increasing the gap lowers the opening voltage; decreasing the gap raises the opening voltage. (Contact gap must not be less than 0.015".)

3. Replace cover and recheck.

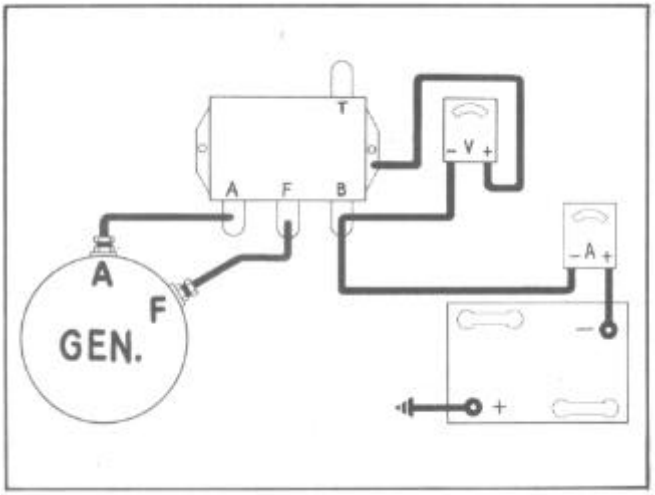



FIGURE 14

**VOLTAGE REGULATOR CHECK:**

1. Remove wires from regulator "B" terminal and connect ammeter between this terminal and the battery lead. Figure 14.

2. Connect voltmeter from "B" terminal to base of regulator.

3. Place a reliable thermometer about 2" from the regulator cover, but not touching the cover.

4. Operate the generator at about 15 ampere charge for 15 minutes or until the regulator is at normal operating temperature (70° F).

5. Stop the engine and then bring it back to about 2500 generator RPM (about 30 MPH).

6.Adjust output to a 10 to 15 ampere charge by turning on lights or accessories. Voltage should be within the limits shown in the specifications.

**NOTE: Check must be made with a fully charged battery or sufficient resistance inserted in the charging circuit to produce required voltage.**

**VOLTAGE REGULATOR ADJUSTMENT:**

1. To adjust operating voltage remove cover and change the armature spring tension by bending the lower spring hanger. Increasing the tension raises the operating volt-age; decreasing the tension lowers it.

2. Replace cover and recheck.

3. After each adjustment stop the engine and restart it. Bring engine up to speed and adjust current to 10 to 15 amperes before taking a reading.

**CURRENT REGULATOR CHECK:**

1. Connect ammeter and voltmeter as for voltage regulator check. Figure 14.

2. Run the generator at approximately 3000 RPM (35 MPH).

3. Turn on lights and accessories to get maximum charging rate. Load must be in excess of 36 amperes to prevent operation of voltage regulator unit. If necessary, remove regulator cover and place a jumper across the voltage regulator points (left unit), or place a bank of standard head lamps or a carbon pile rheostat across battery.

4. Ammeter should read between 34.0 and 36.0 amperes with cover in place.

**CURRENT REGULATOR ADJUSTMENT:**

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

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

**REGULATOR CONTACT POINTS:**

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

## DISTRIBUTOR

The distributor for the 6 and 8 cylinder engines rotate in a clockwise direction. The lower end of the 8 cylinder distributor is provided with a spiral gear which meshes with a similar gear on the camshaft. Six cylinder distributor shafts have an offset tongue end which fits into a slot at the end of the oil pump shaft gear.

Incorporated in the distributor in an automatic centrifugal advance and vacuum advance control.

The automatic centrifugal advance provides the proper ignition timing in relation to engine speed.

The vacuum advance control provides additional spark advance over the centrifugal advance through the engine vacuum. When the engine is running under light load and engine vacuum is high, the breaker plate is rotated to the maximum advanced position. However, under heavy load conditions, as when the throttle is opened for additional acceleration or hill climbing, and engine vacuum is low, the breaker plate is rotated to the retarded position to prevent fuel detonation or pinging.

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

**BREAKER POINT ADJUSTMENT**:

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

1. Remove distributor cap and rotor.

2. Crank engine until the fibre block on the contact arm rests on the highest point of the cam lobe.

3. Loosen the contact support lock screw (B), Figure 15, and turn the eccentric adjusting screw (D) until

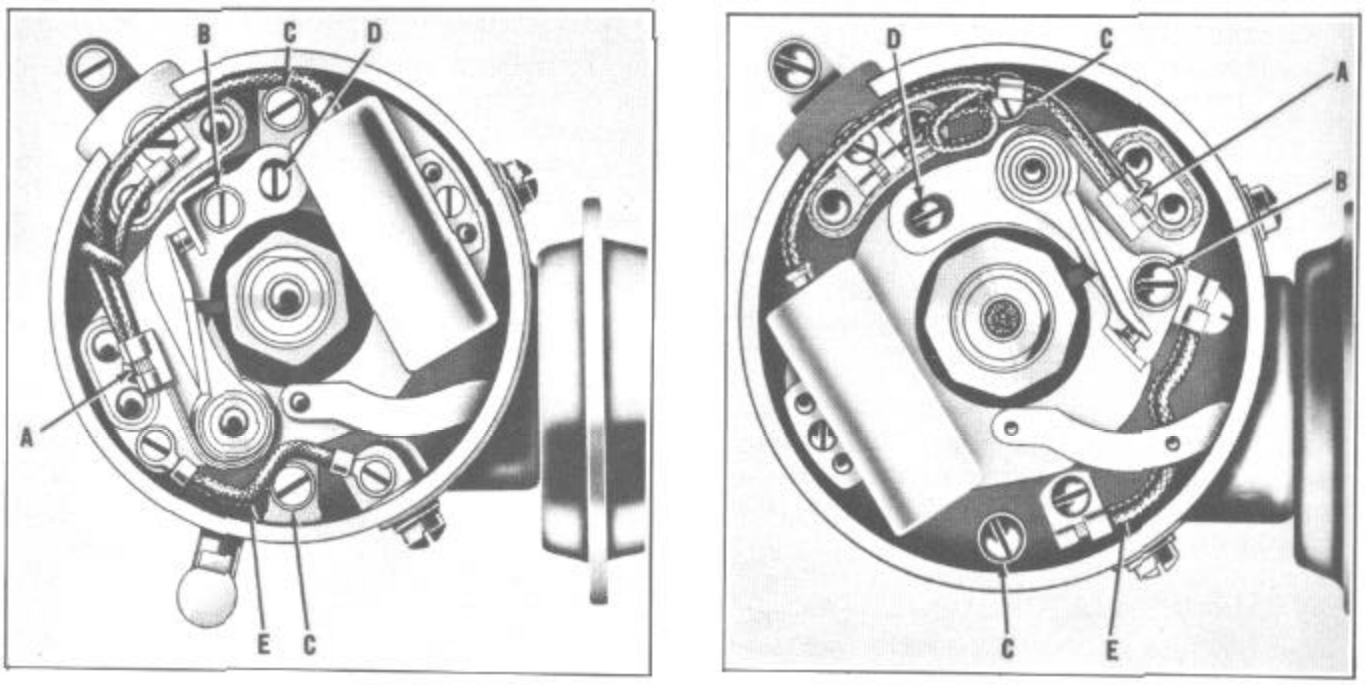



FIGURE 15

the correct gap is obtained. Distributor point gap is .017" on eight cylinder engines and .020" on six cylinder engines.

4. Tighten contact support lock screw and recheck point gap.

5. If necessary bend stationary contact to secure correct alignment.

**BREAKER POINT RENEWAL:**

1. Remove distributor cap and rotor.

2. Remove screw and clip (A), Figure 15, attaching breaker arm spring and remove breaker arm.

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

4. Install new stationary contact, but do not tighten lock screw.

5. Install new breaker arm.

6. Attach primary and condenser lead wires to breaker spring clip and attach clip to spring and plate

7. Adjust breaker point gap.

8. Check alignment of points. Bend the stationary contact if necessary to secure proper alignment and contact.

9. Check breaker arm spring tension. Hook a spring scale to the arm at the contact and pull at a right angle to the contact surface. Tension should be 17 to 20 ounces just as the contact separate.

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

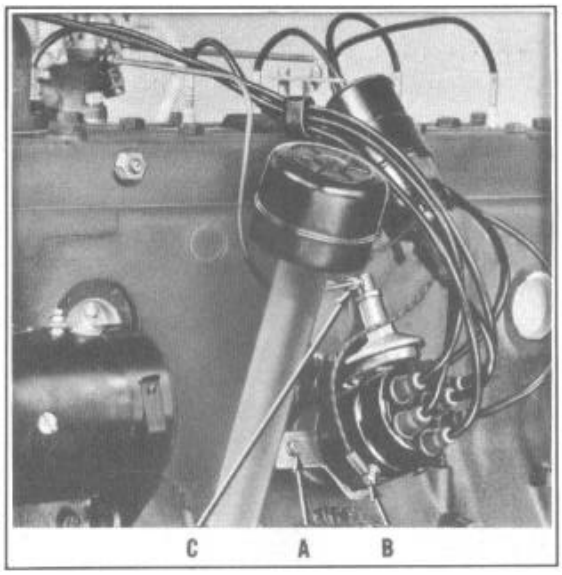



FIGURE 16

**DISTRIBUTOR REMOVAL:**

1. Remove wires from distributor cap and remove cap.

2. Disconnect vacuum line (C), Figure 16 and distributor primary wire (B).

3. Remove lock plate hold down screw @ attaching distributor quadrant to engine and remove distributor from engine.

**DISASSEMBLY:**

1. Remove rotor.

**NOTE: On 500 Models, remove breaker plate, Paragraph 6, with breaker points and condenser attached.**

2. Remove screw and clip (A), Figure 15, attaching breaker arm spring, primary lead, and condenser lead to breaker plate and remove breaker arm.

3. Remove condenser.

4. Remove stationary contact lock screw (B) and remove contact.

5. Remove vacuum control unit.

6. Remove breaker plate screws (C) and bearing retainer clips on Super and Commodore Models and lift out breaker plate. On 500 Models remove screws attaching distributor cap clips and screw attaching primary lead to distributor, and remove plate.

7. Remove oil wick from cam and remove hairpin retainer from oil well.

8. Pull cam off shaft.

9. Remove centrifugal weights and springs.

**NOTE: Use care to prevent distortion of springs.**

10. Drive pin from collar or gear on shaft below distributor housing and remove shaft from top of distributor.

**ASSEMBLY:**

1. Install new shaft and bushings in distributor base if clearance between shaft and bushings is greater than .005". Soak bushings in engine oil for. 15 minutes before installing shaft.

2. Install distributor shaft, thrust washer, collar or gear and pin.

3. Check distributor shaft end play for minimum of .003" and maximum of .010".

4. Install centrifugal weights and springs.

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

6. On super and Commodore Models, pack breaker plate bearing 1/2 full of high melting point grease and install breaker plate, bearing retainers and breaker plate screws. On 500 Models, install breaker points and condenser on breaker plate before installing plate. Install plate and distributor cap clips and screws and install primary lead screw. (Do not allow wire from breaker arm to primary terminal to ground on breaker plate.)

7. Install vacuum control unit.

8. Replace stationary contact, breaker arm, and condenser and adjust point gap.

9. Attach primary and condenser leads to clip on breaker arm spring and check spring tension.

**NOTE: Make sure ground wire (E), Figure 15, is securely attached to upper and lower sections of breaker plate and that condenser lead and mounting are tight.**

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

11. Replace rotor.

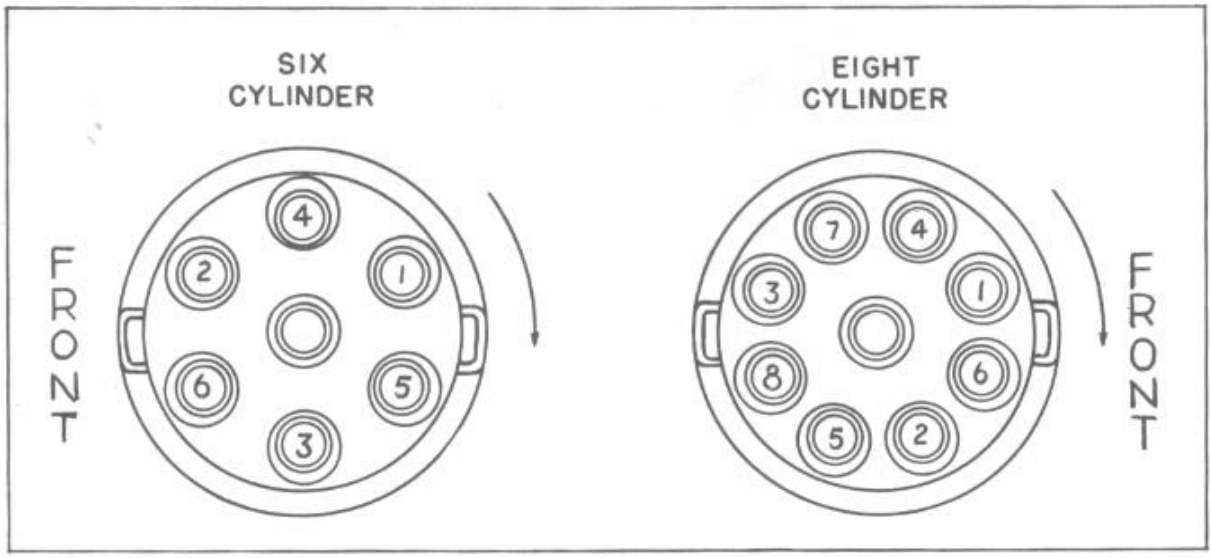



FIGURE 17

**INSTALLATION:**

1. Line up the first line before the UDC mark on the flywheel with the pointer on the flywheel housing, Figure 18, with No. 1 cylinder on compression stroke.

2. Set distributor rotor to point to No. 1 contact in the distributor cap, Figure 17.

3. Insert and engage distributor shaft.

4. Insert lock plate hold down screw attaching distributor quadrant to engine. Set distributor midway on the quadrant.

5. Replace distributor cap, secondary wire and spark plug wires, Figure 17.

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

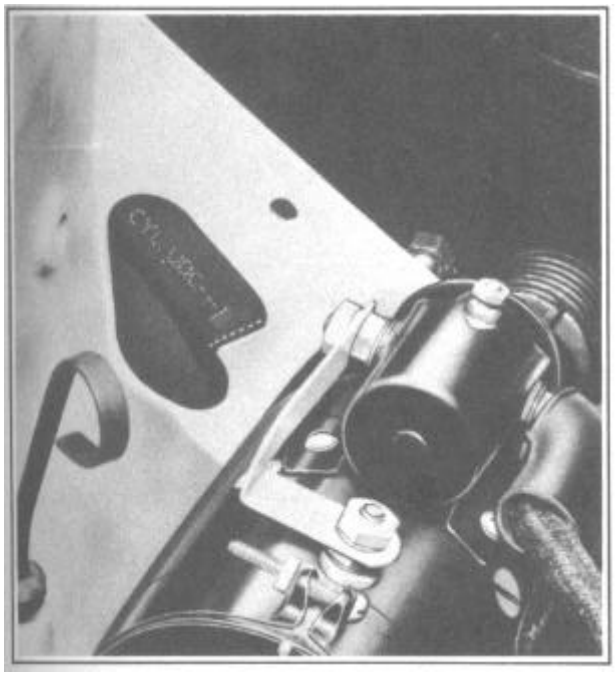


FIGURE 18

**IGNITION TIMING**

For average operating conditions both 8 and 6 cylinder engines should be set to fire at top dead center of the compression stroke at cranking speed. When the long mark before the UDC on the flywheel is lined up with the pointer, No. 1 piston is at top dead center.

The timing is advanced by rotating the distributor counter-clockwise. Clockwise rotation of the distributor retards the spark.

Ignition timing may be accurately set by using a neon timing light. Connect the timing light as recommended by manufacturer. Mark the long line on the flywheel (Figure 18) with white chalk and loosen the screw attaching distributor quadrant to engine. Operate the engine at idle speed with the timing light aimed at the flywheel opening and rotate the distributor until chalk mark lines up with the pointer. Tighten the quadrant screw and accelerate the engine. Chalk mark should move to the left of pointer as centrifugal governor advances the spark.

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

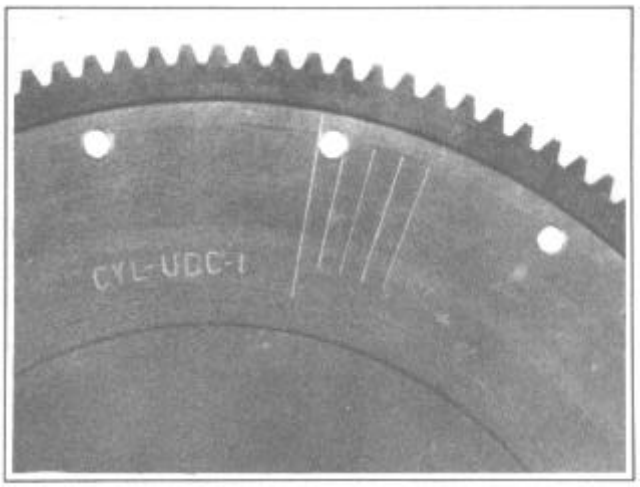



FIGURE 19

Correct ignition timing is indicated by a slight "ping" at about 15 MPH when accelerating at full throttle from 10 MPH in high gear. If no ping is heard, timing should be advanced one quadrant graduation mark at a time until the ping is heard. Under no circumstances should the pointer at the flywheel opening be more than one inch (first short mark) before the UDC mark when the spark occurs, Figure 19.

If too much ping occurs or if the engine pings at higher speeds, timing should be retarded by rotating the distributor clockwise one graduation at a time.

**NOTE: When a change is made from one grade of gasoline to another, or when the altitude at which the car is operated is changed considerably, ignition timing should be adjusted for efficient operation. With premium grade fuels or for high altitude operation, a more advanced spark setting may be used.**

## SPARK PLUGS

Spark plugs used on the 500 series Hudson's with cast iron heads are 14 mm plugs with a 3/8" thread length (Champion J-7). For aluminum heads a 14 mm plug with a 7/16" thread length is used (Champion H-10). Gaps on both plugs should be set at .032" . Check gap with a wire feeler gauge and adjust by bending the ground (side) electrode, Figure 20.

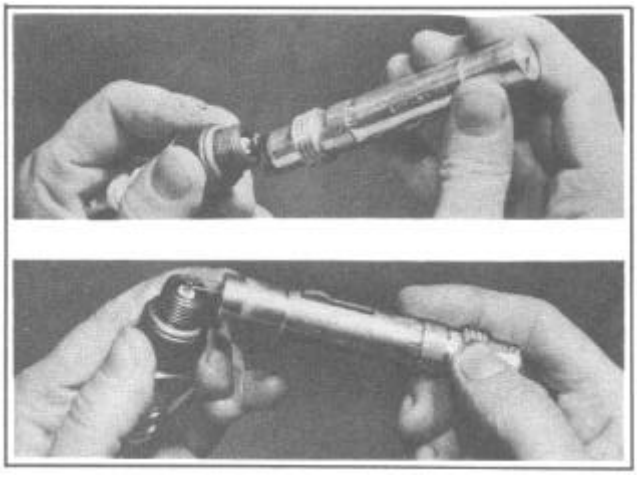


FIGURE 20

When replacing spark plugs always use new gaskets to assure correct seal. Seat the plug with the fingers and use a torque wrench to tighten Recommended torque is 25 to 30 foot pounds. If a torque wrench is not available, seat the plug finger tight (on a new gasket) and tighten 3/4 of a turn with a wrench.

Spark plug condition often indicates other engine trouble according to the nature and color of the deposit on the firing end of the plug as shown in the following table:

| DEPOSIT | CONDITION | |
|---|---|---|
| Brown-Powdery<br>Tan-Powdery | Normal<br>Normal | Operation with regular fuel. |
| White-Powdery<br>Yellow-Powdery | Normal<br>Normal | Operation with leaded fuel. |
| Black-Wet | Oil Fouled | Oil pumping or plug too cold. |
| Black-Fluffy | Gas Fouled | Air-fuel mixture too rich or plug too cold |
| White-Blistered | Burned Electrode | Air-fuel mix - ture too lean, incorrect ignition timing, leaking valves, or plug too hot. |

**HOT AND COLD PLUGS:**

Spark plugs specified above are for average operating conditions. If the car is operated under conditions resulting in consistently high engine temperatures, a colder plug should be used. If the car operates under conditions resulting in consistently low engine temperatures hotter plug may be indicated.

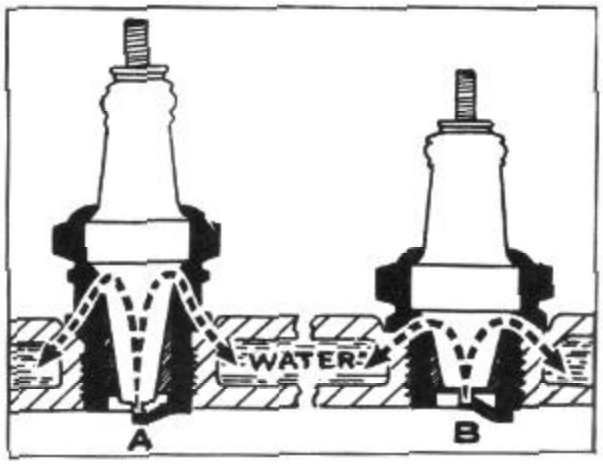



FIGURE 21

The heat range of a spark plug is determined by the distance from the tip of the insulator to the internal gasket through which the heat passes from the plug to the head. Plug A, Figure 21, is a hot plug; plug B, with a shorter heat transfer path, is a cold plug.

### CONDENSER

A six volt condenser is used in conjunction with the distributor breaker points to prevent arcing at the contacts. On eight cylinder models 503 and 504 and Pacemaker Six model 500 a .20 to .25 microfarad condenser is used. On six cylinder models 501 and 502 a .25 to .28 microfarad condenser is used.

The condenser is mounted in the distributor, and the condenser lead is connected to the breaker arm spring by the same clip attaching the primary lead. The condenser body is grounded to the breaker plate by the mounting screw.

Contact pitting will result if a condenser of incorrect capacity is used. The breaker contacts should be examined, and if the pit mark is on the breaker arm (negative), the condenser is under capacity. If the pit is on the stationary contact (positive), the condenser is over capacity.

Condensers may be tested for capacity (microfarads) by a suitable condenser tester. No current should pass through the condenser, and a check for broken insulation may be made with a test lamp; but a tester is necessary to check for leakage through the condenser and for resistance to breakdown.

### COIL

The ignition coil used on model 500 is Auto-Lite CR-6012-A; other models use Auto-Lite CE-6006-A. The coil provides a means of stepping up the six volt primary current to high voltage necessary to jump the spark plug gap. The primary winding of the coil is connected to the battery through the ignition switch and to ground through the distributor contact points. The secondary winding of the coil is connected to the spark plugs through the rotor and distributor cap.

If a coil tester is not available, a coil may be checked by comparing the length of the spark with the spark from a standard coil of the same make and type. The coil should be checked both hot and cold.

To heat the coils, connect the primary of the coil to be checked in series with the standard coil across a 12 volt battery. Ground the secondary windings and heat both coils at about 5 amperes for 5 minutes.

To check the spark length, hold the secondary leads a short distance from the ground and make and break the primary connection to the battery.

Internal repairs cannot be made to the coils; in case of a defective coil, it is necessary to replace the complete coil.

## HEADLAMPS

The headlamps are the "Sealed Beam" type, designed so that the bulb, reflector, lens, and the gasket are assembled in one securely sealed unit making them dust and moisture free, Figure 22.

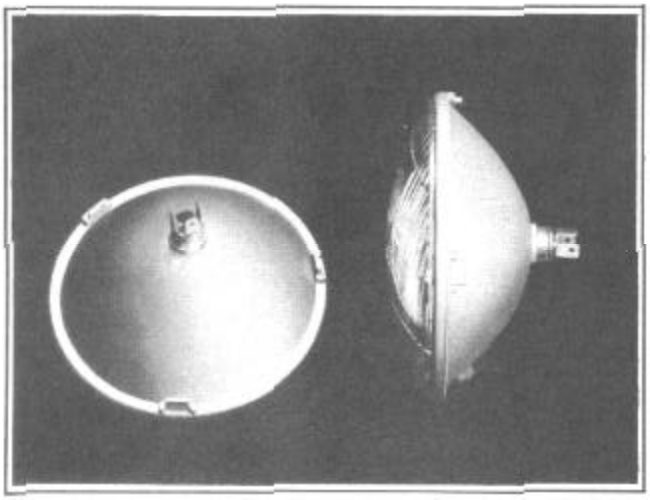


FIGURE 22

When the filament burns out or the lens breaks, the entire unit is discarded and a new one installed, thereby assuring maximum lighting efficiency through the life of the car.

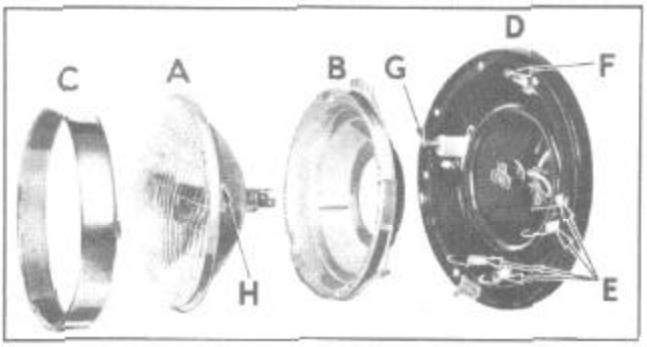



FIGURE 23

The Sealed Beam reflector unit (A) Figure 23 is held to a sub-body (B) by the retainer (C) and three screws. The sub-body (B) forms a ball and socket joint with the lamp housing (D) and is held to the housing by four coil springs (E) plus the vertical adjustment screw (F) and the horizontal adjustment screw (G).

The three locating lugs (II) are located so that the reflector unit can be mounted in only one position.

The Sealed Beam units are interchangeable right and left.

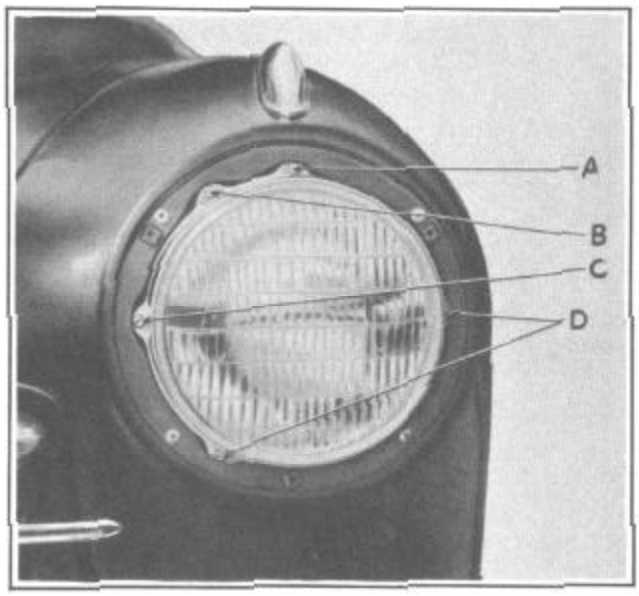



FIGURE 24

## SEALED BEAM UNIT

**REPLACEMENT:**

1. Remove headlamp lens rim by taking out the three screws.

2. Loosen, but. do not remove, the three screws (B) and (D), Figure 24, holding the retainer. Do not disturb the aiming screws (A) and (C) at the top and left side of the unit.

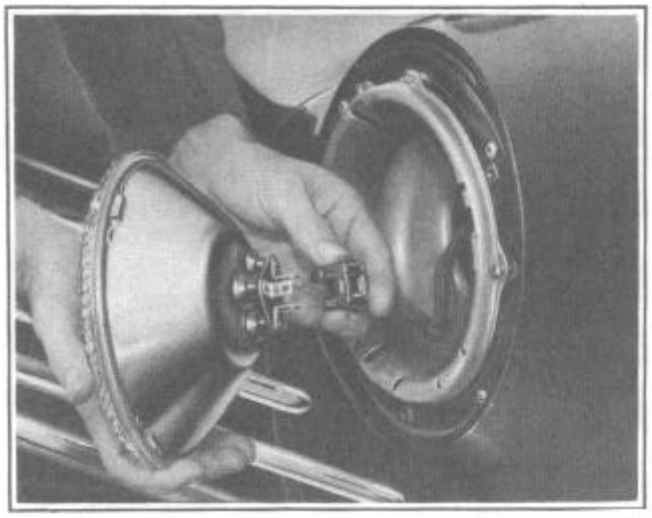


FIGURE 25

3. Remove retainer by rotating counter -clock-wise, allowing the Sealed Beam unit to be removed.

4. Remove the reflector plug from the unit as shown in Figure 25.

5. Install new unit by reversing above operations.

**HEADLAMP AIMING**

Place the car on a level surface with a light colored vertical screen 25 feet ahead of headlamp lens.

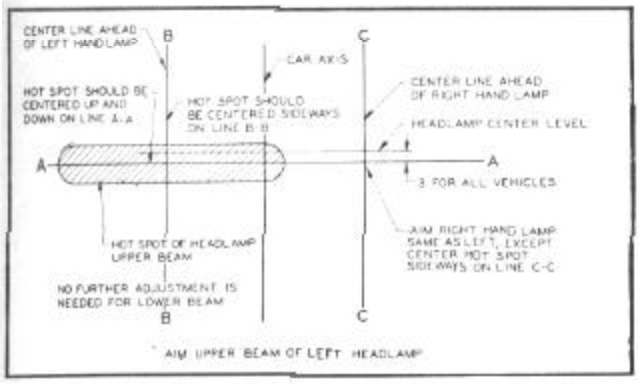



FIGURE 26

Draw a horizontal line on this surface at the level of a point 3" below the headlamp center, as shown in Figure 26. This line is 26-3/4" above the floor line. If, however, your state requires a loading allowance, draw this horizontal line below the above line by whatever amount that is required in your state.

Locate center of car by sighting through the center of the rear window along the right and then along left of windshield center bar and mark these two points on the horizontal line. The point midway between these two lines is the center of the car which should be temporarily located on the screen.

Draw vertical lines (B-B) and (C-C), on the screen to the right and left of the center line at a distance equal to one-half of the center to center distance (28 inches) between the two lamps.

Place dimmer switch in position which produces highway (upper) beam on screen.

Remove headlamp lens rim.

Move the light beam to the right or left by turning the horizontal adjustment screw (C), Figure 24. Raise or lower the beam by turning the vertical adjustment screw (A).

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 26, 3" below the head-lamp center, and the vertical line directly ahead of the lamp.

Repeat the operation for the other lamp. No further adjustment is needed for the traffic (lower) beam.

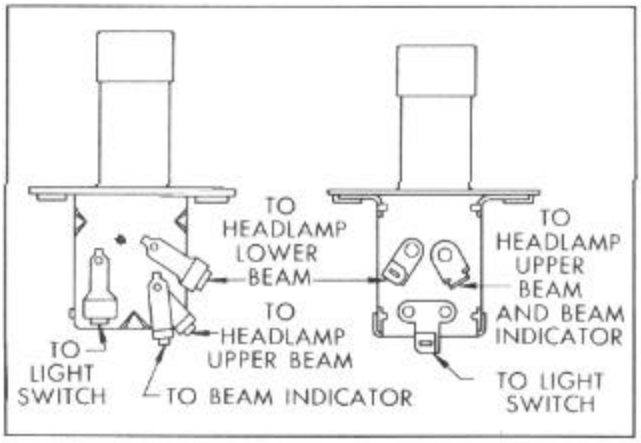



FIGURE 27

**DIMMER SWITCH**

The headlamp beam is controlled by a foot operated dimmer switch mounted in the floor panel. Dimmer switches have two single terminals and a double terminal, Figure 27. The single terminals connect to the battery and the headlamp lower (dim) beam. The double terminal connects to the headlamp upper beam (bright) and to the beam indicator lamp on the instrument panel.

**DIMMER SWITCH CHECK:**

1. Disconnect all wires from the dimmer switch.

2. With the light switch on, connect the dimmer switch battery wire to a test lamp and ground the other lamp terminal, Figure 28.

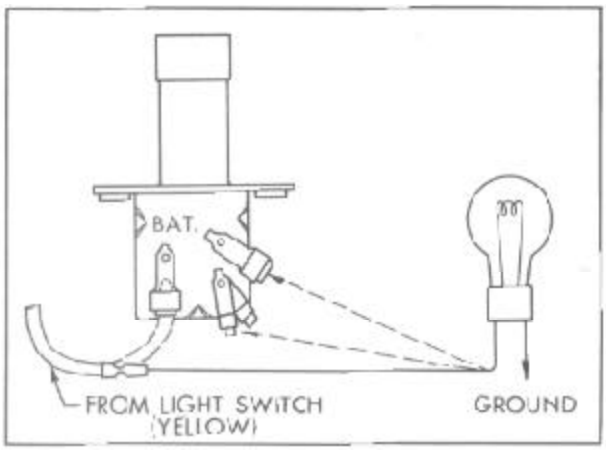



FIGURE 28

3. Correct the circuit to the dimmer switch if lamp does not light.

4. If lamp lights, replace the switch battery wire and touch one lamp lead to the double connector and ground the other lead.

5. Operate the dimmer switch. Lamp should light in one switch position and not in the other. Repeat with lamp connected to the low e r beam terminal. If switch fails to turn the lamp on and off from each terminal, replace switch.

## CIRCUIT BREAKERS & FUSES

The main circuit breaker is incorporated in the car headlight switch and is connected to an auxiliary circuit breaker by a jumper wire.

The auxiliary circuit breaker is located on the steering column brace under the dash panel.

**NOTE: WHEN ACCESSORY ITEMS SUCH AS CLOCK OR CIGAR LIGHTER ARE INSTALLED, THEY MUST BE CONNECTED AS SHOWN IN THE WIRING DIAGRAM .**

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

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

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

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

Drivemaster - Ten ampere fuse in the drive-master control switch on the instrument panel.

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

## HORNS

Two electric air horns are standard equipment on all models except the 500. A second horn is available as an accessory for this model.

The horn is operated by a magnetic type motor which consists of a field, armature, and a set of breaker points which interrupt the flow of current in the coil.

The armature is securely attached to the diaphragm.

Interruption of the current in the coil causes the diaphragm to vibrate which produces the sound.

The twin horns are constructed in such a manner as to produce different tone frequencies and the frequencies of each horn are synchronized to produce a harmonious tone when the horns are sounded together.

The major items that govern the frequencies of tone are as follows:

1. The form and thickness of diaphragm.

2. The weight attached to diaphragm.

3. The length of the air column.

4. The air gap setting between field and armature.

.

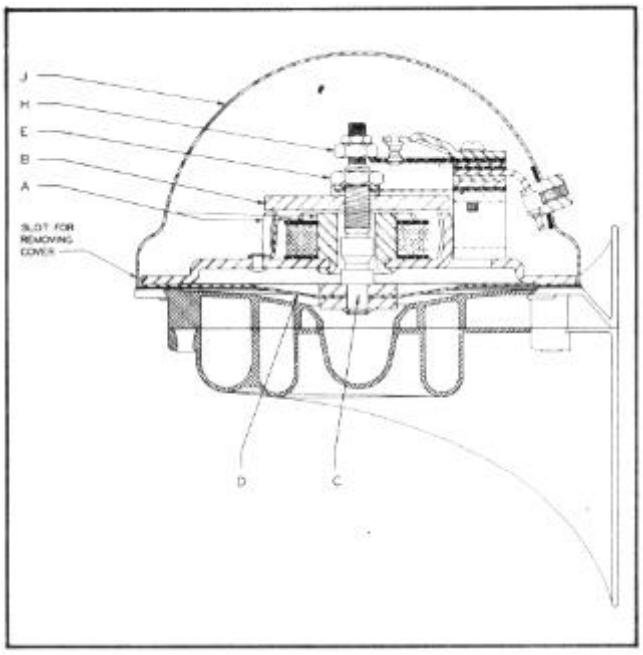



FIGURE 29

Adjustment of horn tone qualities is very seldom necessary; however, if an adjustment of tone is desired, proceed as follows:

**NOTE: It is advisable to have only one horn connected when the following adjustment is being made. Remove the wire at the horn relay from the horn not being adjusted. Proceed in this manner with each horn, and after each horn has been tested, connect both to relay and sound together, then replace cover "J", Figure 29.**

1. Remove cover (J) by inserting a screw driver in opening provided at edge of cover.

2. With car engine running at proper RPM to deliver the maximum charging rate, loosen the lock nut and turn the adjusting nut (H) up or down until the desired tone is obtained.

3. After adjustment is made, be sure to tighten lock nut against the adjusting nut (H).

The air gap between field "A" and the armature "B" should be:

.027" to .029" on the high horn.
.032" to .034 on the low horn.

The armature (B) is threaded on to diaphragm stud (C) which is attached to diaphragm (D). Armature (B) is locked in the desired position by lock nut (E). Therefore, to set air gap between field (A) and armature (B) loosen lock nut (E) and turn armature (B) in a clockwise direction to decrease air gap and counter-clockwise to increase air gap. Tighten lock nut (E) securely before checking gap. Gap can be checked with standard feeler gauge. The armature (B) should be approximately parallel with the field (A). If it is out of alignment, it may be corrected with a hammer and punch by tapping the armature down on the open side.

After the air gap has been properly adjusted, it is necessary to readjust nut (H) to obtain maximum volume and the best one. If for any reason the front housing and air column assembly has been removed, care should be taken when replacing it to see that the gasket between the diaphragm, front housing, and air column assembly is in good condition.

A new gasket is recommended as any air leak in the air column reduces the volume and quality of tone.

The short air column is used in conjunction with the thick diaphragm for the high horn. The lo n g air column is used in conjunction with the thin diaphragm for the low horn.

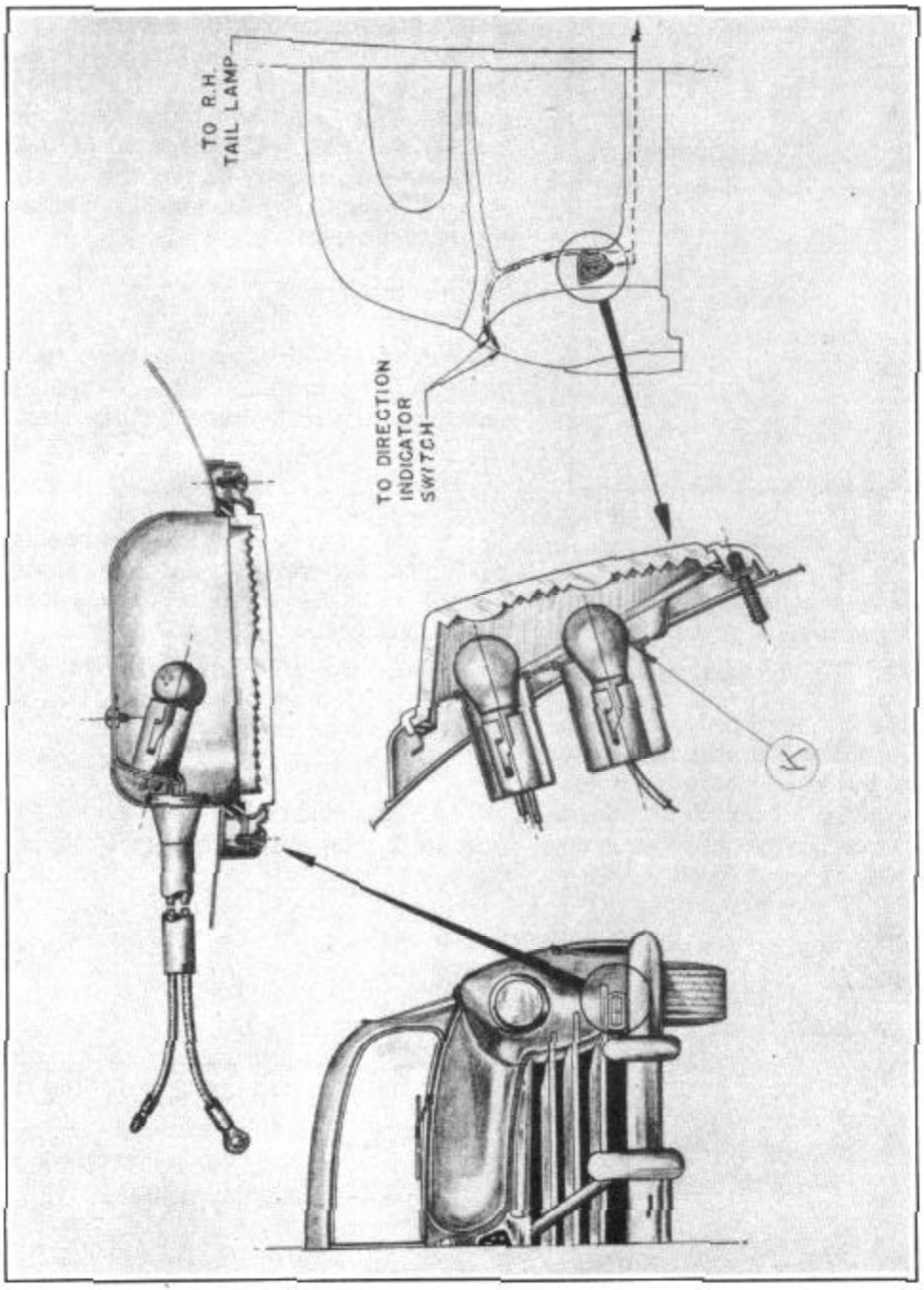



FIGURE 30

# DIRECTION INDICATOR

The direction indicator switch is operated by a lever located on the steering column and this lever is turned manually in the same direction that the steering wheel is to be turned (up for right or down for left turn). The switch turns off automatically as the turn is being made. If the lever is turned to signal for one direction but the turn is made in the opposite direction, the switch will be turned off automatically as the turn is made.

A jeweled light on the left end of the instrument panel flashes to indicate unit is operating.

## INDICATOR LAMPS AND WIRE HARNESS (REAR)

**INSTALLATION:**

1. Assemble the direction indicator light sockets to tail lamps by plugging into the provided opening shown at K, Figure 30, according to the following identification:

   Right side wire - yellow
   Left side wire - blue

2. Clip rear indicator wires to deck opening trough by existing clips and follow the trough to the left corner of deck opening as shown in Figure 30.

3. Remove left rear door scuff plate on sedan or left door scuff plate on broughams and coupes.

4. Starting from in front of rear door lock pillar between frame and rocker panel, insert a fish wire at point A, Figure 31, which is between the rear pillar and fender and above the fender to frame seal. Guide the fish wire upward and back between the wheelhouse and fender to project into the rear compartment. Attach the rear wire harness to the fish wire and withdraw the fish wire.

5. Install loom (3/8" I.D. x 6" long) over wire harness to protect wires at base of pillar shown at A, Figure 31.

6. At the left front fender wheel opening, lift the lower outside corner of the rubber stone guard and insert a fish wire between the r o c k e r panel and frame at a point shown at B, Figure 31. Guide fish wire back through to where scuff plate has been removed. Attach wire harness to fish wire; then withdraw fish wire.

7. F r o m the engine compartment, enter a fish wire through the opening between dash panel and stone guard (C) Figure 31. Guide the fish wire down till engaged with the wire harness. Then withdraw the fish wire, bringing the wire harness out through opening shown at C, Figure 31.

8. Enter the rear wire harness through the existing grommet in the dash panel shown at D, Figure 31, and pull through from inside the car.

9. Wrap a strip of electrical friction tape around the rear wire harness and lay the tape across the top of frame at a location c e n t e r e d with the scuff plate attaching holes shown at E in Figure 31.

10. Reinstall scuff plate.

## INDICATOR LAMPS AND WIRE HARNESS (FRONT)

**INSTALLATION:**

1. Remove the front fender parking light lens and bezel assemblies by extracting the two screws on face of bezel. (See Figure 30).

2. Remove the socket bracket and wire assemblies by extracting the screw on the back face of the lamp housing and disconnecting the wire terminals at junction block. Then pull the wire out through the rubber grommet in lamp.

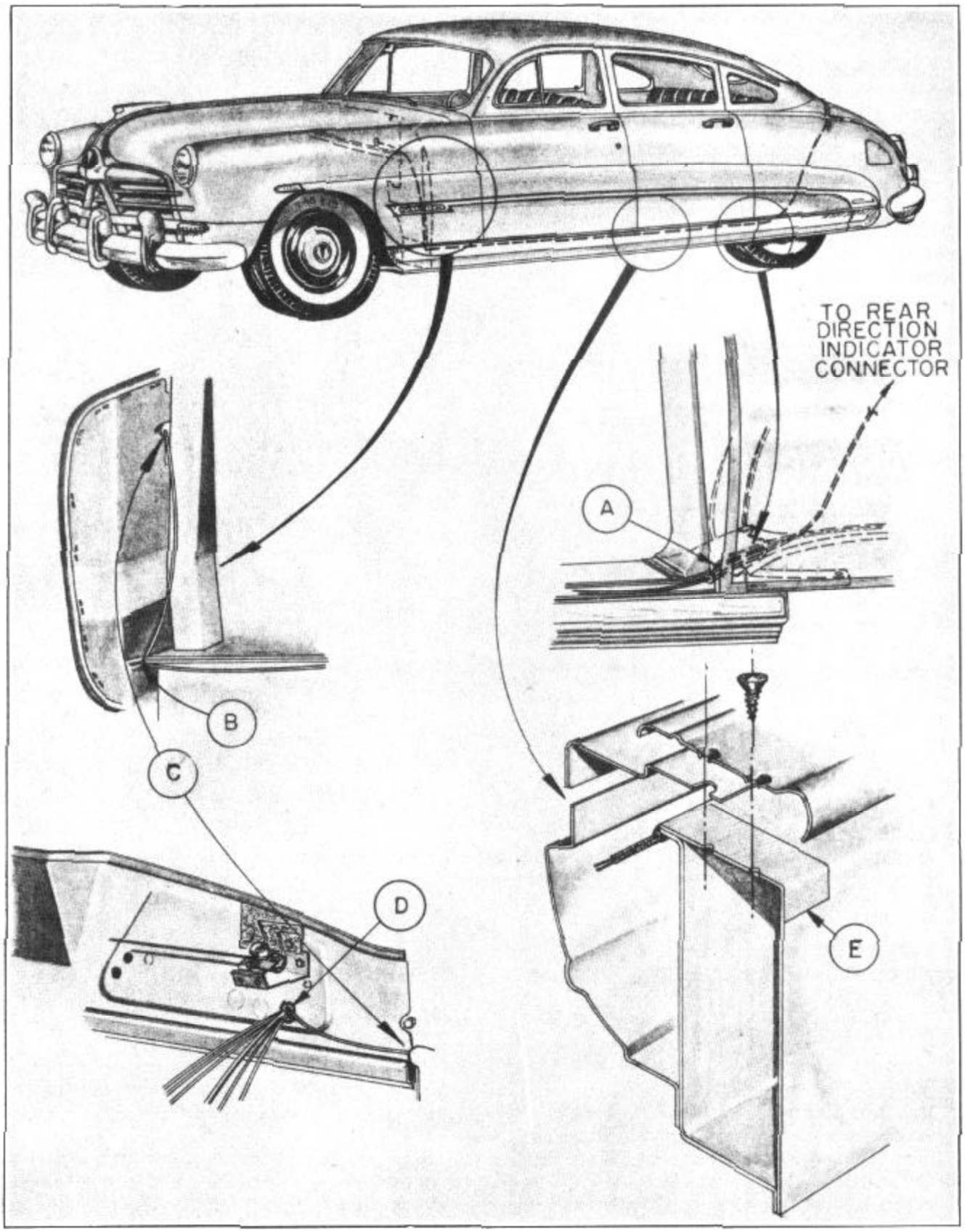



FIGURE 31

3. Install the socket bracket and wire assemblies to parking lamp housings and tighten the socket bracket retaining screw securely. Then attach the white insulated wire to the parking light terminal of junction block.

4. Install bulbs in sockets and reassemble the lens and bezel assemblies.

5. Install a connector to each of the direction indicator wires from the parking lights,

6. To the right hand connector attach the terminal of the yellow jumper wire and clip with the existing clips used for the head-lamp wires in the path followed to the left hand junction block. Then attach a connector to the terminal of the yellow jumper wire.

7. To the connector of the yellow jumper wire insert the terminal of the yellow wire of the front indicator wire harness. To the left hand indicator light wire (blue) connector, insert the blue wire terminal of the
front indicator wire harness.

8. Attach the front wire harness to the existing clips used for the headlight wires on the left front fender side dust shield.

9. Enter the wire harness through the existing grommet shown at D, Figure 31. Then pull through from inside of car.

## JACKET TUBE AND SWITCHES

**INSTALLATION:**

1. Remove steering wheel and jacket tube.

2. Install jacket tube and bearing assembly contained in direction indicator kit.

3. Install direction indicator steering column switch and conduit assemblies to the upper gear shift support.

**NOTE: Indicator switch case and cover assembly replaces the upper control lever tube bracket.**

4. Insert rubber part No. 301852 between the steering column and switch wires under the conduit. See (A) Figure 32.

5. Install the steering column bracket cap over the conduit.

6. Tighten the steering column bracket bolts securely.

7. Clamp wires from steering column switch with clamp attached to the steering column brace as shown in Figure 32.

8. Install flasher switch in the hole located at rear of auxiliary circuit breaker in the steering column brace. See Figure 32.

9. Use a letter F drill and drill a .257" diameter hole through the instrument panel for the jeweled light. Locate hole 3 inches from left end of instrument panel and 5/8" down below instrument panel upper bead.

10. Assemble the jewel light and retainer to instrument panel.

11. Drive the two tapered switch trip pins into the holes in the steering wheel hub.

12. Install the steering wheel.

## STEERING COLUMN AND FLASHER SWITCHES

**WIRING INSTRUCTIONS:**

1. Insert the yellow wire terminals of the front and rear harnesses and the yellow switch wire into a double connector.

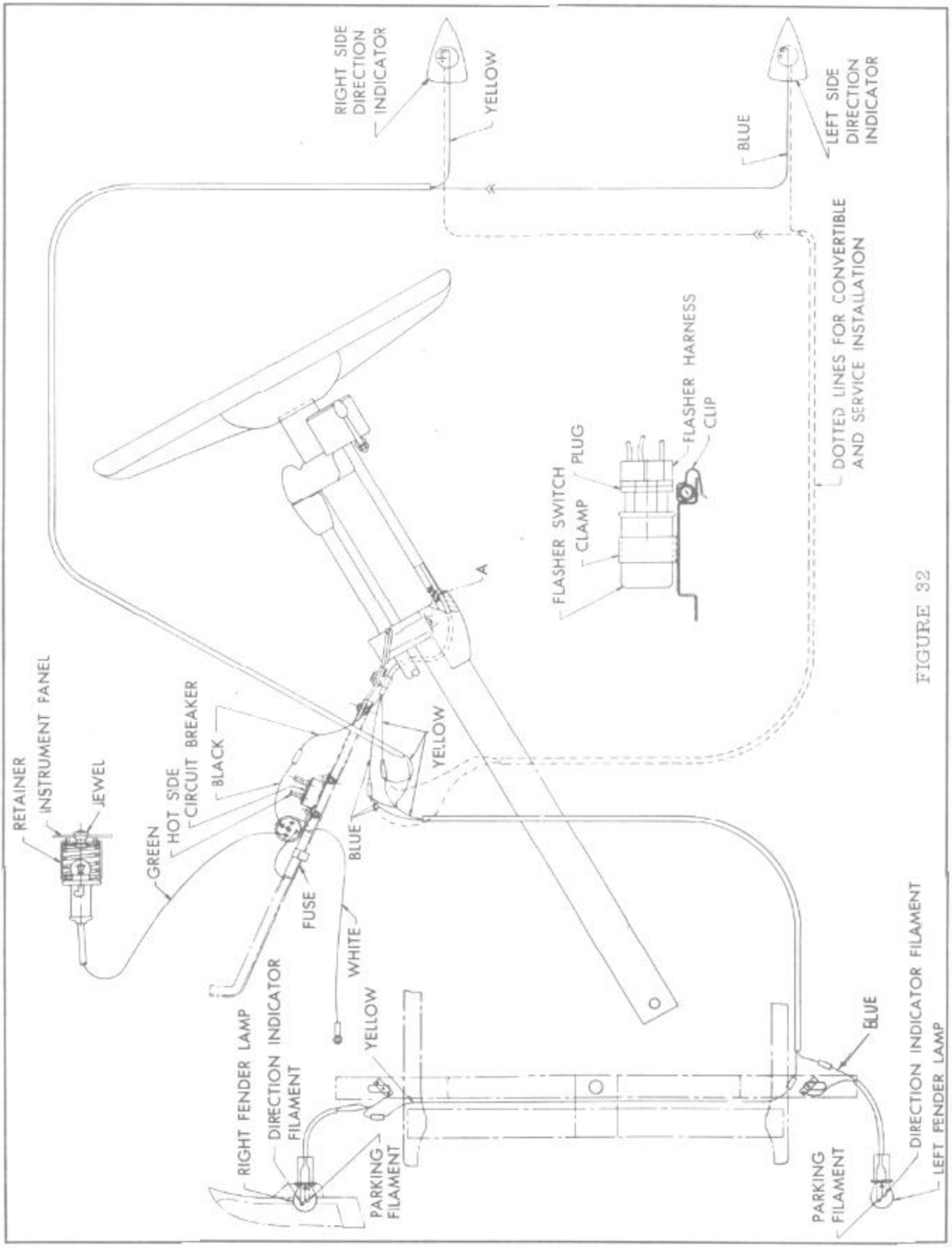

RIGHT SIDE DIRECTION INDICATOR
YELLOW
BLUE
LEFT SIDE DIRECTION INDICATOR
DOTTED LINES FOR CONVERTIBLE AND SERVICE INSTALLATION
FLASHER HARNESS CLIP
PLUG
FLASHER SWITCH
CLAMP
A
RETAINER
INSTRUMENT PANEL
JEWEL
HOT SIDE CIRCUIT BREAKER
BLACK
GREEN
FUSE
BLUE
YELLOW
WHITE
YELLOW
RIGHT FENDER LAMP
DIRECTION INDICATOR FILAMENT
PARKING FILAMENT
BLUE
DIRECTION INDICATOR FILAMENT
LEFT FENDER LAMP
PARKING FILAMENT

FIGURE 32

2. Insert the blue wire terminals of the front and rear harnesses and the blue switch wire into a double connector.

3. Assemble a single connector to the black wire of the flasher switch and join to the black wire of the steering column switch.

4. Plug flasher light into the jewel retainer.

5. Connect the white wire from the positive post of the flasher switch to the battery side of the temperature gauge.

**NOTE: For complete illustration of wiring, see Figure 32.**

## DIRECTION INDICATOR SWITCH

**ELECTRICAL CHECK:**

1.Disconnect switch wires from connectors under instrument panel.

.

2. Connect black wire to hot side of circuit breaker.

3. Connect one lead of test lamp to blue switch wire and ground the other lamp lead. Move switch lever down and lamp should light.

4. Connect one lead of test lamp to yellow switch wire and ground the other lamp lead. Move switch lever up and lamp should light.

5. If lamp fails to light in either position, switch should be replaced.

**MECHANICAL CHECK:**

**NOTE: For proper operation of direction indicator, steering wheel must be properly installed in straight ahead position on steering column**.

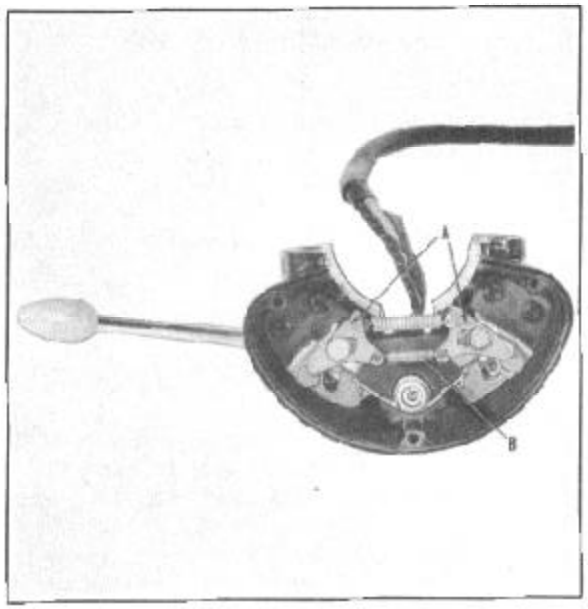


FIGURE 33

1. Remove switch case cover and check canceling pawls (A), Figure 33, to see that they slide freely. Apply a small amount of vaseline to slot in each pawl.

2. Move switch lever up and turn steering wheel 1/2 turn right. Canceling pin in steering wheel hub should strike and pass left pawl without moving switch. The pawl spring (B) should return the pawl to extended position when the pin clears.

3. If canceling pawls do not return to extended position, pawl may be binding on pawl lever. Examine spring attaching loop on pawl and see that open end of loop is bent up - not down. If pawl still fails to return, pawl spring may be weak. Spring may be removed and shortened.

4. Return wheel to straight ahead position. Canceling pin should strike pawl and disengage switch.

5. Repeat test with switch lever down and turn wheel left.

6. If switch fails to operate properly, canceling pin in wheel hub may be too short or bent.

7. Move switch lever up and turn wheel turn left. Pin should strike left pawl and disengage switch.

8. Repeat with switch lever down and turn wheel right. Pin should strike right pawl and disengage switch.

9. If pin fails to strike pawl, pin may be too short or bent.

**NOTE: Switch lever must NOT be held in position while steering wheel is turned. If lever is held, canceling pawl may be locked on the trip lever and switch will cancel in one direction only. The additional tension on the canceling lever spring may cause the switch to change to the opposite direction when cancelled.**

**REMOVAL:**

1. Remove three switch wires from clip under instrument panel and disconnect wires at connectors.

2. Remove two Phillips head screws attaching switch case to control lever tube bracket .

3. Loosen steering column bracket cap at instrument panel and remove switch wire cover.

4. Remove switch case and wire assembly.

**INSTALLATION**:

Reverse procedure of removal. Connect switch wires to harness wires of same color.

## DIRECTION INDICATOR FLASHER UNIT

The direction indicator flasher unit is mounted under the instrument panel forward of the circuit breaker. The flasher unit contains two sets of breaker points. One set makes and breaks the circuit to the pilot light on the instrument panel to indicate that the unit is operating. Pilot lamp flashes only when both lamps in either left or right circuit are operating. The other set of points alternately inserts and removes resistance in the circuit to the direction indicator lamps, flashing the lights.

**FLASHER UNIT CHECK:**

1. Remove clamp attaching flasher unit to brace and remove Essex plug from flasher.

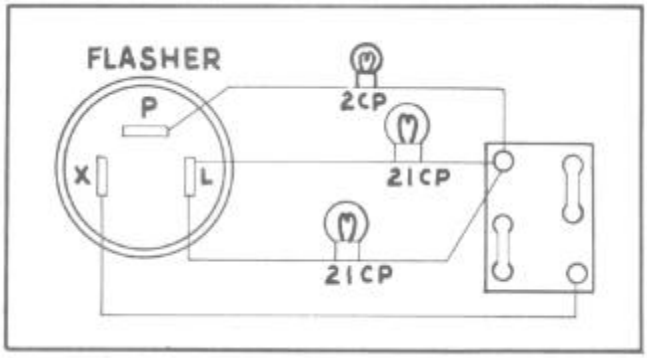



FIGURE 34

2. Connect a six volt battery to terminal marked "X", Figure 34.

3. Connect two 21 C.P. test lamps in parallel to terminal marked "L" (Lamps) and to the battery. Lamps should flash on and off.

4. With above lamps connected, connect a 2 C.P. test lamp to terminal marked "P" (pilot) and to the battery. All lamps should flash on and off.

5. Disconnect one 21 C.P. test lamp. Pilot test lamp should go out and remaining 21 C .P. lamp flash rapidly.

6. Replace flasher unit if defective.

**NOTE: If direction indicator lights flash too rapidly, the front indicator lamp is reversed, placing the parking filament in the indicator circuit and increasing the circuit resistance, or only one lamp is operating.**

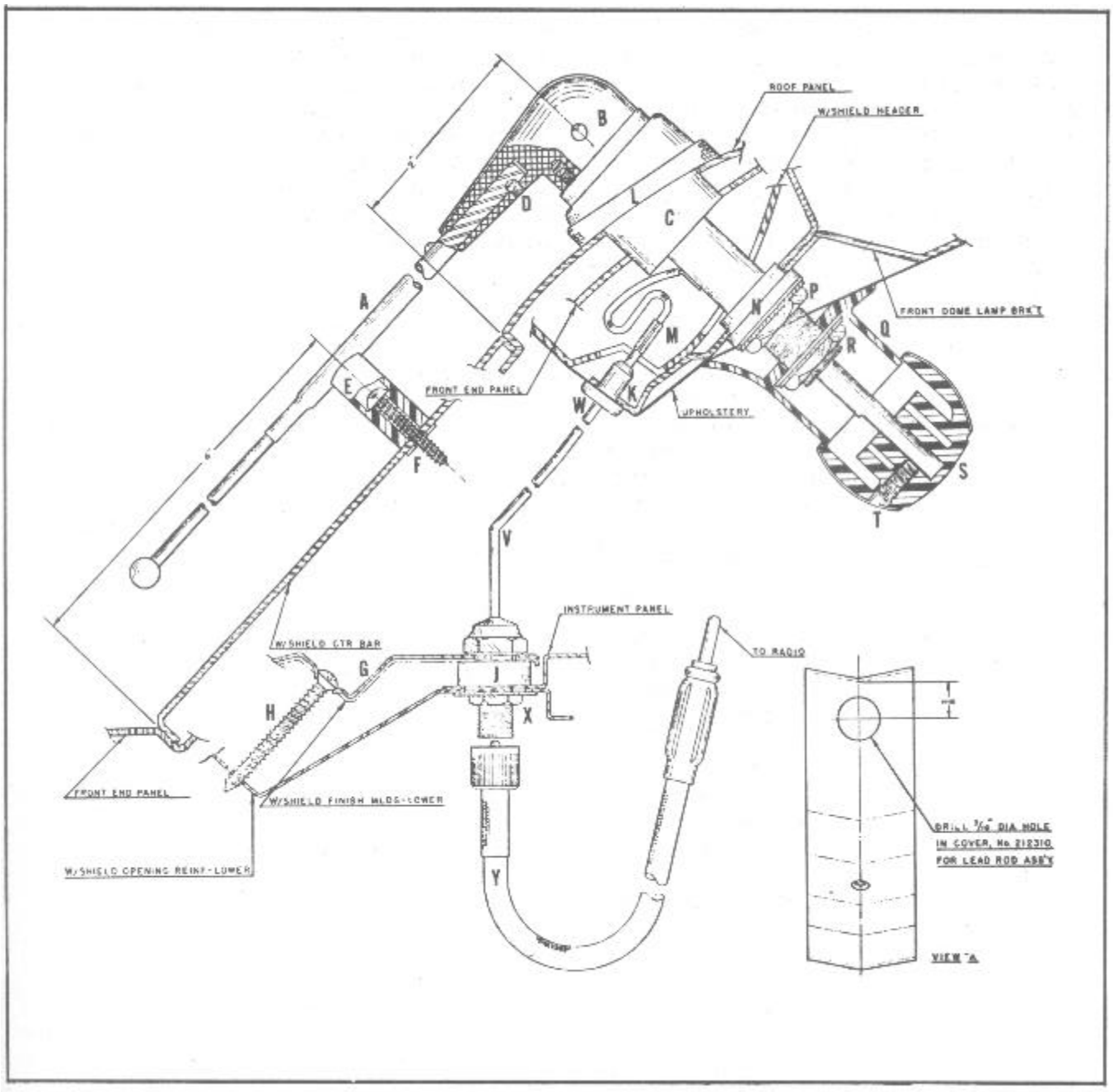



FIGURE 36

**RADIO ANTENNA**

**INSTALLATION:**

1. Insert tube and rod assembly (A) into arm (B) of control assembly (C) and lock securely in place with set screw (D).

2. To mount stop (E), drill a No. 31 (.120) hole (F) in the windshield center bar 4" from the cowl panel. Mount the stop with screw as shown.

3. On centerline ridge of roof panel, drill a 1-1/8" diameter 2" above windshield center bar for control assembly. Inside the car, remover mirror and locate a 1/4" diameter hole (K) which can be felt through the upholstery in the bottom tab of the front dome lamp bracket. Pierce the upholstery at this point with a pencil.

4. To mount control assembly, first assemble rubber insulator pad (L) over the bakelite insulator of the control assembly. Note the word "Top" on the under-side of the pad for correct positioning. Tie a piece of string approximately 12" long onto the contact (M) on the control assembly. Thread the string through the roof panel, front end panel and into the interior of the car by way of the hole previously pierced in the upholstery. With the tube and rod assembly in a line parallel to the windshield center bar, push the control assembly through the 1-1/8" diameter hole in the roof panel. Where the assembly pushes against the upholstery on the inside of the car, make a slit approximately 5/8" long. Pull the assembly through, making sure that the rubber insulator pad (L) is in correct position.

5. Assemble bushing (N) over the threaded sleeve so that it fits into hole in front dome lamp bracket as shown. Slip flat washer and lock washer over the sleeve and secure with hex nut (P). Tighten assembly in place so that the tube and rod assembly rests in the stop as shown.

6. Position the escutcheon plate (Q) so that it comes flush with the upholstery and secure with flat washer, lock washer and hex nut (R). Do not tighten the hex nut too much or the plastic escutcheon plate may distort or crack.

7. Place knob (S) on end of shaft. The arrow will point in the direction of the tube and rod assembly. Fasten the knob to the shaft with set screw (T).

**NOTE: The tube and rod, when in "down" position, must rest in the stop. If it does not seat completely, lift the arm about 900 from the windshield and remove the screw (U) from the under-side using the Bristol wrench. Thread screw into the hole diagonally opposite in the arm. If the mast rests too heavily in the stop, the screw in its original position can be backed slightly out of its hole to raise the mast from the stop.**

Remove joint cover (G) from instrument panel by taking out screw (H). Drill a 7/16" diameter hole in joint cover as indicated in view "A". Position spacer (J) on instrument panel and re-install joint cover. Leave the screw a little loose.

9. To mount lead rod (V), first pull contact (M) through upholstery and insert the upper end of the lead rod. Push contact back through upholstery and through the bracket, pressing the bushing (W) firmly into the 1/4" diameter hole in the front dome lamp bracket.

10. Insert the threaded sleeve of the lead rod through the 7/16" diameter hole in joint cover, spacer and instrument panel. From the under-side of the dash board, assembly the lock washer and hex nut (X). Tighten securely. Finally tighten the screw in the upper face of the joint cover. Replace the mirror.

11. Assemble the lead-in cable assembly (Y) by screwing the coupling nut on to the sleeve of the lead rod. Make certain that the male pin is directed straight into the female contact in the lead rod. Insert cable plug into socket in radio.

# SECTION 7
# CLUTCH
## SPECIFICATIONS

| | 9" Clutch | 10" Clutch |
|---|---|---|
| Type | Single Plate in Oil | Single plate in Oil |
| Fluid used | Hudsonite Compound | Hudsonite Compound |
| Amount of fluid | 1/3 pint | 1/3 pint |
| Filler plugs | Front of flywheel | Front of flywheel |
| Plate facing. . . | Cork inserts | Cork inserts |
| Number of corks | 90 | 108 |
| Pilot bearing | Ball | Ball |
| Throwout bearing | Ball | Ball |
| Engaging fingers | 3 | 3 |
| Throwout bearing | | |
| Lubricant | Chassis lube | Chassis lube |
| Lube fitting | Right side of clutch housing | Right side of clutch housing |
| Clutch pedal free play limits (measured from underside of floorboard to face of clutch pedal lever) | 1-1/4" - 1-3/4" | 1-1/4" - 1-3/4" |
| Engaging springs: | | |
| Inner | 6 | 3 |
| Outer | 9 | 12 |
| Engaging spring tension (Compressed to 1-5/8"): | | |
| Inner | 75-85 lbs. | 75-85 lbs. |
| Outer | 130-140 lbs. | 130-140 lbs. |
| Tightening Torque (both clutches): | | |
| Throwout finger retainer nuts | | 40-45 ft. pounds |
| Cover cap screws | | 20-25 ft. pounds |
| Cover driving lug nuts (10" only) | | 40-45 ft. pounds |
| Clutch housing cap, screws | | 40-45 ft. pounds |
| Flywheel bolt nuts | | 20-25 ft. pounds |

## CLUTCH

Clutches used in the 500 series Hudson's except Model 500, are the same as the 480-490 series.

Model 500 has as standard equipment a 9 fluid cushioned, cork insert, clutch, Figure 1, Model 500 with Drive-Master uses the same 10" clutch, Figure 2, as on other models. On the 9" clutch the pressure plate is driven by three lugs pressed into the flywheel. On the 10" clutch the pressure plate is driven by lugs attached to the clutch cover.

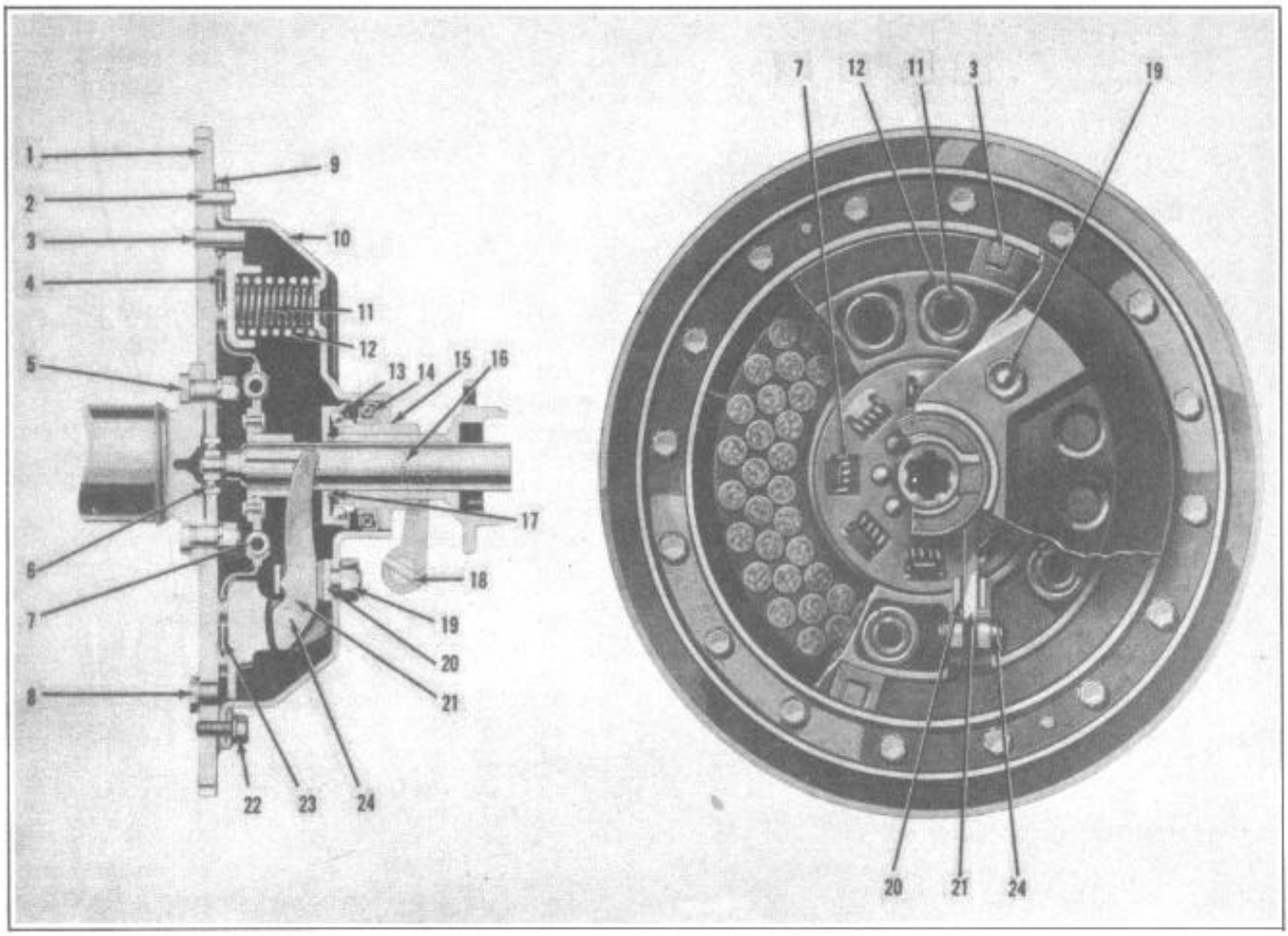



FIGURE 1

1. Flywheel
2. Flywheel dowel pin
3. Flywheel driving pin
4. Clutch driven disc
5. Flywheel bolt
6. Clutch pilot bearing
7. Clutch driven disc spring
8. Clutch filler plug
9. Clutch cover gasket
10. Clutch cover
11. Clutch engaging spring, inner
12. Clutch engaging spring, outer
13. Clutch throw-out bearing
14. throw-out bearing oil seal
15. Clutch collar
16. Main drive shaft
17. throw-out bearing grease retainer
18. Clutch shifter yoke
19. throw-out finger retainer nut
20. throw-out finger retainer
21. throw-out finger
22. Clutch cover bolt
23. Clutch driver disc
24. throw-out finger pin

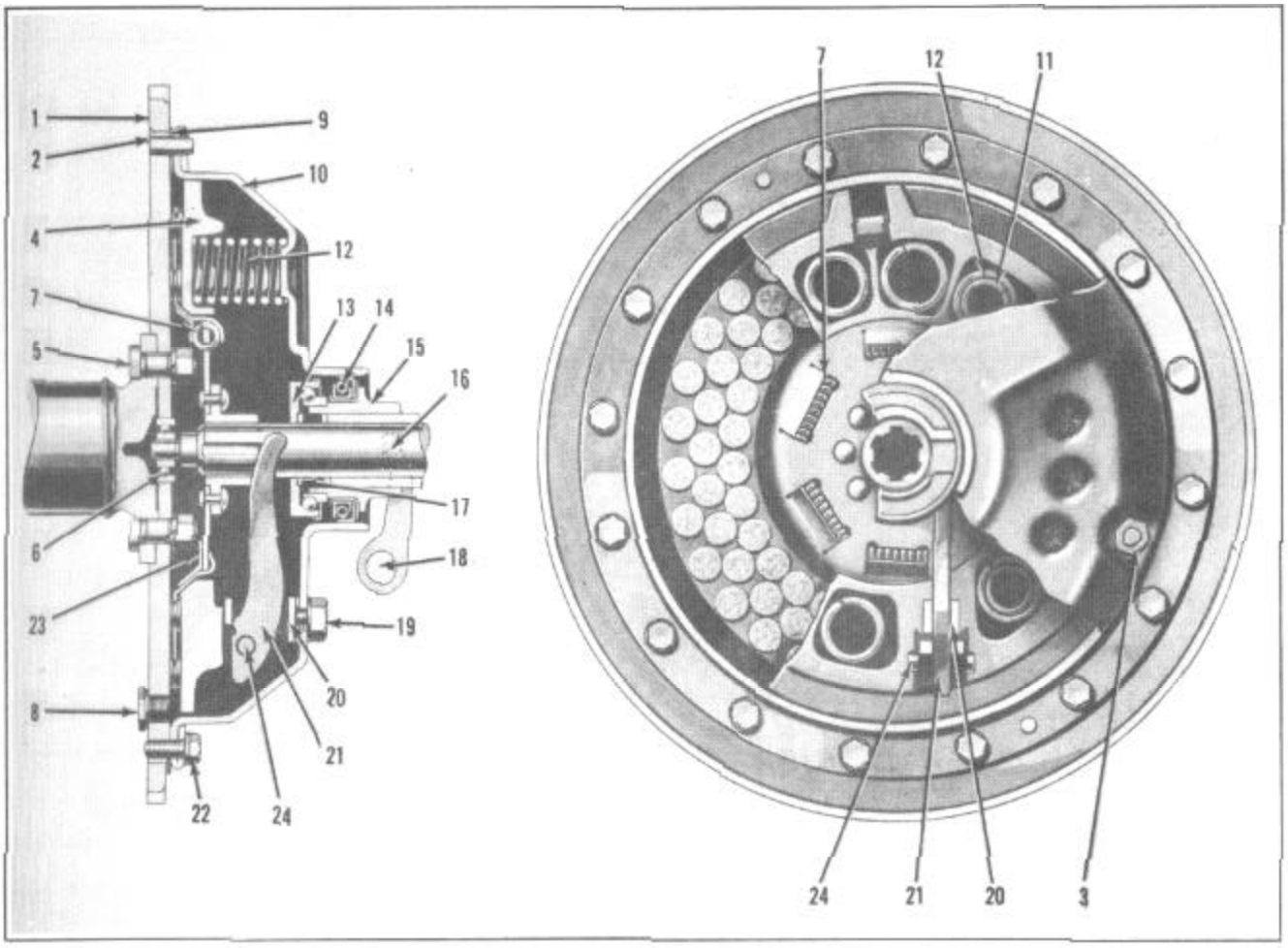



FIGURE 2

1. Flywheel
2. Flywheel dowel pin
3. Clutch cover driving lug
4. Clutch driven disc
5. Flywheel bolt
6. Clutch pilot bearing
7. Clutch driven disc spring
8. Clutch filler plug
9. Clutch cover gasket
10. Clutch cover
11. Clutch engaging spring, inner
12. Clutch engaging spring, outer
13. Clutch throw-out bearing
14. throw-out bearing oil seal
15. Clutch collar
16. Main drive shaft
17. throw-out bearing grease retainer
18. Clutch shifter yoke
19. throw-out finger retainer nut
20. throw-out finger retainer
21. throw-out finger
22. Clutch cover bolt
23. Clutch driven disc
24. throw-out finger pin

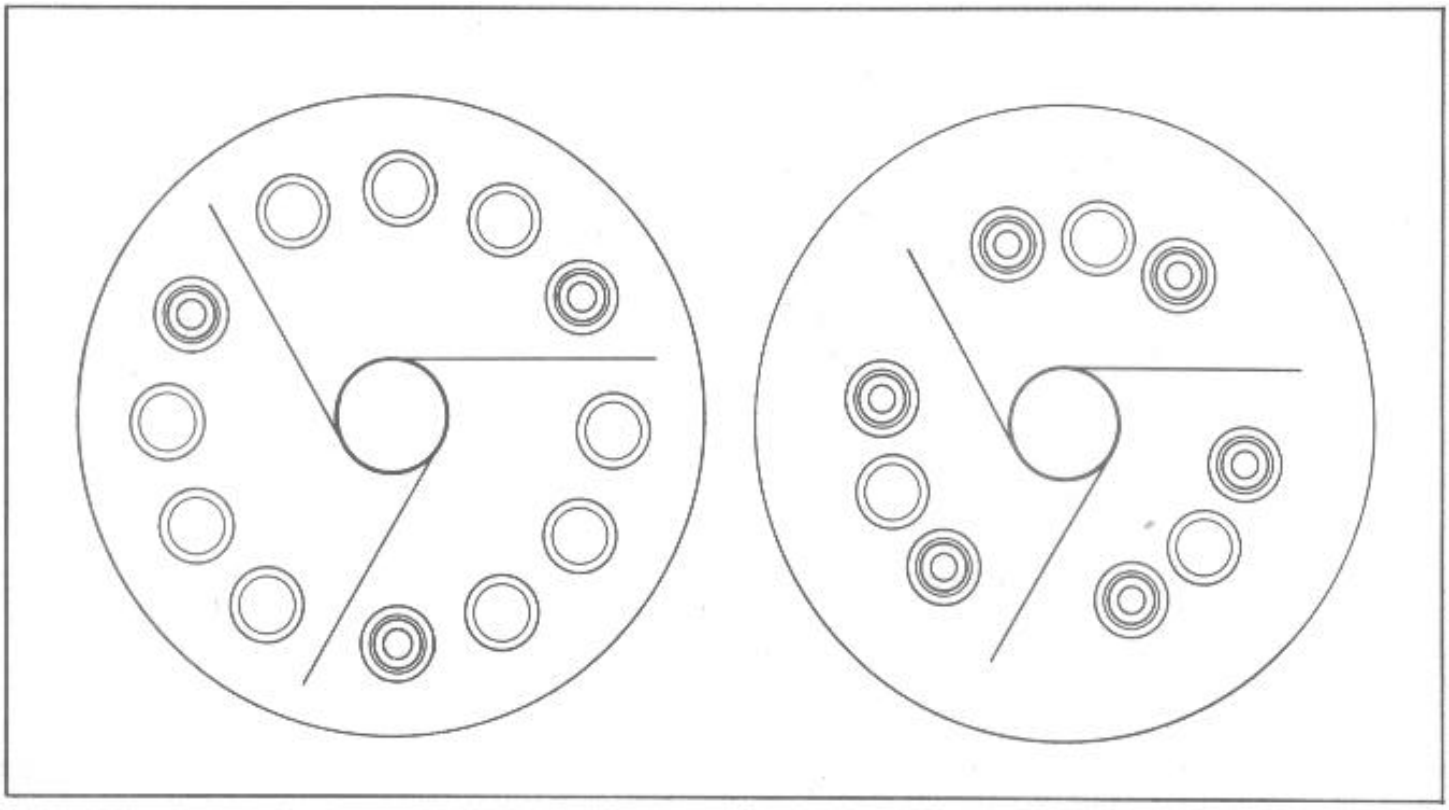


FIGURE 3

Arrangement of clutch engaging springs in relation to the clutch throw-out fingers is shown in Figure 3. The ten inch clutch is shown at the left and the nine inch at right.

## REFERENCE

| Source of Information | Date | Subject |
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# SECTION 8
# TRANSMISSION

## SPECIFICATIONS

**GEAR RATIO**

All Series With or Without Drive-Master

2.88 to 1 Low
1.82 to 1 Second
1 to 1 High
3.5 to 1 Reverse

**NUMBER OF TEETH**

Countershaft Gear Cluster

| | |
|---|---|
| High | 26 Teeth |
| Second | 21 Teeth |
| Low | 17 Teeth |

Main Drive Gear

| | |
|---|---|
| 2.88 to 1 Ratio | 17 Teeth |

main-shaft-Intermediate

| | |
|---|---|
| Helical 25 Teeth | 25 Teeth |
| Clutch 30 Teeth | 30 Teeth |

Main-shaft - Low and Reverse

| | |
|---|---|
| External | 32 Teeth |
| Spline Internal | 24 Teeth |

**END PLAY**

| | |
|---|---|
| Countershaft | .006" to .016" |
| main-shaft Intermediate Gear & Synchronizer | .003 to .016 |

BEARINGS AND BUSHINGS LUBRICATION

| | |
|---|---|
| Main Drive Gear | Ball |
| Main-shaft Pilot | Needle Roller |
| Main-shaft Rear Ball | Ball |
| Reverse Idler Gear Steel Back Babbit | Steel Back Babbit |
| Crankshaft Gear Steel Back Babbit | Steel Back Babbit |

**SPEEDOMETER DRIVE GEAR**

| | Axle Ratio | Tire Size | No. of Teeth |
|---|---|---|---|
| Less Overdrive | 4-1/10 | 7.10-15 | 10 |
| ` | 4-1/10 | 7.60-15 | 11 |
| | 4-5/9 | All | 11 |
| With Overdrive | All | All | 11 |

**SPEEDOMETER PINIONS**

| Axle Ratio | Tire Sizes | No.of Teeth |
|---|---|---|
| 4-1/10 | 7.10-15 | 15 |
| 4-1/10 | 7.60-15 | 16 |
| 4-5/9 | 7.10-15 | 18 |
| 4-5/9 | 7.60-15 | 18 |

**GOVERNOR PINIONS**

| Axle Ratio | Tire Sizes | No.of Teeth |
|---|---|---|
| 4-1/10 | 7.10-15 | 15 |
| 4-1/10 | 7.60-15 | 16 |
| 4-5/9 | 7.60-15 | 18 |

**SPEEDOMETER CABLE**

| | |
|---|---|
| Without Overdrive | 56” |
| With Overdrive | 64" |

## LUBRICATION

Capacity of Transmission is 2-1/4 pints or pounds if Disassembled and parts washed; 2 pints or pounds if drained and refilled. Use S.A.E. 90 E.P. Summer, and S.A.E. 80 E. winter

## TRANSMISSION REPAIR PROCEDURES

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The Transmission for the 500, 501, 502, 503 and 504 models is the same as that used in the 480-490 models. Refer to your 480-490 Mechanical Procedure Manual for instructions and repair procedures.

# REFERENCE

| Source of Information | Date | Subject |
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# SECTION 9

# DRIVE-MASTER

CONTENTS

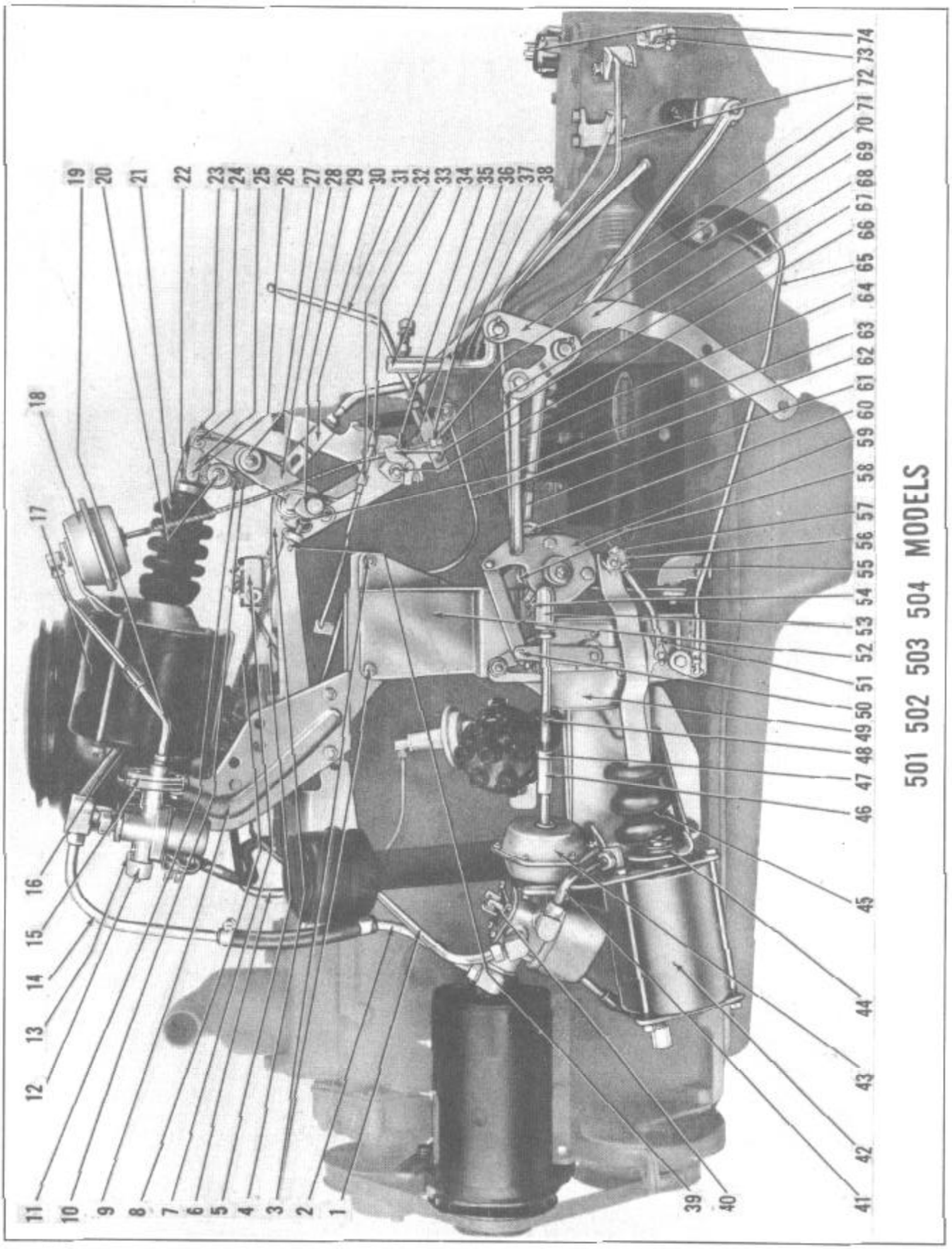



FIGURE 1

LEGEND.

1. Power Unit Air Intake Pipe Assembly
2. Power Unit Vacuum Pipe Assembly
3. Power Unit Mounting Bracket Studs
4. Clutch Unit bell-crank Bracket Assembly
5. Accelerator Switch to Cross Shaft Rod
6. Power Unit to Air Cleaner Pipe Assembly
7. Accelerator Switch
8. Clutch Power Cylinder Tension Spring
9. Clutch Power Unit Mounting Bracket
10. Clutch Unit Compensator Trip Lever
11. Clutch Unit Compensator Trip Lever Spring
12. Clutch Unit Solenoid Valve Assembly
13. Throttle Lock Solenoid Valve Assembly
14. Solenoid to Power Shift Pipe Assembly
15. Clutch Power Unit Solenoid Gasket
16. Vacuum Pipe Assembly
17. Clutch Power Unit Cylinder Assembly
18. Throttle Lock Diaphragm Cylinder Assembly
19. Throttle Lock Solenoid to Diaphragm Tube Assembly
20. Clutch Unit Compensator Trip Lever Shaft
21. Clutch Power Unit Piston Rod Guard
22. Clutch Power Unit Piston Rod Assembly
23. Clutch Unit Piston Rod Pivot Bolt
24. Clutch Unit Piston Valve and Rod Link Pin
25. Clutch Unit Piston Valve and Rod Link
26. Clutch Unit Piston Valve and Rod Assembly
27. Clutch Power Unit Valve Lever Eccentric Bushing
28. Clutch Unit bell-crank and Compensator Assembly
29. Valve Lever Cam
30. Bell crank to Clutch Coupling Lever Rod
31. Accelerator Pedal to bell-crank Rod Assembly
32. Threaded Sleeve Rod Swivel
33. Threaded Sleeve Rod Assembly
34. Control Lever to bell-crank Rod Ball Joint Assembly
35. Accelerator Pedal Link bell-crank Bracket Stop
36. Accelerator Pedal Link bell-crank Bracket
37. Throttle Lock Diaphragm Rod Check Nut
38. bell-crank Rod and Ball Joint Assembly
39. Valve Lever Cam Adjusting Screw Nut
40. Transfer Diaphragm Solenoids
41. Solenoids to Power Cylinder Tube Assembly
42. Power Cylinder Assembly
43. Transfer Diaphragm Assembly
44. Power Cylinder Mounting Stud, Nut, Spacer and Ferrule
45. Power Cylinder Piston Guard
46. Transfer Diaphragm and Rod Assembly
47. Transfer Rod Lock Nut
48. Transfer Diaphragm Engaging Rod Assembly
49. Transmission Control Switch Assembly
50. Selector Switch Lever
51. Neutral and Limit Switch Rod Assembly
52. Power Unit Mounting Bracket Assembly
53. Transfer Rod Ball joint
54. Transfer Key
55. Neutral and Limit Switch Rod Lock Nut
56. Neutral and Limit Switch Trunnion Block
57. Neutral and Limit Switch Rod Lock Nut
58. Shift Shaft Transfer Key, Hub Assembly
59. Shift Shaft (Hand Shift) Lever Assembly
60. Shift Rod to Power Shift Lever Pin
61. Transmission Shift Rod Assembly
62. Accelerator Cross Shaft Operating Rod
63. Valve Lever Cam Adjusting Screw
64. bell-crank to Shift Shaft Lever Rod
65. Off-On Switch Operating Rod
66. Accelerator Pedal Link bell-crank Bracket Shaft
67. Throttle Lock Diaphragm Rod Swivel
68. Cross-Over Switch Rod Clip
69. Hand Shift Bell Crank Support
70. Throttle Lock Cable Lock Nut
71. Hand Shift bell-crank
72. Cross-Over Switch Rod
73. Shift Rail Switch
74. Governor Switch

## DRIVE-MASTER OPERATION

The 500 series cars equipped with Drive-Master have the same controls as the conventional car and can be driven in exactly the same manner. The owner has the choice of either automatic or manual shifting. Pushing the instrument panel switch "HDM" button in provides automatic clutch operation and automatic gear shifting in second and high gear. If the car owner desires to shift gears manually he merely presses the "OFF" button on the instrument panel switch and the car immediately reverts back to conventional drive.

TO START engine, turn on ignition switch depress the clutch pedal and press the instrument panel starter control button.

TO START the car moving place the gear shift lever in high gear position, depress the accelerator pedal and the car will move forward in pick-up gear (second gear). When the car has reached the speed at which the driver desires to shift into high gear, he simply releases the accelerator pedal momentarily and the shift is made quickly and automatically into high gear. When corning to a stop, the transmission is automatically shifted from high to pick-up gear and the car is ready to move as soon as the accelerator is depressed.

## DRIVE-MASTER UNITS

Drive-Master comprises the following units:

Instrument Panel Control Switch
Clutch Control Unit and
Throttle Lock
Accelerator Switch
Transmission Shift Rail Switch
Transmission Power Shift Unit
Governor Switch
Transmission Control Switch

### INSTRUMENT PANEL CONTROL SWITCH

The instrument panel control switch, Figure 2, mounted in the center of the instrument panel controls Drive-Master operation.

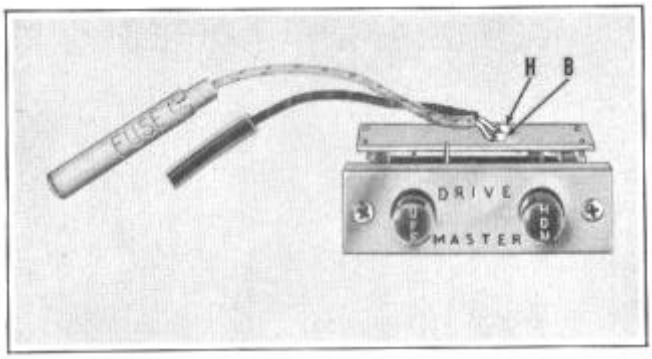



FIGURE 2

A 15 ampere fuse enclosed in a round fuse holder, located in the wiring circuit 6" from the control switch protects the Drive-Master units.

### CLUTCH CONTROL UNIT

The clutch power unit, Figure 3, is mounted on the left side at the top of the engine. A vacuum line connects to the engine intake manifold to provide the power for operation.

The power is transmitted from the vacuum cylinder piston through a rod direct to the clutch throwout yoke shaft, so that the clutch is disengaged when the piston is moved forward. When the piston moves toward the rear, the clutch is engaged.

The movement of the piston is controlled through linkage by the power unit valve to the accelerator pedal.

When the accelerator pedal is depressed, the valve is moved to equalize the pressure on both sides of the piston and the clutch is engaged by the pressure of the clutch springs on the pressure plate.

When the accelerator is in its released position, full manifold vacuum is obtained on the front of the power cylinder piston and atmospheric pressure on the rear of the piston moves it forward and the clutch is disengaged.

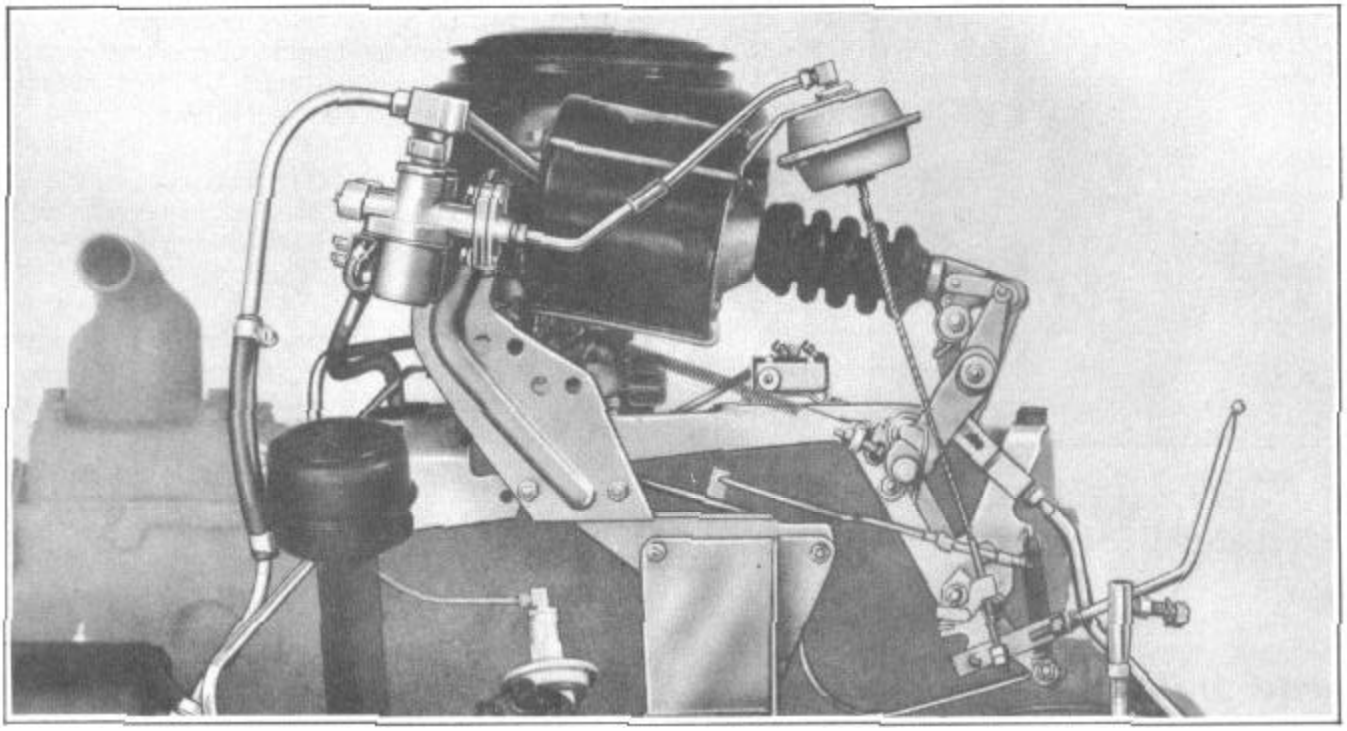


FIGURE 3

## THROTTLE LOCK

The throttle lock, Figure 3, consists of a vacuum operated diaphragm connected to the accelerator linkage through a cable.

Vacuum in the cylinder actuates the diaphragm which pulls up on the cable closing the throttle and holding the accelerator switch against its stop even if the accelerator pedal is pushed to the wide open position, preventing gear clash while the transmission shift is being made.

A solenoid mounted beside the clutch control unit solenoid and connected to it controls the vacuum to the throttle lock.

## ACCELERATOR SWITCH

The accelerator switch, Figure 4, used in conjunction with the Clutch Control Unit prevents engine racing when shifting into high.

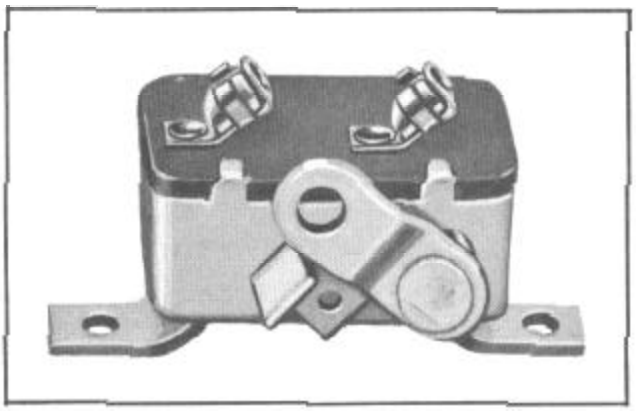


FIGURE 4

In high at less than 20 MPH when the driver's foot is removed from the accelerator pedal and the throttle is closed, the accelerator switch closes the electrical circuit through the clutch control solenoid, opening the vacuum valve and the clutch is then disengaged.

## TRANSMISSION SHIFT RAIL SWITCH

The shift rail switch, Figure 5, permits automatic clutch operation in low, second or reverse gears regardless of car speeds.

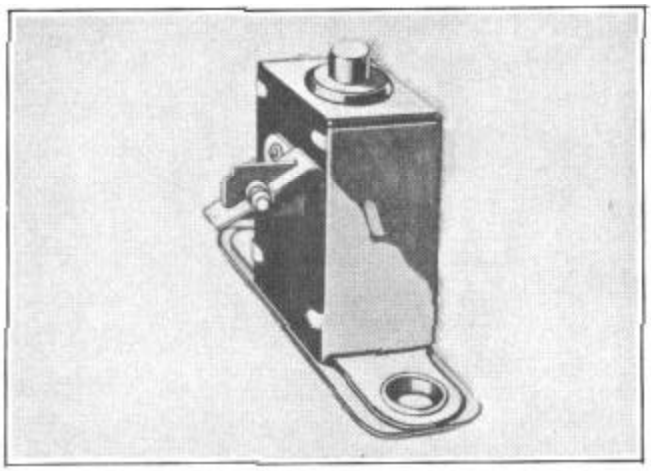


FIGURE 5

## TRANSMISSION POWER SHIFT UNIT

The transmission power shifting unit, Figure 6, is made up of the transfer diaphragm cylinder, power shift cylinder and solenoid valves.

**TRANSFER DIAPHRAGM, POWER SHIFT CYLINDER AND SOLENOIDS**:

The solenoid selector valves control the transfer diaphragm and the movement of the piston in the power shift cylinder.

The power cylinder piston is connected to the piston rod, which in turn is connected through linkage to the shift lever mounted on the transmission. Both ends of the power shift cylinder are closed except for the vacuum lines to the solenoid control valves.

The solenoid selector valve assembly is comprised of the transfer diaphragm solenoid, a second gear solenoid and a high gear solenoid.

If the solenoid valve controlling the rear end of the cylinder is energized, the valve opens to the vacuum line and the piston moves to the rear. This movement shifts the transmission into pickup gear.

If the solenoid valve controlling the forward end of the cylinder is energized, the piston is moved forward, shifting the transmission into high gear.

## OPERATING LINKAGE AND TRANSFER KEY

The movement for manual or power shifting is transferred to the transmission lever through a rod from the transfer key lever, mounted on a stationary shaft at the

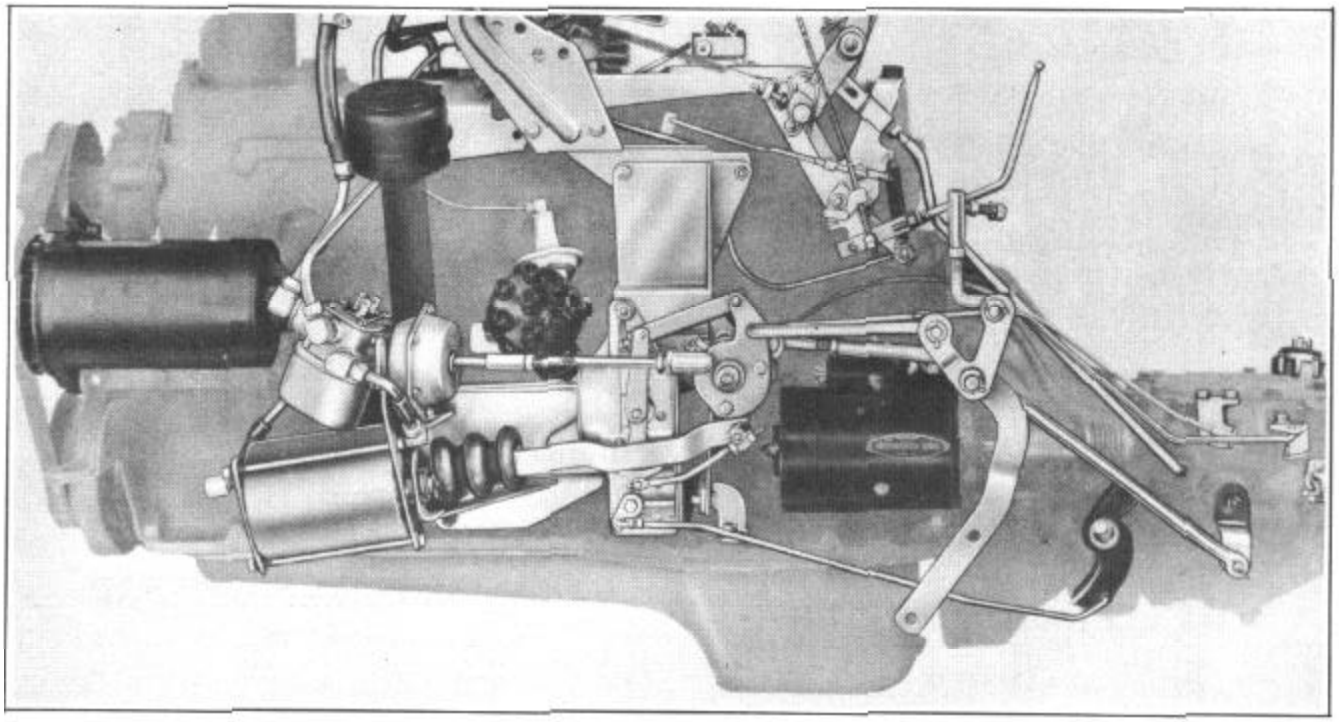


FIGURE 6

rear of the power unit mounting bracket, Figure 7.

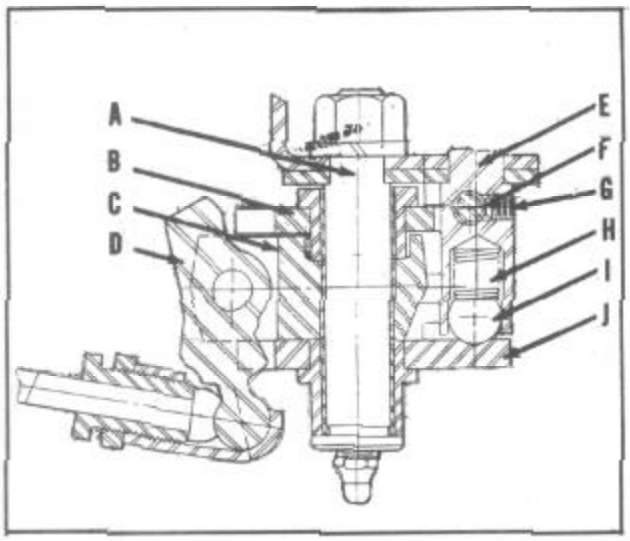



FIGURE 7

A. Transfer key
B. Shift shaft transfer key hub
C. Shift shaft power shift lever
D. Shift shaft
E. Mounting bracket pin
F. Power shift lever adjusting screw
G. Power shift lever adjusting screw set screw
H. Hand shift lever detent ball spring
I. Hand shift lever detent ball
J. Hand shift lever assembly

This shaft also carries the manual and power shifting levers, each provided with a notch for engagement with the transfer key.

Normally the transfer key is held in the manual shifting lever notch by spring pressure exerted on the transfer diaphragm rod. When the instrument panel control switch is "ON" and the gear shift lever on the high and second side, electrical connections open the solenoid valve, admitting vacuum to the transfer diaphragm cylinder, positioning the transfer key so that it engages in the notch of the power shift lever. This operation prepares the transmission for automatic or power shifting.

When the gear shift lever is moved to neutral and lifted through the "neutral gate" as required to make a shift to reverse or low, the circuit is broken to the solenoid operating the transfer diaphragm and the spring pressure behind the diaphragm positions the transfer key so that it re-engages in the manual shift lever notch. Low or reverse gear can then be shifted with the gear shift lever in the regular manner.

Returning the gearshift lever to neutral and dropping through the "neutral gate" again closes the transfer key circuit causing the key to engage the power shift lever notch. This again prepares the transmission for power shifting.

## TRANSMISSION CONTROL SWITCH ASSEMBLY

The control switch, Figure 8, bolted to the power unit bracket on the left side of the engine, contains the mechanically operated switches used to control the Drive-Master.

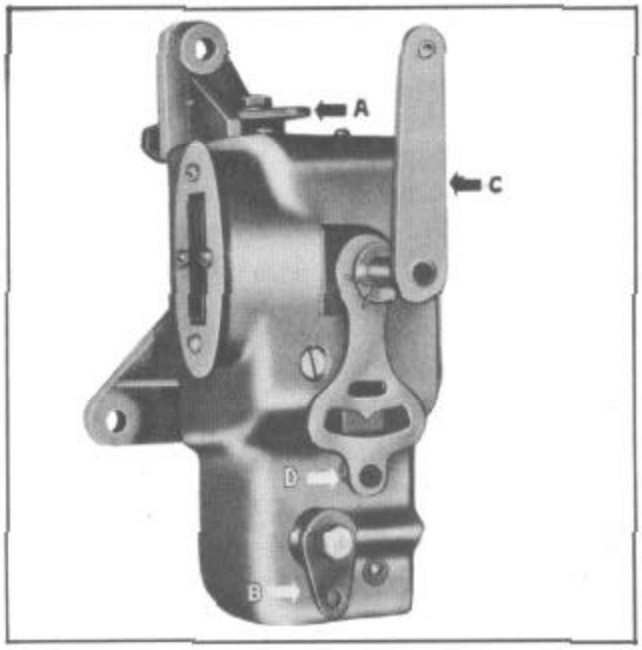



FIGURE 8

The switches contained in this unit are:

(A) Transfer Switch
(B) Clutch Switch
(C) Selector Switch
(D) Neutral and Limit Switch

(A) THE TRANSFER SWITCH, Figure 8, is located at the top of the transmission switch and is operated by a non-adjustable link connected to the transmission cross shift selector lever.

The gear shift lever, when in neutral must return by means of its own return spring, to the second-high side when released from any position in the crossover. It must work free.

When the gear shift lever on the steering column is moved through the neutral or cross-over to second high side, the transfer switch lever is moved forward closing the switch points. This completes a circuit to the solenoid of the power unit, which controls the transfer diaphragm drawing the diaphragm back and connecting the power shift lever to the transmission shift lever through the transfer key.

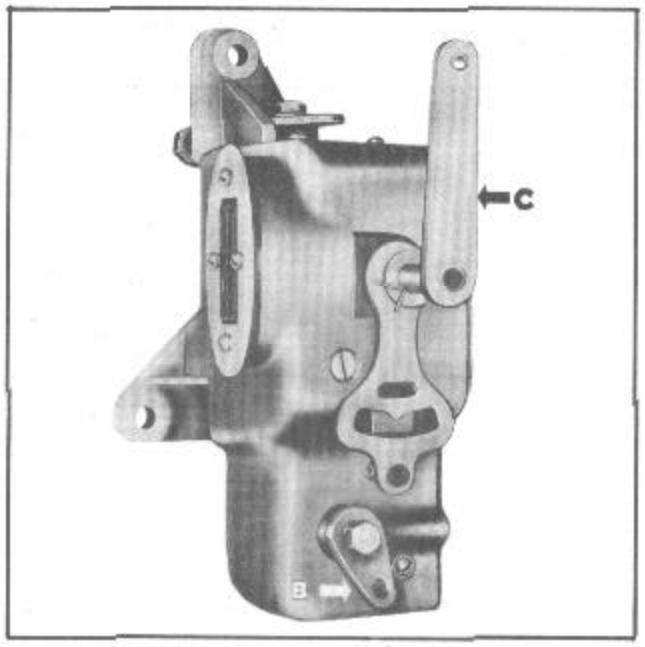
When the gear shift lever is again moved to the low-reverse side, the transfer switch lever moves backward, opening the switch. The diaphragm spring moves the transfer key and linkage to disconnect the power shift lever and reconnect the manual shift thus preparing it for shifting into low or reverse.

(B) THE CLUTCH SWITCH is located at the bottom of the transmission switch housing, it is operated by a non-adjustable link connected to the clutch throw-out shaft lever. When the clutch is disengaged the clutch switch lever is moved backward.

One set of points closes to complete the circuit to the starter button.

A second set of points is closed completing the circuit to the selector, neutral and limit switches.

The clutch switch is open when the clutch is engaged, therefore, no current (except that required for the transfer diaphragm solenoid) is used when the car is being driven in any gear speed.




(C) THE SELECTOR SWITCH lever, Figure 9, is connected to the transmission manual shift lever by a non-adjustable rod. When the gearshift lever on the steering column is moved to second gear position, the selector switch lever closes the circuit to the power
unit causing the power unit piston to move into second or pick-up gear position.

When the gear shift lever is moved to the high gear position, the selector switch lever closes the circuit to the governor, which automatically selects the pick-up (second) or high gear. When the gear shift lever is placed in neutral, the selector switch closes a circuit to the neutral switch.

(D) THE NEUTRAL SWITCH AND LIMIT SWITCH, Figure 10. Both neutral and limit switches are operated by the same lever. This lever is connected to the transmission power shifting lever by an adjustable rod.

The neutral switch has two sets of points, both of which are open when the transmission is in neutral. When the transmission gears are in either pick-up or high gear position, one set of points is closed and the other open.

If neutral is selected on the gear shift lever and the transmission gears are in high gear position, the circuit then is from the neutral point on the selector switch to the closed points of the neutral switch and from there to the power unit solenoid which controls the shift forward to pick-up gear position. The piston then moves rearward shifting the gear out of high toward neutral. When the shift reaches the neutral position, the neutral switch points are opened and the shift stops.

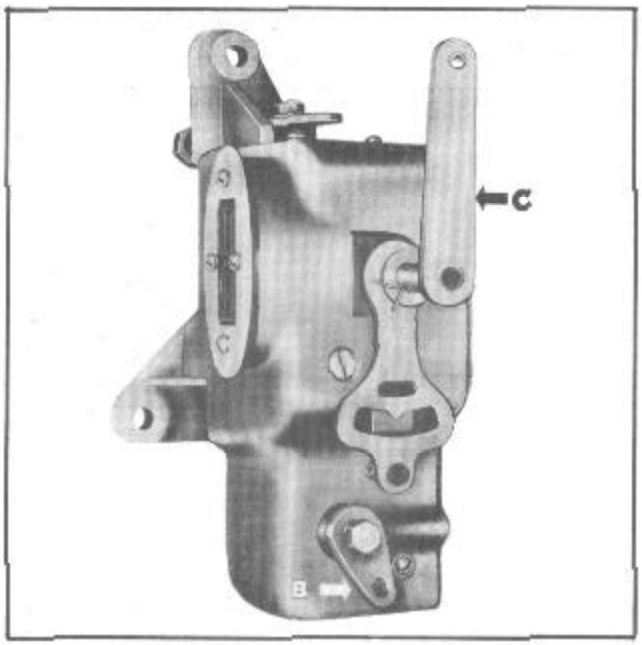



FIGURE 10

If the transmission gears are in pick up position when neutral is selected the other set of points in the neutral switch are closed and complete the circuits to the power unit solenoid which controls forward movement of the power cylinder. As before, when the transmission reaches neutral, the neutral switch
points are opened and the shift stops.

The limit switch also has two sets of points, but both are closed when the transmission is in neutral. One set of points is opened when the shift to high gear is completed and the other set of points opens when the shift to pick up gear is completed.

The limit switch completes the circuit to the throttle lock solenoid on the clutch control, thus preventing the throttle being opened until each shift is entirely completed.

## GOVERNOR SWITCH

The governor switch is located on the rear of the transmission and is operated by the speedometer drive gear.

**NOTE : There are two types of governors used in the 500 series cars identified as follows:**

Figure 11 illustrates the governor used on all 500 series with Drive-Master only and all 501, 502, 503 and 504 Models with Drive-Master and overdrive.

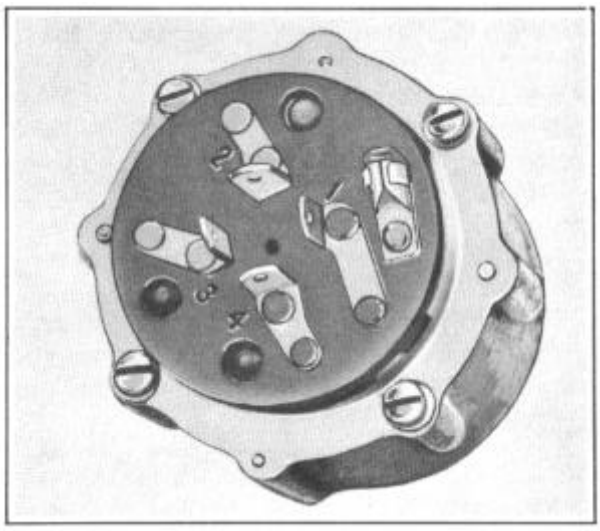


FIGURE 11

Figure 12 illustrates the governor used on model 500 with Drive-Master and Over-drive.

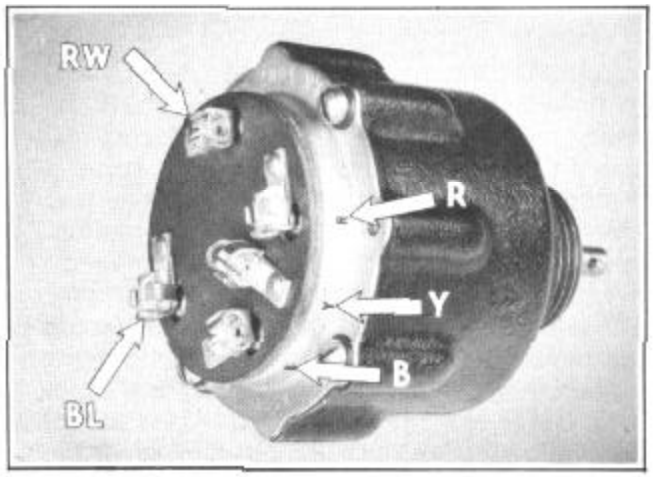



FIGURE 12

Although different type connections are used for these two governors the wiring circuits are the same. The No. 1 blade in Figure 10 corresponds to "Y" terminal in Figure 11, No. 2 is the same as "RW", No. 3 same as "BL", No. 4 same as "B". "R" terminal is common to both governors and is used only with cars equipped with both overdrive and Drive-Master.

The governor controls circuits in the clutch control unit and in the transmission power unit.

When the gear shift lever is in the high gear position, the circuit is completed from the selector switch to the No. 1 or "Y" terminal of the governor. At speeds below 9 to 13 miles per hour the points are closed to connect No. 1 or "Y" terminal to No. 3 or "BL" terminal.

The No. 3 or "BL" terminal is connected with the transmission power unit so as to actuate the rear of the power cylinder and shifts into pick up gear.

At speeds above 9 to 13 miles per hour the No. 1 or "Y" terminal is connected to the No. 4 or "B" terminal actuating the front of the power cylinder and the transmission is shifted into high gear.

## SERVICING THE DRIVE-MASTER

In the servicing of Drive-Master any of the following units which tests prove to be faulty must be replaced in their entirety rather than to attempt internal repairs: solenoids, transmission switch, governor switch, accelerator switch, and instrument panel switch.

As power for operating the clutch control unit and the power unit of the Drive-Master is obtained from engine vacuum it is very important that engine performance be checked first when servicing the Drive-Master. The vacuum gauge should read from 17 to 18 to insure proper engine performance as well as correct Drive-Master operation.

**LEAKS IN THE VACUUM LINES** will cause sluggish operation or failure of the Drive-Master.

All vacuum line fittings should be checked and hose connections given particular attention. These are as follows:

1. Between clutch power unit and intake manifold.
2. Between clutch power unit solenoids.
3. Between throttle lock solenoids and diaphragm.
4. Between transmission power unit and air cleaner.
5. Between transmission and clutch power unit.
6. Between front of power cylinder and solenoid housing.
7. Between rear of power cylinder and solenoid housing.

### ELECTRICAL CONNECTIONS

The battery should be in good condition and gravity not less than 1225.

**ALL TERMINAL CONNECTIONS** should be clean and in solid contact.

The important points to be checked are as follows:

1. Connector plugs on clutch power unit.
2. Connections at accelerator switch.
3. Power unit plug.
4. Transmission control switch plug.
5. Shift rail terminal.
6. Governor switch plug.

The following checks are general but experience has shown that it is good practice to make these checks before attempting any changes or adjustments.

## TRANSMISSION SWITCH PLUG

This plug is held in place by clips, Figure 13. When replacing, be sure clips enter and engage behind the plug cover plate. The plug is released by pressing the clips together indicated by arrows.

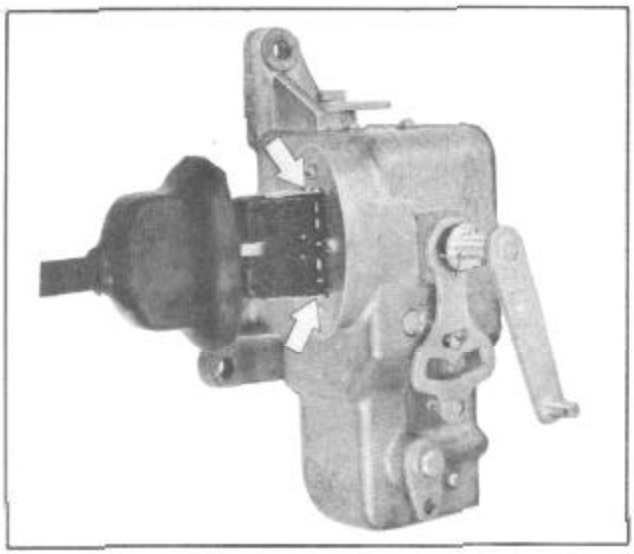


FIGURE 13

**NOTE: Be sure the boot is in place to keep water from entering the switch housing. The prongs and sockets are silver coated to eliminate corrosion.**

## INSTRUMENT PANEL SWITCH

Always determine that panel switch is on. Also check fuse and fuse holder.

### LINKAGE

While checking power unit wires and plugs, make sure all the rods and linkage are in place and properly connected and locked by their clips.

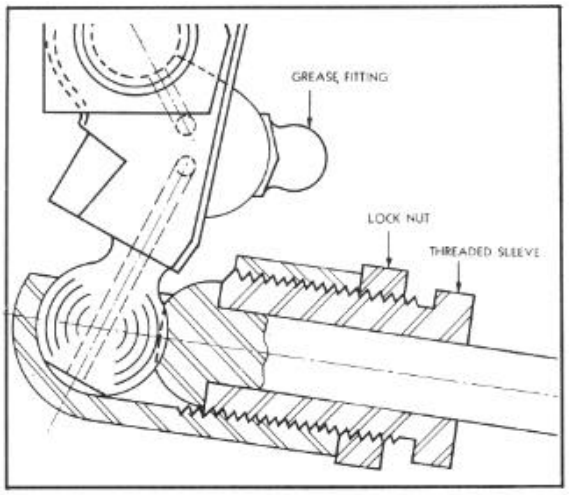



FIGURE 14

Recheck the ball and socket joint at the transfer key. This is a specially designed joint to permit adjustment without affecting clearance of the ball in the socket, Figure 14.

Adjustment is made by loosening the lock nut and turning the threaded sleeve inward so that it has no appreciable looseness and yet works free. Lubricate this joint and the transfer key pivot with viscous chassis lubricant through the fitting on the transfer key.

The accelerator linkage and the bell crank with the torsional spring assembly must work freely and should be well lubricated.

The accelerator switch lever must return solidly against the stop when the accelerator is released, otherwise, the clutch will not release and the Drive-Master cannot work.
THIS IS VERY IMPORTANT.

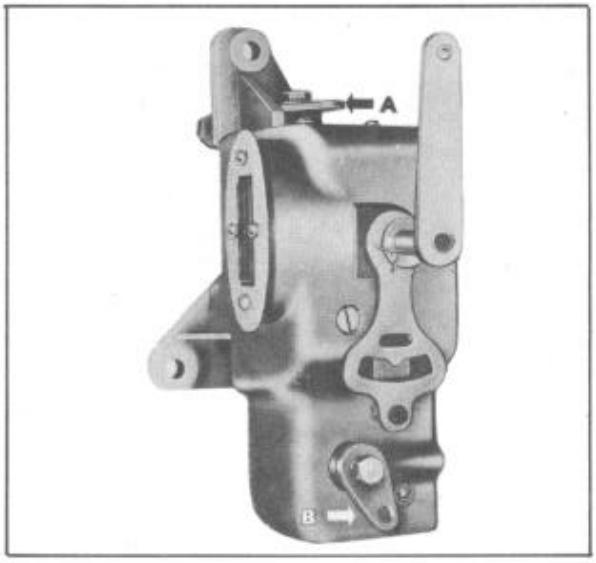



FIGURE 15

### CLUTCH SWITCH

Before checking the operation of the clutch switch B, Figure 15, (housed in Transmission Switch Assembly) check clutch pedal lash. Clutch pedal must have 1-1/2" free play. With engine not operating, ignition switch turned on and starter button depressed, slowly push the clutch pedal down. The starter should operate before the pedal is within two inches of the toe-board.

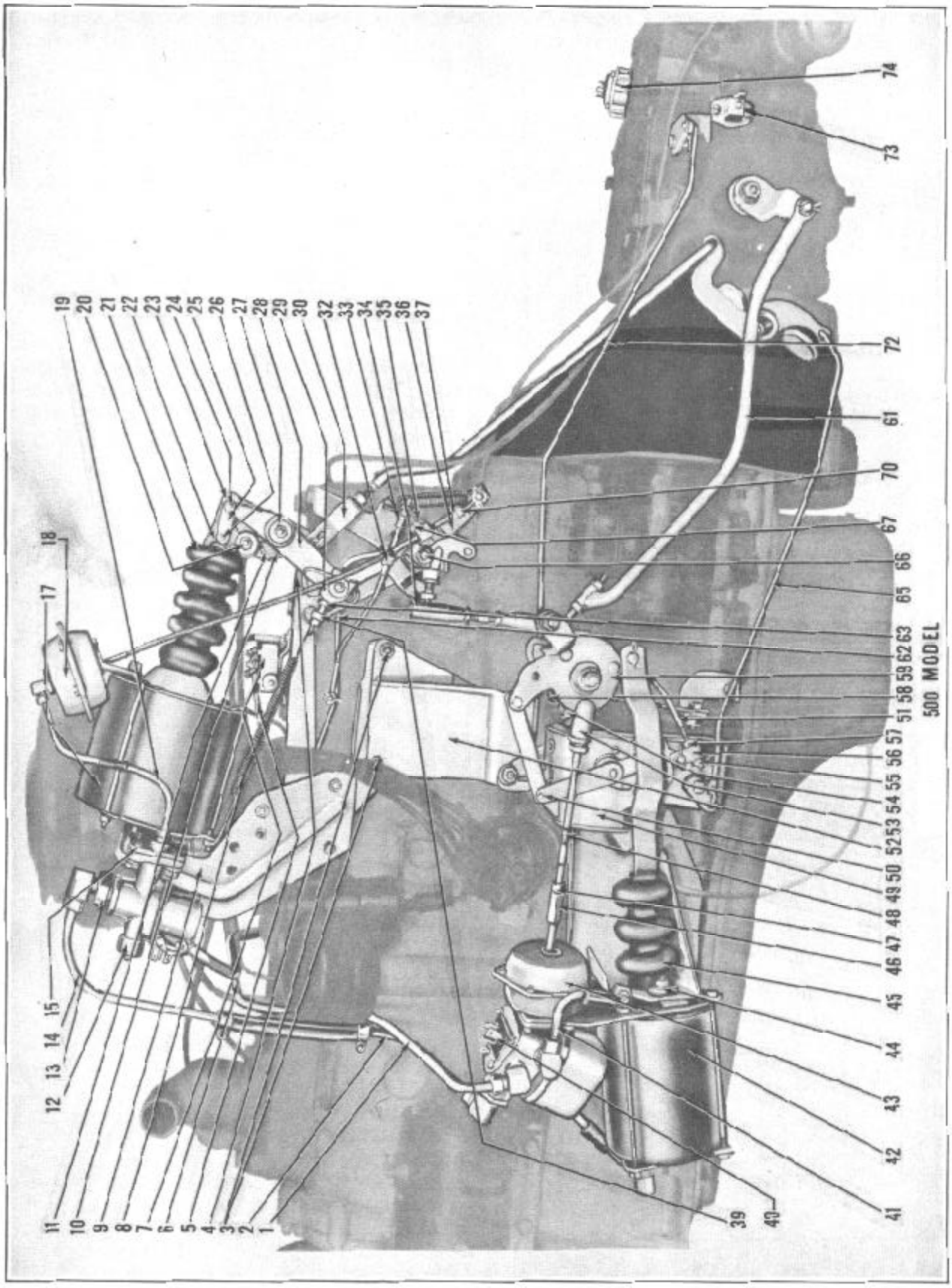



FIGURE 16

**LEGEND**

1. Power Unit Air Intake Pipe Assembly
2. Power Unit Vacuum Pipe Assembly
3. Power Unit Mounting Bracket Studs
4. Clutch Unit bell-crank Bracket Assembly
5. Accelerator Switch to Cross Shaft Rod
6. Power Unit to Air Cleaner Pipe Assembly
7. Accelerator Switch
8. Clutch Power Cylinder Tension Spring
9. Clutch Power Unit Mounting Bracket
10. Clutch Unit Compensator Trip Lever
11. Clutch Unit Compensator Trip Lever Spring
12. Clutch Unit Solenoid Valve Assembly
13. Throttle Lock Solenoid Valve Assembly
14. Solenoid to Power Shift Pipe Assembly
15. Clutch Power Unit Solenoid Gasket
17. Clutch Power Unit Cylinder Assembly
18. Throttle Lock Diaphragm Cylinder Assembly
19. Throttle Lock Solenoid to Diaphragm Tube Assembly
20. Clutch Unit Compensator Trip Lever Shaft
21. Clutch Power Unit Piston Rod Guard
22. Clutch Power Unit Piston Rod Assembly
23. Clutch Unit Piston Rod Pivot Bolt
24. Clutch Unit Piston Valve and Rod Link Pin
25. Clutch Unit Piston Valve and Rod Link
26. Clutch Unit Piston Valve and Rod Assembly
27. Clutch Power Unit Valve Lever Eccentric Bushing
28. Clutch Unit bell-crank and Compensator Assembly
29. Valve Lever Cam
30. bell-crank to Clutch Coupling Lever Rod
32. Threaded Sleeve Rod Swivel
33. Threaded Sleeve Rod Assembly
34. Control Lever to bell-crank Rod Ball Joint Assembly
35. Accelerator Pedal Link bell-crank Bracket Stop
36. Accelerator Pedal Link bell-crank Bracket
37. Throttle Lock Diaphragm Rod Check Nut
39. Valve Lever Cam Adjusting Screw Nut
40. Transfer Diaphragm Solenoids
41. Solenoids to Power Cylinder Tube Assembly.
42. Power Cylinder Assembly.
43. Transfer Diaphragm Assembly.
44. Power Cylinder Mounting Stud, Nut, Spacer and Ferrule
45. Power Cylinder Piston Guard
46. Transfer Diaphragm and Rod Assembly.
47. Transfer Rod Lock Nut
48. Transfer Diaphragm Engaging Rod Assembly.
49. Transmission Control Switch Assembly.
50. Selector Switch Lever
54. Transfer Key
55. Neutral and Limit Switch Rod Lock Nut
56. Neutral and Limit Switch Trunnion Block
57. Neutral and Limit Switch Rod Lock Nut
58. Shift Shaft Transfer Key, Hub Assembly.
59. Shift Shaft (Hand Shift) Lever Assembly.
61. Transmission Shift Rod Assembly.
62. Accelerator Cross Shaft Operating Rod
63. Valve Lever Cam Adjusting Screw
64. bell-crank to Shift Shaft Lever Rod
65. Off-On Switch Operating Rod
66. Accelerator Pedal Link bell-crank Bracket Shaft
67. Throttle Lock Diaphragm Rod Swivel
69. Hand Shift bell-crank Support
70. Throttle Lock Cable Lock Nut
71. Hand Shift bell-crank
72. Cross-Over Switch Rod
73. Shift Rail Switch
74. Governor Switch

## TRANSFER SWITCH

When the gear shift lever is in neutral, the switch lever A, Figure 15, must return to the second-high side when released from any position in the cross over by means of its own return spring. If it sticks, it will cause incomplete shifting, throttle locking, engine racing, etc. The hand gear shift lever must be on the second and high side at all times to energize the transfer cylinder and hold the transfer key engaged in the power shift lever.

Check the operation by moving the gear shift lever through the neutral cross over. The key should engage in the manual lever during the upper part of the movement, and engage the power shift lever during the lower half of the movement.

## ADJUSTMENTS

**NOTE: Do not attempt any adjustments of the Drive-Master until the engine has reached normal operating temperature. The engine must be in proper tune and should idle smoothly at 580 to 300 RPM, when the Drive-Master instrument panel control switch is at the "on" position.**

### 1. CLUTCH PEDAL ADJUSTMENT:

Clutch pedal must have 1-1/2" free play.

To adjust proceed as follows:

A. Loosen lock nut (A) Figure 17.

B. Remove cotter pin and clevis pin (C).

C. Turn clevis Yoke (B) to increase or decrease length of rod for proper pedal clearance.

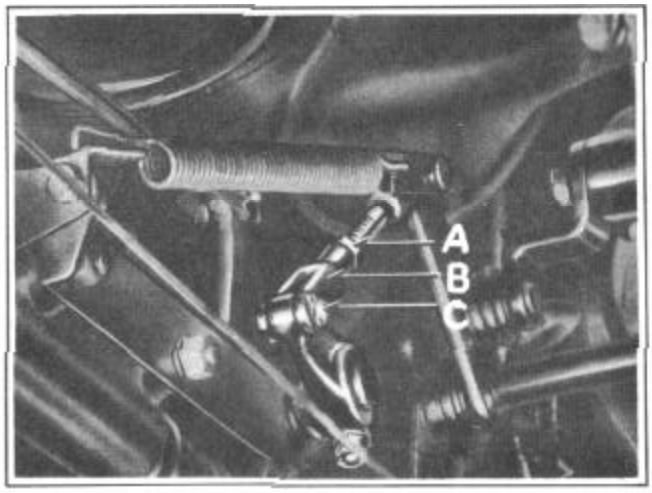



FIGURE 17

**NOTE: On the 500 models the clevis yoke is provided with two holes to allow greater latitude of adjustment, and either hole may be used.**

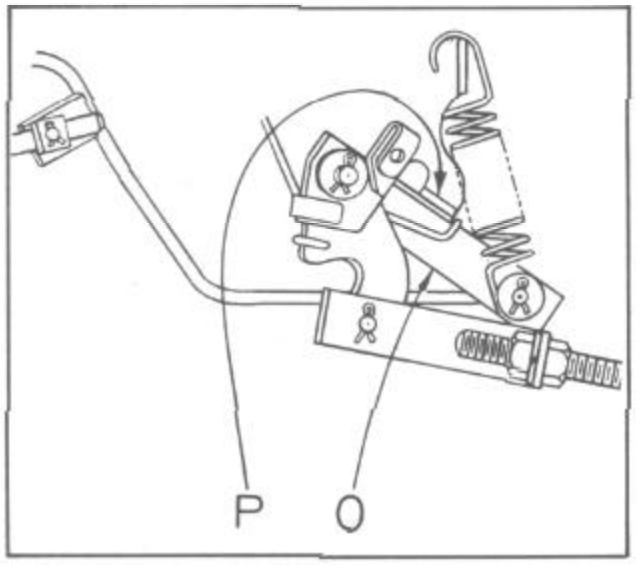



FIGURE 18

### 2. LINKAGE:

All linkage joints must work freely; check for binding at throttle cross rods, throttle bell-crank and clutch control unit bell-crank and lubricate as necessary. Depress control switch "off" button and open throttle slightly. Release very slowly and check to see that bell-crank arm (0) comes solidly against stop (P), Figure 18.

### 3. ACCELERATOR PEDAL ADJUSTMENT:

All 500, 501, 502, 503 and 504 models equipped with overdrive have a kickdown switch mounted in the floor panel under the accelerator pedal.

All 501, 502, 503, and 504 models without overdrive have an accelerator pedal stop in the kickdown switch location.

The accelerator pedal rod on these cars should be so adjusted, that the carburetor throttle is in the wide open position just before the accelerator pedal touches either the pedal stop or the moveable stem of kickdown switch.

On the 500 models without overdrive the accelerator pedal rod should be so adjusted that wide open throttle is obtained just before the tip of the accelerator pedal strikes the floor mat.

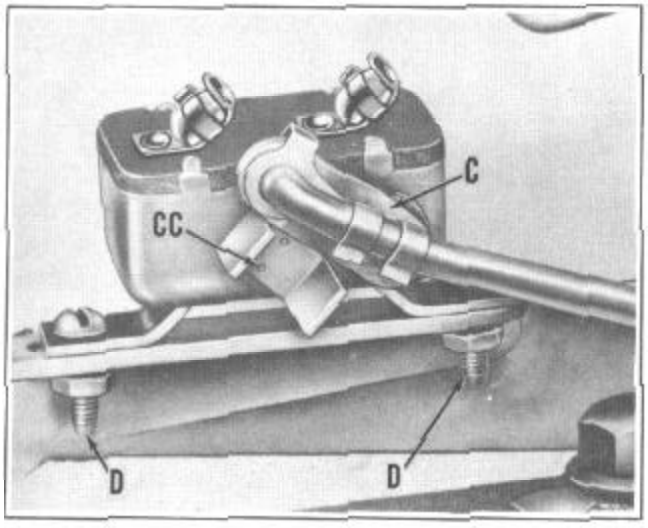



FIGURE 19

### 4. ACCELERATOR SWITCH ADJUSTMENT:

With the throttle bell-crank (0), Figure 18 against its stop (P) loosen screws (D) Figure 19 and slide the accelerator switch forward until switch arm (C) bottoms against stop (CC) on switch. Tighten screws (D). Figure 19.

Recheck by depressing the accelerator pedal and releasing pedal slowly. After releasing pedal both accelerator switch lever (C) Figure 19 and bell-crank lever (0) Figure 18 should solidly contact their stops.

### 5. THREADED SLEEVE ROD ADJUSTMENT:

Adjust the threaded sleeve (33), Figure 20 until the vacuum cylinder piston is 1/2" from its extreme forward position.

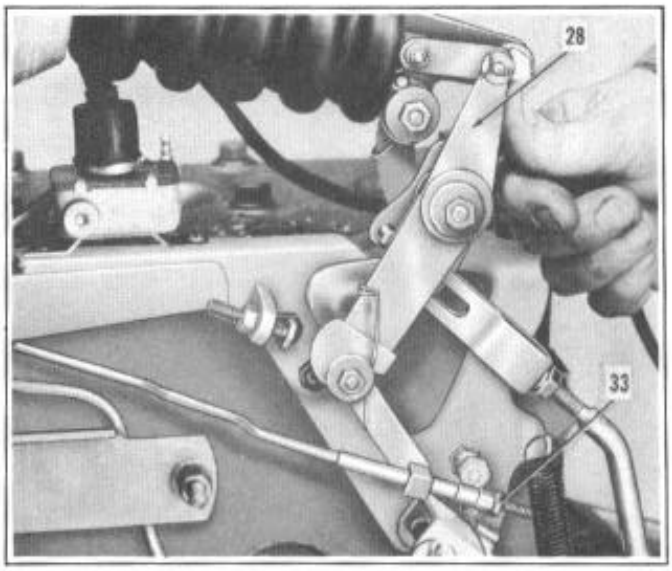



FIGURE 20

Check this adjustment by pushing on valve lever (28) and then releasing. Above adjustment should be made with the compensator lever in the starting position; pin (10) forward as shown in solid lines Figure 21.

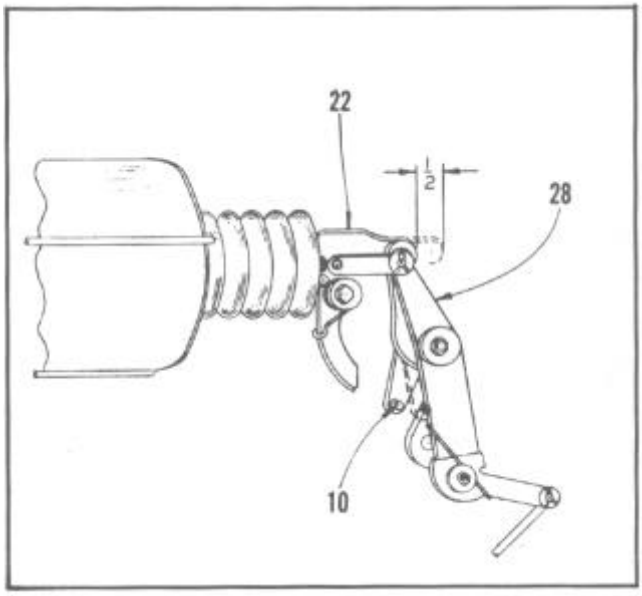



FIGURE 21

**6. COMPENSATOR PIN ASSEMBLY CHECK:**

Check compensator by pushing the compensator lever and pin (10), Figure 22, down to its normal running position; piston rod (22) should move forward. If the piston rod (22) moves backward, the eccentric (27) is assembled upside down.

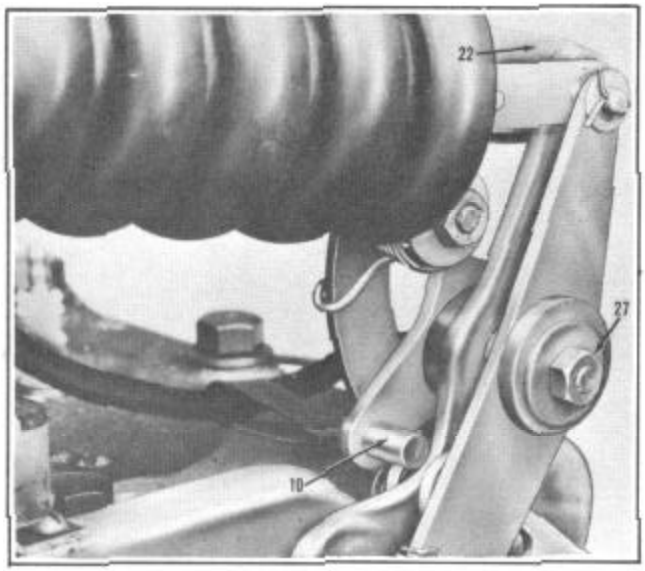



FIGURE 22

**7. PISTON VALVE ROD CHECK**:

Check length of valve rod assembly (25), Figure 23. If the setting is correct the center line of the pin (24) will be exactly in line with the center line of the piston rod pivot bolt (23) as indicated by large arrow.

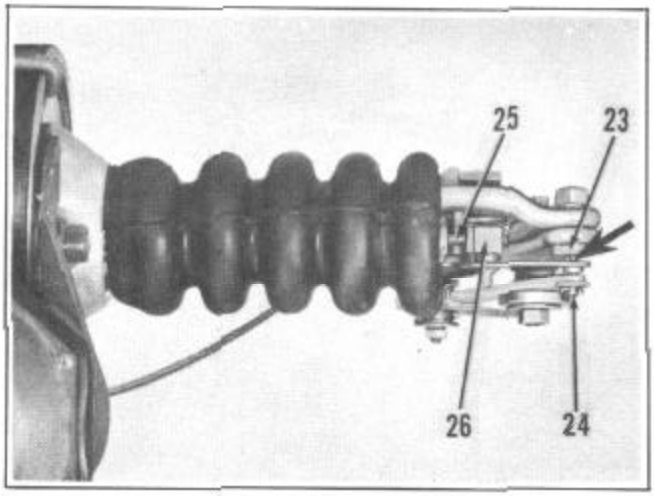



FIGURE 23

Valve rod (25) can be adjusted by loosening lock nut and turning the valve rod in or out of the threaded trunnion (26).

**NOTE: The valve rod assembly is properly adjusted at the factory and should never have to be adjusted unless the adjustment has been altered by someone unfamiliar with proper adjustment procedure.**

**8. CLUTCH PULL ROD ADJUSTMENT:**

Stop the engine. Pull the piston rod (22), Figure 24, out to its full travel (to rear of car). Pull the clutch rod up and forward to check for 1/8" lash. If lash is correct, front end of slotted clevis (30) will just touch pin (10).

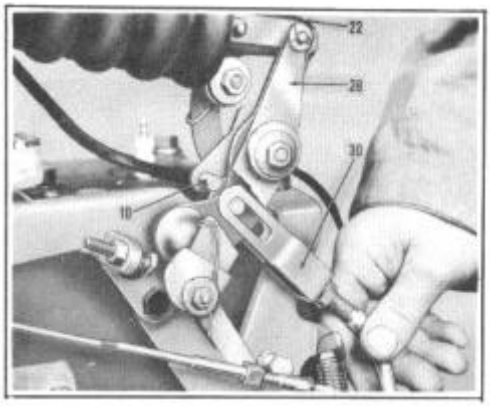



FIGURE 24

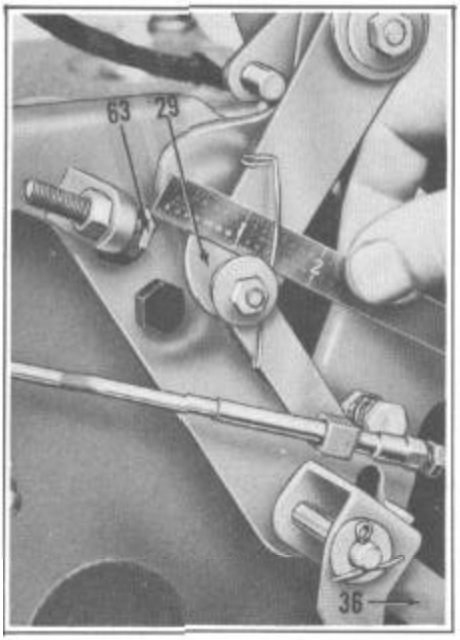



FIGURE 25

**9. THROTTLE ADJUSTMENT:**

Back out cam adjusting screw (63), Figure 25, until there is approximately 1/2" gap between cam (29) and screw (63). Depress clutch pedal (IMPORTANT) and start engine; hold clutch pedal down until clutch control unit cylinder takes up load. DO NOT RACE ENGINE. Put transmission in second gear and release the brakes. Slowly rotate throttle bellcrank (36) until clutch drags.

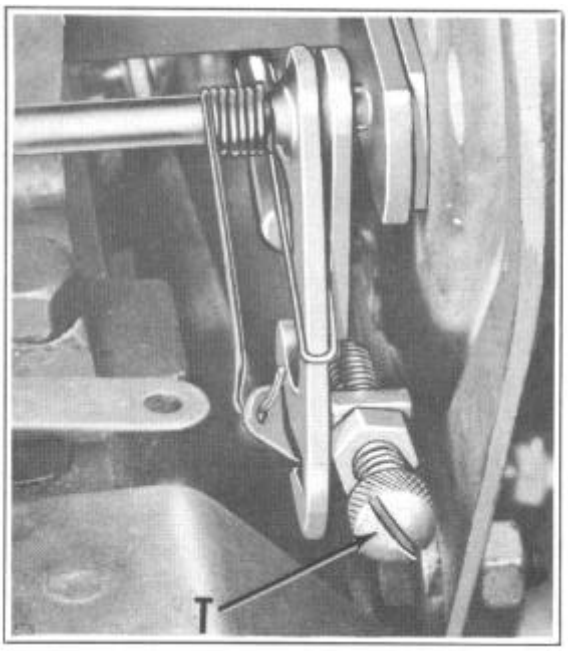



FIGURE 26

Adjust screw (T), Figure 26, until there is a slight increase in engine speed to 625-750 RPM when the car begins to move forward.

**NOTE: Above adjustment should be made with the compensator in the starting position, pin (10) forward. The throttle adjusting screw on the 500 series is mounted in a bracket on top of the cylinder head.**

**10. CUSHION POINT ADJUSTMENT:**

Stop engine; depress clutch pedal (IMPORTANT) and restart engine; DO NOT RACE ENGINE. Set hand brake, transmission in second gear. Screw cam screw (63), Figure 27, in fully towards cam (29). Push cam (29) against screw (63) and back out screw (63) until engine stalls. Above adjustment should be made with the compensator in the starting position.

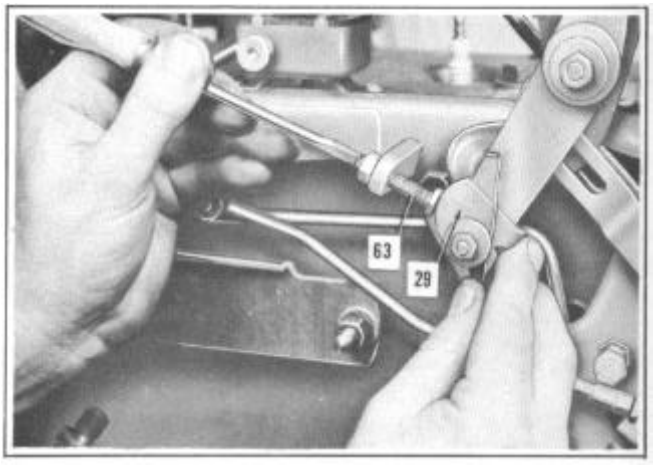



FIGURE 27

**11. ROAD TEST:**

A. To check slow start, depress accelerator pedal very slowly - engine should speed up slightly just before car starts to move. If necessary adjust screw (T), Figure 26, to meet this requirement.

B. To check fast start, depress accelerator pedal 1/2 way to floor - car should move forward smoothly without excessive slipping of clutch. If necessary adjust screw (63) "in" or "out" to meet this requirement, Figure 27. Do not screw (63) "in" toward cam more than two (2) turns from No. 9 Adjustment setting.

**CAUTION: Too frequent operation of the clutch will cause it to become overheated, making satisfactory adjustment impossible. Drive two city blocks between starts while adjusting.**

**12. TRANSFER KEY**:

Check adjustment of ball joint for free rotation without perceptible end play. Adjust by loosening the lock nut, Figure 28, and turn the threaded sleeve inward or outward. Retighten lock nut.

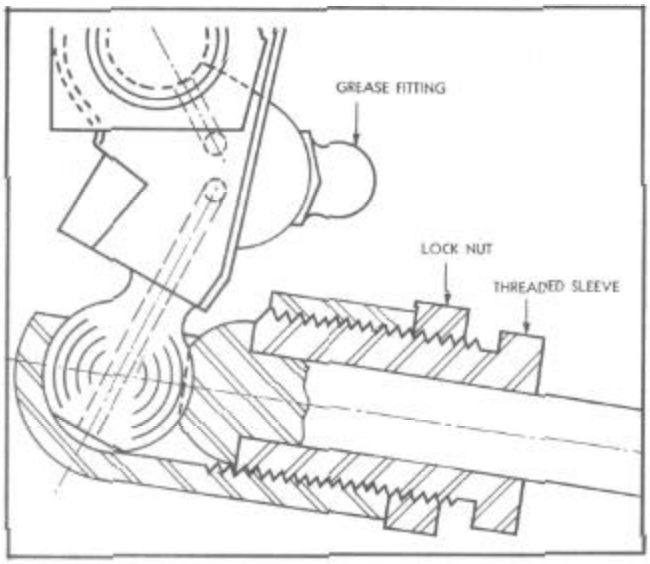



FIGURE 28

**13. TRANSFER ROD:**

With engine not running shift transmission into high gear and adjust length of selector diaphragm rod (48), Figure 29, until it is just long enough to allow selector key (54) to bottom solidly in the slot in hand shift lever (59). Check this adjustment by starting engine and shifting transmission to neutral. Selector key (54) should bottom solidly in the slot in power shift lever (59). If it does not, recheck above adjustment.

**CAUTION: While adjusting length of rod (46) hold diaphragm rod end (48) with a wrench to prevent rod from turning and damaging diaphragm.**

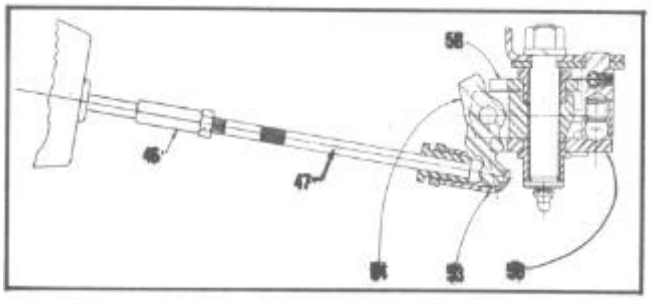


FIGURE 29

**14. TRANSMISSION SHIFT ROD:**

On models 501, 502, 503, 504, with transmission in neutral disconnect rod (61) at pin (60), Figure 30. Push or pull rod (61) to obtain a free crossover at the transmission. Move lever (59) until ball is seated solidly in neutral detent. Adjust length of rod (61) so that it can be reconnected to pin (60) without moving either lever to which it is attached.

Adjust in 1/2 turn steps until crossover works free. On model 500 loosen adjusting nuts at end of rod (64), Figure 6 and retighten when crossover is free.

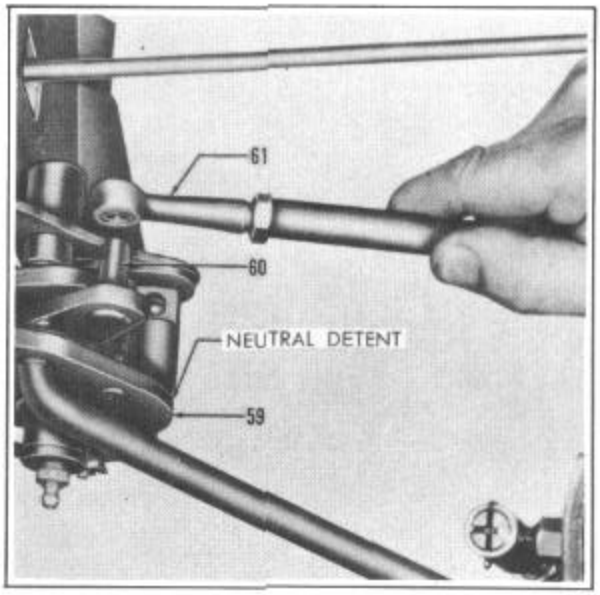



FIGURE 30

**15. GEAR SHIFT LEVER:**

Adjust length of remove control tube to bellcrank rod assembly (38) so that when in neutral, the end of the gear shift lever is approximately 1" above a transverse horizontal line, Figure 31.

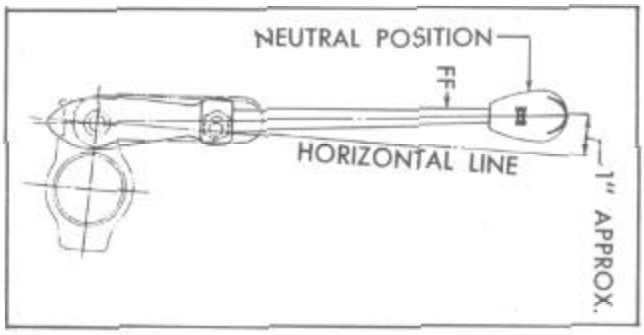



FIGURE 31

**16. POWER SHIFT LEVER:**

With engine running and instrument panel control switch "on", shift to second gear. Turn stop screw (M) down until it contacts shift lever (0) and then turn it down 1/2 turn more. Lock in place with Allen head set screw (N).

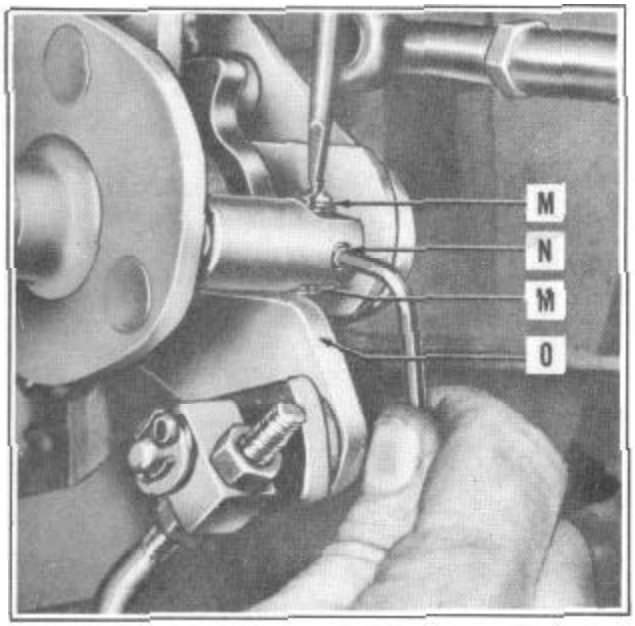



FIGURE 32

**17. THROTTLE LOCK CABLE:**

With engine running, operate throttle lock by running a jumper wire from the battery negative post to either one of the throttle lock. solenoid pins. Adjust nut (37),

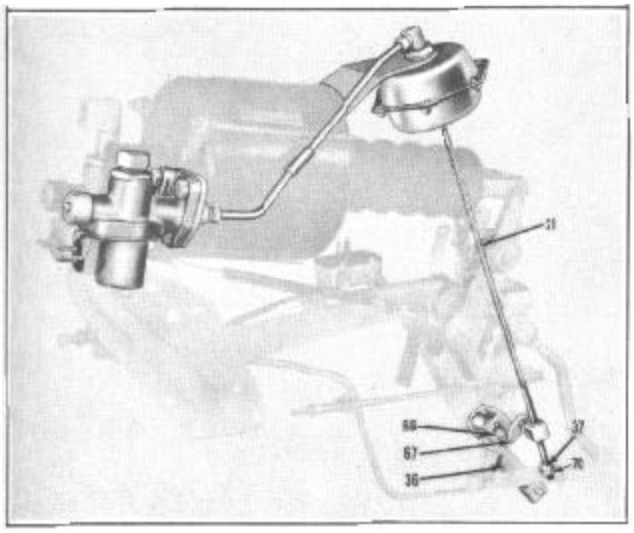


FIGURE 33

Figure 33, on the diaphragm cable until lever (67) is held solidly against stop (36) when accelerator pedal is depressed. Securely lock nut (37) with nut (70). Cable (21) should not be so short that shaft (66) is deflected when throttle lock operates.

**18. NEUTRAL AND LIMIT SWITCH:**

With instrument panel switch "on" and engine running, gear shift in neutral, disconnect rod (61), Figure 34; then move gear shift lever to second and back to neutral, push or pull slightly on rod (61) until a free crossover is obtained. If rod (61) appears too short to go back on pin (60) shorten neutral switch rod
(51); if too long, lengthen neutral switch rod. Adjust nuts (55) and (57) against trunnion block (56) as required. Repeat all above operations until rod (61) can be reconnected without moving either of the levers to which it is attached.

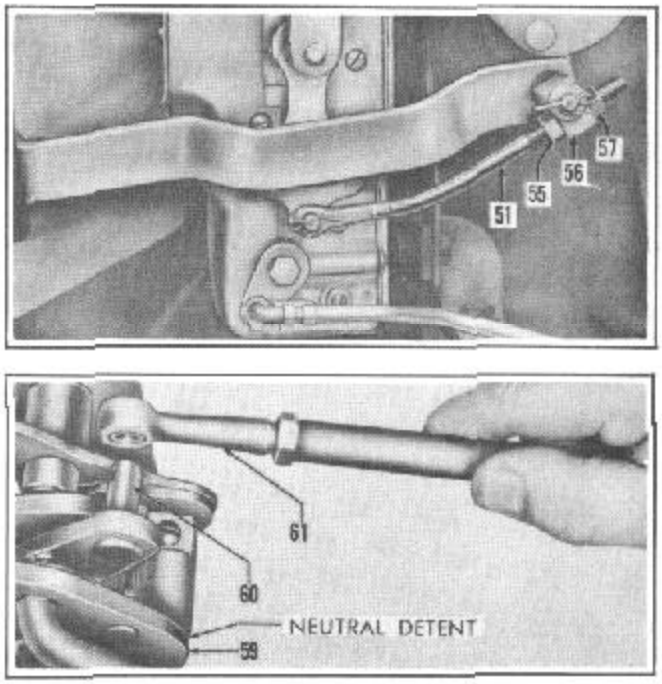



FIGURE 34

**19. CROSS-OVER**

If cross-over is sticky recheck adjustments 14 and 16 and see that transfer switch rod (72) is centered in clip (68) at clutch housing, Figure 16.

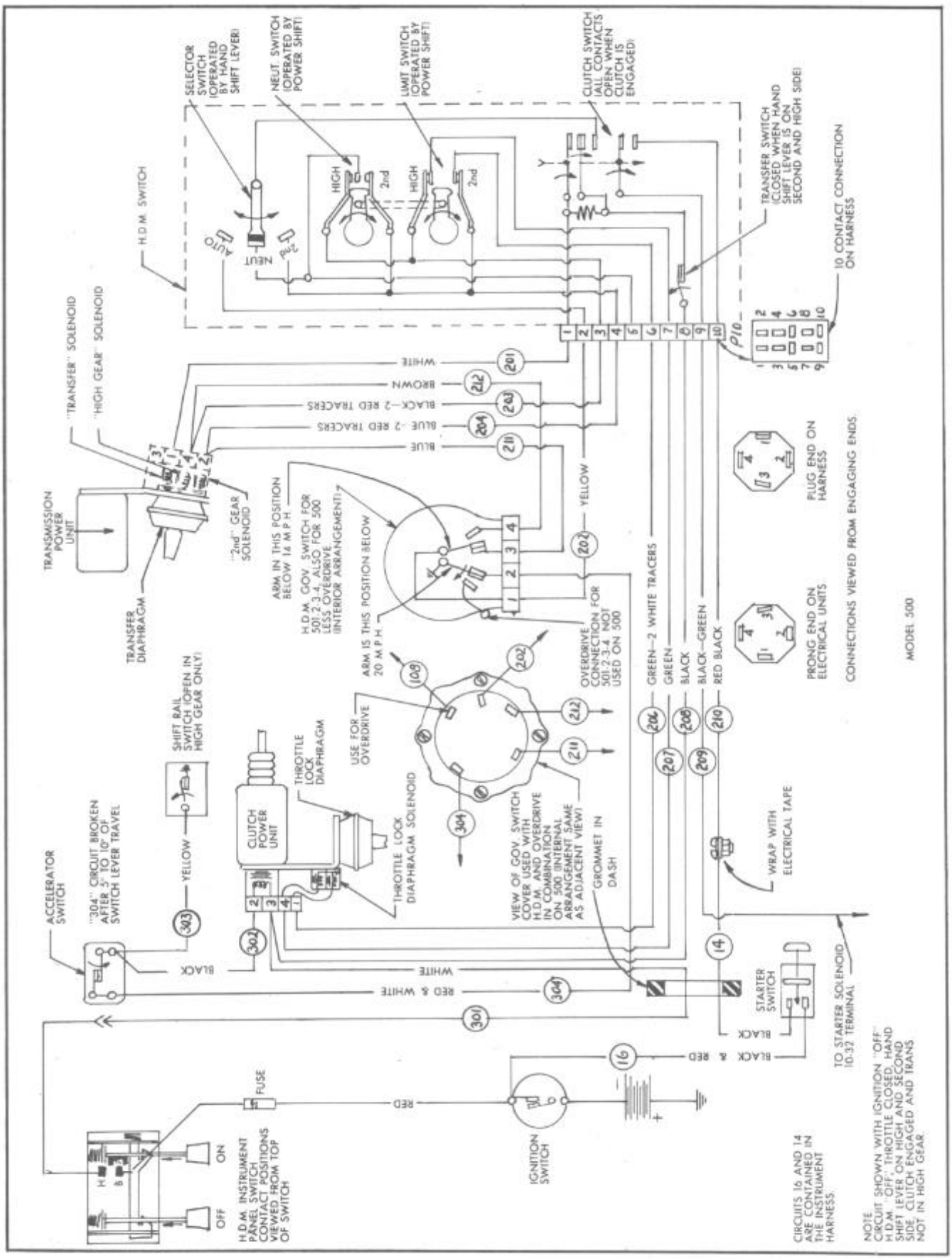

SELECTOR SWITCH (OPERATED BY HAND SHIFT LEVER)
NEUT. SWITCH (OPERATED BY POWER SHIFT)
LIMIT SWITCH (OPERATED BY POWER SHIFT)
CLUTCH SWITCH (ALL CONTACTS OPEN WHEN CLUTCH IS ENGAGED)
TRANSFER SWITCH (CLOSED WHEN HAND SHIFT LEVER IS ON SECOND AND HIGH SIDE)
10 CONTACT CONNECTION ON HARNESS
H.D.M. SWITCH
HIGH
2nd
NEUT
"TRANSFER" SOLENOID
"HIGH GEAR" SOLENOID
"2nd" GEAR SOLENOID
TRANSMISSION POWER UNIT
TRANSFER DIAPHRAGM
WHITE
BROWN
BLACK—2 RED TRACERS
BLUE—2 RED TRACERS
BLUE
YELLOW
ARM IN THIS POSITION BELOW 14 M P H
H.D.M. GOV. SWITCH FOR 501.2.3.4. ALSO FOR 500 LESS OVERDRIVE (INTERIOR ARRANGEMENT)
ARM IS THIS POSITION 20 M P H
OVERDRIVE CONNECTION FOR 501.2.3.4 NOT USED ON 500
GREEN—2 WHITE TRACERS
GREEN
BLACK
BLACK—GREEN
RED BLACK
PLUG END ON HARNESS
PRONG END ON ELECTRICAL UNITS
CONNECTIONS VIEWED FROM ENGAGING ENDS.
MODEL 500
SHIFT RAIL SWITCH (OPEN IN HIGH GEAR ONLY)
USE FOR OVERDRIVE
THROTTLE LOCK DIAPHRAGM
CLUTCH POWER UNIT
THROTTLE LOCK DIAPHRAGM SOLENOID
VIEW OF GOV. SWITCH COVER USED WITH H.D.M. AND OVERDRIVE IN COMBINATION ON 500 (INTERNAL ARRANGEMENT SAME AS ADJACENT VIEW)
GROMMET IN DASH
WRAP WITH ELECTRICAL TAPE
ACCELERATOR SWITCH
"304" CIRCUIT BROKEN AFTER 5" TO 10" OF SWITCH LEVER TRAVEL
YELLOW
BLACK
WHITE
RED & WHITE
STARTER SWITCH
TO STARTER SOLENOID 10-32 TERMINAL
BLACK
BLACK & RED
FUSE
RED
IGNITION SWITCH
H.D.M. INSTRUMENT PANEL SWITCH CONTACT POSITIONS VIEWED FROM TOP OF SWITCH
ON
OFF
CIRCUITS 16 AND 14 ARE CONTAINED IN THE INSTRUMENT HARNESS.
NOTE
CIRCUIT SHOWN WITH IGNITION "OFF"
H.D.M. "OFF," THROTTLE CLOSED, HAND SHIFT LEVER ON HIGH AND SECOND SIDE, CLUTCH ENGAGED AND TRANS NOT IN HIGH GEAR.

FIGURE 35

# UNIT CHECKS

**1. PLUG CHECK:**

Insert a blade 1/4" wide and 1/32" thick successively into each socket of plug for a distance of 1/2". Socket should grip rod tightly enough to make a good electrical contact.

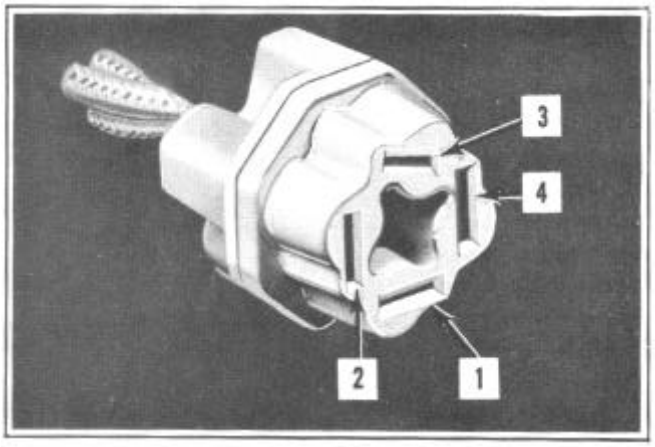



FIGURE 36

**2. INSTRUMENT PANEL SWITCH CHECK:**

Ignition switch on. Ground long lead of test lamp. Switch button pushed in DRIVE -MASTER SIDE (Right Side). Examine fuse and if fuse is OK, test lamp prod to terminal H, Figure 36, should light test lamp.

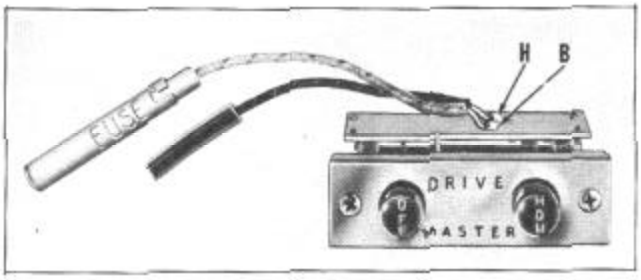



FIGURE 37

**3. GOVERNOR SWITCH:**

Rear wheels on stands. Start engine, shift high gear. Remove connector plug. Long ad to test lamp to negative terminal of battery. Test lamp prod to No. 2 (RW) prong wire governor, Figure 38 - 39, should light test lamp up to 18-21 miles per hour.

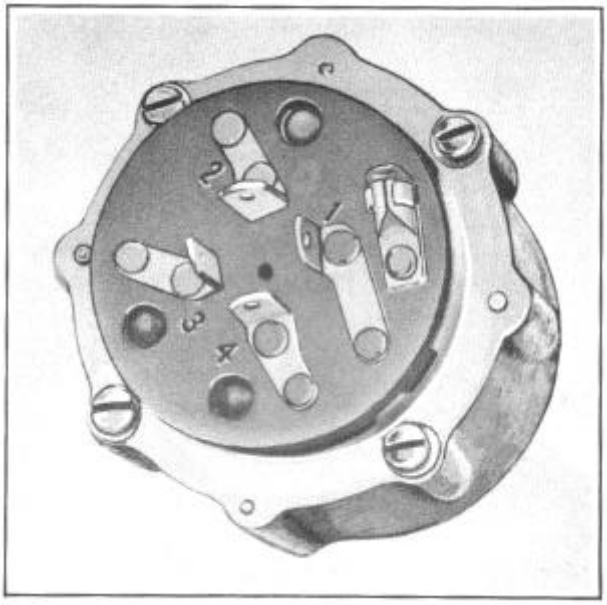


FIGURE 38

Ground No. 1 (Y) prong of governor, test lamp prod to No. 3 (BL) prong should light test lamp up to 9-13 miles per hour, above that speed test prod to No. 4 (B) prong should light test lamp.

A separate terminal for use with over-drive should light test lamp any speed over 16-21 MPH.

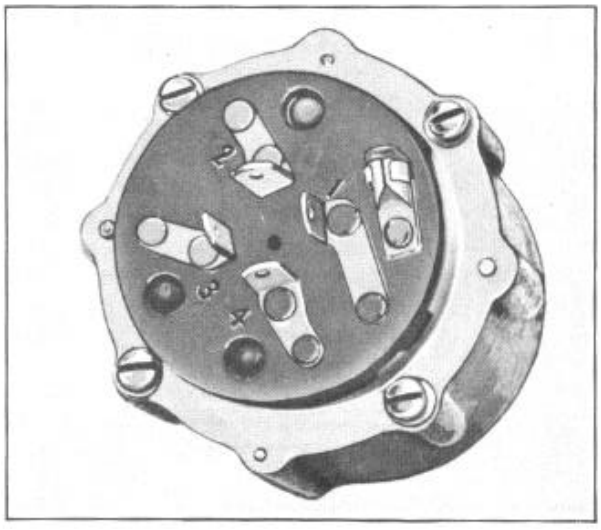


FIGURE 39

**4. SHIFT RAIL SWITCH:**

Disconnect double wire bullet terminal at accelerator switch and connect a test lamp between this bullet terminal and battery negative terminal. Shift gear shift. Dim

light in high gear, bright light in all others. FIGURE 405.

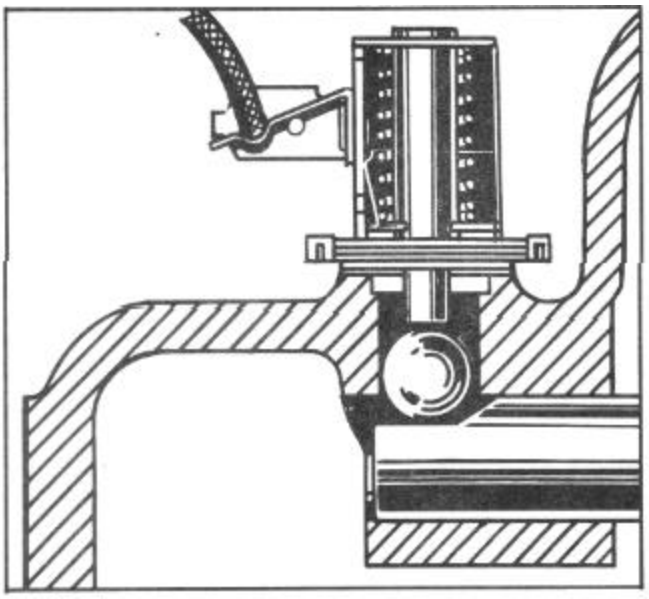


FIGURE 40

## 5. CLUTCH POWER UNIT SOLENOID:

Remove connector socket, connect one jumper wire between a ground and No. 2 prong of the clutch power unit solenoid Figure 41 at A, connect another jumper wire between No. 3 prong and negative battery terminal. Solenoid should be felt and heard to operate.

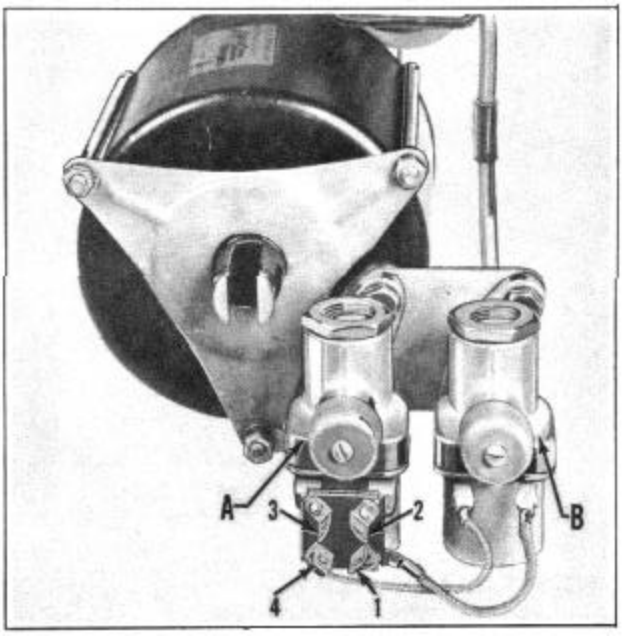



FIGURE 41

All the 500 models equipped with Drive-Master have an improved check valve at the clutch power unit solenoid which provides a smoother clutch engagement with less racing of the engine. To test the effectiveness of check valve, set hand brake, put gear shift lever in neutral and warm up engine. Then stop the engine by grounding the low tension ignition circuit at the distributor or at the distributor terminal of the ignition coil. Do Not Turn Off Ignition. After engine has stalled, note the rate at which the clutch control piston falls out and allows the clutch to engage. Time required for piston to fall out should be more than 7 seconds. If piston falls out faster than this examine valve seat for dirt and valve poppet to see that the rubber faced side is toward the valve seat. Also check for vacuum leaks between the solenoid valve and the cylinder and around the piston.

## 6. THROTTLE LOCK SOLENOID:

Disconnect the wires at throttle lock solenoid (B) Figure 42, connect a jumper wire from the battery negative terminal to either throttle lock solenoid terminal, valve should operate. Move the jumper wire to the other terminal, valve should operate.

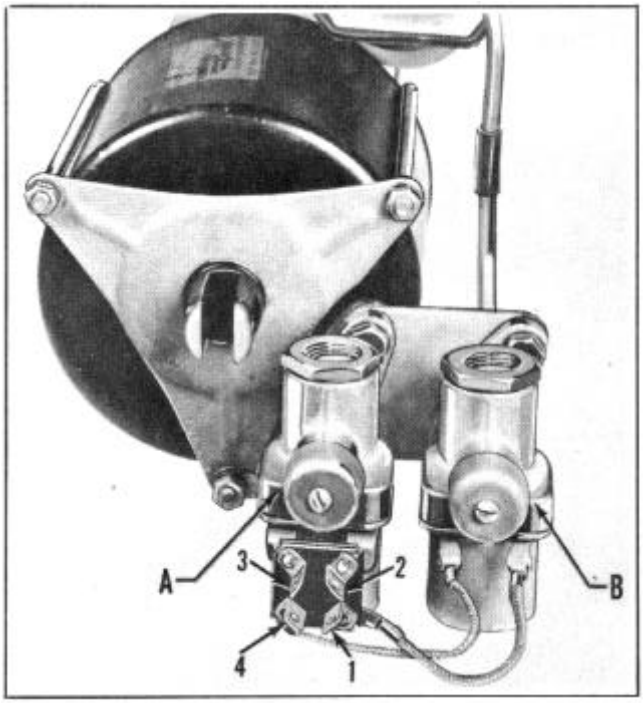



FIGURE 42

## 7. THROTTLE LOCK FAILURE:

It is the function of the throttle lock to hold the throttle closed until a shift is complete. Failure to shift through neutral and clashing gears when accelerator pedal is pushed down again immediately after releasing is a sign of defective throttle lock.

To check proceed as follows:

With engine idling and H.D.M. button pushed in, shift from neutral to second, throttle should lock momentarily. Next shift from second back to neutral throttle should again lock momentarily. If preceding checks were OK put transmission in second gear by pulling the hand lever down into automatic (high) position. Stop engine, pull plug connector from transmission power shifter unit. Start engine and move hand lever to neutral. Throttle should lock. Jack up rear wheels and push accelerator down to floor while holding foot lightly on clutch pedal to stop it if clutch control should release suddenly.

A. The throttle lock should hold engine at idling speed while the accelerator pedal is at floor. If it does not, adjust cable length (Adjustment No. 17). If this adjustment does not stop pedal from breaking through throttle lock, check adjustment No. 4 and No. 5 of Adjustment Instructions. If these adjustments fail to correct the trouble, change transmission control switch.

If the throttle failed to lock on either the shift into or out of second, check as follows:

With engine idling disconnect the wires at throttle solenoid Figure 42 at B; attach jumper wire from the negative battery terminal successively to each terminal. Lock should operate in each case. If it does not operate, check for a defective solenoid, ruptured diaphragm, or a defective throttle lock ground wire, Figure 43.

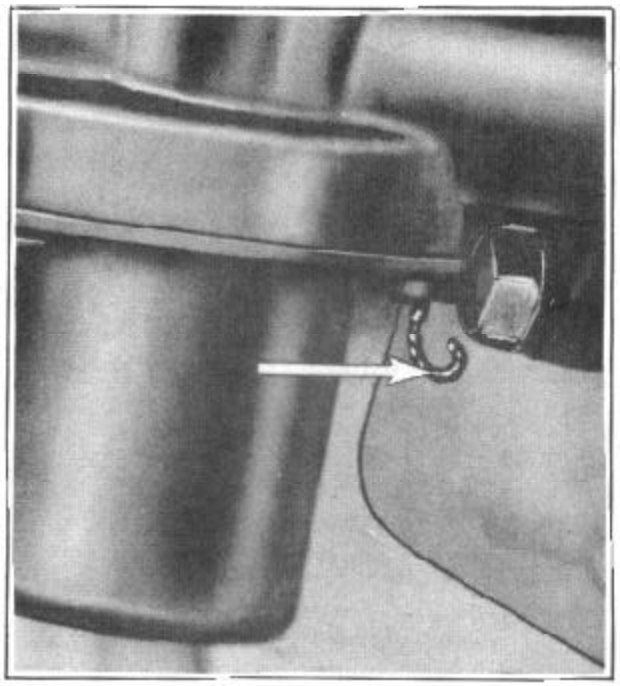


FIGURE 43

If it does operate, adjust length of cable per adjustment instructions.

Connect a test lamp successively between a ground and No. 1 and No. 4 sockets in harness plug. In each case lamp should flash when the gear shift lever is moved from neutral to second and back to neutral. If lamp flashes in both cases, plug is at fault. Make (Check 1) under unit checks. If lamp does not flash in both cases, replace the transmission control switch. Make (Check 10) under unit checks, or check harness from plug socket No. 4 at throttle lock solenoid to No. 7 prong at ten prong plug and from No. 1 prong of connector plug at throttle lock to No. 6 prong of ten prong plug.

## 8. ACCELERATOR SWITCH:

Ground one lead of jumper wire, other lead to one terminal of the accelerator switch Figure 44, long lead of test lamp to negative b a t t e r y terminal and other switch terminal. Lever against stop, test lamp should light. Move lever 5° to 10° from stop. Light should go out.

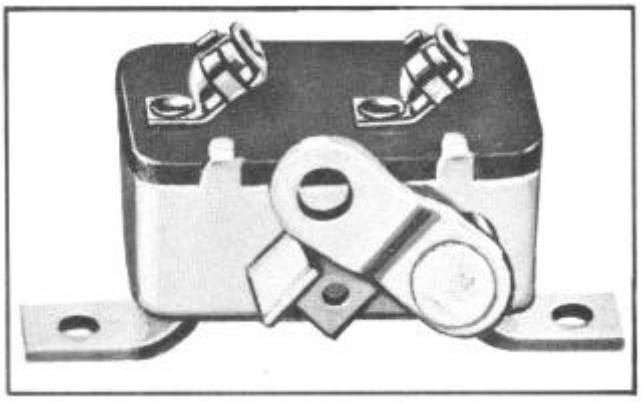


FIGURE 44

**9. TRANSMISSION POWER UNIT SOLENOIDS:**

Start engine, remove connector socket. Connect a jumper between negative battery terminal and No. 2 prong of power shift unit solenoid Figure 45. Piston rod should move "out". Moving jumper to the No. 4 prong, piston rod should move "in", to the No. 1 prong should operate transfer diaphragm.

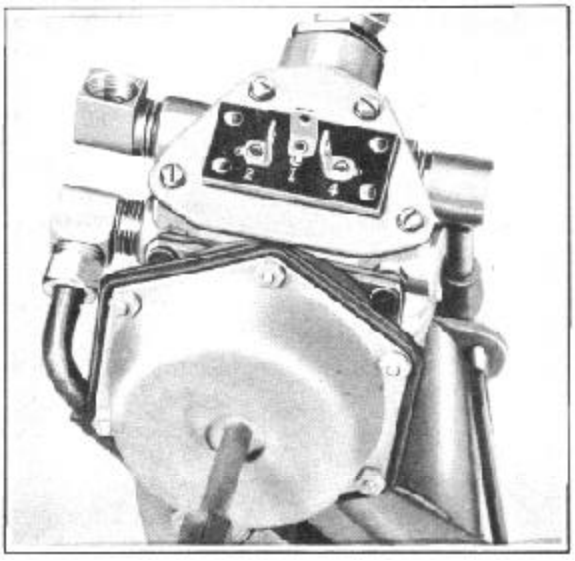


FIGURE 45

**10. DRIVE-MASTER HARNESS CHECK:**

Before test is started, harness should be disconnected from all Drive-Master units. These points are:

White wire at bullet connector 4" from instrument panel switch.
Ten contact plug at control switch.
Connector plug at power shift unit.
Connector plug at clutch control solenoid.
Two wires at accelerator switch.
One wire at shift rail switch.
Connector plug or wires at governor.

In cases of starting motor failure remove the tape at the bolted together splice located 6" from the power shift unit and disconnect the wire at the 10-32 terminal of the starter solenoid.

Guard against unintentional grounding of any leads while making the check by taping all loose bullet connectors which might accidentally make contact with metal parts of the car.

The following chart gives a complete check of continuity and shows up any unwanted cross circuits. To use the chart, ground the indicated lead and connect one terminal to test lamp to negative terminal of battery and then touch test lamp prod successively to each of the prongs in the transmission control switch ten contact plug. If lamp fails to light on the indicated prong a continuity break is indicated. If lamp lights when it should not, a cross circuit or ground is indicated.

On cars equipped with both Drive-Master and Overdrive the two harnesses are taped together to make a single unit. However, there is no electrical connection between the two and either harness may be checked independently of the other.

| GROUND LEAD TO | TEST LAMP PROD. TO 10 CONTACT PLUG PRONG NO. | | | | | | | | | | TEST PROD TO | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | RW wire at switch | Y & BK wire at switch | Clutch control socket No. 2 |
| Power shift unit plug socket No. 1 | * | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Power shift unit plug socket No. 2 | 0 | 0 | 0 | * | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Power shift unit plug socket No. 4 | 0 | 0 | * | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Clutch control solenoid socket No. 1 | 0 | 0 | 0 | 0 | 0 | * | 0 | 0 | 0 | 0 | | | |
| Clutch control solenoid socket No. 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Clutch control solenoid socket No. 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | * | 0 | 0 | | | |
| Clutch control solenoid socket No. 4 | 0 | 0 | 0 | 0 | 0 | 0 | * | 0 | 0 | 0 | | | |
| White wire at instrument panel Switch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | * | 0 | 0 | | | |
| Governor plug socket No. 1 or Y wire △ | 0 | * | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Governor plug socket No. 2 or RW wire △ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | * | 0 | |
| Governor plug socket No. 3 or BL wire △ | 0 | 0 | 0 | * | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Governor plug socket No. 4 or B wire △ | 0 | 0 | * | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Y wire at shift rail switch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | * | * |
| Splice near shifter unit ☐ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | * | | | |
| Starter solenoid wire terminal ☐ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | * | 0 | | | |

△ Model 500 with Overdrive and Drive-Master combination uses separate wires at the governor switch instead of a plug.

0 Lamp not lighted.

* Lamp lighted.

☐ For starting failure only.

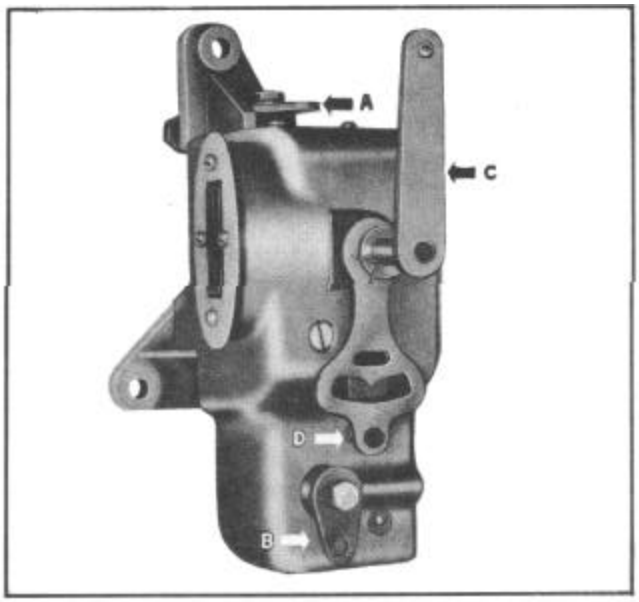



FIGURE 46

**11. TRANSMISSION SWITCH:**

Place gear shift in neutral. Remove connector plug. Insert plug of test harness. Long lead of test lamp to negative terminal of battery. Test lamp prod free for testing.

| | | Test Lamp from battery to Prong No. | Ground Lead to Prong No. | Lamp Lights |
|---|---|---|---|---|
| **Clutch and Transfer Switch** | Disconnect clutch switch operating rod. Move switch lever to rear (on). | 8 | 1 | Yes* |
| | | 8 | 5 | Yes |
| | Gear shift lever in neutral. | 9 | 10 | Yes |
| **Selector Switch** | Clutch switch on. | 1 | 4 | Yes |
| | 1.- Move gear shift to second gear. | 1 | 5 | No |
| | Neutral switch in neutral. | 1 | 2 | No |
| | 2.- Move gear shift to neutral. | 1 | 5 | Yes |
| | Neutral switch in neutral. | 1 | 2 | No |
| | | 1 | 4 | No |
| | 3.- Move gear shift to high. | 1 | 2 | Yes |
| | Neutral switch in neutral. | 1 | 4 | No |
| | | 1 | 5 | No |
| **Neutral and Limit Switch** | 1.- Move power lever to neutral | 3 | 7 | Yes |
| | (center). Gear shift lever | 3 | 5 | No** |
| | in neutral. | 4 | 5 | No** |
| | | 4 | 6 | Yes |
| | 2.- Move power lever to second | 3 | 7 | Yes |
| | (to the rear). Gear shift lever | 3 | 5 | Yes |
| | in neutral. | 4 | 6 | No |
| | | 4 | 5 | No |
| | 3.- Move power lever to high | 3 | 7 | No |
| | (forward). Gear shift lever in | 3 | 5 | No |
| | neutral. | 4 | 6 | Yes |
| | | 4 | 5 | Yes |

Remove test harness and replace plug.

* When clutch switch is moved forward (off) the lamp should burn dim, and brighten when lever is moved to rear (on).

** If lamp lights, recheck neutral switch adjustment, before proceeding further.

# TROUBLE SHOOTING

## PRELIMINARY CHECKS

When checking a Drive-Master complaint first determine that the clutch and transmission are functioning properly in manual operation.

Do not attempt any adjustments of the Drive-Master until the engine has reached the normal operating temperature.

The engine must be in proper time and should idle smoothly at 580 to 600 RPM, with the Drive-Master switch "ON".

The vacuum gauge should read from 17 to 18 inches of vacuum.

Check all joints of throttle and Drive-Master linkage to see that they work freely.

All terminal connections, sockets and plugs should be clean and in solid contact. The battery should be in good condition and gravity reading not less than 1225.

All electrical checks should be made with the Ignition and Drive-Master switches in the "ON" position; test should be made with a test lamp of 15 candle power rating.

**NOTE: A call for a lamp to light indicates a call for a bright light; a dim light indicates a high resistance circuit and for checking purposes is the same as no light.**

## CONDITION NO. 1

**CLUTCH DOES NOT DISENGAGE:**

A. Check vacuum lines for leaks or collapsed hose.

B. With ignition and Drive -Master switches "ON", disconnect plug at clutch unit solenoid plug, connect one end of test harness to the clutch unit solenoid prongs, other end to car harness plug. Connect a test lamp between No. 3 lead of test harness and a ground. If test harness is not available connect direct to the No. 3 socket of harness plug.

C. Lamp should light in test B. If it does not, instrument panel switch (Check No. 2 under unit checks) or wire harness is defective. Also check wire connection located 4 inches from instrument panel switch, feed wire from ignition switch and the fuse in this feed wire.

D. Place gear shift lever in neutral, remove harness plug from clutch control solenoid and connect the test harness to harness plug but DO NOT connect to solenoid. Connect a test lamp between the test harness No. 2 lead and negative battery terminal. If test harness is not available connect direct to No. 2 socket of harness plug. Lamp should light; if it does not, shift rail switch or the wire in the harness is defective.

E. If tests B, C and D show completed circuits, check for defective socket plug or clutch power unit solenoid. Make (Checks No. 1 and 5) under unit checks.

## CONDITION NO. 2

**CLUTCH DOE S NOT DISENGAGE WHEN COMING TO STOP:**

A. Make adjustment Checks 2 and 4.

B. If above adjustments are OK, remove red and white wire at accelerator switch and connect a test lamp between this wire and the negative battery terminal. Lamp should light.

C. If lamp lights accelerator switch may be defective. Make check No. 8 under unit checks.

D. If lamp does not light, check connection at governor switch and with the test lamp still connected as in B connect a wire between No.

2 socket (RW terminal) of governor socket plug and a ground. If lamp lights, governor switch is defective; make Check No. 3 under unit checks. If lamp does not light harness is defective; make Check No. 10 under unit checks.

## CONDITION NO. 3

**CAR FREE WHEELS AT ALL SPEEDS IN HIGH GEAR:**

A. Disconnect accelerator switch wires and connect a jumper wire between ground and one switch terminal; connect a test lamp between the battery negative terminal and t h e o t h e r terminal of the accelerator switch.

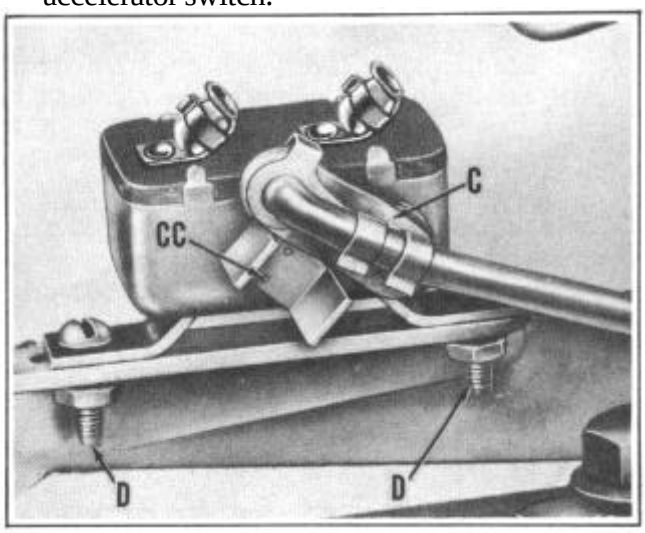



FIGURE 47

B. With lever (C) Figure 47 against stop (CC) as indicated by an arrow lamp should light.

C. Move lever (C) 10 degrees from stop (CC) light should go out.

D. One black and one yellow wire are soldered together at a single bullet terminal at the accelerator switch. Disconnect this bullet terminal from the accelerator switch and connect a test lamp between the battery negative terminal and this bullet terminal. Shift gear shift. Light should be dim when in high gear, bright in all other. If so proceed to paragraph F.

E. If lamp is bright when transmission is in high gear; disconnect wire at shift rail switch Figure 48 if light goes dim shift rail switch is defective. Make Check No. 4 under unit checks. If light stays bright harness is defect

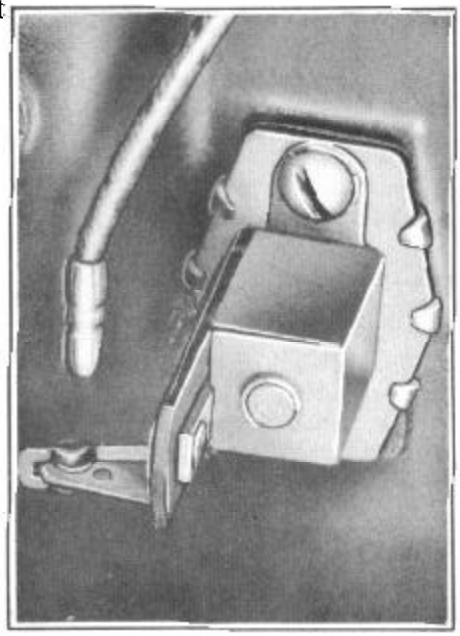


FIGURE 48

F. Disconnect red and white single wire at accelerator switch and connect test lamp between bullet terminal of the wire and negative terminal of battery. Jack up rear wheels and drive car in high gear. If lamp does not go out at speeds over 20 MPH, disconnect plug at governor switch. If lamp does not go out harness is grounded (Check No. 10) if lamp does go out governor is defective (Check No. 3). Also check for missing shift rail detent ball.

## CONDITION NO. 4

**TOO MUCH ENGINE SPEED ON START:**

Make Adjustments No. 9 and 10.

## CONDITION NO. 5

**ENGINE STAGGERS OR STALLS ON START:**

Make Adjustments No. 9 and 10.

## CONDITION NO. 6

**CLUTCH CHATTERS ON ENGAGEMENT:**

Chatter will be less if engine speed does not exceed 625 RPM as car starts to move.

Make Adjustments No. 9 and 10.

## CONDITION NO. 7

**ENGINE STALLS ON FAST STOP:**

A. Tune engine and set idle speed at 580-600 RPM if necessary make tests under Condition No. 2 "Clutch Does Not Disengage When Coming to A Stop".

B. Check to see that car starts to free wheel at not less than 16 MPH. If car does not free wheel at less than 16 MPH when in high gear, check governor drive pinion for proper number of teeth. Also check governor (unit check 3).

## CONDITION NO. 8

**HARD SHIFTING AND GEAR CLASH:**

Above complaint is due to incomplete clutch disengagement and throttle lock failure. Make Adjustments No. 5 and 8 and Unit Check No. 7.

## CONDITION NO. 9

**CLUTCH DOES NOT DISENGAGE AT SPEEDS ABOVE 21 MPH, TRANSMISSION NOT IN HIGH GEAR:**

A. One black and one yellow wire are soldered together at a single bullet terminal at the accelerator switch. Disconnect this bullet terminal from the accelerator switch and connect a test lamp between the battery negative terminal and this bullet terminal. Shift gear shift. Light should be dim when in high gear, bright in all others. If so proceed to test B.

B. If lamp does not light brightly in any gear in tests D, place transmission in neutral; with test lamp still connected as in test D, connect a jumper wire from a ground to the shift rail switch terminal Figure 49 at A. Now if lamp does not light, the wire from the accelerator switch terminal to the shift rail switch is defective.

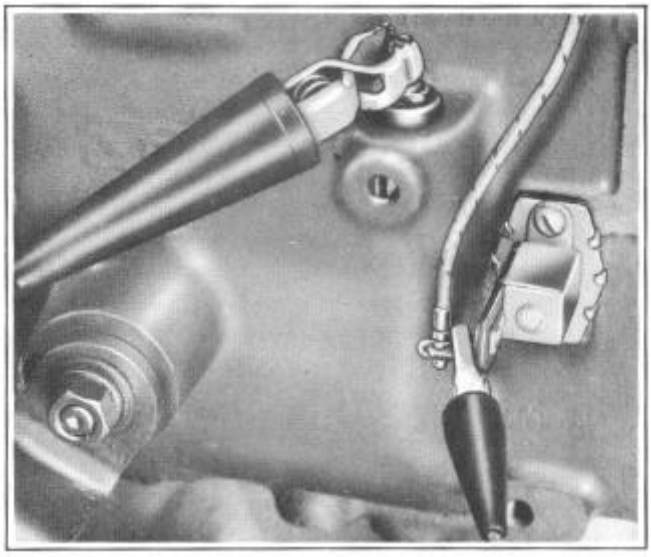


FIGURE 49

C. If lamp does light brightly, shift rail switch is defective. Make Check No. 4 under unit checks.

## CONDITION NO. 10

**CLUTCH SLIPS WHEN FULLY ENGAGED:**

Make Adjustments No. 1 and No. 8 also try clutch operation manually. Refer to "Clutch Section" in the 480-490 Mechanical Procedure Manual.

## CONDITION NO. 11

**CLUTCH DRAGS:**

Make Adjustments No. 5 and No. 8

## CONDITION NO. 12

**CLUTCH SLIPS EXCESSIVELY ONLY WHEN FIRST OPERATING CAR AFTER STARTING ENGINE:**

Make Adjustment No. 6.

## CONDITION NO. 13

**STARTING MOTOR WILL NOT OPERATE**:

A. Check clutch switch rod (65) Figure 1, to see that it operates the clutch switch in transmission control switch when the clutch pedal is depressed.

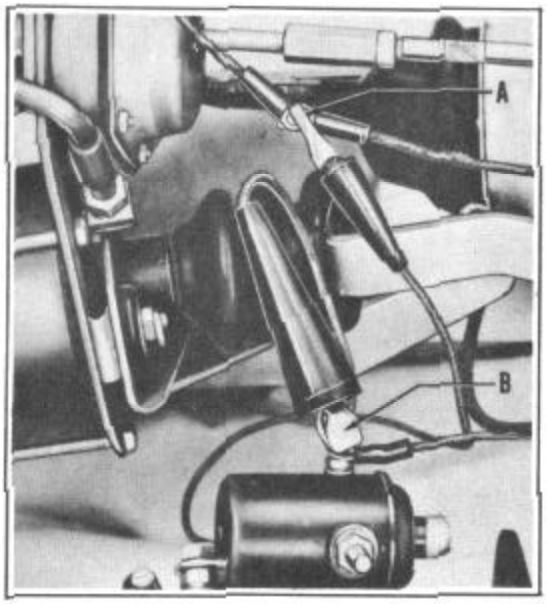



FIGURE 50

B. Remove the friction tape from wire splice at (A) Figure 50 and connect a jumper wire from this connection to the small terminal on starting motor solenoid at (B).

C. If starter does not operate when starter button is pushed, trouble is in the regular starting circuit.

D. If starter does operate, the trouble is in either the wire harness, see "Wire Harness Check", or in the transmission control switch. Make Checks 10 and 11 under unit checks.

E. Remove transmission control switch plug Figure 51. Short across plug prongs No. 9 and No. 10 while pressing the starter button.

F. If starter does not operate, harness is defective, see "Wire Harness Check". Check 10 under unit checks.

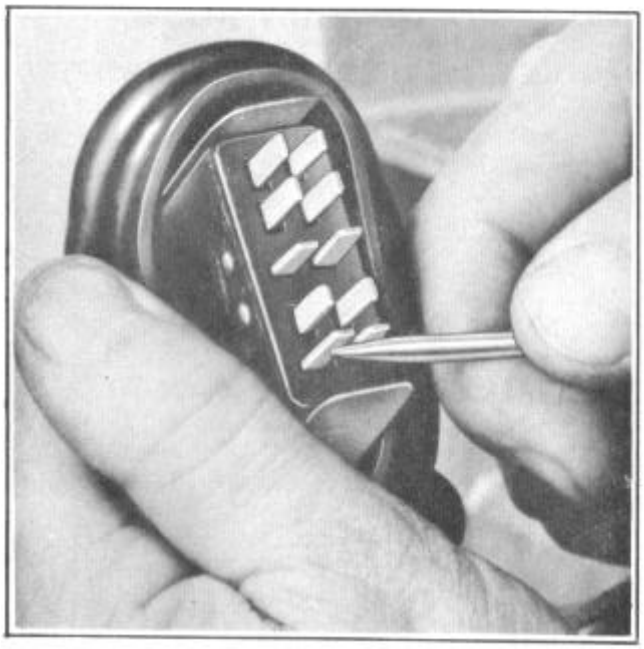


FIGURE 51

G. If starter operates, trouble is in the transmission control switch. Make Check 11 under unit checks.

## CONDITION NO. 14

**TRANSMISSION REMAINS IN NEUTRAL**:

A. Lift gear shift lever through cross-over and return. If transfer diaphragm works proceed to paragraph (J).

B. If transfer diaphragm does not work, make check 9 under unit checks, also see that cross-over switch operating rod (72), Figure 1, is connected; and if OK, proceed to paragraph C.

C. With engine idling, attach a jumper wire from the negative battery terminal to the No. 1 power shift unit prong.

D. If transfer key does not operate check for leaks in vacuum lines. If none are found either the solenoid valve is defective or the diaphragm is ruptured. If engine speeds up when solenoid is energized check for ruptured diaphragm by disassembling unit.

If solenoid valve seems dead and cannot be heard or felt to operate when energized it should be replaced.

E. If the transfer key does operate, connect a test lamp between a ground and No. 1 socket of power unit plug.

F. If lamp lights in test E, plug is at fault. Make Check 1 under unit checks.

G. If lamp does not light, remove the ten prong plug from transmission control switch and connect a test lamp from No. 8 prong to a ground Figure 52.

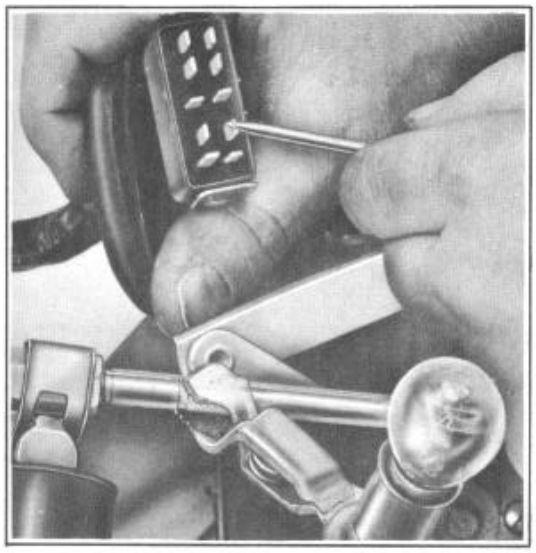


FIGURE 52

H. If lamp does not light, the wire between No, 8 prong and terminal "H" of the instrument panel control switch is open. Also check connector 4" from instrument panel switch.

H. If lamp does light in test (G) disconnect the the transmission control switch plug. Connect a test lamp between the battery negative terminal and power unit plug socket No. 1 and ground the No. 1 prong of the 10 prong plug.

If lamp lights in test (I), check transmission control switch. Make Check 11 under unit checks. If lamp does not light, white wire in harness is broken.

J. Move gear shift lever from neutral to second while watching power unit. If transmission shifts to second gear, proceed to paragraph (M).

K. Touch a jumper wire from the battery negative terminal to the No. 2 prong and No. 4 prong of the transmission power shift unit alternately; power cylinder piston rod should move "out" and "in".

If power cylinder piston rod does not move "in" or "out" in the above tests; check for leaks in vacuum lines to each end of cylinder and for defective second gear solenoid. Make check No. 9 under unit checks.

L. With engine running and the gear shift lever in second gear, ground one lead of the test lamp, other end to No. 2 socket of power shift unit harness plug. If lamp does not light, transmission control switch or wire harness is defective. Make check No. 10 and 11 under unit checks.

M. If transmission shifts to second gear in paragraph J, connect No. 1 and No. 3 sockets at governor socket plug with a short jumper wire.

N. Place gear shift lever in high gear position. If transmission shifts from neutral to second, the governor socket plug or the governor is defective. Make Checks 1 and 3 under unit checks.

O. If shift does not occur, either the wire harness, or the transmission control switch is faulty. Make checks 10 and 11 under unit checks.

## CONDITION NO. 15

**DOES NOT SHIFT INTO SECOND FROM HIGH AT SPEEDS BETWEEN 9 AND 12 MPH**:

A. If transmission shifts from neutral to second; but not from high to second; check for binding throttle linkage which may be restricting clutch disengagement. Adjustment No. 2.

B. If clutch disengages but transmission stays in high gear, check for defective governor switch or switch socket plug. Make Checks No. 1 and No. 3 under unit checks.

## CONDITION NO. 16

**DOES NOT SHIFT OUT OF SECOND INTO NEUTRAL:**

A. With engine idling, attach a jumper wire from the battery negative terminal to the power shaft unit No. 4 prong. Power cylinder piston rod should move "in". If it does not move "in" check for air leaks in lines to end of cylinder if engine speeds up when solenoid is energized, and for defective high gear solenoid if valves seems dead and cannot be heard or felt to operate when energized.

B. Place gear shift lever in neutral, connect a test lamp between a ground and the No. 4 socket of the power unit plug. If lamp lights, plug is at fault. Make Check 1 under unit checks.

C. If lamp does not light, the transmission control switch or wire harness is defective. Make Checks 10 and 11 under unit checks.

## CONDITION NO. 17

**DOES NOT SHIFT OUT OF SECOND INTO HIGH AT SPEEDS BETWEEN 9.5 AND 14 MILES PER HOUR:**

A. Improper adjustment of power shift lever stop screw. Make adjustment No. 16.

B. If trouble still exists, set hand brake. Install a jumper wire between socket No. 1 (Y) and No. 4 (B) of governor switch plug or wires; on the 500 model with overdrive, disconnect RW, Y and B wires. Start engine and shift to automatic (High) position while holding the clutch pedal down lightly with left foot. DO NOT REMOVE FOOT FROM CLUTCH PEDAL DURING THIS CHECK. Shift to high gear will be indicated by an increase in pressure on the clutch pedal.

C. If shift to high gear does occur, either the governor socket plug or the governor is faulty. Make Checks No. 1 and No. 3 under unit checks.

D. If shift to high gear does not occur, check wire between the governor socket No. 4 (B) wire and power shift unit socket No. 4 for an open circuit also check both plugs. Make Check No. 1 under unit checks.

## CONDITION NO. 18

**SHIFT INCOMPLETE, STOPS IN NEUTRAL:**

Make Check No. 7 under unit checks.

## CONDITION NO. 19

**FREE WHEELS AT SPEEDS ABOVE 21 MPH:**

If free wheeling never continues for more than 2 or 3 seconds, check spring behind gear shift lock detent as indicated by arrow, Figure 53. This should be a 30 pound spring (Part No. 41236). If free wheeling continues f or longer periods, check governor switch and see Condition No. 3 "Car Free Wheels At All Speeds In High Gear". If car is equipped with overdrive push Drive-Master Switch "off" button and if free wheeling continues see "Overdrive Trouble Shooting Chart Condition No. 12".

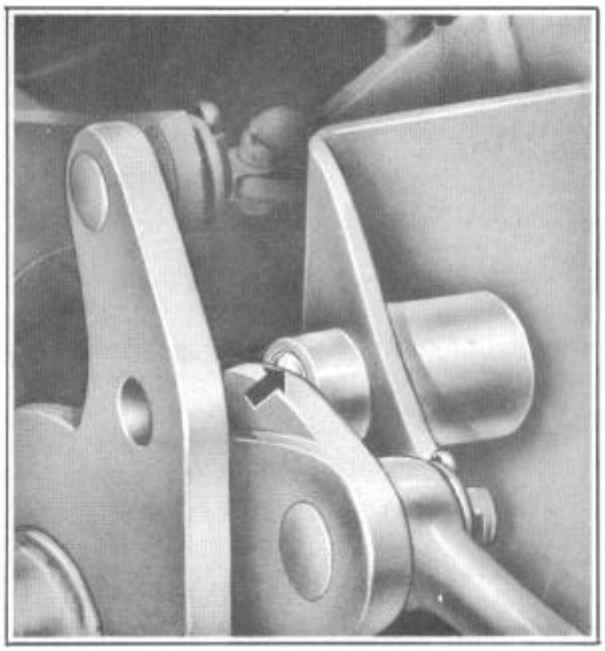


FIGURE 53

### CONDITION NO. 20

**THROTTLE REMAINS LOCKED:**

NOTE: A locked throttle indicates an incomplete shift.

A. If locking occurs when shifting from second to neutral, refer to. Condition No. 16 "Does Not Shift Out Of Second Into Neutral".

B. If locking occurs on some other shift, check accordingly under the condition covering that particular shift. C. Follow with Adjustment Checks 13, 15 and 17.

### CONDITION NO. 21

**SLOW RELEASE OF THE THROTTLE LOCK:**

Check transmission lubricant. In cold weather too heavy of a lubricant in the transmission will result in slow shifting, causing the throttle to remain locked for a longer period of time. Check for vacuum leaks in tubing.

### CONDITION NO. 22

**NOISY CROSS-OVER**:

Check for loose transfer diaphragm ball joint Figure 28, Adjustment Check No. 12. Lubricate transfer key.

### CONDITION NO. 23

**STICKY CROSS-OVER:**

Make Adjustment No. 19.

### CONDITION NO. 24

**GEARS CLASH DURING SHIFT:**

Check for throttle lock failure. Make unit check No. 7.

## PARTS REMOVAL AND REPLACEMENT

### CLUTCH POWER CYLINDER

**REMOVAL:**

1. Disconnect power unit air intake pipe (1) Figure 16, and pipe from intake manifold to clutch power unit solenoid.
2. Remove valve lever eccentric bushing nut (27) and pull bellcrank lever (28) out to allow clearance for removal of link (25).
3. Remove cotter pin at (24) and disconnect lever link from bell-crank
4. Remove pivot bolt (23).
5. Remove two screws attaching throttle lock diaphragm bracket to clutch power unit cylinder and disconnect pipe (19).
6. Remove two bolts attaching clutch unit solenoid (13) to clutch power unit cylinder and remove clutch unit and throttle lock solenoids as a unit.
7. Remove palnut, nut and bolt attaching clutch power cylinder to mounting bracket (9) and remove clutch power unit, piston rod and piston valve rod and link as a complete unit for disassembly and overhaul.

**INSTALLATION:**

Reverse procedure of removal and recheck piston valve rod adjustment, Adjustment No. 7 - also check that ground wire Figure 43 has not been broken.

## CLUTCH POWER CYLINDER MOUNTING BRACKET

**REMOVAL:**

1. Remove two nuts, washers and bolts attaching rear of bracket to throttle bellcrank bracket.

2. Disconnect air intake pipe (1) and vacuum pipe at clutch power unit solenoid.

3. Remove two bolts attaching clutch power unit mounting bracket to support bracket and one bolt attaching mounting bracket to throttle cross rod mounting bracket.

4. Remove palnut, nut and bolt attaching clutch power cylinder to mounting bracket.

5. Pull complete bracket towards fender to allow for removal of the cotter pin, flat washer, one small and one large spacer washer and spring washer attaching bell-crank support pin to mounting bracket.

6. Slide out bracket toward engine and remove.

**INSTALLATION:**

To install reverse procedure of removal and check for throttle cross rod binding in the mounting bracket.

## PISTON VALVE LEVER

**REMOVAL:**

1. Remove cotter pin at (24).

2. Remove cotter pin attaching threaded sleeve swivel (32) to valve lever cam (29).

3. Remove valve lever eccentric attaching nut (27) and washer, and remove lever (28) with valve lever cam (29) and springs attached.

**INSTALLATION:**

Reverse procedure of removal, recheck cushion point adjustment No. 10 and piston valve rod adjustment No. 7, Page 16, also stake nut (27) securely after tightening.

## COMPENSATOR LEVER

**REMOVAL:**

1. Perform operations 1, 2 and 3 under valve lever removal and remove pin attaching the eccentric bushing to the compensator lever shaft.

2. Push piston rod forward (towards power cylinder) and remove compensator lever.

**NOTE: A spring loaded detent ball is positioned between the compensator lever and bell-crank; use care when removing the compensator lever.**

**INSTALLATION:**

Reverse procedure of removal, and check eccentric bushing installation. Heavy side of bushing is assembled up. Also check adjustment No. 6 Page 16.

## VALVE LEVER CAM

**REMOVAL:**

1. For easy removal of the valve lever cam (29) Figure 16 follow removal and installation procedure for the "Valve Lever" and remove the nut, washer, bolt and spring attaching the cam lever to the valve lever. After installing recheck adjustment No. 10 under adjustments.

## BELLCRANK TO COUPLING LEVER ROD AND PLAY LINK

**REMOVAL:**

1. Perform operations 1, 2 and 3 under valve lever removal and remove the cotter pin, flat washer, spring and pin attaching play link to piston rod bell-crank

2. Raise car and remove cotter pin and flat-washer at clutch coupling lever and remove rod (30).

**INSTALLATION:**

Reverse procedure of removal and check Adjustments 7 and 8, page 16; also make sure spring is underneath flat washer at play link. Cotter pin should be securely fastened with the ears of the pin down so not to interfere with the action of the compensator lever.

## COMPENSATOR TRIP LEVER AND SPRING

**REMOVAL:**

1. Remove nut and washer (20) Figure 16.

2. Remove spring (11).

3. Remove lever and pin (10).

**INSTALLATION:**

1. Install lever and pin (10).

2. Install spring (11) hooking one end of spring on anchor but do not fasten other end of spring on trip lever,

3. Install washer and nut (20) and fasten securely.

4. Hook end of spring at trip lever and stake nut (20) securely in place.

## TRANSMISSION POWER SHIFT CYLINDER AND TRANSFER DIAPHRAGM REMOVAL:

1. Disconnect the diaphragm to transfer key engaging rod (48) Figure 1 from rod diaphragm end (46).

2. Disconnect shift strap by removing bolt attaching the strap to the power shift cylinder.

3. Disconnect battery cables, battery hold down, battery, battery tray, and battery support.

4. Disconnect the vacuum lines at transfer diaphragm solenoids.

5. Remove two cotter pins, nuts, ferrules, flat washers, and rubber bushings (44) attaching the power shift cylinder to power shift cylinder support bracket and remove the power shift cylinder (42) and transfer diaphragm as a unit.

**INSTALLATION:**

1. Place complete unit in position and enter mounting studs with flat rubber bushings inserted between power cylinder support bracket and mounting bracket.

2. Install two bushings (with collar) over studs and through holes of mounting bracket and install brass ferrules over studs with flanged ends of ferrules entered in counter-bore of the rubber bushings.

3. Install flat washers, nuts, and cotter pins. Tighten nuts sufficiently to enter cotter pins, then back off nuts until face of nut touches cotter pin.

4. Attach power shift cylinder shift strap and transfer diaphragm engaging rod (48). Adjust engaging rod Adjustment No. 13 under adjustment checks.

**NOTE: Hold diaphragm rod (46) with a wrench to prevent rod from turning and damaging the diaphragm.**

5. Adjust sleeve nut so that joint (53) is loose on transfer key ball without any appreciable end play.

6. Connect vacuum lines (1) and (2) at diaphragm.

7. Install battery support, tray, battery, battery hold down, and battery cables.

**NOTE: Tighten battery hold down nuts to 3 lbs. torque**.

8. Recheck operation of unit and adjust as necessary.

## POWER SHIFT UNIT SOLENOID AND TRANSFER DIAPHRAGM

**REMOVAL:**

**NOTE: Use same procedure as outlined in "Power Cylinder and Transfer Diaphragm Removal and Installation" and remove transfer diaphragm unit from power unit on bench by removing the transfer diaphragm attaching screws.**

**NOTE: The solenoid valves are not serviced separately.**

### TRANSMISSION CONTROL SWITCH

**REMOVAL**:

1. Lift off distributor cap (on 6 cylinder engines).

2. Disconnect coil wire at distributor vacuum control tube, distributor attaching screw, and remove distributor (6 cylinder only).

3. Disconnect clutch operating rod (65) transfer switch rod (72), neutral and limit switch rod (51) and selector switch rod (50).

4. Disconnect harness plug.

5. Remove one bolt, lockwasher and nut attaching transmission switch to support bracket at top and one bolt, lockwasher and nut at bottom and remove transmission switch.

**INSTALLATION:**

Reverse procedure of removal, attaching upper bolt first. Make sure all cotter pins and clips have been locked securely. Check adjustments and engine timing.

## POWER SHIFT UNIT TRANSFER DIAPHRAGM ENGAGING ROD AND/OR ROD END AND SLEEVE

**REMOVAL:**

1. Hold diaphragm rod end (46) Figure 1, with a suitable wrench and loosen the lock nut (47) .

2. Hold diaphragm engaging rod (48) with pliers and back out sleeve nut sufficiently to remove shift rod from transfer key ball.

**INSTALLATION:**

To install, reverse procedure of removal and adjust diaphragm engaging rod, Adjustment No. 13. Sleeve nut should be adjusted so that rod swivels freely on transfer key ball without any appreciable end play.

## POWER UNIT SHIFT STRAP

**REMOVAL:**

1. Remove bolt and shakeproof lockwasher at power cylinder.

2. Remove cotter pin, plain washer and disconnect neutral and limit switch rod (51).

3. Remove inner cotter pin, flat washer, anti-rattle washer and remove shift strap.

**INSTALLATION:**

Reverse procedure of removal.

## TRANSFER KEY

**REMOVAL:**

Use procedure of "Power Unit Transfer Diaphragm Engaging Rod" and remove cotter pin and clevis pin from transfer key.

**NOTE: Push shift shaft to rear to allow clearance for cotter pin removal.**

**INSTALLATION:**

Reverse procedure of removal and check adjustment.

**NOTE: To lubricate transfer key, (54) grasp diaphragm engaging rod (48) and pull towards front of car. This action will allow clearance at transfer key alemite for lubrication gun.**

## DRIVE-MASTER SHIFT SHAFT AND/OR SHIFT LEVERS

**REMOVAL:**

1. Remove shift shaft nut located at rear of Drive-Master support bracket. (It will be necessary to disconnect transfer switch rod (72) at transmission switch to allow more wrench clearance.)
2. Remove cotter pin and clevis pin and disconnect power shift rod (61).
3. Slide the shift shaft out toward fender (use care as detent balls and springs may fall out of their retainers).

**INSTALLATION:**

Reverse procedure of removal and make sure the detent ball springs are properly positioned as follows: Part 163442 a 19 pound spring when compressed to 11/16" is assembled in Drive-Master mounting bracket pin for the (Hand shift) Lever Assembly. Part 41236 a 30 pound spring when compressed to 13/16" is assembled in the shift shaft mounting bracket recess.

The detent balls should be well lubricated with water resistant grease prior to assembly.

**NOTE: If replacement of the transfer key hub bushing is necessary, remove bushing with a driver having a .625" pilot. Bushing inside diameter to be .625" to .626" after assembly. Shift shaft bushings also have a .625" to .626" inside diameter to allow a shift shaft clearance of .0025" to .0035".**

# REFERENCE

| Source of Information | Date | Subject |
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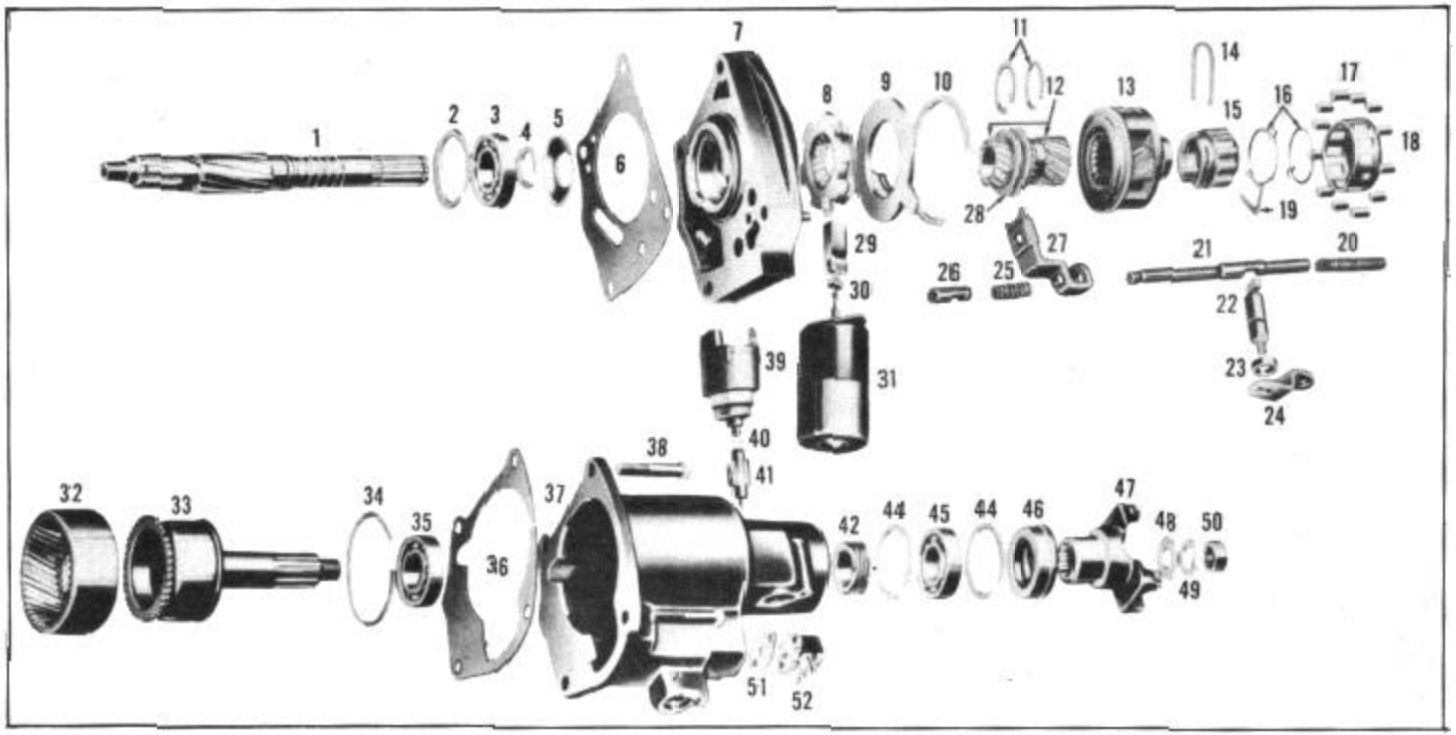


**FIGURE 1**

1. Transmission main-shaft
2. Transmission main-shaft snap ring
3. Transmission main-shaft bearing
4. Transmission snap ring
5. Bearing oil baffle
6. Overdrive to transmission case gasket
7. Overdrive housing adapter
8. Sun gear plate & balk ring
9. Sun gear plate cover
10. Cover plate snap ring
11. Sun gear snap ring
12. Sun gear
13. Pinion cage assembly
14. Pinion cage retainer clip
15. Cam assembly
16. Cam roller retainer spring
17. Cam roller
18. Cam roller retainer
19. Cam retainer clip
20. Shift rail retractor spring
21. Shift rail
22. Control shaft
23. Control shaft oil seal
24. Control lever
25. Shift rail sleeve spring
26. Shift rail sleeve
27. Shift fork
28. Sun gear shift collar
29. Sun gear pawl
30. Sun gear pawl oil seal
31. Solenoid assembly
32. Overdrive main-shaft ring gear
33. Overdrive main-shaft output shaft
34 Snap ring
35. Overdrive main-shaft bearing - front
36. Overdrive housing gasket
37. Overdrive housing
38. Overdrive housing to adapter bolt
39. Governor switch
40. Lock ring
41. Governor pinion
42. Speedometer drive gear
44. Shaft bearing snap ring
45. Overdrive main-shaft bearing - rear
46. Overdrive main-shaft oil seal
47. Companion flange
48. main-shaft plain washer
49. main-shaft lockwasher
50. main-shaft nut
51. Control switch gasket
52. Control switch

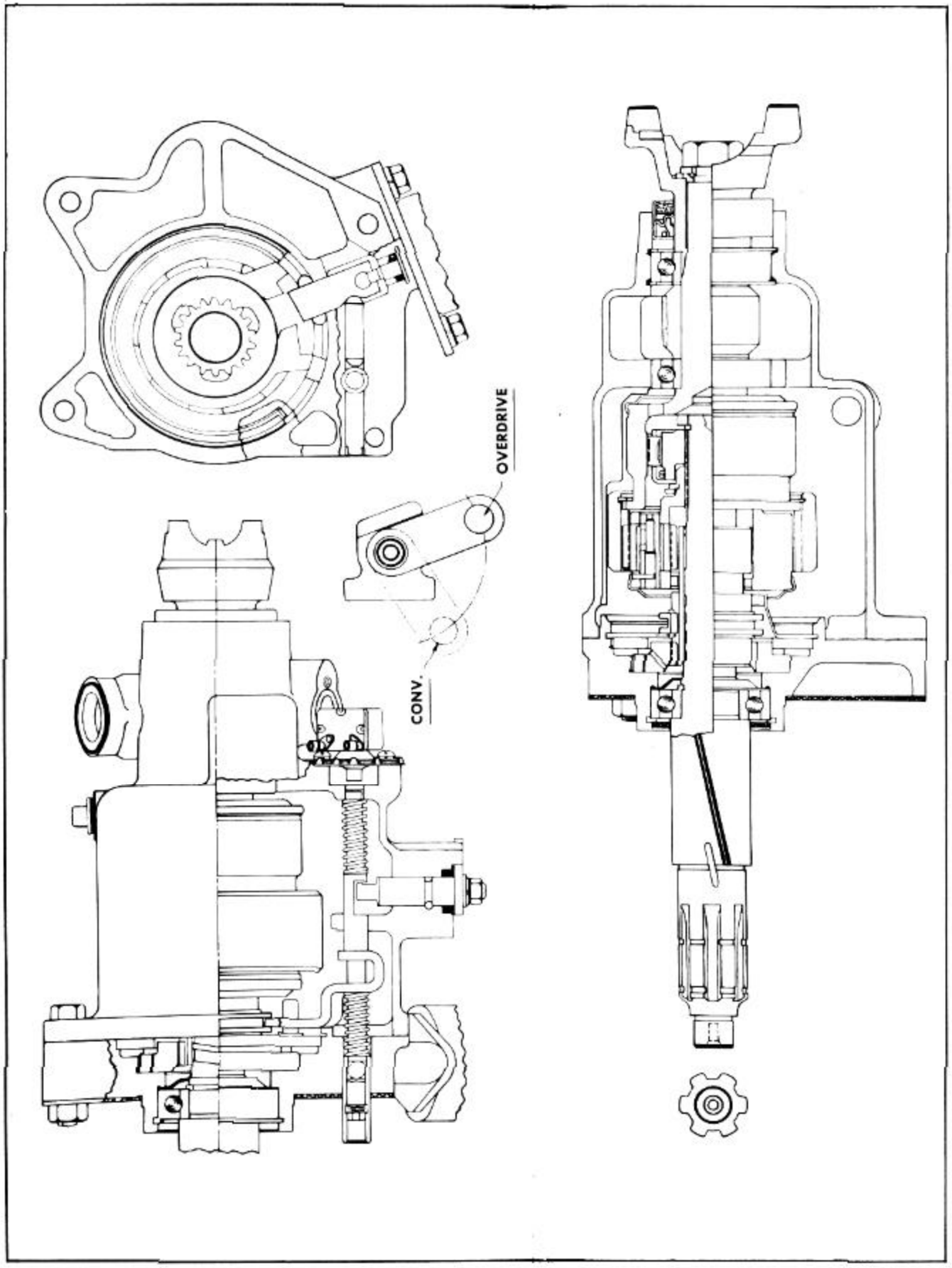


FIGURE 2

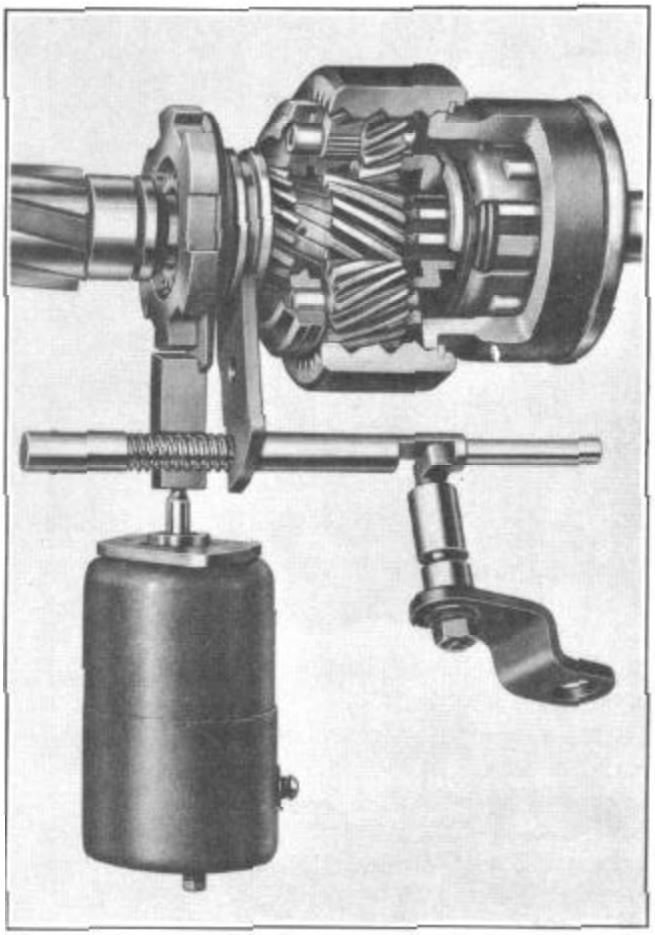

FIGURE 3

## OPERATION

Overdrive provides a driving ratio of engine speed to rear wheel speed that is numerically lower than direct drive. In overdrive the engine revolves 30% slower than in direct gear at the same car speed, resulting in less wear on engine parts as well greater fuel and oil economy and smoother operation at high speeds.

**HIGHWAY DRIVING:**

When the car is operated below a predetermined "cut-in" speed, varying from 18 to 21 mph, the direct drive is used, making available the acceleration so desirable at lower speeds. As the car speed increases above the cut-in point the overdrive unit will shift into over drive ratio, but only when the driver desires no further acceleration; when consciously, or unconsciously, he lifts his foot from the accelerator, whereupon the shift is completed. Thereafter, the overdrive remains in effect until the car speed falls below the "cut-out" points, 16 to 19 mph, when the overdrive is released.

However, at high speeds, the driver while operating in overdrive may require additional acceleration beyond that available by opening the throttle wide. His natural impulse is to press the accelerator further, and his act releases the overdrive, making available the full acceleration of direct drive. The direct drive is retained as long as the full acceleration is required; when the driver no longer requires it he unconsciously lifts his foot from the accelerator, whereupon the overdrive is resumed. If the driver so desires, he may retain the direct drive indefinitely by maintaining a small amount of throttle opening. By thus combining the unconscious reflexes of the driver with the automatic mechanism of the overdrive unit, it is possible to endow a mechanical "brain" with "judgement", and still have the entire action subject to the conscious control of a skilled driver.

**CITY TRAFFIC DRIVING:**

Much city driving is under conditions which permit speeds of 20-32 mph, with frequent stops. Many drivers are accustomed to start in second gear under such conditions. With overdrive-equipped cars, the driver may start in second gear, accelerate up to the cut-in speed, and, by merely lifting the foot from the accelerator pedal, engage the overdrive-second gear combination, which is approximately the same ratio as the usual third speed. At the first traffic stop, it is merely necessary to release the clutch; the gear shift lever is not touched. Furthermore, if a special burst of acceleration is needed in a tight traffic spot, the full power of second gear may be had by pressing the accelerator to the floor, resuming the overdrive-second by the usual method of closing the throttle.

# OPERATION

## MECHANICAL

### FREE-WHEELING DIRECT DRIVE

The transmission main-shaft, Figures 2 and 3, extends through the sun gear and is spindled into the pinion cage and roller clutch cam. The latter has 12 cam surfaces and 12 clutch rollers located against these surfaces by means of the roller cage and the roller cage spring.

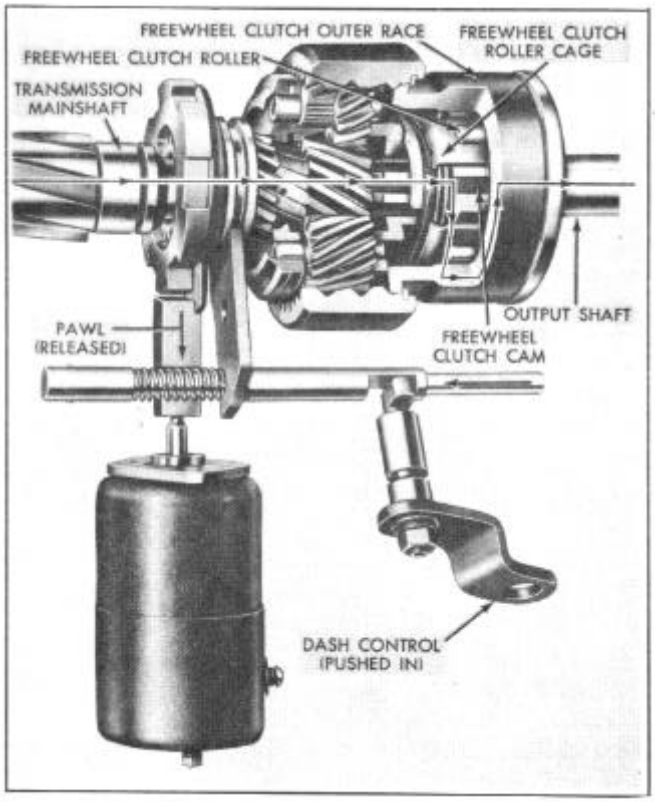


FIGURE 4

When a driving torque is applied against the cam, the rollers are forced outward into wedging contact with the outer race, Figure 5-A, thus driving the car. Under such driving conditions, all the overdrive gears and their directly-associated control parts revolve together as a unit.

On the other hand, if the throttle is closed, removing the driving force, the rollers release their wedging contact, Figure 5-B, permitting the roller clutch to overrun, with the main-shaft, pinion cage, and engine turning at a slower speed than the ring gear, output shaft and propeller shaft. Under such conditions the ring gear

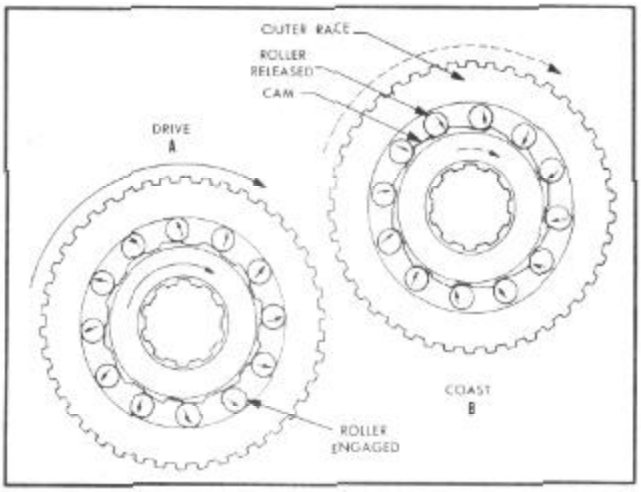


FIGURE 5

gear will turn faster than the pinion cage, and the sun gear will turn slower than the latter. In fact, the sun gear may turn forward, stand still, or turn backward, depending solely upon the relative speeds of the transmission main shaft, and the output shaft. If the former

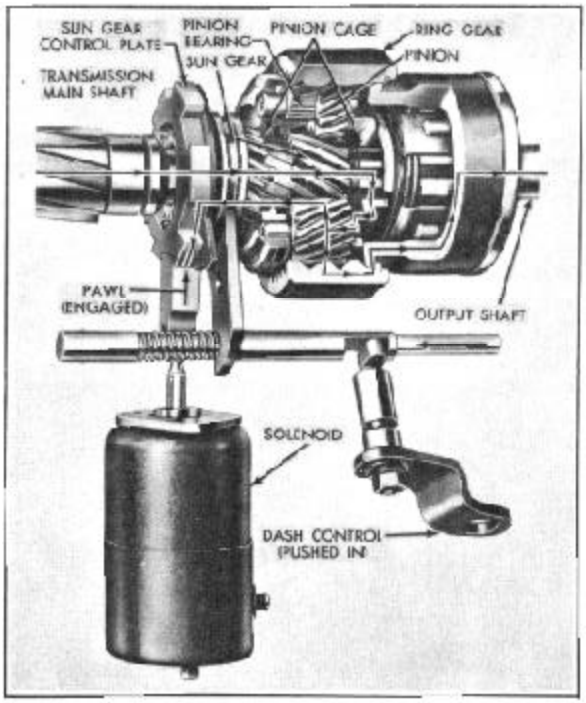


FIGURE 6

is turning at exactly 70% of the speed of the latter, the sun gear will stand still; if it turns faster than this, relatively, the sun gear will turn forward; and if it turns slower, the sun gear will turn backward. If the engine is idling with the car moving forward, this reverse rotation may be quite fast.

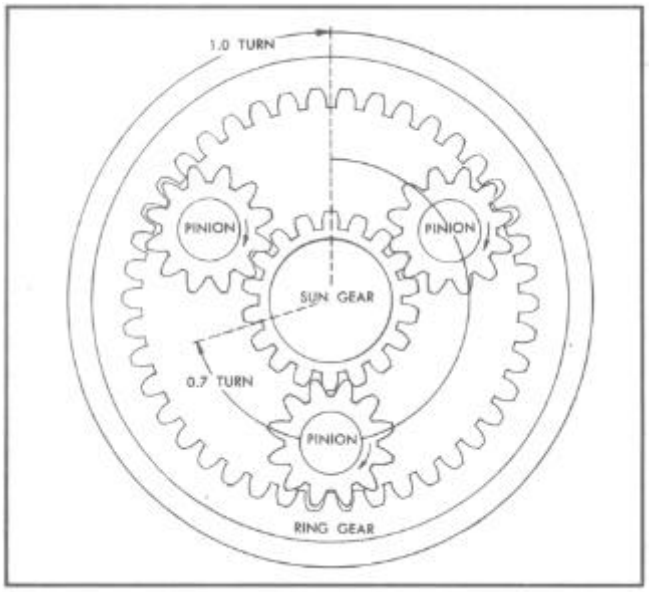


FIGURE 7

## OVERDRIVE

If the sun gear is held against rotation, Figure 6 the pinion cage, and also the engine, will revolve through only 0.7 turn for each turn of the propeller shaft, Figure 7. The action of the control elements involved is as follows:

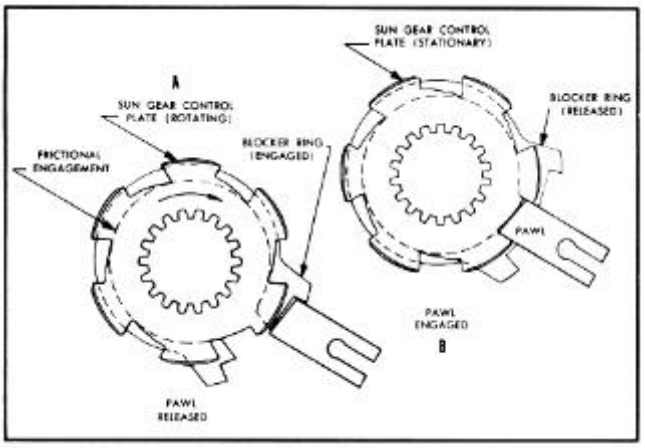


FIGURE 8

Assuming that the car is being driven with the dash control pushed in, Figure 4, the sun gear control plate revolves along with the sun gear at the speed of the transmission main-shaft. Under such circumstances, the blocker ring, by its frictional drag upon the hub of the control plate, is rotated into such a position as to latch the control pawl against inward movement, Figure 8-A.

When the car reaches a predetermined speed (the "cut-in" speed, which varies between 18 and 21 mph.) the governor contacts close, acting through the overdrive electrical circuit to energize the solenoid. The latter sets up a spring pressure against the pawl, tending to push it into engagement. This movement is prevented by the blocker. However, the driver either consciously, or unconsciously, and according to his own choice, may momentarily close the throttle, whereupon the roller clutch releases, and the engine slows down. At the same time, the sun gear slows down, more rapidly, so that the sun gear passes through the stand-still condition when the engine speed has fallen 30%, and then reverse its motion. Upon the instant of reversal, the blocker ring, moved by its frictional drive from the control plate hub, also rotates slightly in this direction and releases the pawl which snaps into the first notch of the backwardly rotating control plate, Figure 8-B.

The extreme rapidity of this action insures that the control plate cannot rotate back-ward more than 1/3 turn at the most; usually, it will be less. This engagement, at nearly perfect synchronism, accounts for the smooth action of this control. Once engaged, under the conditions of normal driving, the overdrive is in action until the car speed falls to a value 2 or 3 mph lower than the cut-in speed, when the governor contacts open, releasing the solenoid, which withdraws the pawl (if throttle is closed), whereupon the condition of free-wheeling direct drive is resumed.

### DRIVER-CONTROLLED DOWNSHIFT (KICKDOWN)

It has been noted above that when the overdrive is engaged, the engine only turns 0.7 as fast as when in direct drive. This reduces the power available (excepting at high car speeds) and although this reduced power is usually sufficient for all purposes,

there are times when it is desirable to return to direct drive for more power without reducing the car speed to the point where the overdrive would normally release.

Under such circumstances, the driver merely presses the accelerator pedal beyond the wide-open position. Through suitable electrical controls, this releases the solenoid, urging the pawl toward release from the control plate. However, due to the driving torque reaction, the pawl is held, and cannot move to release until the torque is momentarily relieved. This is accomplished by interrupting the ignition, whereupon the pawl snaps to release, which immediately restores the ignition. When the overdrive has been thus disengaged the roller clutch carries the direct drive, and the driver may hold it in this condition at his pleasure, until he chooses to reengage over-drive by merely lifting his foot from the accelerator momentarily. Thereupon the over-drive is resumed, unless the car speed has in the meantime fallen below the overdrive release point.

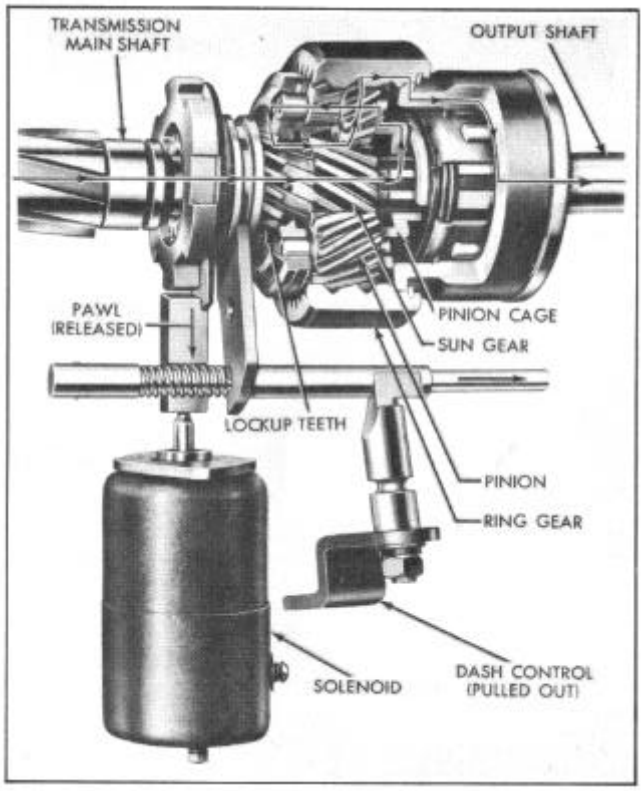


FIGURE 9

**CONVENTIONAL DRIVE:**

Although the normal procedure is to operate that unit as above, taking advantage of the free-wheeling and the overdrive, there are times as when descending long steep grades, where it may be desirable to use the frictional drag of the engine as a brake.

Under such circumstances, the overdrive dash control may be pulled out, swinging the control lever, Figure 9, forward, thus moving the shift rail and shift fork backwards, shifting the sun gear so that the lockup teeth will engage the corresponding teeth of the pinion
cage. This causes the entire group of working parts to revolve as a unit, duplicating in all respects the action of the conventional transmission.

In order to thus lock up the unit, if the car is in motion, it is necessary to open the throttle, to assure that all parts revolve together, or to release the overdrive, if engaged, by pressing the accelerator pedal to the floor, pulling out the overdrive dash control at the same time. Thereafter, the car will have the usual conventional drive until the driver chooses to push the overdrive dash control in, which may be easily done at any time.

Since the roller clutch will not transmit a reverse drive, it is necessary for the lockup mechanism to be used whenever it is desired to reverse shift mechanism, which pushes the shift rail to the rear, independently of the overdrive control lever, whenever the transmission is shifted into reverse.

## ELECTRICAL

While the mechanical structure of the overdrive unit just described, may be considered the working portion of the combination, its automatic action is controlled entirely by the external electrical control system. This system consists of certain units, connected by a wiring circuit. Figure 10.

**SPEED-CONTROLLED OPERATION:**

At low car speeds, the electrical control system is completely inactive. Whenever the car speed reaches the predetermined cut-in point, (18 to 21 miles per hour) centrifugal force, acting upon the revolving governor weights, is sufficient to cause the governor contacts to close.

## 10-8 OVERDRIVE

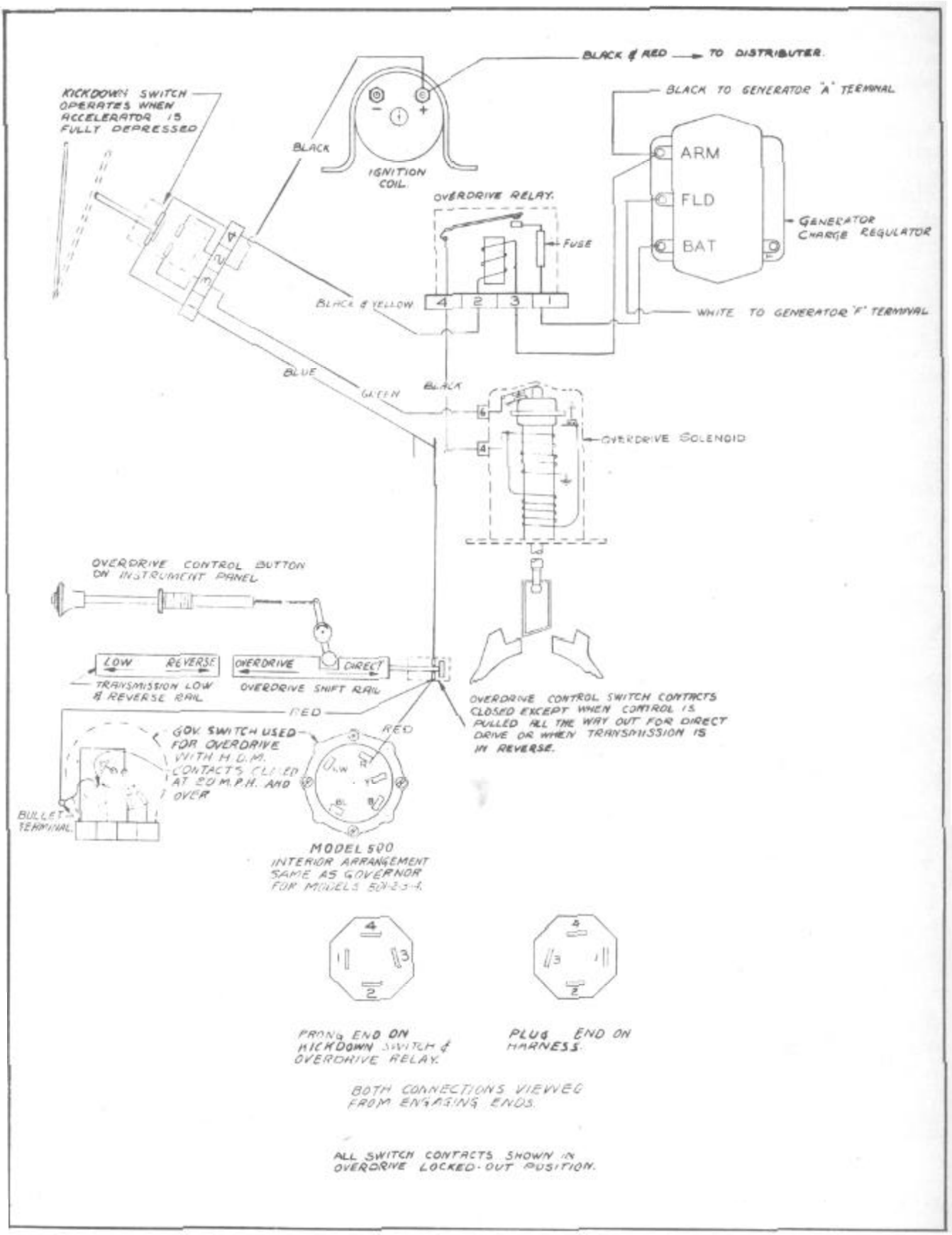


FIGURE 10

This grounds that portion of the circuit connected to one terminal of the relay (marked 2), and if the generator is charging the relay contacts will close. This sends battery current to the solenoid terminal No. 4 (1/4" terminal screw) energizing the windings of the solenoid, causing the solenoid plunger to move, compressing the inner spring, and urging the pawl toward engagement.

Upon completion of the plunger movement, a contact within the solenoid opens, disconnecting the heavy traction-coil winding, leaving the lighter holding-coil winding energized. The solenoid parts remain in this position until the driver closes the throttle, which causes the slowing-down of the sun gear to the reversal point and permits the pawl to move into engagement under the pressure of the inner spring.

The movement of the solenoid plunger also compresses the outer spring; whenever the car speed falls to a point 2 or 3 mph. below the cut-in point, the governor contacts open, releasing the relay, and opening the solenoid circuit, whereupon the outer spring withdraws the pawl from engagement. The circuit then remains inactive until the car speed again reaches the cut-in point.

**DRIVER CONTROLLED OPERATION**

When operating in overdrive, the driver may require to return to direct drive without reducing the car speed below the cut-out point. If the accelerator pedal is pressed down beyond the position corresponding to wide-open throttle, the stem of the kickdown switch is pressed, thus opening that part of the control circuit between the governor and relay, whose contact points open, de-energizing the solenoid, the outer spring of which urges the pawl toward release. Due to the fact that the engine is driving the car through the overdrive gear train, the pawl is pinched by the torque reaction and cannot release until the driving torque is removed. This is accomplished as follows:

The solenoid stem is provided with a contact which closes whenever the pawl is engaged grounding the No 10-32 screw terminal of the solenoid, which is connected to one of the lower terminals of the kick-down switch; when the latter is moved to open the connection across its upper terminals, the lower terminals are connected, and this grounds the primary breaker of the ignition distributor, thus interrupting the engine torque. The pawl immediately snaps out of engagement, and this movement opens the grounding contacts of the solenoid, restoring the ignition. This entire action occurs with such rapidity that not more than 3 or 4 cylinder explosions are missed. In the event that the driver raises his foot slightly from the accelerator pedal the normal position of the throttle switch is restored, thus re-energizing the solenoid, but the pawl cannot reengage until the throttle is closed to cause the engine to slow down sufficiently to reverse the rotation of the sun gear, as previously explained.

**LOCKED-OUT OPERATION:**

When the overdrive unit is operated in the locked-out, or conventional drive condition, either by having the dash control knob pulled out, or by shifting the transmission into reverse, the shift rail is moved to the rear which also opens the control switch. Since this opens the circuit between the governor and relay, the latter cannot act to energize the solenoid. This prevents any possible attempt to engage the pawl when operating in either conventional drive or reverse.

## OVERDRIVE REPAIR

### SERVICING EXTERNAL UNITS

**GOVERNOR SWITCH AND PINION:**

Servicing of governor switch and governor switch pinion may be accomplished by disconnecting wire or wires at governor switch and then screwing governor switch out of over-drive case. When reconnecting wires on cars not equipped with H.D.M., make sure that the overdrive wire (Red) is inserted in the 5/32" dia. terminal and not in the 3/16" dia. terminal.

## CONTROL SWITCH

The control switch is attached to the Overdrive housing by two 10 -24 screws. Before reinstalling check for damaged gasket and defective wire terminals.

## SOLENOID

Detach the solenoid by removing the two mounting screws and turning solenoid 1/4 turn clockwise while pulling out. To install, reverse this procedure. After holes in flange and housing are lined up, but before installing cap screws, pull straight out on solenoid. If it can be pulled out, the ball at the end of the solenoid rod was improperly installed (not locked in the pawl.)

## OIL SEAL (OD. main-shaft)

1. Disconnect universal joint at transmission com panion flange.

2. Remove the bolts attaching the propeller shaft center bearing support bracket and move propeller shaft rearward to clear companion flange.

3. Remove the companion flange nut, washer, and with puller tool J-820, remove the companion flange.

4. Pry out oil seal from rear of case.

**NOTE: DO NOT DAMAGE overdrive case bore during this operation.**

To install, reverse procedure of removal and coat outside of seal with a film of white lead and drive seal into place with a suitable driver. Tighten companion flange nut to 90-100 foot pounds.

## OIL SEAL (OD. CONTROL SHAFT)

Remove control lever and pry out seal with sharp punch. Coat outside of new seal with white lead and drive seal into place with a tubular driver having an inside diameter of 5/8" and outside diameter of 15/16".

## SERVICING UNITS REQUIRING REMOVAL OF OVERDRIVE HOUSING ONLY

Repairs to the overdrive case, overdrive main-shaft, main-shaft ring gear, free wheeling cam, pinion cage assembly, stationary gear, shift rail and fork assembly, overdrive main-shaft rear and front bearing, overdrive main-shaft oil seal, speedometer drive gear, solenoid pawl and interlock plunger may be performed underneath the car by removing the overdrive housing without disturbing the transmission. See "Overdrive Housing Removal". However, if the transmission main-shaft, over-drive adapter, or transmission main-shaft bearing are to be replaced, it will be necessary to proceed as outlined under "Transmission and Overdrive Removal".

## OVERDRIVE HOUSING REMOVAL

1. Place car on stand jacks.

2. Remove drain plugs and drain transmission and overdrive cases.

3. Disconnect governor switch and overdrive solenoid and control switch wires.

4. Disconnect universal joint at overdrive companion flange.

5. Remove the bolts attaching center bearing support bracket and move propeller shaft rearward to clear companion flange.

6. Remove speedometer cable and speedometer driven gear.

7. Disconnect overdrive control cable at control shaft lever.

8. Remove the companion flange nut, washer and with puller J-820, remove the companion flange.

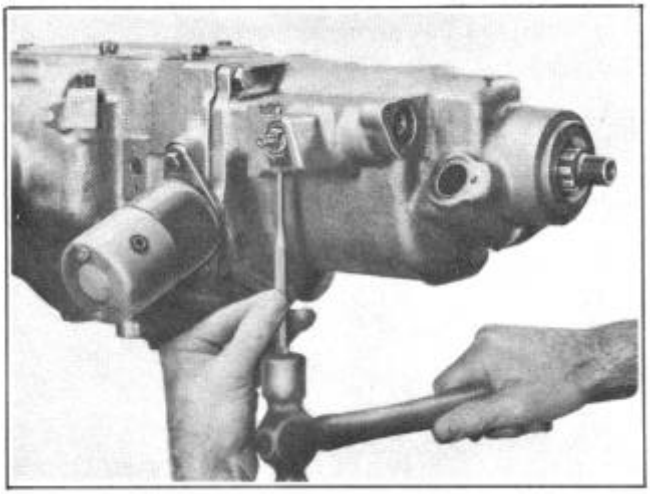

FIGURE 11

9. Drive out the overdrive control shaft tapered pin, Figure 11, and pull control shaft out as far as possible to disengage the operating cam of the shift shaft from the slot in shift rail.

**NOTE: Small end of taper pin is down.**

10. Remove the four bolts attaching the over-drive housing to transmission and over-drive adapter.

11. Remove overdrive housing. (Lightly tap the end of the overdrive main-shaft with a rawhide mallet to prevent main-shaft from corning off with the overdrive housing and spilling the free wheeling rollers).

**NOTE: Removal of the overdrive housing will expose the overdrive main-shaft and ring gear, free wheeling cam, pinion and cage assembly, shift rail and fork, stationary gear, stationary gear coverplate and overdrive main-shaft bearings**

## REMOVAL OF PARTS FROM REAR OF ADAPTER

1. Install one bolt removed from housing to hold the adapter plate to the transmission case.

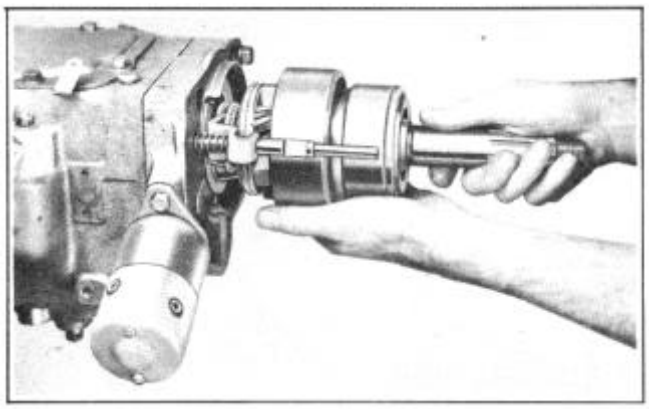

FIGURE 12

2. Remove the overdrive main-shaft and ring gear assembly, Figure 12, (Catch the rollers as they drop out of the free wheeling cam roller retainer.)

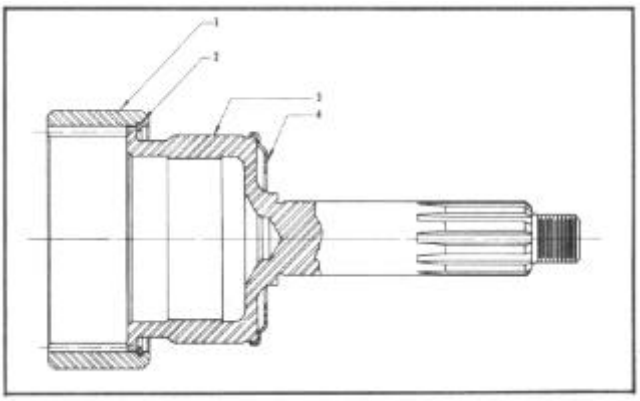

FIGURE 13

3. Removing lock ring (2), Figure 13, will permit the removal of the ring gear (1) from the overdrive main-shaft (3). The oil slinger (4) can be pried off and replaced if required.

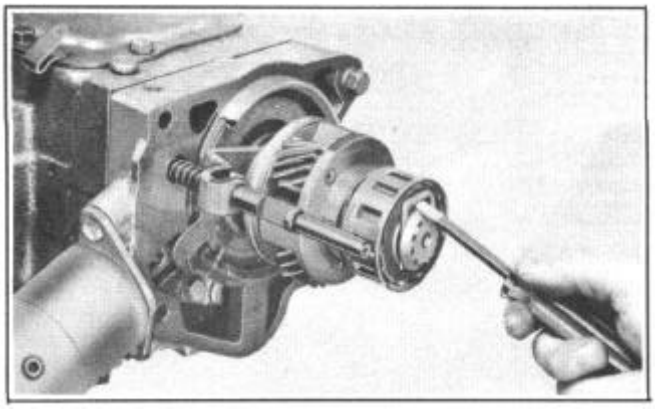

FIGURE 14

4. Remove the retaining clip at the end of the clutch cam, Figure 14, this will allow removal of the cam and the pinion cage assembly.

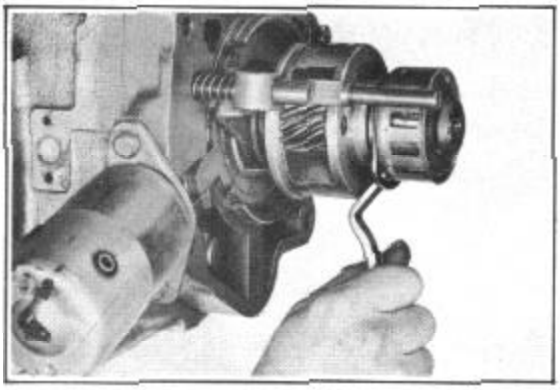

FIGURE 15

5. Remove the "U" clip located between the free wheeling cam and pinion cage and separate these units, Figure 15.

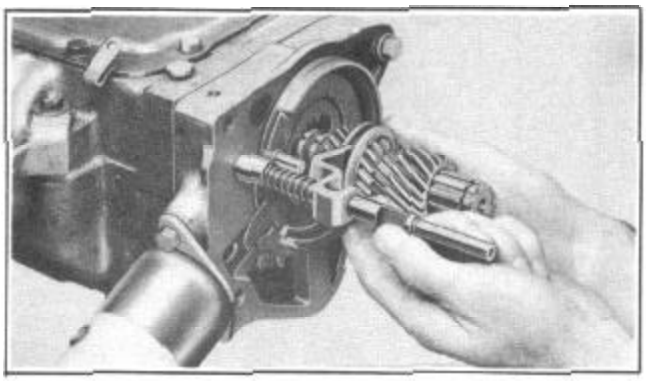

FIGURE 16

6. Remove the sun gear and shift rail assembly, Figure 16.

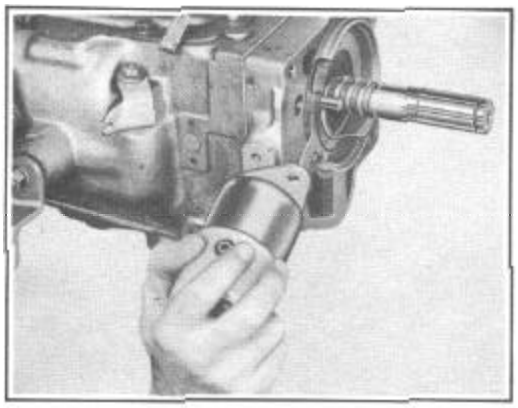

FIGURE 17

7. Remove the solenoid attaching screws, turn the solenoid one-quarter turn clock-wise and remove, Figure 17.

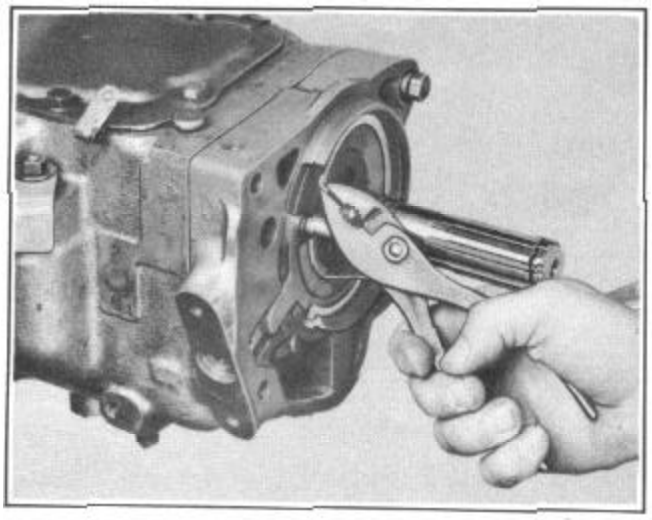

FIGURE 18

8. Remove the large snap ring at the adapter plate, Figure 18.

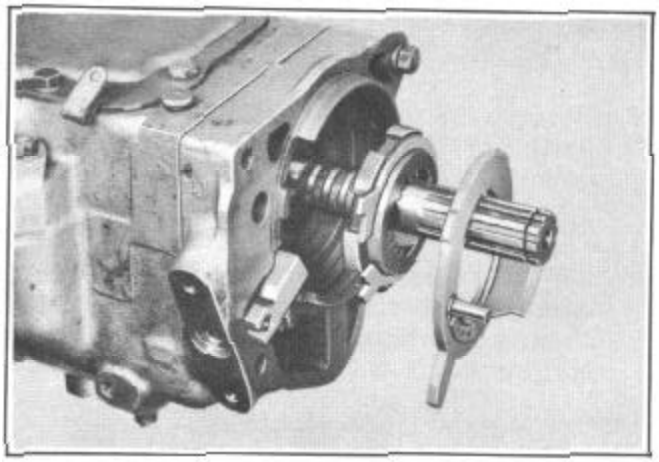

FIGURE 19

9. The retainer plate, the sun gear, control plate and blocker assembly, and the pawl can then be removed, Figure 19.

10. The interlock lock plunger can be removed by lifting out the plug at the adapter with a sharp punch. Remove interlock by pushing it through the opening uncovered by the plug. Use a stiff wire and work through the opening uncovered by the solenoid.

**DISSASSEMBLY OF HOUSING**

1. Place overdrive housing (37), Figure 1, on front face and use a brass drift against the rear face of speedometer drive gear to drive out the overdrive main-shaft front bearing and speedometer drive gear.

2. Remove the overdrive main-shaft oil seal (46) with Remover J-943.

3. Remove the two bearing snap rings (44) and remove overdrive main-shaft rear bearing (45).

## CLEANING AND INSPECTION

As each part is removed from the assembly, wash it clean solvent and wipe dry. Protect parts from subsequent dirt accumulation.

After cleaning give parts visual inspection for wear or damage. Replace any broken or excessively worn parts.

Roller clutch parts should be carefully inspected. If rollers show surface markings of any kind they should be replaced. If inner surface of the outer roll shows slight length-wise indentations, they are normal and do not impair the action of the clutch. However, if the 12 flat surfaces of the cam show such markings, it should be replaced.

**BEARINGS:**

DO NOT place bearings where dirt is liable to mix with the lubricant in the bearings.

Bearings should be washed in clean gasoline or kerosene. DO NOT SPIN the bearings and particularly do not spin bearings with an air hose. Spinning a bearing at high speeds will almost certainly do considerable damage. After washing the bearings, blow them out with clean dry air. Direct the flow of air into the open face of the bearing while holding the inner race and slowly rotate the outer race by hand. DO NOT ALLOW the air to spin the bearing.

a. Inspect the bearing for cracks and defects.

b. Lubricate the bearing with clean, new engine oil, rotating the bearings by hand in order to spread the lubricant over all surfaces.

Transmission main-shaft bearings are built originally with end play and although they may feel quite loose, it does not necessarily indicate that they are worn and unfit for use.

**GEARS:**

Inspect all gears for damaged teeth. Remove any and all raised edges from tooth surfaces by hand stoning. Pitted and worn gears should be replaced.

**CONTROL SHAFT AND SEAL:**

Recommended clearance between control shaft and overdrive housing bore is .001" to .003" but clearance of twice this amount if not accompanied by oil leakage is permissible.

If a new control shaft seal is installed make sure that it does not interfere with rotation of control shaft.

**OVERDRIVE MAINSHAFT OIL SEAL:**

If the seal is hard, cracked, or glazed, or if signs of oil leakage are apparent at disassembly, install a new seal.

## OVERDRIVE SHIFT RAIL

**DISASSEMBLY:**

Drive out shift rail pin (2), Figure 20, remove sleeve (1), spring (3) and shifter fork (4).

Check weight of shift rail springs. The shift rail sleeve spring (3) should have a free length of 2-7/32" and 1-25/64" length under load of eight pounds. The retractor spring has a free length of 2-3/4" and 1-21/32" under load of 12 pounds.

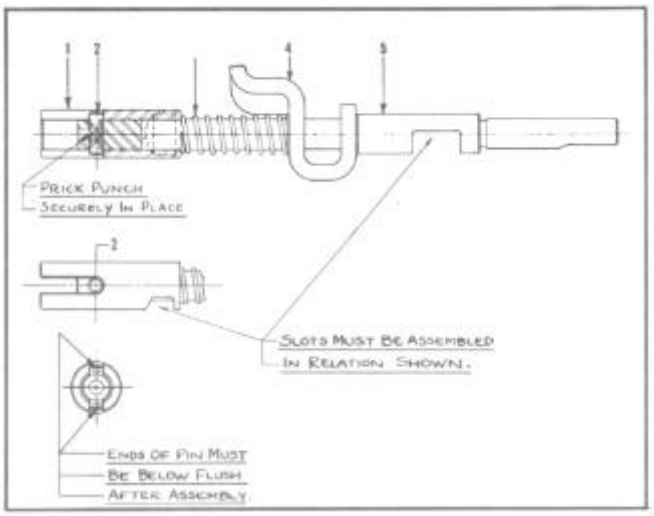


FIGURE 20

1. Shift rail sleeve
2. Shift rail sleeve pin.
3. Shift rail sleeve spring.
4. Shift fork.
5. Shift rail.

## REASSEMBLY OF OVERDRIVE HOUSING

1. Install overdrive main-shaft rear bearing, rear lock ring (44) Figure 1, rear bearing (45), and rear bearing front lock ring (44).

2. Install new oil seal (46) in overdrive case (37).

3. Install speedometer drive gear (42) and overdrive main-shaft front bearing (35).

4. Before installing shift shaft (22) in the overdrive housing, coat the shift shaft oil seal counter-bore with white lead and tap in a new oil seal (23). Dip the threaded end of the shift shaft in liquid soap, and using care, push the shaft through the new seal, turn the shaft so that the shifter lug will be in an upright position.

## INSTALLATION OF PART TO REAR OF OVERDRIVE ADAPTER

1. Position the adapter plate and fasten the adapter to the transmission case and install the solenoid pawl, sun gear control plate and blocker assembly, Figure 21.

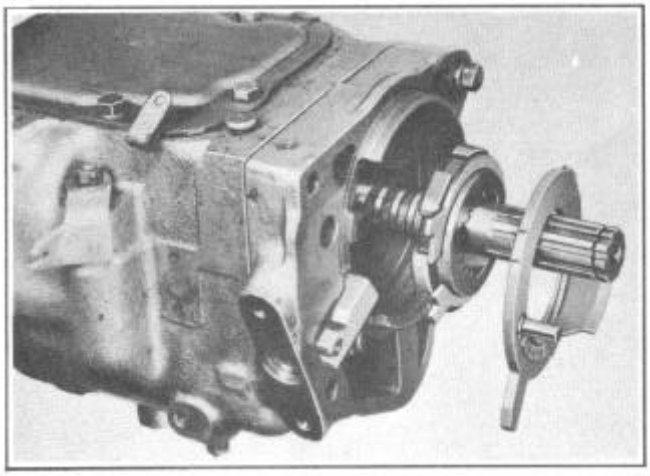

FIGURE 21

**NOTE: Insert the pawl with the notched side up, be sure that the blocker ring and pawl are properly positioned before installing the snap ring, Figure 22. The interlock plunger is furnished in six different lengths. With pawl fully engaged in slot in stationary gear and one end of the interlock plunger contacting shift rail (NOT SLEEVE) there should be .008" to .021" clearance between the other end of the plunger and the side of the pawl. Select a plunger of proper length to give this clearance.**

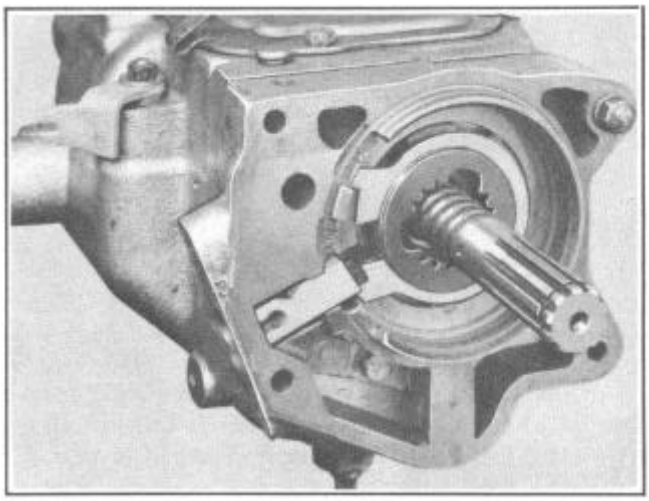

FIGURE 22

2. Install the large snap ring, Figure 23.

3. The large adapter lock rings are furnished in the following thickness: .0625" , .0665" and .0705" , select the size required to obtain a tight fit in groove in overdrive adapter.

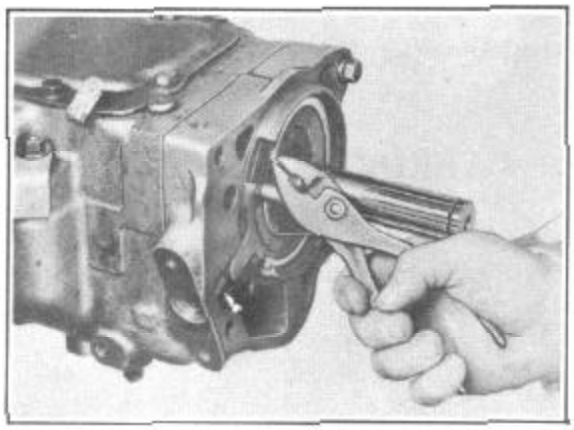

FIGURE 23

4. Install the solenoid by turning the solenoid counter-clockwise one-quarter turn, Figure 24, and attach the solenoid to the case with the two lock washers and cap screws.

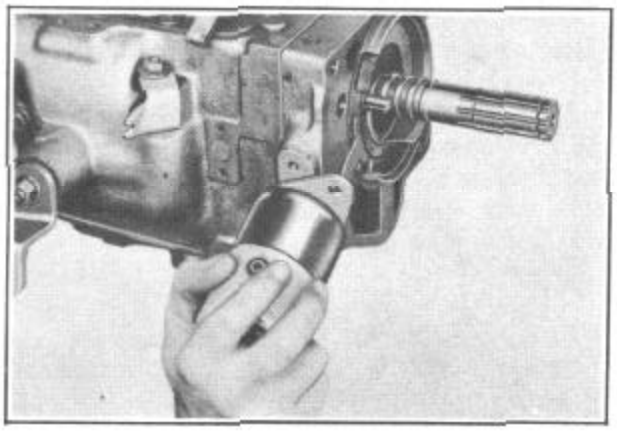

FIGURE 24

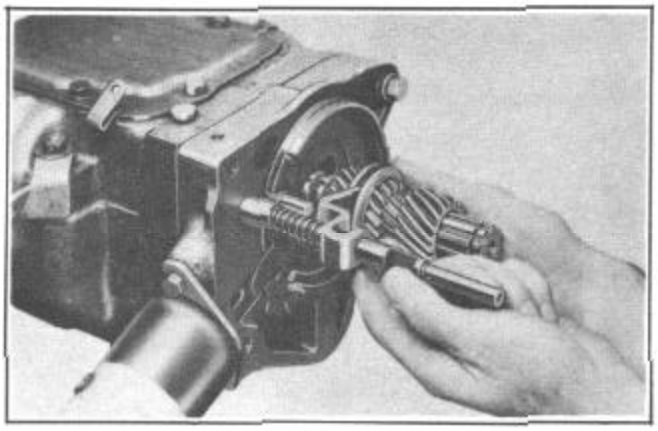

FIGURE 25

5. Install the sun gear, shift rail and fork assembly, Figure 25. Check position of shift rail slots as shown in Figure 20, at assembly. (THIS IS IMPORTANT).

**NOTE: If shift rail assembly has been taken apart, prick punch pin (2), Figure 20, securely in place before reinstalling assembly. Shifter fork should be a sliding fit in sun gear collar groove**.

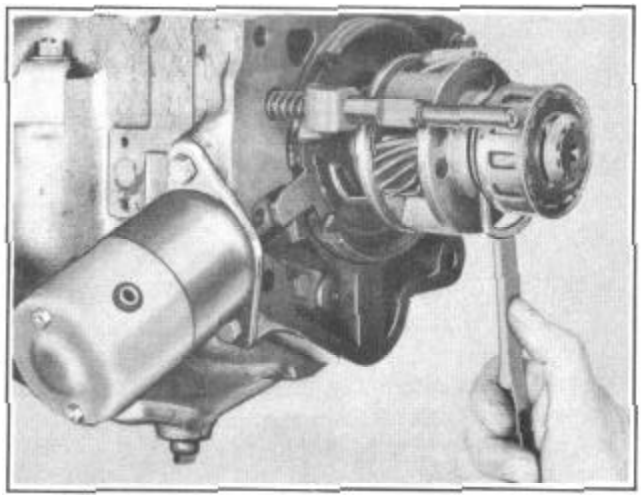

FIGURE 26

6. Install clutch cam and pinion cage, attach the clutch cam to the pinion cage assembly with the large retaining clip, Figure 26.

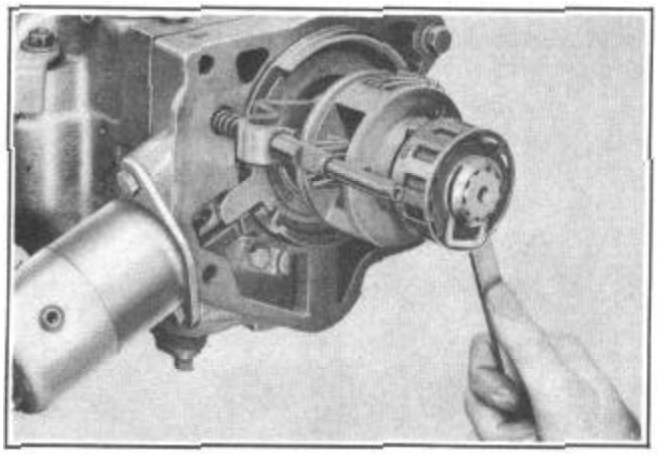

FIGURE 27

7. Install the pinion cage and the clutch cam assembly on the main shaft and secure the assembly in place with the retaining clip. Figure 27.

**NOTE: Replace any "U" clips that are worn or damaged.**

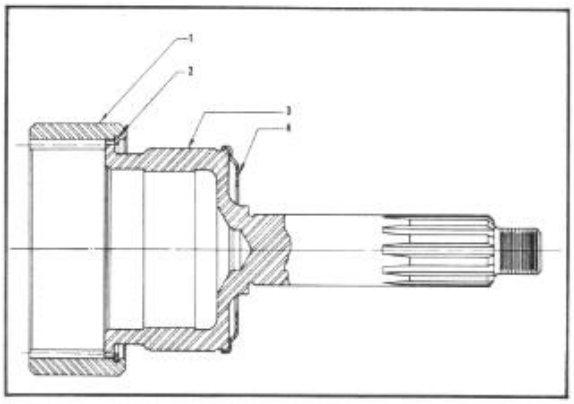

FIGURE 28

1. Ring gear
2. Snap ring
3. Overdrive main-shaft
4. Oil collector ring (front)

8. Install the ring gear (1), Figure 28, on the overdrive main-shaft (3) and lock it in place with the large snap ring (2).

**NOTE: To facilitate installation of the main-shaft (output shaft on the free wheeling cam rollers, insert the free wheeling rollers in the cam roller retainer cage, using heavy grease to hold them in position. Then, with the low gear of the transmission engaged, turn the cage and rollers counter-clock wise until the rollers are in their low positions, and snap a tight fitting rubber band around them. Install the output shaft and ring gear on the pinion cage and free wheeling clutch cam and roller unit assembly, turning the shaft to the left as it assembles over the clutch rollers Figure 29.**

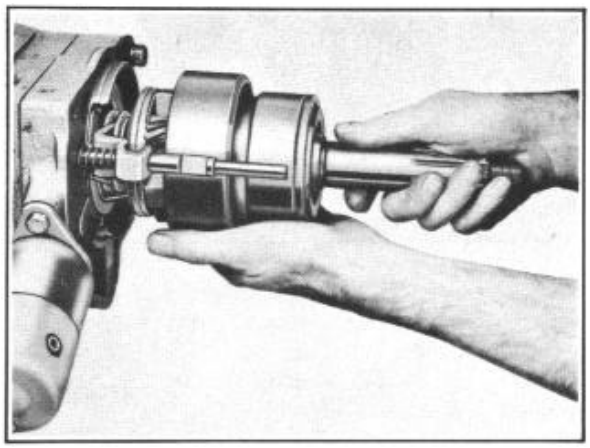

FIGURE 29

## OVERDRIVE HOUSING INSTALLATION

1. Remove bolt holding adapter to transmission case.

2. Install overdrive to adapter gasket.

3. Install overdrive case, hold speedometer gear with a drift for alignment until case has been installed in position.

4. With the control switch removed, insert a long thin drift through the housing at the control switch opening to line up the retractor spring and the overdrive shift rail.

5. While case is being installed, push the control shaft inward and engage the slot in the shift rail with the shifter shaft lug. (Lug must be up and outside control lever down.)

Insert J-4149 O.D. Aligning Pilot in lower right hand hole of adapter and housing while tightening the other three Overdrive to transmission case bolts. Tighten all 4 bolts to 20-30 ft. lbs. torque.

6. Install control shaft locating pin, large end up.

7. Install control switch, governor pinion, and governor switch.

8. Install companion flange, washer, and nut, Tighten nut to 90-100 lbs. torque.

9. Add lubricant to get proper level in both transmission and O. D. units.

## SERVICING UNITS THAT REQUIRE REMOVAL OF COMPLETE ASSEMBLY

**REMOVAL:**

1. Remove front seat cushion.

2. Remove the four bolts attaching the bottom of front seat frame to seat track. Remove two screws attaching seat adjusting lever to seat frame and remove seat back from car.

3. Disconnect accelerator pedal at accelerator rod.

4. Remove foot brake pedal rod from brake lever.

5. Pull the steering column hole rubber grommet up out of the way.

6. Remove the floor mat.

7. Remove Hudson Weather Control blower unit held by four screws, (2 each side). Disconnect cable at Ranco weather control valve.

8. Disconnect plug at overdrive kickdown switch.

9. Release speedometer cable from clip on under side of floor opening cover.

10. Remove the floor opening cover over the transmission.

11. Raise car place on stand jacks.

12. Drain transmission and overdrive units.

13. Disconnect wires at governor switch, solenoid, and overdrive control switch (located at left rear side of overdrive case).

14. Disconnect speedometer cable and remove speedometer driven gear.

15. Disconnect overdrive control cable from overdrive shift shaft lever.

16. Disconnect the front universal joint at transmission. Remove bolts attaching center bearing support bracket and move propeller shaft rearward to clear transmission companion flange.

**NOTE: Use a wire or rubber band to prevent the trunnions from slipping off the "U" joint journal.**

17. Disconnect the clutch pedal lever return spring.

18. Remove the two clutch cross shaft bracket bolts and remove clutch cross shaft bracket.

19. Remove the clutch control link clevis pin and unhook clevis.

20. Remove shifter shaft outer lever, nut and washer. This will disconnect the linkage connecting the gear shift to the transmission.

21. Remove two screws and remove flywheel guard from bottom of clutch housing.

22. Remove the two engine rear mounting bolts.

23. Jack up rear end of engine about 1/2" off the frame.

**CAUTION: Place a block of wood under head of jack to prevent damage to oil pan.**

24. Remove the two top screws holding clutch housing to engine end plate and install two J-2969 headless screws or studs to support the transmission until the balance of the screws are removed.

25. Remove breather pipe bracket from clutch housing and bolt attaching breather pipe and rear tappet cover.

26. Remove the nut from brake control hand brake cable lever pivot plate brace and remove bolt and nut attaching hand brake cable lever to cable lever pivot plate side brace. This will allow the hand brake control

levers to be pushed out of the way to facilitate removal of the overdrive and transmission.

27. With a helper pull transmission and clutch housing back towards the rear and down, removing the unit from underneath the car.

**NOTE: For removal of parts from rear of adapter, see instructions on page 10-11.**

**NOTE: For disassembly of housing, see instructions on page 10-12.**

**DISASSEMBLY-COMPLETE UNIT**

1. Remove six bolts attaching clutch housing to transmission case and remove clutch housing.

2. Install transmission on bench holding fixture and remove transmission cover, gasket, shift rail ball spring and ball.

3. Remove low and reverse shifter fork lock screws.

**NOTE: To remove these special self locking screws, use a screwdriver having a straight blade that will enter to the bottom of screw slot. DO NOT USE A TAPERED BLADE SCREW DRIVER.**

4. Slide low and reverse shift rail out of front of case, then remove shift fork and shifter, also the shift rail interlock.

5. Remove the set screw from the second and high shift fork and the shift rail stop screw, then slide the shift rail out of front of case. Remove the lock ball and spring from case.

6. Pull main-shaft rearward and main drive gear forward until main-shaft is fully with-drawn from needle roller pilot bearing in rear end of main drive gear.

**NOTE: Some of the bearing rollers may fall into transmission case at this time.**

7. Remove main-shaft lock ring with Lock Ring Pliers KMO-630.

8. Remove the synchronizer shift sleeve and hub assembly, intermediate gear low and reverse gear through cover opening in transmission and pull out main-shaft with overdrive housing adapter.

## DISASSEMBLY OF ADAPTER ASSEMBLY

1. Remove the main-shaft rear bearing snap ring, Figure 30.

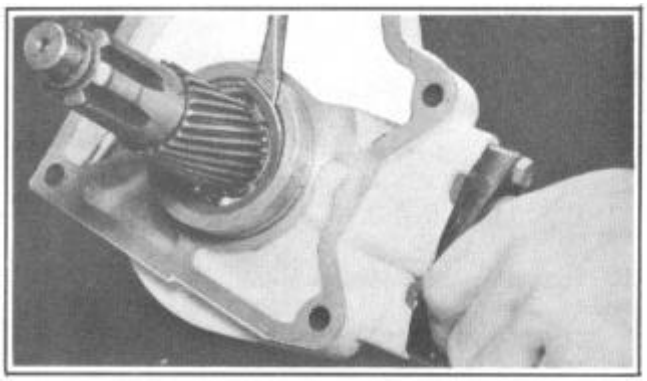

FIGURE 30

2. Remove transmission main-shaft rear bearing and oil baffle from adapter.

**NOTE: For inspection procedure, see instruction on page 10-13.**

REASSEMBLY-ADAPTER ASSEMBLY

1. Thoroughly clean both transmission and overdrive cases.

2. Install transmission main-shaft bearing and oil baffle on main-shaft and in overdrive adapter.

3. Install bearing lock ring in adapter.

**REASSEMBLY-COMPLETE UNIT**

1. Install new overdrive adapter to transmission case gasket.

2. Install transmission main-shaft part way in transmission case and install low and reverse gear with shifter fork groove toward front of shaft.

It is important that the four oil holes be lined up with the grooves in main-shaft. See 480-490 Procedure Manual "Transmission Section" for procedure.

**NOTE: The transmission main-shaft and transmission gears are a select fit If it is ever necessary to replace a transmission main-shaft or a complete overdrive assembly, the fit between the involute splines of the main-shaft and splines in the gears should be free from any binding. In the event binding exists, it may be necessary to stone the splines of the main-shaft to obtain proper clearance.**

3. Slide the intermediate gear on main-shaft with the tapered side of the hub toward the front of the main-shaft.

4. Install synchronizer shift sleeve assembly and two bronze synchronizer rings on the main-shaft with the tapered end of the shift sleeve toward the front of the main-shaft.

5. Install synchronizer shift sleeve hub lock ring on end of main-shaft using lock ring pliers.

6. Apply a coating of viscous grease to main-shaft pilot bearing recess end of main drive gear. Insert the sixteen individual rollers comprising the pilot bearing.

7. Engage front end of main-shaft in pocket of main drive gear and press firmly in place.

**NOTE: Do not hammer on end of main-shaft.**

8. Place one bolt to hold adapter to transmission case while performing balance of assembly.

9. Install second and high shift rail lock ball and spring in transmission case.

**NOTE: Light spring for high and second shift rail. Heavy spring for low and reverse shift rail.**

10. Place second and high shift fork in position in synchronizer shift sleeve groove and install shift rail and set screw.

11. Install shift rail stop screw.

12. Install shift rail interlock.

13. Place low and reverse shifter in position behind shift shaft inner lever.

14. Place low and reverse shift fork in position, install shift rail and shift fork and shifter set screw.

Install parts per "Installation of parts to rear of adapter". Page 14.

Reassembly and install housing per "Reassembly of Housing" and "Installation of Housing". Page 14.

## TRANSMISSION AND OVERDRIVE INSTALLATION

1. Install two headless screws or studs in engine end plate to assist in supporting the overdrive and transmission at installation.

**NOTE: Before installing the overdrive and transmission to engine rear support plate, check cylinder block rear support plate very carefully for tightness and alignment. This is especially important in cases where the car has been subject to chronic transmission trouble, noisy and jumping out of gear. Make a similar check of transmission clutch bell housing.**

In lieu of highly precise equipment, use a steel straightedge to check steel rear support plate and a surface plate or other flat surface to check the front face of clutch bell housing. Both units should be flat and in place within .005".

Be sure to check position of clutch driving plate and see that it is perfectly centralized within the clutch assembly. This can be done by using the J-449 aligning arbor or with a standard main drive gear if arbor is not available. If this precaution is not taken, difficulty will be encountered when installing the transmission and the front end of the drive gear shaft and pilot bearing in the flywheel will be damaged.

2. Rotate clutch collar and throwout bearing to position for proper alignment with throwout yoke on transmission.

3. Tighten all rear engine support plate to block screws.

4. Bring the overdrive and transmission assembly to position where the main drive gear (clutch shaft) is aligned with bore of clutch throwout collar, then carefully push transmission forward to enter drive gear splined shaft through grease retainer leather washer, splines of clutch driving plate and into pilot bearing in flywheel.

**NOTE: During this operation the main drive gear must be relieved of all over hanging weight of the transmission until the bell housing engages the dowels on engine rear support plate. Before transmission assembly is moved up against rear support plate make a last inspection to verify that end face of throwout collar in clutch is properly aligned with throwout yoke on transmission and that oil seal lip has not turned under.**

**CAUTION: Alignment of bell housing with engine is controlled by the sleeve dowel in the upper left location of the bell housing attaching bolt circle and by the dowel bolt at the lower right location viewed from rear of car. Make sure that the former is in place and entered in bell housing hole before tightening bolts. Install lower right bolt (dowel bolt) first. NEVER grind or otherwise reduce the diameter of the dowel bolt to facilitate installation.**

5. Remove the two headless screws or guide studs, J-2969.

6. Install remaining clutch bell housing bolts and screws and tighten with a torque wrench to 40-45 foot pounds.

7. Complete remainder of installation by reversing the order of removal of the remaining parts. Check adjustments and refill transmission and overdrive. A total of 3-1/4 pounds of lubricant is required, two pounds for transmission and 1-1/4 pounds for the overdrive unit. S.A.E. - 90 E.P. Summer, S.A.E. - 80 Winter.

## UNIT CHECKS

### OVERDRIVE RELAY CHECK:

Disconnect plug at relay and install test harness to overdrive relay, but do not connect test harness to overdrive harness plug. A jumper wire must be connected between No. 3 pin and negative terminal of battery at all times during check 1. Connect test lamp successively between a ground and Nos. 1 and 4 contact pins. The test lamp should not light on either of these checks. Connect No. 1 to No. 3 (pin) and a test lamp between No. 4 and a ground. Relay should click and test lamp should light when No. 2 pin is grounded.

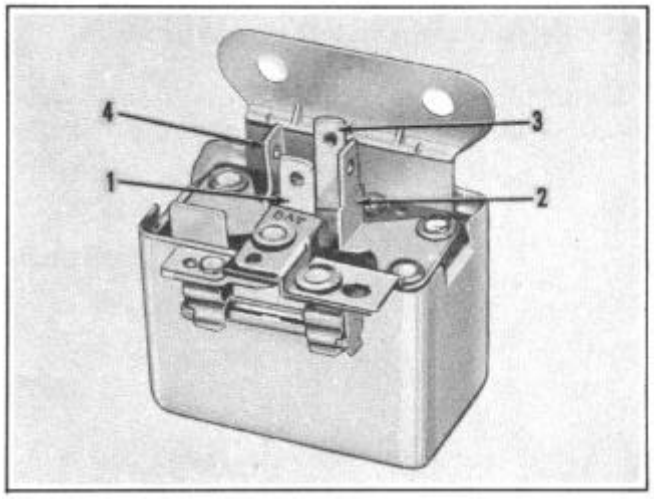


FIGURE 31

If relay clicks and test lamp does not light, check fuse and fuse holder.

**SOLENOID CHECK:**

A. **CLOSING COIL** - Remove solenoid from transmission, connect a jumper wire between positive terminal of battery and mounting flange of solenoid. Connect a second jumper wire between the battery negative terminal and solenoid terminal No. 4; this should cause the solenoid pawl rod to move out. If solenoid chatters in Check A, Hold-In Coil is defective.

B. **ENGAGING SPRING** - With jumper wire still connected as in paragraph "A" (solenoid energized, plunger extended) place ball end of solenoid against bench. Push down on solenoid. The pawl rod should move in 3/8" under a load of not less than 8 lbs. nor more than 12. Pawl should move out to extended position when load is removed.

C. **IGNITION GROUNDING CONTACT** - Place a test lamp between negative battery terminal and solenoid terminal No. 6. Lamp should light when this connection is made. Remove jumper from between negative battery terminal and solenoid terminal No. 4. Pawl rod should snap "in" and test lamp should go out.

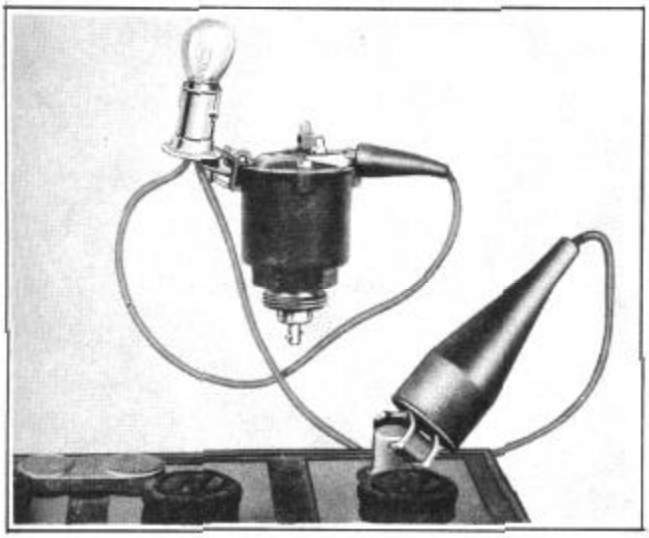

FIGURE 32

**GOVERNOR CHECK**:

Remove overdrive wire at governor and connect test lamp between governor overdrive terminal and negative terminal of battery Figure 32. Drive car on road or raise on jacks. The lamp should light at a car speed of between 18.5 to 21 M.P.H. Upon decreasing speed, the lamp should go out at between 18.5 and 16 M.P.H. Differential between light "on" and light "off" should be 2 or 3 M.P.H. car speed.

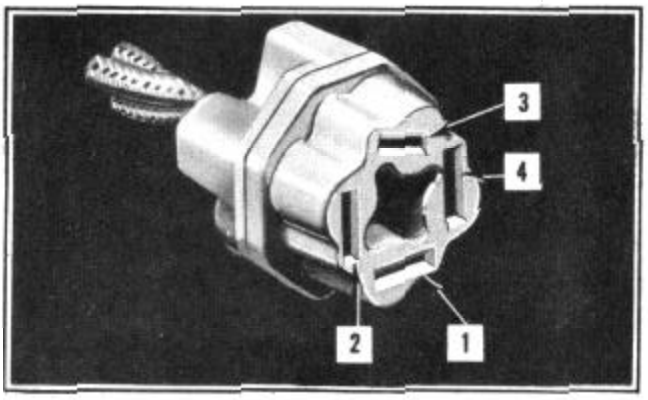


FIGURE 33

**CONNECTOR PLUG CHECK:**

Insert a blade 1/4" wide and 1/32" thick successively into each socket of plug for a distance of 1/2" .

Socket should grip blade tightly enough to make a good electrical contact.

**NOTE: Flutes on side of plug indicate the plug numbers for example 1 flute or notch is for the No. 1 terminal, 2 flutes No. 2 terminal etc.**

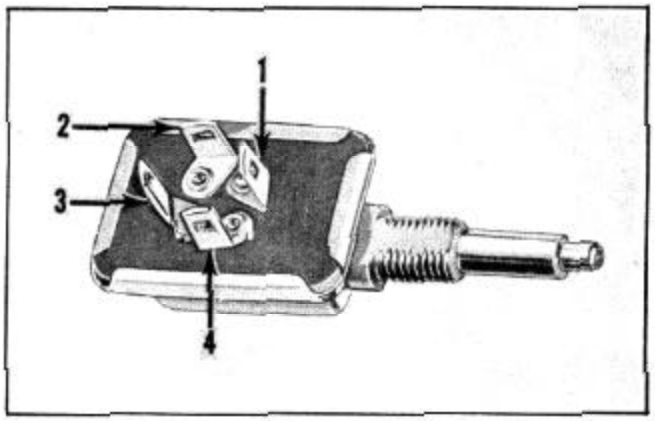


FIGURE 34

**KICKDOWN SWITCH CHECK:**

Disconnect plug at kickdown switch and install test harness to kickdown switch but do not connect test harness to overdrive harness.

A. Connect test lamp between No. 1 terminal and negative terminal of battery; with switch in normal position, lamp should light when No. 4 is grounded but should not light when No. 2, No. 3 or switch case

B. Connect test lamp between No. 2 terminal and negative terminal of battery; with switch stem pushed in, lamp should light when No. 3 is grounded, but should not light when No. 1, No. 4 or switch case is grounded.

**NOTE: All models with overdrive have a kick-down switch mounted in the floor under the accelerator pedal. The accelerator pedal rod on these cars should be adjusted so that the carburetor throttle is wide open just before the accelerator pedal touches the moveable stem of the kick-down switch.**

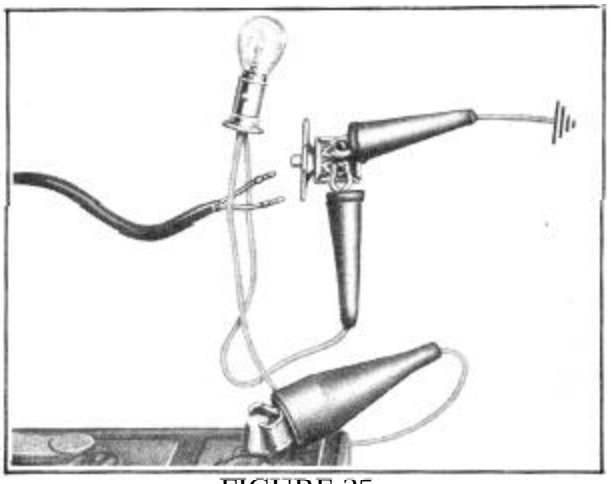

FIGURE 35

**CONTROL SWITCH CHECK:**

Remove overdrive wires at switch terminals. Ground one switch terminal; connect a test lamp between the other switch terminal and the battery negative terminal Figure 35. Put transmission in neutral. Lamp should light when the overdrive control button is pushed in and should go out when the control button is pulled out.

If switch is tested after removal from car, lamp should light when switch plunger is "out" and should not light when plunger is "in".

**HARNESS CHECK:**

1. Remove overdrive harness plug at the overdrive relay and connect test harness to overdrive harness but not to overdrive re1ay. Disconnect harness plug at kick-down switch.

2. Connect test lamp between test harness lead No. 1 and ground. Lamp should light.

3. Connect test lamp between test harness leads No. 1 and No. 3. Lamp should light with engine not running but should go out when engine is started. Shut off engine after this test.

4. Connect test lamp between test harness leads No. 1 and No. 4. Disconnect over-drive black wire at solenoid terminal No. 4. Lamp should light only when this black wire is grounded.

5. Connect test lamp between test harness leads No. 1 and No. 2. Lamp should light when kickdown switch plug socket No. 4 is grounded but not before. To ground this plug socket use a second test harness or a suitable jumper wire.

6. Connect test harness to kickdown switch harness plug but not to kickdown switch put transmission in neutral and push overdrive control button "in". Connect test lamp between negative battery terminal and No. 1 test harness lead. Remove red overdrive wire at governor switch. Lamp should light when the wire is grounded but not before. If the harness does not meet this test the overdrive control switch may be at fault. Disconnect the two wires at the control switch, join them with a 153622 connector, and repeat test.

7. Connect test lamp between negative battery terminal and No. 2 test harness lead. Also connect a jumper wire to negative battery terminal. Touch other end of jumper wire to 10-32 terminal of starter solenoid. Lamp should flash on and off in time with distributor contacts.

8. Connect test lamp between negative battery terminal and test harness lead No. 3. Lamp should light only when overdrive green wire from solenoid terminal No. 6 is grounded.

# TROUBLE SHOOTING

## MECHANICAL

### CONDITION NO. 1

**DASH CONTROL IMPROPERLY CONNECTED**:

A. Unless the overdrive dash control wire is connected to the control lever on the left side of the overdrive housing in such a manner as to move the lever all the way back when the dash control knob is pushed in, the lockup switch may be held open, thus disabling electrical control operation. Likewise, it may hold the shift rail in such a position as to interlock the pawl against full engagement, even though the control switch is not held open, resulting in a buzzing noise when overdrive engagement is attempted.

B. To correctly make this connection, loosen binding post at lever, pull dash control knob out 3/64", move lever all the way to the rear, and tighten binding post.

### CONDITION NO. 2

**TRANSMISSION AND OVERDRIVE IMPROPERLY ALIGNED**:

A. The same symptoms as above may also result from misalignment at assembly of the overdrive housing to the transmission case, resulting in binding of the overdrive shift rail, so that the retractor spring cannot move the rail fully forward, when the dash control knob is pushed in, and the transmission is not in reverse. Under such conditions, the unit may remain fully locked up.

B. To test for this, be sure that the transmission is not in reverse; disconnect the dash control wire from the lockup lever, and feel the lever for free forward movement. If the lever can be moved forward more than 1/4 inch, it indicates that misalignment probably exists. To correct this, loosen the 4 cap screws holding the overdrive housing to the transmission; remove the lower right hand screw completely and insert J-4149 Aligning Pilot or any short .375" diameter rod. Tighten the 3 cap screws to 20-30 foot pounds torque. Remove pilot and similarly tighten 4th cap screw. To check shift rail alignment compare loads on overdrive control lever with transmission in reverse and with transmission not in reverse.

**NOTE: With transmission in reverse overdrive control lever will move forward under a pull of less than 1 oz. When transmission is not in reverse pull required should be about 5 lbs.**

### CONDITION NO. 3

**THROTTLE SWITCH IMPROPERLY ADJUSTED:**

The accelerator pedal rod should be so adjusted that the carburetor throttle lever at carburetor strikes its full open stop just before the pedal touches the throttle switch stem.

## CONDITION NO. 4

**IMPROPER INSTALLATION OF SOLENOID:**

A. If car cannot be rolled backward under any circumstances and there is no relay click when the engine is started it is probable that the solenoid has been improperly installed, jamming the pawl permanently into overdrive engagement.

B. I f the car will occasionally roll backwards, but not always, (and there is no relay click when the engine is started) it may indicate that upon installation the bayonet lock was caught and the solenoid forcibly twisted into alignment with the attaching flange, thus shearing off the internal keying of the solenoid. Under these circumstances, the end of the solenoid stem may not catch in the pawl and upon release of solenoid the pawl will not be withdrawn promptly from engagement, but may simply drift out. If the solenoid stem end has its two flats exactly facing the two solenoid flange holes, it will not withdraw the pawl properly. If the stem can be rotated when grasped by a pair of pliers, it indicates that the internal keying has been sheared.

## CONDITION NO. 5

**IMPROPER POSITIONING 0 F BLOCKER RING:**

A. Occasionally, either in assembly at the factory, or in service operations in the field, the internal parts of the overdrive unit may have been rotated with the solenoid removed, and the pawl withdrawn from its normal location. This may cause the blocker ring to rotate, so that its two lugs are not located with respect to the pawl. In other words, the solid portion of the blocker ring may be in alignment with the pawl, which will prevent full engagement of the pawl with the sun gear control plate.

B. To test for this condition, remove solenoid cover, pull dash control knob out, roll car 2 ft. forward. Push dash control in, disconnect "A" wire at generator and connect loose end of wire to negative post of battery. Then ground the governor terminal, and watch movement of center stem of solenoid. It should not move more than 1/8 inch when the solenoid clicks. Then, with the relay terminal still grounded, shift into low gear, and roll car forward by hand. Solenoid stem should then move an additional 3/8 inch as the pawl engages fully. These two tests indicate proper blocker action. Unless both tests are met, the b l o c k e r ring is probably not in the correct position.

## CONDITION NO. 6

**ROUGH ENGAGEMENT OF OVERDRIVE:**

A. If the unit engages with a severe jolt, usually accompanied by noise, it indicates that the blocker ring has lost its frictional grip upon the hub of the sun gear control plate. This grip should be sufficient to set up a frictional drag of 4 to 6 pounds when new, which will fall to 1 to 1-1/2 pounds when thoroughly broken in. This is easily measured by carefully holding one lug of the control plate in a soft-jawed vise, and with a spring balance hooked into the notch of the nearest blocker lug, and noting the pull required to rotate the blocker after it has started moving. While it is frequently possible to correct this by squeezing the blocker ring together for a tighter fit, installation of new parts is recommended.

# ELECTRICAL

## CONDITION NO. 7

**OVERDRIVE DOES NOT ENGAGE:**

A. Disconnect wire from "A" terminal of generator and connect loose end of wire to negative post of battery by means of a jumper.

B. Install test harness at overdrive relay and ground the No. 2 terminal of harness. If relay does not click, check wiring between relay and "A" terminal of regulator by connecting a test lamp between the relay No. 3 terminal and ground. If lamp lights but relay does not click, replace relay. If relay clicks, but solenoid does not click, follow procedure F. If both relay and solenoid click, make check C.

C. Leave generator wire connected as in A but remove test harness from overdrive relay and install it at the kickdown switch. Ground the No. 1 and No. 4 terminals of the kickdown switch in turn. If no click results, it indicates a defective wire or poor terminal connection between the kick-down switch and overdrive relay. If a click results from grounding one terminal, but not from grounding the other, it indicates an open kickdown switch. If a click results as the two terminals are grounded in turn make check D.

D. Make similar test at overdrive control switch (test harness not required). If an open switch is indicated, note Condition No. 1 before discarding switch. If click results as the two terminals are grounded in turn -

E. Ground the governor terminal. If no click results it indicates defective wire or terminal connections between the governor and the control switch. If relay clicks, replace governor unless governor drive pinion is found to be missing or governor drive gear is slipping.

F. If, in procedure 7-B, relay clicked but solenoid did not, connect a test lamp between relay terminal No. 4 and ground. If test lamp does not light when relay clicks, inspect relay fuse; replace it if necessary. If fuse is good, connect the test lamp between ground and each of the fuse clips in turn. If lamp does not light at either fuse clip, inspect wire between between relay terminal No. 1 and voltage regulator terminal "B". If lamp lights at each fuse clip, replace relay.

G. If lamp lit in the first part of test F, connect test lamp between solenoid terminal No. 4 (the terminal with the 1/4" diameter screw) and ground. If lamp does not light when relay clicks a defective wire between relay terminal No. 4 and solenoid terminal No. 4 is indicated. If lamp does light it indicates a defective solenoid or connections. Remove solenoid cover, examine solenoid contacts, clean if necessary, reconnect and test again for clicks before discarding solenoid.

## CONDITION NO. 8

**FAILS TO SHIFT OUT OF OVERDRIVE BELOW 16-21 M. P. H.**

**CAUTION: If this condition actually exists car will not roll backward and any attempt to force it to do so may seriously damage the overdrive unit itself.**

A. Check for this condition by rolling the car backward by hand with the gear shift lever in neutral. If it will roll forward but not backward, disconnect the wires at No. 4 terminal of solenoid and loosen the solenoid and loosen the solenoid mounting screws. If this does not unlock the transmission, remove the mounting screws completely and pull straight out on solenoid to disengage the solenoid pawl from slot in the overdrive stationary gear. If solenoid pulls free from transmission in this operation without having been rotated 1/4 turn, indicates that the solenoid was improperly installed (solenoid stem was not engaging pawl). See Condition No. 4 "Improper Installation of Solenoid".

B. Remove solenoid cover and see if solenoid stem has been forced past upper contact spring. Check pawl for release; if pawl cannot be withdrawn freely from engagement, or if the car cannot be pushed forward by hand, with one of the forward transmission speeds engaged, the solenoid unit has probably been damaged internally and must be repaired or replaced. If no such damage is apparent and the solenoid installation appears proper, the solenoid itself may be sticking. If car will roll backward -

B. Push overdrive dash control knob in, disconnect wire from "A" terminal of generator and momentarily connect loose end to negative post of battery by means of a jumper. If overdrive relay and solenoid do not click, follow procedure at E. If click occurs it indicates a circuit ground between the relay and the governor or within the relay or governor.

C. Pull overdrive dash control knob out and again momentarily connect loose end of generator "A" terminal wire to the negative post of battery. If no click occurs grounded circuit is indicated between the control switch and governor or within the governor; follow procedure E and F. If click occurs -

D. Hold kickdown switch open, either by pressing the accelerator pedal to the floor, or by pressing the kickdown switch stem by hand, and momentarily connect loose end of generator "A" wire to negative post of battery. If no click occurs, a grounded circuit. is indicated between the control switch and the kickdown switch; follow tracing procedure. If click occurs ground is indicated between kickdown switch and relay or within one of these units; follow procedure G and H.

E. With generator "A" wire connected to the negative post of battery and overdrive dash control pushed in disconnect governor. If click occurs, replace governor. If no click occurs at governor, replace connection, and disconnect governor wire at control switch. If click occurs, inspect wire for ground; also inspect switch terminal for grounding contact with some other part of the car. If no click occurs replace connection, and -

F. With governor "A" wire connected as in E, disconnect other wire at control switch; if click occurs inspect terminal for a ground. If none is found replace switch. If no click occurs disconnect harness plug from kickdown switch. If click occurs a ground is indicated in either the wire between the kickdown and the control switch or in the kickdown switch. Connect test harness to overdrive harness plug which was removed from kickdown switch but do not plug into kickdown switch. Connect circuits 1 and 4 momentarily. If no click occurs, kickdown switch is defective; if relay clicks the wire between the kick-down switch and the control switch is grounded.

G. With generator "A" wire connected as in E, disconnect harness plug from kickdown switch. If relay clicks, kickdown switch is grounded. If there is no click the wire between the relay and the kickdown switch or the relay is grounded.

H. Connect test harness in system at relay and break the No. 2 circuit. If relay clicks the wire to the kickdown switch is grounded, if it does not click relay is grounded and should be replaced.

## CONDITION NO. 9

### WILL NOT KICKDOWN FROM OVERDRIVE:

A. Ground No. 6 (3/16" terminal screw) terminal of the solenoid, with engine running. Press kickdown switch stem by hand. If engine stops inspect connection at terminal, and also contacts inside solenoid for proper closing when stem is extended. If engine does not stop, install test harness at kickdown switch and ground No. 4 circuit. When the No. 3 circuit is grounded engine should stop when the throttle switch stem is pressed. If it does riot, replace switch. If the engine does not stop when either of the terminals is grounded, wire or connections are defective between the throttle switch and the primary terminal of the ignition coil. This connection is made to the primary terminal of the ignition coil that is connected to the distributor.

B. Occasionally, the upper contacts of the kickdown switch will not open. To test for this condition disconnect "A" generator wire at generator and connect loose end of wire to negative post of battery. Ground overdrive wire at control switch or governor; this should cause the solenoid to click. Press the accelerator pedal all the way to the floor; this should cause a second click; no click indicates a defective kickdown switch, or that the kickdown switch is not being opened. See Condition No. 3 "Throttle Switch Improperly Adjusted".

## CONDITION NO. 10

**ENGINE CUTS OUT WHEN KICKDOWN IS ATTEMPTED:**

With engine running, press kickdown switch stem with hand. If engine stops, disconnect wire from No. 6 terminal of solenoid and press switch stem again. If engine does not stop, it indicates a damaged No. 6 terminal insulator in the solenoid cover, or a defective solenoid. If the engine stops with this terminal disconnected, it indicates either a grounded wire between the kickdown switch and the solenoid, or a defective kickdown switch.

## CONDITION NO. 11

**HARD SHIFT INTO REVERSE:**

**NOTE: A car equipped with Overdrive is normally more difficult to shift into reverse than a car with a standard transmission. When the car is new and all controls a little stiff the shift into reverse will be easier if done as follows:**

A. Shift lever into reverse position as far as it will go easily, then allow clutch to engage slightly while continuing to push on lever.

B. If unusual difficulty is experienced at any time, shift to reverse can be made much easier by pulling Overdrive control button "out" before shifting.

C. If shift to reverse is impossible make check under Condition 8 "Remains in Overdrive after car is stopped".

## CONDITION NO. 12

**FREE WHEELS AT SPEEDS OVER 16-21 MPH,**

**NOTE: If car is equipped with Hudson Drive-Master, check to see if free wheeling is caused by disengagement of clutch. If it is, see trouble shooting for this equipment in Hudson Drive-Master Section 9.**

A. If continuous, make checks for failure to shift into Overdrive, Condition No. 7.

B. If intermittent, check for poor electrical contacts in all parts of Overdrive wiring.

## CONDITION NO. 13

**SHIFTS OUT OF OVERDRIVE AT SPEEDS ABOVE 21 M.P.H.**

See check for intermittent free wheeling under "Free Wheels at Speeds Over 16-21 M.P.H."

## CONDITION NO. 14

**TRANSMISSION LOCKED:**

**NOTE: If transmission does not shift out of overdrive when the car is brought to a stop and the car then rolls backward slightly, the transmission will lock. The car cannot be moved forward or backward by the engine or by towing. Make check under Condition No. 8 "Fails to Shift Out of Overdrive Below 16 to 21 M.P.H.", under Test A.**

## CONDITION NO. 15

**REMAINS IN OVERDRIVE AFTER CAR IS STOPPED:**

If car is in overdrive, engine running, a clicking noise will be heard whenever the relay plug is connected or disconnected. To remedy this condition, make checks as outlined under Condition No. 8.

# REFERENCE

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SECTION 11

# PROPELLER SHAFT AND UNIVERSAL JOINTS

The propeller shafts and universal joints used on the 500 series Hudsons are the same as used on corresponding 480-490 series with exception of the 500 models, which have a shorter propeller shaft. Service procedures are the same as 480 -490 series.

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# SECTION 12
# REAR AXLE

The rear axle used in the 500 series Hudsons is the same as the 490 Series. Axle ratios of 4.1 to 1 and 4.55 to 1 are used on the 500 series. An axle with 3.82 to 1 ratio is available as an option on cars not equipped with overdrive.

| 500 Series | Standard | Optional |
|---|---|---|
| Without Overdrive | 4.1 to 1 | 4.55 to 1 or 3.82 to 1 |
| With HDM | 4.1 to 1 | 4.55 to 1 or 3.82 to 1 |
| With Overdrive | 4.55 to 1 | 4.1 to 1 |
| With Super-Matic Drive | 4.1 to 1 | 4.55 to 1 |

For service procedures, refer to the 480-490 Mechanical Procedure Manual.

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# SECTION 13
# FRONT SUSPENSION

The front suspension system of the 490 Series has been continued for the 500 series without change except for model 500. On this model, the length and angle of ball arm on the center steering arm has been changed; the tie-rod arm, pivot and bracket remain the same as other models.

Specifications, tools, and mechanical procedures for the 500 series are continued exactly as for the 490 series.

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# SECTION 14

# STEERING GEAR

## CONTENTS



## SPECIFICATIONS

| | |
|---|---|
| Type | Worm and 3 tooth roller |
| Ratio, 501-2-3-4 | 20.4 to 1 |
| 500 | 18.2 to 1 |
| Steering wheel, 500 | 18" Hard rubber steering wheel with horn button |
| 501-503 | 18" Plastic steering wheel with horn button |
| 502-504 | Custom 18" plastic steering wheel with horn ring (Optional on 500, 501, 503) |
| Gear shaft bearings | Needle |
| Worm shaft bearings | Tapered roller |
| High Point | Notch on steering column tube straight down |
| Lubrication | S.A.E. 90 E.P. |
| Wheel Nut Torque | 20 to 30 foot pounds |
| Gear Shaft Nut Torque | 125 to 140 foot pounds |
| Gear to Frame bolts | 50 to 60 foot pounds |

## CONSTRUCTION

The steering gear used on 500 series Hudsons emp1oys a worm gear and three tooth roller. The worm gear is pressed on the lower en d of the steering column tube and operates on two tapered roller bearings. The three tooth roller operates on needle bearings. The gear shaft also operates on two needle bearings separated by a bearing spacer in the shaft housing.

A leather oil seal at the end of the gear shaft protects the unit against loss of lubricant. A grease retainer tube is pressed into the worm cover to provide a passage for the horn wire and seal the lubricant in the housing.

A thrust plate is assembled on the end of the gear shaft adjustment screw and fits into a slot in the end of the gear shaft. The adjustment screw is held in place by a lock plate and lock nut. Adjustment of the roller shaft for proper mesh

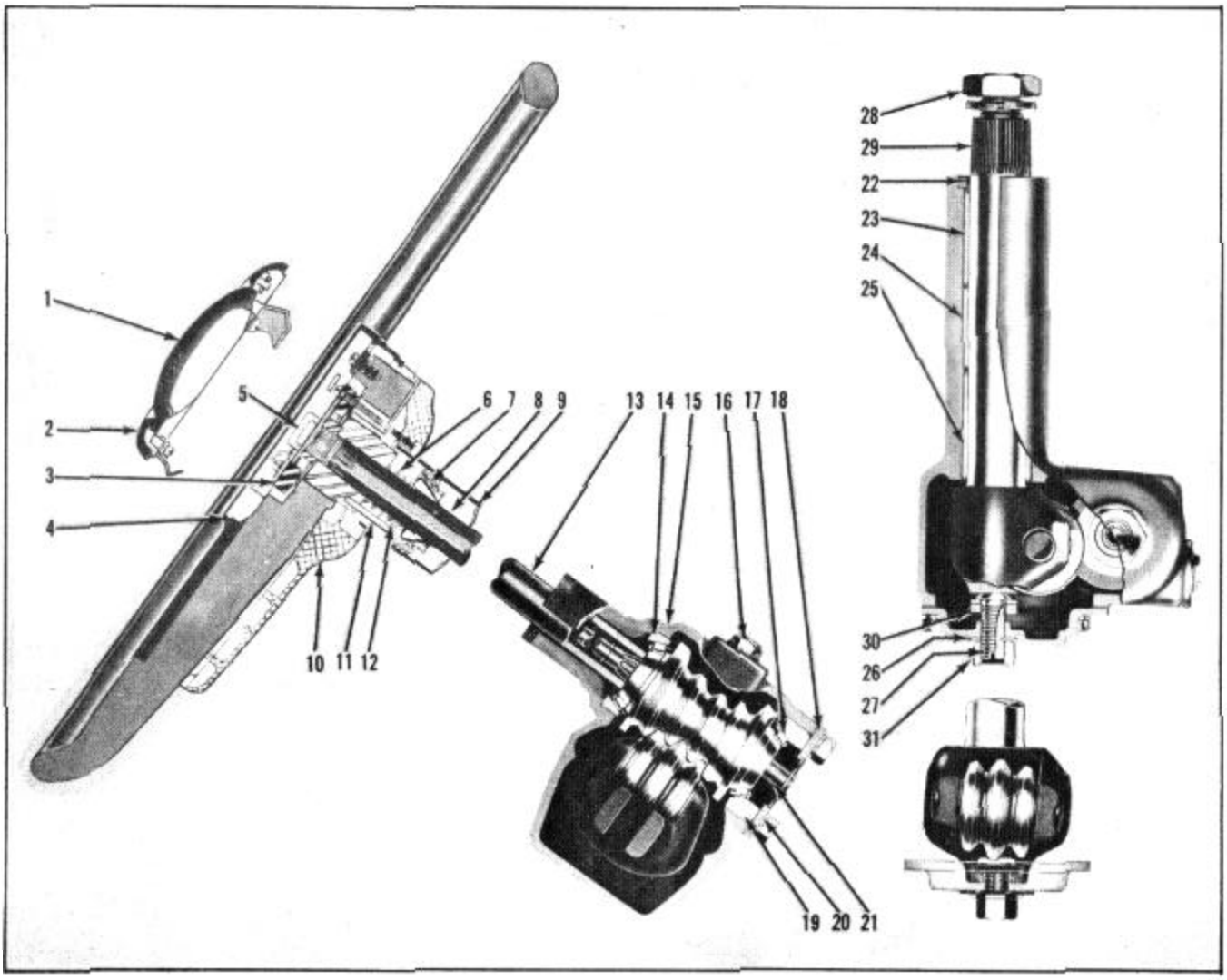


FIGURE 1

Steering Gear with Custom Steering Wheel

1. Steering wheel ornament
2. Steering wheel ornament ring
3. Horn ring insulator
4. Steering wheel spoke cover
5. Horn ring contact cup
6. Jacket tube spring
7. Jacket tube bearing
8. Jacket tube bearing spacer
9. Jacket tube
10. Horn ring
11. Direction Indicator cancelling pin
12. Direction Indicator cancelling pin spacer
13. Main column tube
14. Worm shaft upper bearing cup
15. Worm shaft upper bearing
16. Oil filler plug
17. Worm shaft lower bearing
18. Worm shaft cover
19. Worm shaft lower bearing cup
20. Worm shaft cover shims
21. Oil retainer tube
22. Oil retainer
23. Needle bearing
24. Bearing spacer
25. Needle bearing
26. Adjusting screw lock plate
27. Adjusting screw
28. Gear shaft nut
29. Gear shaft
30. Adjusting screw thrust plate
31. Adjusting screw lock nut

proper mesh with the worm gear is accomplished by turning the adjustment screw in the gear shaft cover,

Adjustment of the worm gear for end play is accomplished by removing or inserting shims between the worm cover and housing.

## STEERING WHEEL (WITH HORN RING)

**REMOVAL**:

1. Pry ornament and ring assembly (2), Figure 1, out of steering wheel spoke cover. 2. Remove three screws attaching horn ring insulator (3) to horn ring.

3. Disconnect horn wire at horn relay and remove insulator ring, contact cup (5) and wire.

4. Place the adapter (split ring 739-10) around the jacket tube with the small diameter of the adapter under the steering wheel hub. Position the foot of the puller, J-73B, around the outside (large) diameter of the adapter.

5. With the steering wheel nut partially threaded on the column tube, run puller screw down tight against the wheel nut to release the steering wheel.

**NOTE: Always use a puller to remove steering wheel. Striking or wedging may damage worm thrust bearings or break the steering wheel.**

**INSTALLATION:**

1. See that notch in main column tube is pointing down and centered. (This places steering gear at high point for straight ahead position.)

2. Place horn ring (10), Figure 1, over steering column jacket tube (9).

3. Place steering wheel and cover assembly in position on column with two spokes horizontal and third spoke straight down.

4. Insert horn wire, contact cup (5) and insulator (3).

5. Insert three long screws attaching insulator to horn ring and tighten until horn ring is snug against steering wheel.

6. Replace steering wheel nut and tighten to 20 to 30 foot pounds.

7. Attach horn wire and insert ornament and ring assembly.

## STEERING WHEEL (WITH HORN BUTTON)

**REMOVAL:**

1. Disconnect horn wire at horn relay.

2. Push down on horn button (24), Figure 2, and rotate to release button from retainer and remove button.

3. Pull horn wire up slightly and push the wire sleeve into large opening of contact cup.

4. Lift out contact cup (23) and remove horn wire.

5. Remove steering wheel nut, horn button retainer, and lockwire.

6. Replace steering wheel nut but do not tighten.

7. Continue as for custom steering wheel.

**INSTALLATION:**

1. With notch in main column tube straight down, place steering wheel in position on tube with spokes straight across.

2. Install horn button (24) Figure 2, retainer, and lockwire.

3. Install steering wheel nut and tighten to 20-30 foot pounds.

4. Insert horn wire into steering column tube and through large opening in contact cup (23). Move insulator sleeve into small opening with flange of sleeve on top of contact cup.

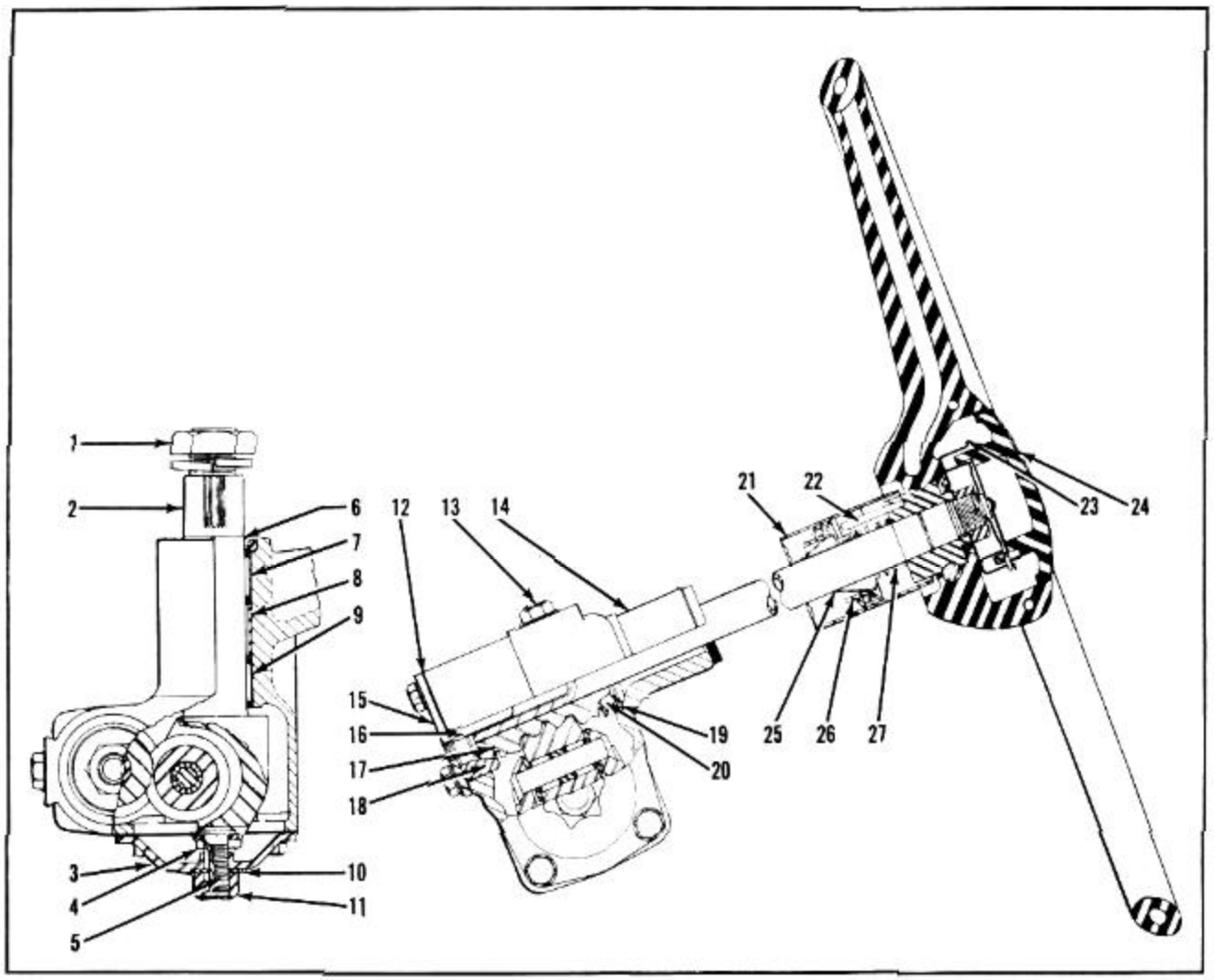


FIGURE 2

500 Steering Gear

1. Gear shaft nut
2. Gear shaft
3. Gear shaft cover
4. Adjusting screw thrust plate
5. Adjusting screw
6. Oil retainer
7. Needle bearing
8. Spacer
9. Needle bearing
10. Adjusting screw lock plate
11. Adjusting screw lock nut
12. Worm cover shims
13. Oil filler plug
14. Main column tube
15. Worm shaft cover
16. Grease retainer tube
17. Worm shaft lower bearing
18. Worm shaft lower bearing cup
19. Worm shaft upper bearing cup
20. Worm shaft upper bearing
21. Jacket tube
22. Direction indicator cancelling pin
23. Horn button contact cup
24. Horn button
25. Jacket tube bearing spacer
26. Jacket tube bearing
27. Jacket tube spring

5. Apply a small amount of water pump grease to head of horn wire terminal.

6. Place contact cup in position and install horn button.

7. Rotate button to lock in place.

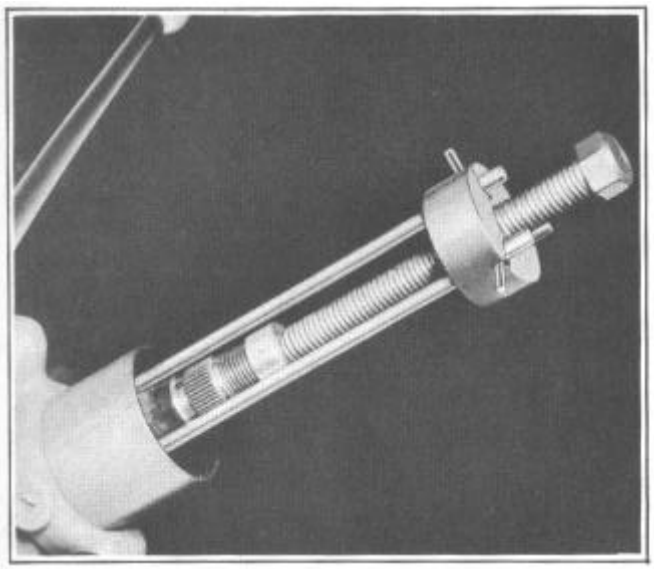

FIGURE 3

**JACKET TUBE BEARING**

**REMOVAL:**

1. Remove steering wheel in accordance with instructions.

2. Remove jacket bearing spring and spacer.

3. Engage fingers of Bearing Puller J-2792 below the bearing and place locating pins in slots in head of puller, Figure 3.

4. Turn the center screw of puller against steering column tube and remove bearing.

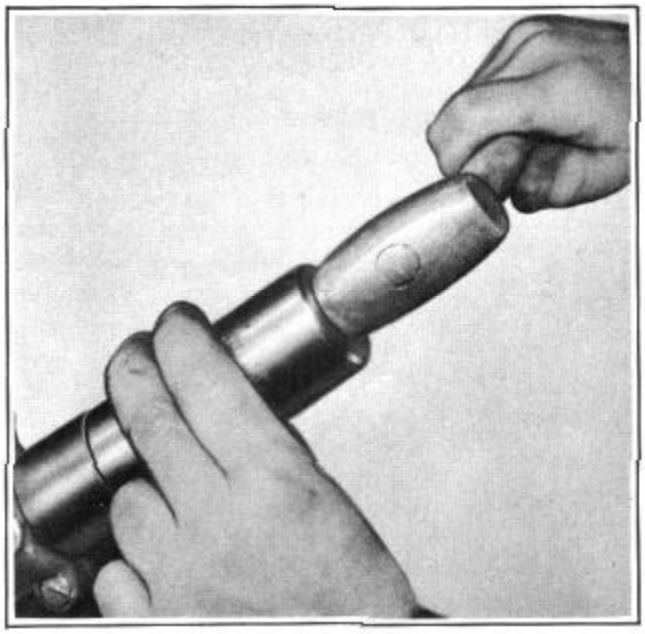

FIGURE 4

**INSTALLATION:**

1. Start bearing into jacket tube by hand.

2. Using Replacer tool J-2952, Figure 4, drive bearing to a depth of 31/32" on cars without direction indicator. If car is equipped with direction indicator, drive bearing to a depth of 1-11/32" from top of tube.

3. Replace jacket bearing spacer and spring.

4. Replace steering wheel.

**STEERING GEAR JACKET TUBE REMOVAL:**

1. Remove steering wheel.

2. Remove bearing spring and spacer.

3. Remove remote control tube bracket (up-per). On cars equipped with direction indicator, remove direction indicator switch assembly.

4. Remove steering column bracket cap at instrument panel.

5. Loosen remote control tube bracket (lower) and jacket tube clamp at steering gear, and remove jacket tube.

**INSTALLATION:**

Reverse procedure of removal.

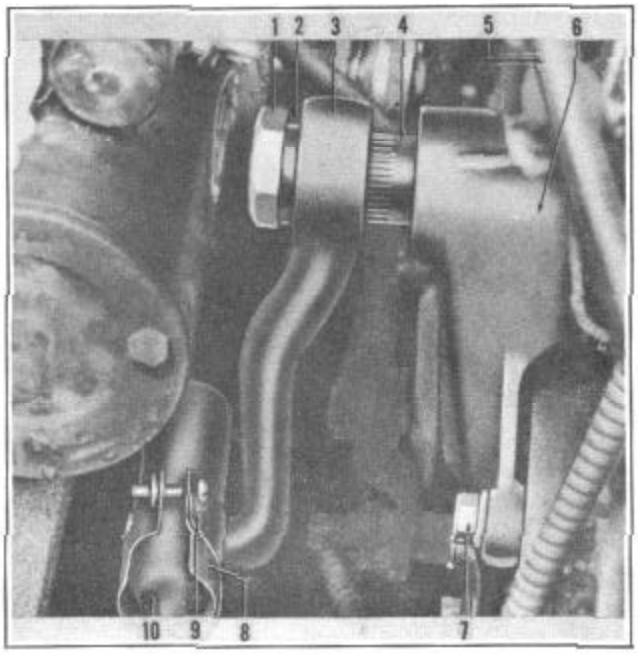


FIGURE 5

## STEERING GEAR
(Chuck Assembly)

**REMOVAL:**

1. Remove left front wheel and fender side dust shield.

2. Remove left frame to cowl brace.

3. Remove steering wheel and horn wire.

4. Remove steering gear jacket tube.

5. Remove three bolts (7), Figure 5, attaching steering gear to side frame.

6. Remove key and plug from drag link (10) at pitman arm and disconnect drag link.

7. Slide steering gear forward on frame and rotate to the left until pitman arm is clear.

8. Remove steering gear through wheel opening in left front fender.

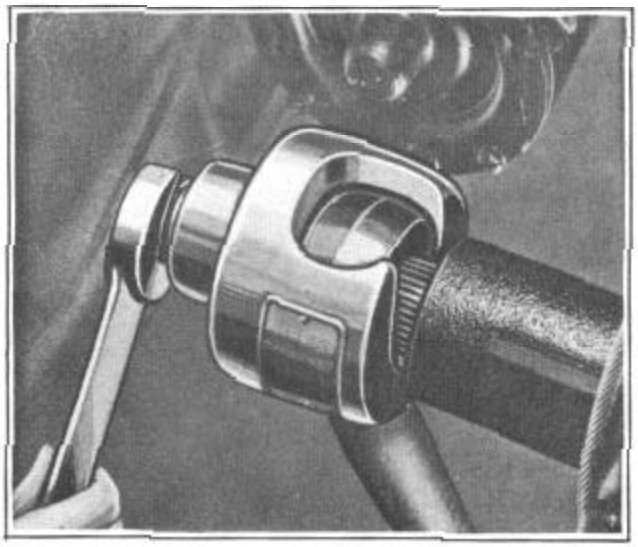

FIGURE 6

**DISASSEMBLY:**

1. Drain lubricant and mount assembly in a vise.

2. Using puller No. J.-1374, Figure 6, remove pitman arm.

3. Remove gear shaft cover.

4. Cover serrations on gear shaft with waxed paper to prevent damage to oil seal and remove gear shaft and roller assembly.

5. Remove oil seal, needle roller bearings, and bearing spacer from gear shaft housing.

6. Remove worm gear cover and grease retainer tube assembly; use care to prevent damage to shims.

7. Remove lower bearing, bearing cup, worm and column tube assembly, and upper bearing.

**ASSEMBLY:**

1. Clean inside of steering gear housing and all parts before assembly.

2. Assembly upper bearing cup and bearing in housing

and install worm and tube assembly.

3. Install lower bearing and cup.

4. Install worm shaft cover shims and cover and grease retainer tube assembly. If grease retainer tube is equipped with silencer make sure silencer is installed on tube.

5. Install gear shaft needle roller bearings and spacer.

6. Turn high point notch on steering column tube straight down and install gear shaft and roller assembly.

7. Assemble thrust plate on adjusting screw into slot in roller housing and attach gear shaft cover and oil seal,

8. Place pitman arm on gear shaft and tighten to 125 to 140 foot pounds.

9. Check worm for end play. If end play exists, adjust by removing one worm cover shim at a time until end play is eliminated. Rotate column tube after each removal to determine if stiffness exists. Stiffness indicates removal of too many shims.

10. Check gear shaft for excess play. If pitman arm can be moved more than 1/32" without turning the steering column tube, remove gear shaft adjustment screw lock nut and lift lock plate clear of cover boss. (Check notch on steering column tube to be sure it points straight down.) Tighten adjusting screw just enough to remove play between gear shaft and worm. DO NOT TIGHTEN BEYOND THE POINT OF TAKING UP LASH. Replace lock plate and lock nut and tighten nut.

11. Replace felt washer on column tube at steering gear housing.

**INSTALLATION:**

1. Install steering gear assembly on frame and insert but DO NOT TIGHTEN three bolts attaching steering gear to frame.

2. Install steering gear jacket tube. Tighten tube in bracket at instrument panel.

3. Tighten the three bolts attaching steering gear to frame to 50 to 60 foot pounds.

4. Loosen bolts attaching steering column bracket cap at instrument panel to allow column to shift to match position of steering gear and retighten bolts.

5. Replace horn wire and steering wheel with notch in column tube straight down and wheel spokes horizontal.

6. Replace frame to cowl brace, dust shield, and front wheel.

7. Check front suspension for stiffness by placing front wheels on roller plates and attaching spring scale to tire thread. Maximum pull required to turn wheels with drag link disconnected is 28 pounds.

8. Set front wheels in straight ahead position and attach drag link to pitman arm. (See "Drag Link Adjustments", page 14-9).

9. Fill steering gear housing with S.A.E. 90 E.P. Lube oil.

## PITMAN ARM

**REMOVAL:**

1. Remove key and plug from drag link at pitman arm and disconnect drag link (10), Figure 5.

2. Disconnect battery cable at starting motor solenoid and disconnect starter switch wire from solenoid.

3. Remove starting motor attaching bolts and remove starting motor assembly.

4. Remove nut (1), Figure 5, and lockwasher attaching pitman arm to steering gear.

5. Install jaws of Puller J-1374, Figure 6 on inner shoulder of pitman arm and turn puller screw tight against gear shaft to remove pitman arm.

**NOTE: Always use puller to remove pitman arm. Any other method will damage adjustment mechanism.**

**INSTALLATION:**

1. Install pitman arm on gear shaft. Tighten to 125 to 140 foot pounds.

2. Set front wheels and steering gear in straight ahead position. (See "Drag Link Adjustment", Page 9).

3. Adjust drag link if necessary and attach to pitman arm.

4. Install starter motor.

## GEAR SHAFT ASSEMBLY

The gear shaft and roller assembly may be removed for replacement of assembly, roller bearings, or grease seal without removing steering gear from the car.

**REMOVAL:**

1. Remove side dust shield.

2. Remove starter motor battery cable and switch wire and remove starter motor.

3. Remove pitman arm from gear shaft, with puller No. J-1374. (Always use puller to remove pitman arm.)

4. Remove gear shaft cover and adjustment screw assembly.

5. If oil seal is not to be replaced, cover serrations on gear shaft with waxed paper to protect seal.

6. Remove gear shaft, needle bearings and bearing spacer.

7. If oil seal is to be replaced, remove oil seal.

**INSTALLATION:**

Reverse procedure of removal and tighten gear shaft nut to 125 to 140 foot pounds.

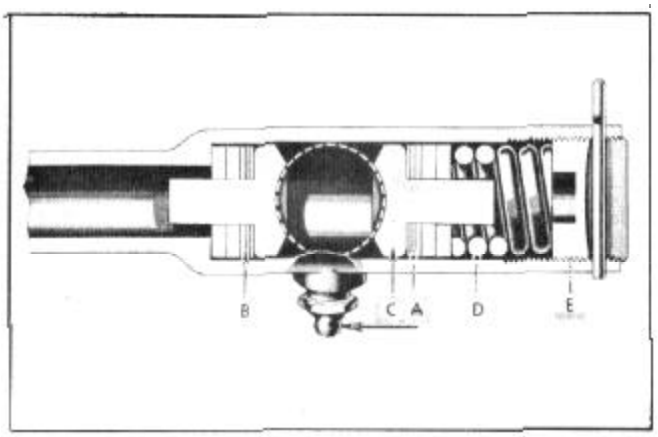


FIGURE 7

**DRAG LINK**

The drag link on all models is of the same construction at each end. However, the rear end has a shim adjustment for setting front wheels in the straight ahead position (A and B), Figure 7. Drag link assembly used on Model 500 differs in length and angle from drag links used on other models.

**REMOVAL:**

1. Remove drag link dust covers.

2. Remove key and plug from drag link at pitman arm and disconnect drag link.

3. Remove key and plug from drag link at center steering arm and remove drag link.

**INSTALLATION:**

1. Set front wheels and steering gear in straight ahead position and attach drag link to center steering arm. (See Drag Link Adjustments.)

2. Adjust drag link if necessary and attach drag link to pitman arm.

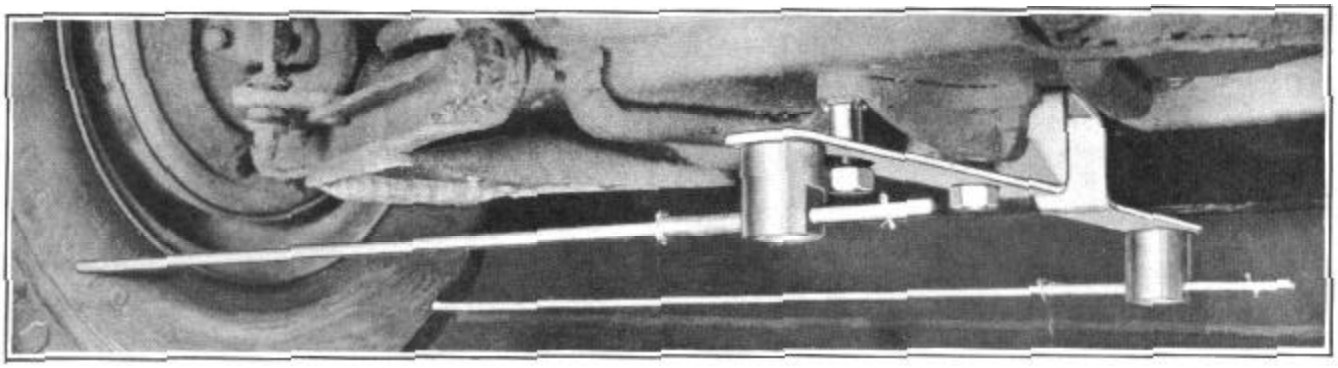

FIGURE 8

**ADJUSTMENT:**

1. Check steering wheel for correct position on steering column tube. (With notch on steering column tube straight down, spokes of steering wheel should be horizontal.

2. Remove nut from bottom of center steering arm pivot and remove bolt from front of steering arm bracket.

3. Install gauge No. J-2953, Figure 8, with gauge clamp on the center steering arm.

4. Attach female screw of gauge to center steering arm pivot and insert bolt at front of gauge into steeing arm bracket.

5. Check front wheels for proper toe-in, which should be from 0 to 1/1611. (If toe-in is incorrect, adjust tie rods.)

6. Place arms of gauge against tire as shown in Figure 8 with both arms at equal height on the tire.

7. Turn wheel until front and rear arms of gauge are of equal length.

8. If steering wheel spokes are not horizontal with gauge in this position, disconnect drag link at pitman arm and interchange shim packs (A and B), Figure 7, until horizontal position of spokes is attained, and attach drag link.

9. Remove gauge and replace nut on center steering arm pivot. (Before re -using elastic stop nut, strike the face of the nut a sharp blow with a hammer to compress the stop and provide a new seal.) Tighten to 50-60 foot pounds.

10. Replace bolt in front of center steering arm bracket.

## STEERING GEAR INSPECTION AND ADJUSTMENT

Elimination of excess play or stiffness in steering gear operation may be accomplished by external adjustment of the steering gear. Do not attempt to correct erratic action of front wheels by adjustment of the steering gear. Such action as indicated by shimmy or steering wheel fight should be corrected at the front suspension.

Before making steering gear adjustment, raise the front wheels and make sure no lost motion exists in the tie rod ends, steering arms, or center steering arm and pivot.

**WORM BEARING END PLAY INSPECTION:**

Excess end play in the worm bearing is indicated by an up and down movement of the steering column tube. This condition may be checked as follows:

1. Raise front wheels off the floor.

2. Check steering column jacket tube clamp at steering gear housing and tighten securely if loose.

3. Turn steering wheel about one turn to the right from straight ahead position.

4. Place one hand around the jacket tube with side of finger barely touching lower edge of steering wheel hub.

5. Have a helper shake the front wheels hard sidewise.

6. End play is indicated if the steering wheel hub moves away from or against the finger.

**WORM BEARING ADJUSTMENT:**

If end play exists in the worm bearing, the following adjustment is necessary:

1. Disconnect drag link at pitman arm.

2. Remove left frame to cowl brace.

3. Loosen the four worm cover bolts about 1/8".

4. Use a knife to separate the top shim. (Use care not to damage remaining shims.)

5. Remove one shim at a time and retighten cover.

6. After each shim is removed turn steering wheel through entire radius to determine if any stiffness exists.

7. If stiffness is felt, replace shims until steering wheel turns freely.

8. Attach drag link to pitman arm and replace frame to cowl brace.

**STEERING GEAR ALIGNMENT**:

Steering gear misalignment is indicated if stiffness exists in steering gear that cannot be eliminated with worm cover shims without resulting in excess worm bearing end play. Align steering gear as follows:

1. Disconnect drag link at pitman arm.

2. Loosen three bolts attaching steering gear housing to frame and allow housing to frame and allow housing to shift to angle determined by attachment of steering column to bracket at instrument panel.

3. Retighten frame bolts to 50-60 foot pounds.

4. Loosen bolts attaching steering column bracket at instrument panel and allow bracket to line up with steering column. Then tighten bolts.

5. Connect drag link to pitman arm.

**ROLLER MESH INSPECTION:**

Improper mesh of roller with worm gear is indicated by excess free play or stiffness in the steering wheel. Inspection for proper mesh should not be made until worm bearing endplay and gear alignment have been checked and corrected if necessary. If free play or stiffness continues, check mesh of roller with worm:

1. Disconnect drag link at pitman arm.

2. Turn steering wheel to straight ahead position.

3. Shake pitman arm to determine amount of lost motion. If lost motion exceeds 1/32", adjust roller for proper mesh.

4. Attach pitman arm to drag link.

**ROLLER MESH ADJUSTMENT:**

1. Disconnect pitman arm from drag link.

2. Remove left side dust shield.

3. Turn steering wheel to straight ahead position.

4. Remove roller shaft adjustment screw lock nut and lift lock plate clear of boss on housing.

5. Tighten roller shaft adjustment screw just enough to eliminate lost motion at pitman arm. (It is better to leave a slight amount of play - not in excess of 1/32" - than it is to tighten too much.)
6. Replace lock plate against cover in locked position and replace and tighten lock nut.
7. Replace dust shield and connect drag link to pitman arm.

**IMPORTANT NOTE:**

Before connecting drag link to pitman arm, place the front wheels on roller plates and attach spring scale to tire tread. Maximum pull required to turn wheels at any point in the turning radius is 28 pounds. Any excess pull indicates a binding in the front suspension that should be corrected to achieve proper functioning of steering mechanism.

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SECTION 15

# SPRINGS, SHOCK ABSORBERS, AND STABILIZERS

Springs and stabilizers for the 500 series Hudsons are continued exactly as for the 480-490 series.

New front shock absorbers are the same as 480-490 series except the dirt shield is omitted on the new models.

Light scale springs are standard on all models. Heavy scale springs are optional on all models for front and rear or rear only.

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# SECTION 16
# BRAKES

Service information for the 480-490 Series will apply to the 500 Series, Models 500, 501, 502, 503 and 504. Specifications for the 500 Series follow:

| | 500 | 501-502-503-504 |
|---|---|---|
| Type | 4 Wheel Bendix Hydraulic | 4 Wheel Bendix Hydraulic |
| Drum Diameter | 11" | 11" |
| Material | Centrifuse | Centrifuse |
| Lining Type | Moulded | Moulded |
| Width, Front | 1-3/4" | 2-1/4" |
| Width, Rear | 1-3/4" | 1-3/4" |
| Wheel Cylinder Size | | |
| Front | 1-1/16" | 1-1/8" |
| Rear | 15/16" | 15/16" |
| Adjustments | Anchor Pin Radially | Anchor Pin Radially |
| Front and Rear Shoe | Adjusting Screw | Adjusting Screw |
| Clearance | | |
| Both Ends of Shoe | .010" | .010" |
| Mechanical Follow-Up | 1-1/4" | 1-1/4" |
| Pedal Free-Play | 1/4" | 1/4" |

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# SECTION 17
# FRAME AND SHEET METAL

## SPECIFICATIONS

| | 500 | 501-502 | 503-504 |
|---|---|---|---|
| Wheel Base | 119" | 123-7/8" | 123-7/8" |
| Overall Length Including Bumpers | 201-1/2" | 208-3/16" | 208-3/16" |
| Height - Road to Roof | 60-3/8" | 60-3/8" | 60-3/8" |
| Width - Fender to Fender (Outside) | 77-1/16". | 77-21/32" | 77-21/32" |
| Road Clearance - Front and Rear | 8" | 8" | 8" |
| Tread | | | |
| Front | 58-1/2" | 58-1/2" | 58-1/2" |
| Rear | 55" | 55-1/2" | 55-1/2" |

## CAR LICENSE INFORMATION

| Series | Models | No. Cyls. | Bore & Stroke | H.P. | Piston Displacement | Serial No.-up |
|---|---|---|---|---|---|---|
| Pacemaker -- 4 Door | 500 | 6 Cyl. | 3-9/168 x 3-7/8" | 112 | 232 | 500101 |
| Brougham | | 6 Cyl. | 3-9/16" x 3-7/8" | 112 | 232 | |
| Bus. Coupe | | 6 Cyl. | 3-9/16" x 3-7/8" | 112 | 232 | |
| Club Coupe | | 6 Cyl. | 3-9/16" x 3-7/8" | 112 | 232 | |
| Convertible Brougham. . | | 6 Cyl. | 3-9/16" x 3-7/8" | 112 | 232 | |
| Super ---------- 4 Door | 501 | 6 Cyl. | 3-9/16" x 4-3/8" | 123 | 262 | 501101 |
| Brougham | | 6 Cyl. | 3-9/16" x 4-3/8" | 123 | 262 | |
| Club Coupe | | 6 Cyl. | 3-9/16" x 4-3/8" | 123 | 262 | |
| Convertible Brougham. . | | 6 Cyl. | 3-9/16" x 4-3/8" | 123 | 262 | |
| Commodore -- 4 Door | 502 | 6 Cyl. | 3-9/16" x 4-3/8" | 123 | 262 | 502101 |
| Club Coupe | | 6 Cyl. | 3-9/16" x 4-3/8" | 123 | 262 | |
| Convertible Brougham. | | 6 Cyl. | 3-9/16" x 4-3/8" | 123 | 262 | |
| Super ---------- 4 Door | 503 | 8 Cyl. | 3" x 4-1/2" | 128 | 254 | 503101 |
| Brougham | | 8 Cyl. | 3" x 4-1/2" | 128 | 254 | |
| Club Coupe | | 8 Cyl. | 3" x 4-1/2" | 128 | 254 | |
| Commodore -- 4 Door | 504 | 8 Cyl. | 3" x 4-1/2" | 128 | 254 | 504101 |
| Club Coupe | | 8 Cyl. | 311 x 4-1/2" | 128 | 254 | |
| Convertible Brougham. . | | 8 Cyl. | 3" x 4-1/2" | 128 | 254 | |

## SERIAL NUMBERS

The car serial number, which is also the engine number, is stamped on a metal plate attached to the right front door pillar post. In the car numbering system, the first three digits of the serial number indicate the series and the model, while the remaining digits
represent the actual car number. As the cars leave the production line, they are numbered in consecutive order, regardless of model.

The cylinder number is stamped on the top of the cylinder block between No. 1 and No. 2 exhaust manifold flanges on eight cylinder engines and on the right side of the cylinder block at the front end on six cylinder engines.

**NOTE: DO NOT confuse engine number with casting numbers appearing at different locations on the engine. Be sure this engine number corresponds with the serial number that appears on the Owners' Policy and Identification Card.**

A code number indicating paint color option is stamped on the upper hinge of the right front door.

Service procedures and information for the 500, 501, 502, 503 and 504 is the same as the 480-490 information in the Body Service Manual except as follows:

## FENDER TIE PANEL

**REMOVAL:**

1. Raise hood and disconnect hood lock control wire.

2. Remove bolt attaching tie panel to grille triangle strut bracket.

3. Remove four bolts from each end of tie panel and remove panel.

**INSTALLATION:**

Reverse procedure of Removal.

## RADIATOR GRILLE

**REMOVAL:**

1. Remove bolt attaching fender tie panel to triangle strut bracket and remove two bolts attaching struts to grille center support below front splash guard.

2. From inside the fender on each side, remove three Phillips head screws attaching grille baffles to side supports. Remove nut from bolt attaching end of center grille moulding to fender and remove nuts from two bolts attaching end of lower moulding to fender extension.

3. From engine compartment on each side, remove Phillips head screws attaching upper and center grille baffles to side supports. (These screws are located forward of radiator mounting channel.)

4. Remove grille.

**INSTALLATION:**

Reverse procedure of removal.

## FRONT SPLASH GUARD

**REMOVAL**:

1. Remove grille.

2. Remove two Phillips head screws attaching splash guard to right and left side supports and one bolt attaching splash guard to fender extension, right and left.

3. Remove bolt attaching grille center support to frame.

4. Lift out splash guard.

**INSTALLATION:**

Reverse procedure of removal.

## GRILLE SIDE SUPPORT

**REMOVAL:**

1. Remove fender tie panel.

2. Remove grille.

3. Remove two bolts from side support attacking support to front splash guard and three bolts attaching side support to fender extension.

4. Remove bolt from radiator channel to fender support at fender extension.

5. Remove three bolts attaching side support to front fender.

6. Remove three bolts, attaching side support to radiator mounting channel.

7. Move support toward center until lip between front fender and fender extension is clear and remove side support.

## GRILLE AND SUPPORT ASSEMBLY

**REMOVAL:**

1. Remove front bumper assembly.

2. Remove two upper bolts from each end of fender tie panel.

3. Remove three bolts, each side, attaching grille side supports to front fender.

4. Remove three bolts, each side, attaching side supports to fender extension.

5. Remove bolt, each side, from radiator mounting channel to fender support at fender extension.

6. Remove three bolts, each side, attaching side support to radiator mounting channel

7. Remove nuts from two bolts, each side, attaching lower moulding to fender extension and one nut from bolt attaching center moulding to fender.

8. Remove bolt attaching grille center support to frame.

**INSTALLATION**

Reverse procedure of removal.

### TRIANGLE STRUTS AND GRILLE MOULDING

The upper and intermediate grille moulding may be removed only by removing the grille assembly. Triangle struts and mouldings may then be easily disassembled.

The lower grille moulding is attached to the baffle by clips and to the fender extension by two tee bolts at each end. Lower moulding may be removed by removing the nuts from the tee bolts and pulling the moulding from the baffle.

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# SECTION 18

# WHEELS AND TIRES

For the 500 series Convertible Brougham the 7.60 x 15, 4-ply tire has been made standard along with the 15 x 5.50 wheels to accommodate this tire. A 6-ply tire has been made optional on all models.

Service procedure for wheels and tires is the same as for 480-490 series.

Recommended tire pressure for front tires is 26 pounds; rear tires, 24 pounds.

Wheels and tires for 500 series Hudsons are shown in the tables.

## WHEELS

| | WHEEL SIZE | |
|---|---|---|
| **MODEL** | **STANDARD** | **OPTIONAL** |
| 501, 503 | 15 x 5.00 | 15 x 5.50 |
| 501, 502, 504 | 15 x 5.00 | 15 x 5.50 |
| All Convertible Brougham | 15 x 5.00 | ---------- |

## TIRES

| | WHEEL SIZE | |
|---|---|---|
| **MODEL** | **STANDARD *** | **OPTIONAL**** |
| 501, 503 | 7.10 x 15 | 7.60 x 15 |
| 501, 502, 504 | 7.10 x 15 | 7.60 x 15 |
| All Convertible Brougham | 7.10 x 15 | ---------- |

* 4-ply, black sidewall is standard; 6-ply tires are optional in both sizes.
** White sidewall, 4-ply tires are optional in both sizes.

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