Hudson

VACUMOTIVE DRIVE

SERVICE INFORMATION

HUDSON MOTOR CAR COMPANY

DETROIT 14, MICHIGAN

U. S. A.

SECTION 8

VACUMOTIVE DRIVE

INDEX

REFERENCES

Source of Information	Date	Subject

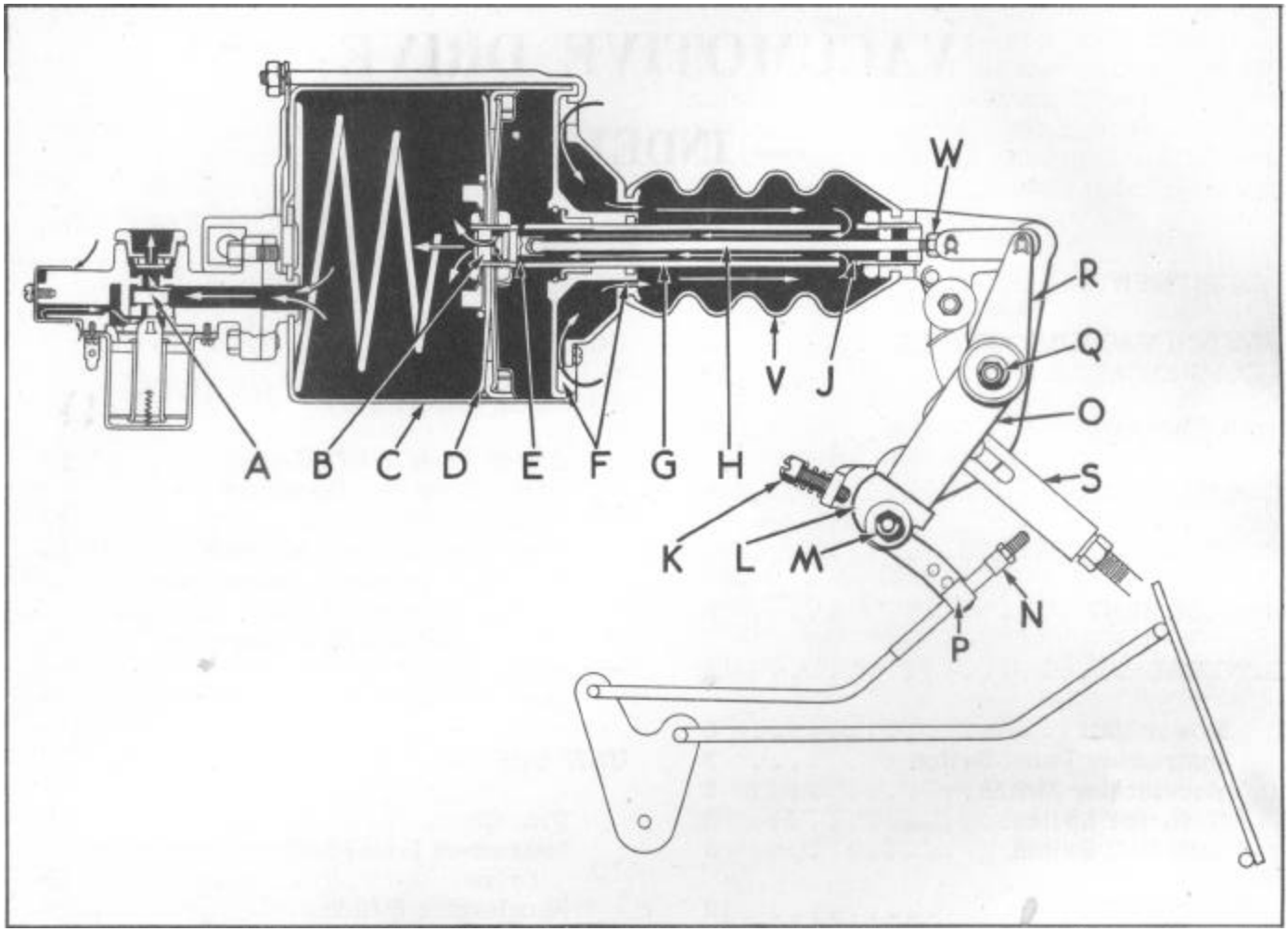

FIGURE 1

A. Solenoid valve
B. Valve plunger
C. Vacuum power cylinder
D. Vacuum piston
E. Piston rod air passage
F. Air cleaner passage
G. Piston rod
H. Valve rod
J. Piston rod air passage
K. Cushion point stop screw
L. Valve lever cam
M. Valve lever cam pivot
N. Threaded sleeve O. Valve lever
P. Accelerator linkage and guide trunnion
Q. Valve lever pivot
R. Operating bell crank
S. Bell crank to coupling lever rod link
V. Piston rod rubber guide
W. Valve rod locknut

GENERAL

Vacumotive Drive provides automatic clutch operation making it unnecessary to depress the clutch manually under any driving condition. Power for operating the clutch is provided by the power cylinder which uses engine manifold vacuum for its operation.

All units included in Vacumotive Drive are also incorporated in Hudson Drive-Master. They are as follows:

1. POWER UNIT - operated by vacuum supplies the mechanical effort to automatically operate the clutch.

2. INSTRUMENT PANEL SWITCH - mounted on the instrument panel permits the driver to change from conventional clutch operation to auto matic operation by merely turning the knob.

3. ACCELERATOR SWITCH - makes it possible to start with a wide open throttle for rapid acceleration.

4. GOVERNOR SWITCH - prevents automatic clutch disengagement when in high gear at speeds of 16 to 21 miles per hour.

5. THE SHIFT RAIL SWITCH - permits automatic clutch operation in low, second or reverse gears regardless of car speeds.

POWER UNIT

The power cylinder piston rod is connected by linkage to the clutch throwout yoke shaft so that the clutch is disengaged when the piston is moved forward. When the piston moves toward the rear, the clutch is engaged.

The movement of the piston is controlled by linkage from the power unit valve to the accelera- tor pedal. When the accelerator is in its released position, full manifold vacuum is obtained on the front of the power cylinder piston and atmospheric pressure on the rear of the piston moves it forward and the clutch is disengaged.

When the accelerator pedal is de- pressed, the valve is moved to equalize the pressure on both sides of the piston and the clutch is engaged by the pressure of the clutch springs on the pressure plate.

ELECTRICAL CIRCUITS

The system is turned on and off by an electric switch on the instrument panel. The electric circuit is from a point on the ignition switch which is "hot" when the ignition is on.

The circuit is completed through a solenoid valve mounted on the power cylinder then to the accelerator switch from which there are ground circuits to the transmission shift rail switch and the governor switch.

When the circuit is complete to either or both "Grounds", the solenoid is energized, opening the valve in the line which connects the power cylinder to the engine manifold.

When the circuit is broken the sole- noid valve closes the passage to the manifold cutting off the vacuum and opens a passage from the power cylinder to atmosphere so that the clutch engages immediately.

OPERATION

Figure 1 shows the position of the power. unit and linkage with engine running and clutch engaged at the instant the accelerator pedal reaches the closed throttle position and before disengagement has started.

The electrical circuit is closed so that the solenoid valve (A) is open and manifold vacuum is impressed on the front side of the power unit

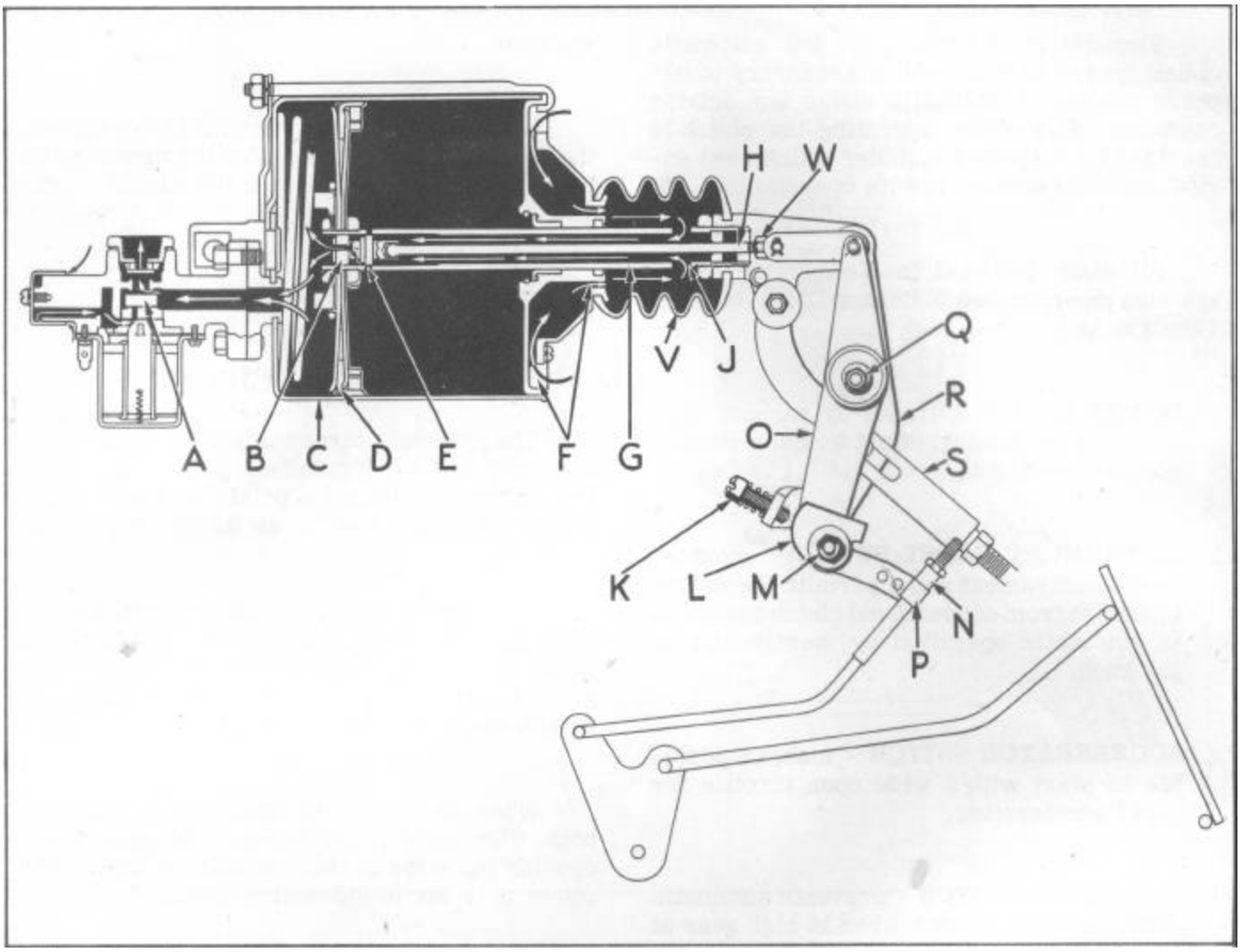

FIGURE 2

piston (D). The shoulder (N) on the sleeve of the valve pull rod (H) has moved away from the trunnion block (P) on the valve cam lever (L) so that the piston (B) has moved forward due to the vacuum acting on its forward surface, thus sealing the forward end of the cylinder from the rear and also opening the ports (E) in the piston rod (G) to admit air to the cylinder. The pressure differential due to vacuum on the front and atmosphere on the rear of the piston causes the piston to move forward and through the linkage, disengage the clutch.

DISENGAGEMENT

Figure 2 shows the conditions existing after the clutch has been disengaged. The piston has moved forward and the control linkage has been moved to correspond to this piston position.

It should be noted that the trunnion block (P) on the valve cam lever (L) has been moved backward by the rotation of the piston rod bell- crank (R) so that it is against the shoulder on the rod sleeve (N).

The movement of the piston valve (B) has been stopped and the piston (D) has continued to travel so that the valve now covers the ports (E) in the piston rod (G), preventing entrance of additional air into the rear of the cylinder and stopping the forward movement of the piston. The sleeve (N) is threaded on the rod, so that the point at which the trunnion block contacts the shoulder of the sleeve and stops the piston, is adjustable.

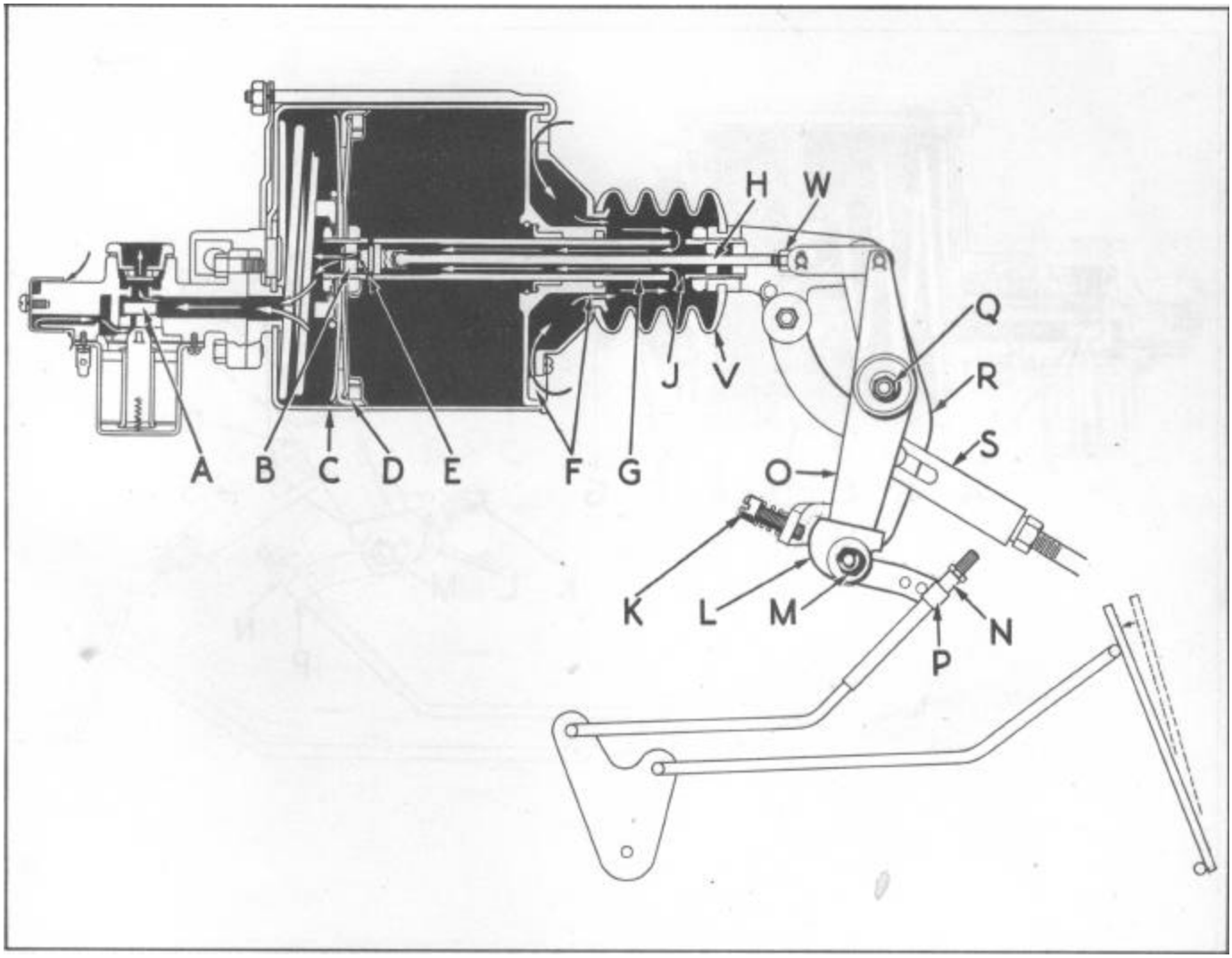

FIGURE 3

ENGAGEMENT

Figure 3 shows the linkage in position of partial throttle opening and the piston in the forward position before engagement has started.

The shoulder (N) on the rod sleeve has pulled the valve cam lever (L) forward moving the piston valve (B) backward.

The valve in moving behind the ports (E) in the piston rod (G), has cut off the entrance at atmospheric air to the rear of the cylinder and opened the ports in the piston rod to give direct passage from the front to the rear of the piston. As the air in the rear of the cylinder flows through the ports to the front of the piston the pressures are equalized and the piston moves freely to the rear through the pull of the clutch engaging springs.

As the piston moves backward, the valve lever cam (L) mounted on the piston rod lever, moves forward. When the cam rests against the stop screw (K), the piston valve is held stationary. The piston continues to move backward and the piston rod ports are partially covered restricting the flow of air from the rear of the cylinder and slowing down the final engagement of the clutch. The point where the retarding of the engagement takes place is known as the cushion point and is determined by the position of the stop screw (K).

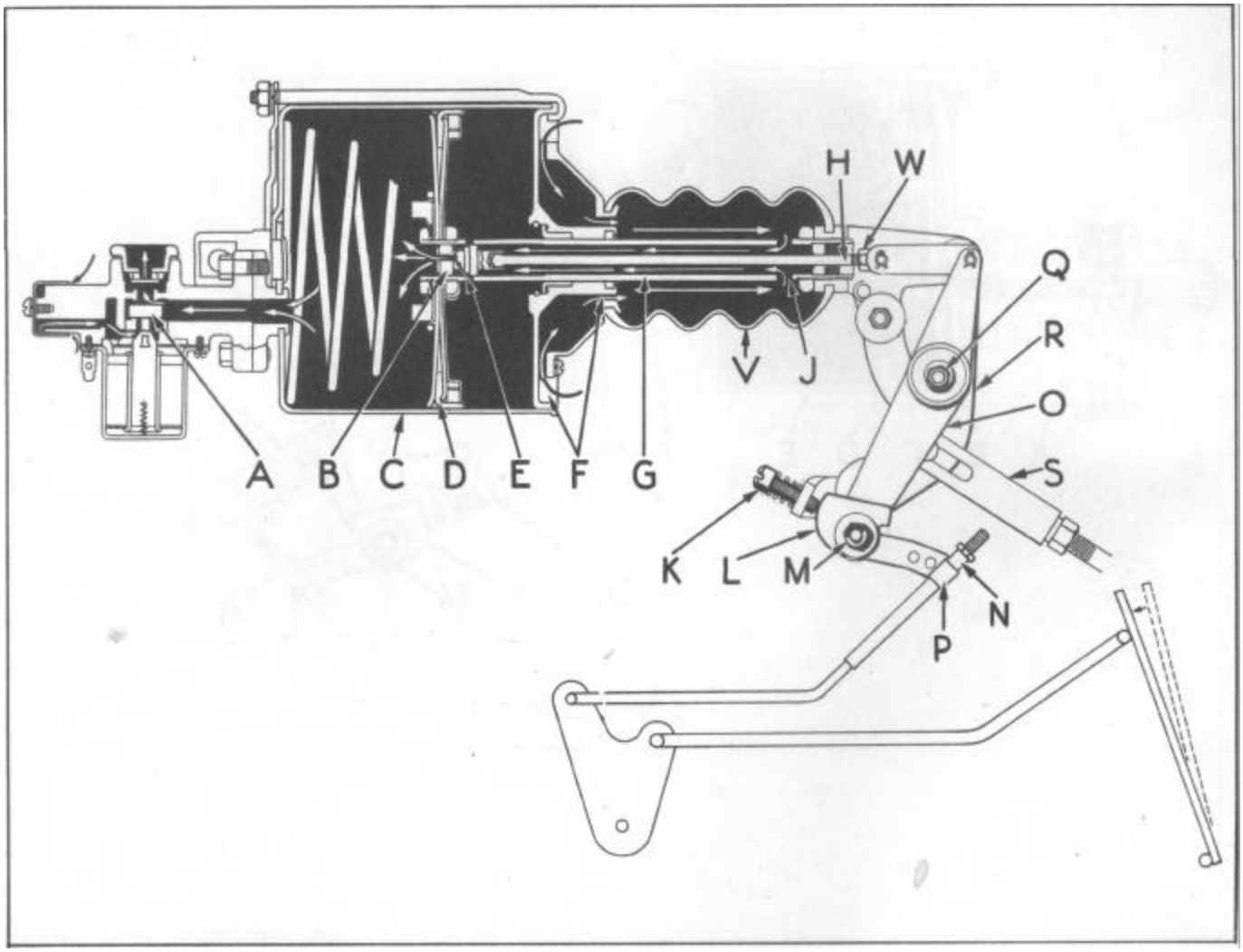

FIGURE 4

CUSHION POINT

Figure 4 shows the conditions at the time the cushion point is reached.

It should also be noted that the further the accelerator pedal is depressed, the greater the rotation of the cam (L). As the cam rotates, greater movement is required before it contacts the stop screw and cushions the final engagement. This prevents excessive engine speed before clutch engagement.

During all the preceeding discussion the solenoid valve (A) has been open to the manifold vacuum. It is readily seen that if the solenoid valve were allowed to move upward, closing the passage to the intake manifold and opening the atmospheric passage to the front of the piston, much more rapid clutch engagement would be obtained.

Rapid engagement is required when starting with more than half throttle in first or second gear or when shifting to second or high gear when the vehicle is moving from 16 to 21 miles per hour.

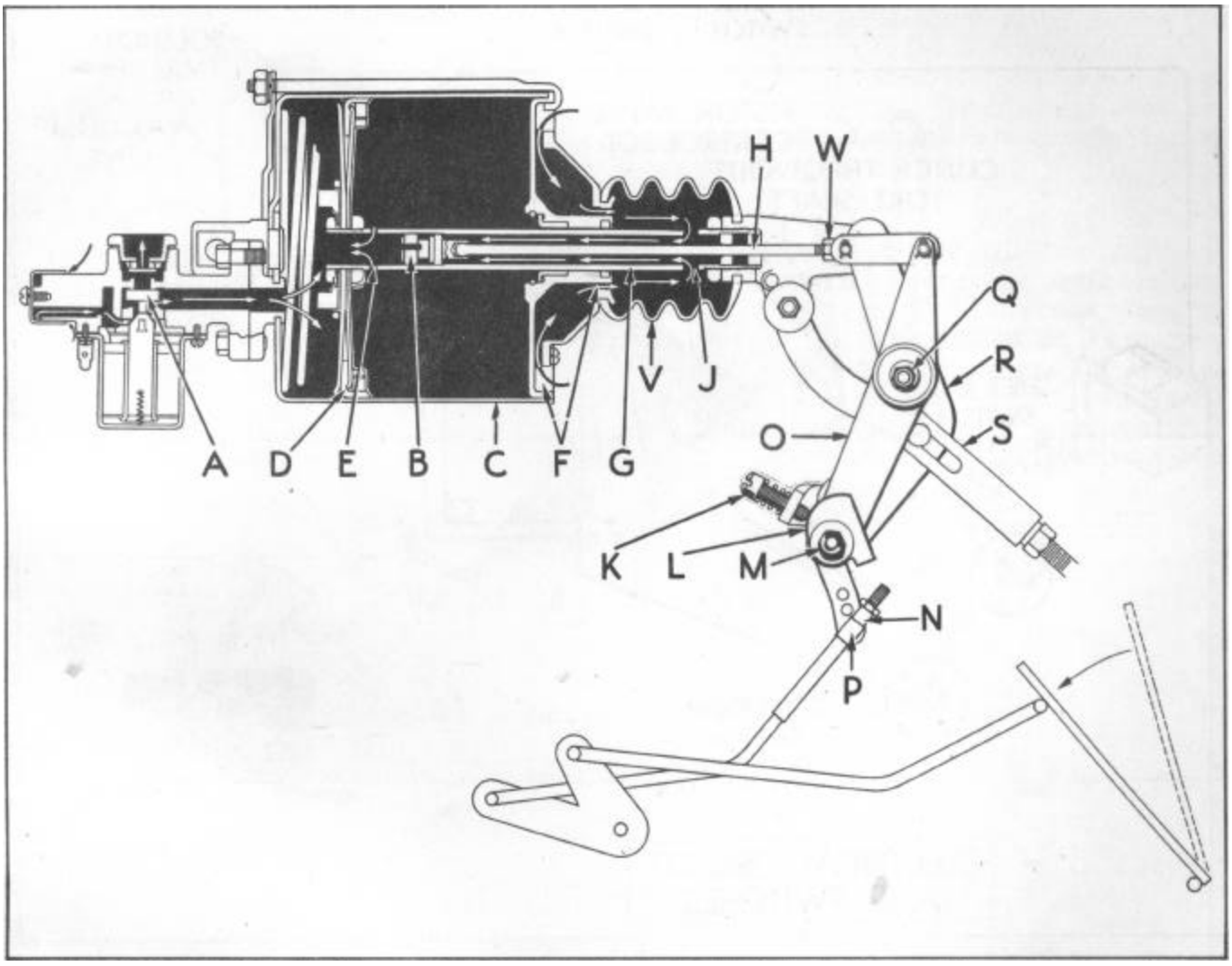

FIGURE 5

Figure 5 shows the conditions at the beginning of such an engagement. The accelerator is depressed to give over half throttle opening.

The piston valve is in its rearward position opening the passages between the front and rear of the piston and the solenoid valve in its upward position.

Figure 6 shows the wiring diagram and the conditions under which the circuits will be opened and the solenoid valve in its upward position as shown in Figure 5.

The circuit through the accelerator switch to the shift rail switch, is closed when the accelerator pedal is in the closed to half throttle position. The shift rail switch is closed except when the transmission is in high gear. The clutch engagement is, therefore, controlled by the piston valve when starting or accelerating in reverse, low or second gear with less than half throttle. When over half throttle is used, the accelerator switch circuit is open and quick clutch engagement is obtained due to the closed solenoid valve as previously explained.

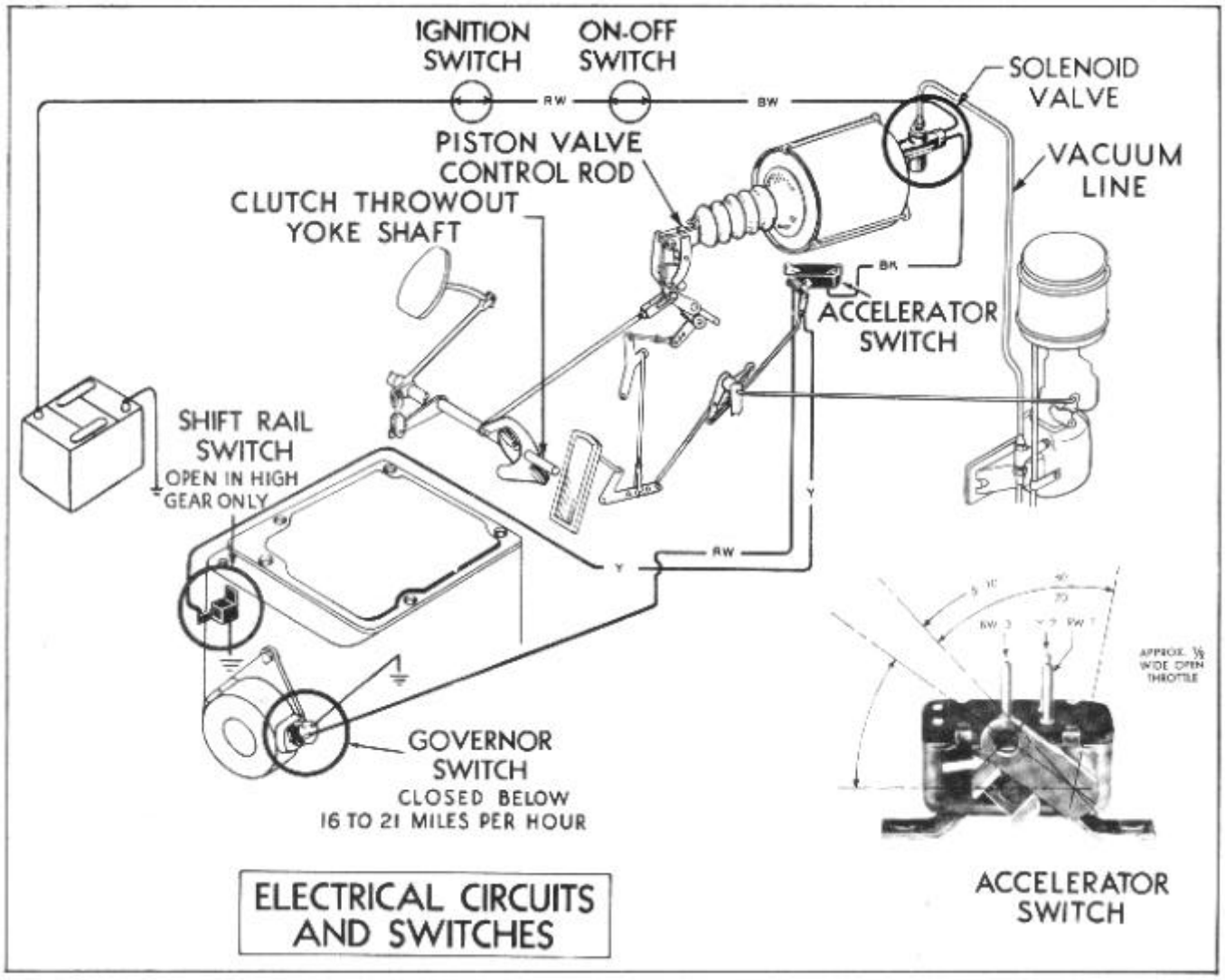

FIGURE 6

It should be noted here that the clutch disengages immediately when the foot is removed from the accelerator pedal, when the transmission is in reverse, low or second gear as the ground circuit is closed by the shift rail switch,

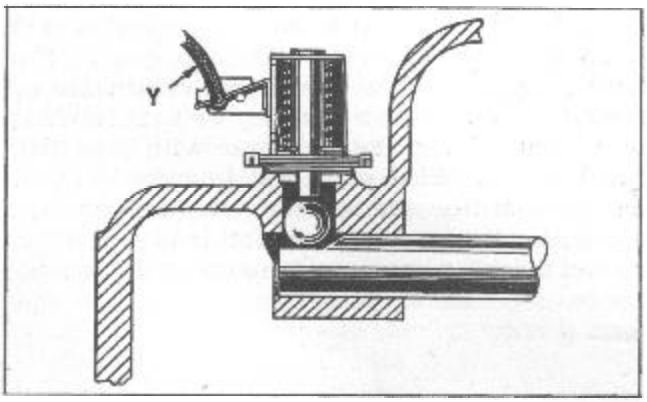

Figure 7

Figure 7. This gives a free wheeling effect which is desirable when manuevering the car in these gears.

When the transmission is shifted into high gear, the shift rail stitch is open so the only ground from the accelerator switch is through the governor switch. The governor switch is closed to ground at speeds below 16 to 21 miles per hour and open above those speeds.

When shifting into high gear at speeds below 16 to 21 miles per hour the clutch engagement is controlled by the power unit piston valve if the accelerator is depressed only slightly to give less than 10° movement of the accelerator switch arm. Under this condition the circuit is closed through the accelerator switch to the governor ground. This gives a very slow engagement of the clutch.

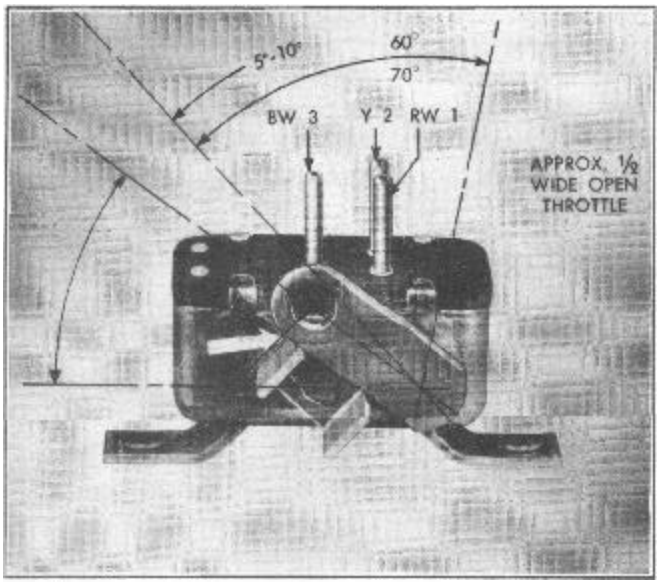

FIGURE 8

The accelerator switch Figure 8 contains two sets of contacts. One point of each set is connected to the (BW#3) terminal. The other point of the sets is connected - one to the (Y#2) terminal and the other to the (RW#1) terminal.

The accelerator switch lever operates both sets of points, when the lever is against the stop (closed throttle position) both sets of points are closed, completing the circuit to both the shift rail switch and the governor.

When the accelerator switch lever is rotated away from the stop, ten degrees, (throttle slightly opened) the points to which the (RW#1) wire (governor) is connected opens, breaking the circuit to the governor.

When the accelerator pedal is depressed to give approximately half open throttle, the accelerator switch arm opens the points (Y#2) connected to the shift rail switch.

Because the circuit to the governor is broken by the accelerator switch before the circuit is broken to the shift rail switch, the governor has no effect on the engagement or disengagement of the clutch except when the shift rail switch is opened by shifting the transmission into high gear.

If the accelerator is depressed sufficient to rotate the accelerator switch arm more than 10 degrees, the circuit through the accelerator switch to the governor switch is opened, the solenoid valve closes and rapid engagement is obtained. This rapid engagement prevents the engine from running above car speed and gives the quick action necessary for maneuverability.

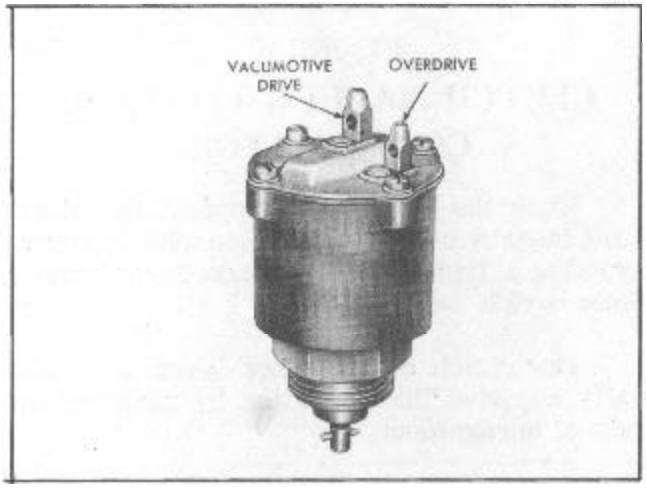

FIGURE 9

The governor switch Figure 9 is operated by the speedometer drive gear located at the rear of the transmission and prevents automatic clutch disengagement when in high gear in speeds over 16 to 21 miles per hour.

NOTE: With the governor switch open above 16 to 21 miles per hour and the shift rail switch open when the transmission is in high gear, the clutch will not disengage when the foot is removed from the accelerator pedal. There is, therefore, no free-wheeling action in high gear above 16 to 21 miles per hour and the engines can be used for braking the car speed in the normal manner.

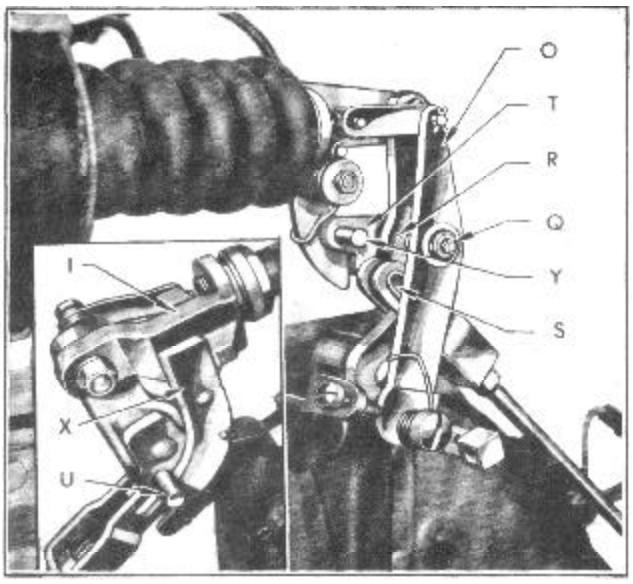

FIGURE 10

CLUTCH VACUUM CONTROL COMPENSATOR

When the engine has stopped, the clutch cork inserts become saturated with lubricant creating a frictional difference in the driving plate corks.

The clutch compensator lever automatically adjusted this condition by changing the rate of engagement.

Attached to the bell crank (R) is a two position compensation lever which turns the eccentric pivot (Q) changing the relation of the valve lever (0) with respect to its pivot point on the bell crank (R).

When first starting the car, the clutch pedal is depressed manually (by the driver's foot) and the action that takes place is--the end of the bell crank yoke (S) strikes the pin (Y) and swings the lever (T) both forward and upward, see Figure 10.

This moves the center of the valve lever pivot backward and permits the clutch to engage farther, to compensate for the cork inserts being covered with oil.

Normal driving position of the compensator lever follows and as soon as the clutch is automatically engaged and after the first shift into high gear, the trip lever (X) which is mounted on the piston rod end (I) will engage the pin (U) and the compensator lever will be rotated back to a position for normal driving. See Figure 10.

The compensator lever must be in an upward position as shown in Figure 10 before making any automatic clutch adjustment.
NOTE: When the compensator is turned up, with clutch disengaged by vacuum the piston rod should move back slightly. If it moves forward, the eccentric is assembled wrong.

ADJUSTMENTS

Do not attempt adjustment of the vacumotive drive until the engine has reached normal operating temperature.
The engine must be in proper tune and should idle smoothly at 580 to 600 R.P.M., when the vacumotive instrument panel knob is at the "on" position.

1. To assure full disengagement of the clutch, a 1-1/2" clearance must be maintained between the floor board and rear face of pedal.

2. Check all joints of throttle linkage and Vacumotive Drive linkage to see that they work freely.

3. Adjust length of accelerator pedal rod (N) to get 4-31/32" between under side of accelerator pedal tip and floor mat.

4. Check that throttle is wide open when accelerator is fully depressed. If throttle is not wide open, recheck instructions No. 2 and No. 3. Release pedal slowly and check that bellcrank arm (0) comes solidly against stop (P).

5. With the accelerator in the released position, that is, bellcrank arm (0) against stop (P) loosen screws (D) on accelerator switch and slide forward on the mounting bracket until lever arm (C) bottoms against stop on switch Tighten screws.

6. Set the brakes; place the remote control lever in the neutral posi tion; depress clutch pedal and start engine, holding clutch pedal down until Vacumotive Drive Cylinder takes up load.

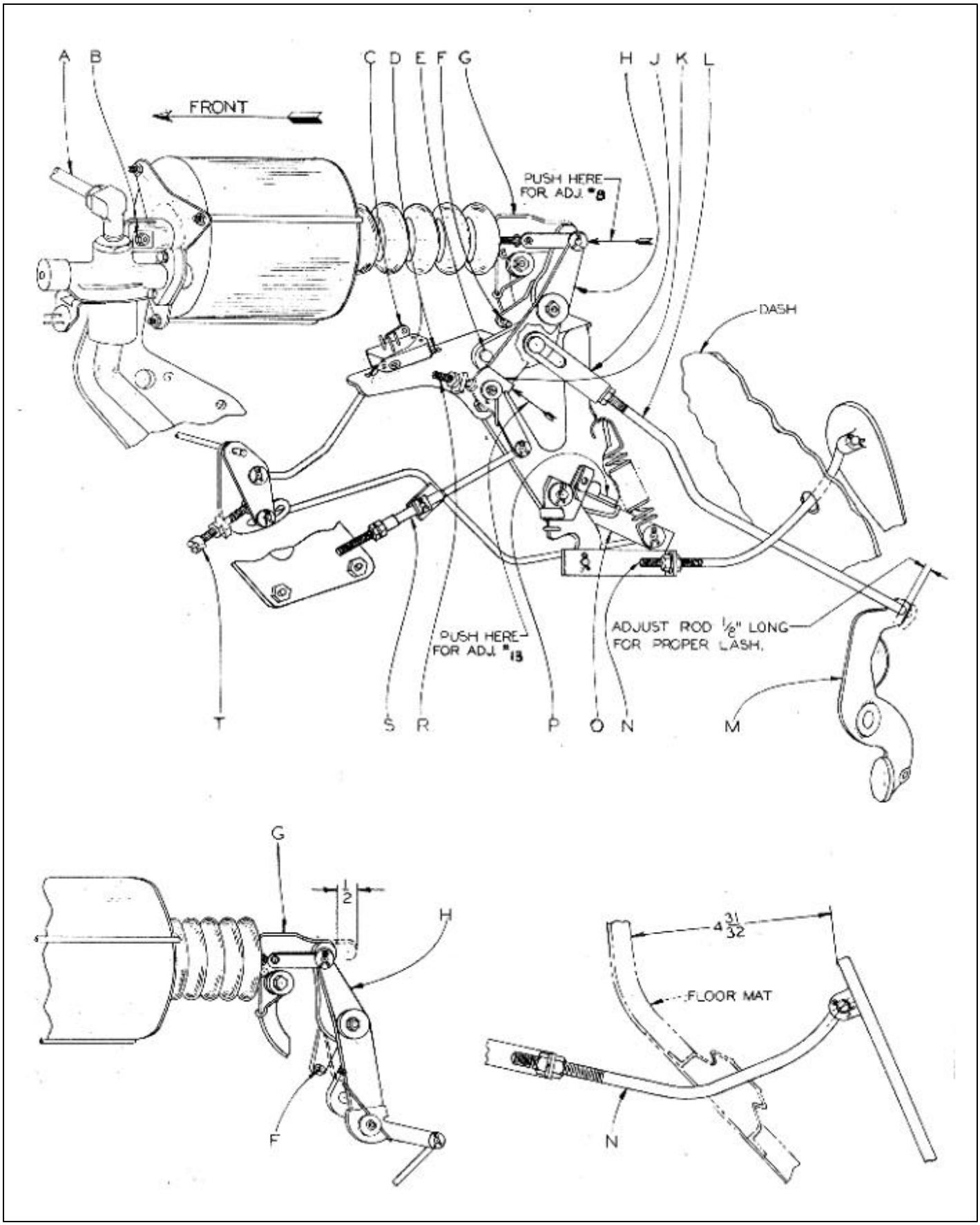
A
B
C
D
E
F
G
H
J
K
L
FRONT
PUSH HERE FOR ADJ. "B"
DASH
PUSH HERE FOR ADJ. "B"
ADJUST ROD 1/8" LONG FOR PROPER LASH.
T
S
R
P
O
N
M
G
1/2
H
F
4 31/32
FLOOR MAT
N

FIGURE 11

7. Run engine until normal operating temperatures are reached. With Vacumotive Drive control on, check the engine idle speed. This should be 580 to 600 R.P.M.

8. Adjust threaded sleeve (S) until piston is 1/2" from its extreme forward position; this is checked by pushing on valve lever (H) as indicated by arrow, and then releasing.

9. Pushing lever down to its normal running position will cause piston to move forward. If piston moves backward, the eccentric is assembled upside down.

10. Back out cam adjusting screw (R) until there is approximately 1/2" gap between cam and screw.

11. Stop the engine. Push piston rod (G) all the way out. Check for the required 1/8" lash in the clutch pull rod by pulling the rod (L) up and forward. If lash is correct, front end of slotted clevis (I) will touch compensator lever pin (F).

12. Depress clutch pedal (IMPORTANT) and start engine; do not race engine. Put transmission in second gear and release the brakes. Slowly rotate accelerator bell-crank (0) until clutch drags. Adjust throttle cross shaft screw (T) until there is a slight increase in engine speed to 800-1000 R.P.M. at the time car begins to move.

13. Stop engine; depress clutch pedal (IMPORTANT) and restart engine--Do not race engine. Set the brakes leaving the transmission in second gear. Screw cam adjusting screw (R) in fully. Push cam (K) against screw, as shown by arrow, and back out adjusting screw (R) until engine stalls.

14. Road check this adjustment for slow and fast starts as follows:

a. To check slow start, depress accelerator pedal very slowly -- engine should speed up slightly just before car starts to move. If necessary, adjust screw (T) to meet this requirement.

b. To check fast start, depress accelerator pedal 1/2 way to floor--car should move forward smoothly without excessive sliping of clutch. If necessary adjust screw (R) "in" or "out" to meet this requirement. Do not screw (R) "in" toward cam more than two (2) turns from No. 13 adjustment setting.

IMPORTANT: Note that adjustments 8, 12, and 13 are made with the compensator in the starting position, that is, with pin (F) forward as shown in solid lines in partial view.

CAUTION: Too frequent operation of the clutch will cause it to become overheated, making satisfactory adjustment impossible.

NOTE: In high gear, Vacumotive Drive must automatically become inoperative at a speed of 16 M.P.H. Min. to 21 M.P.H. Max. and remain inoperative at all higher speeds.

LUBRICATION

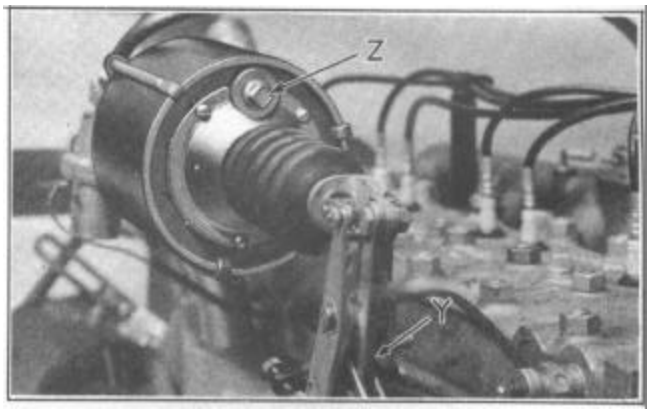

FIGURE 12

1,000 MILES

At intervals of 1,000 miles all pivot points in the mechanism should be lubricated with a few drops of light engine oil. Be sure to put a few drops of oil in the bellcrank bracket oil hole (Y) Figure 12.

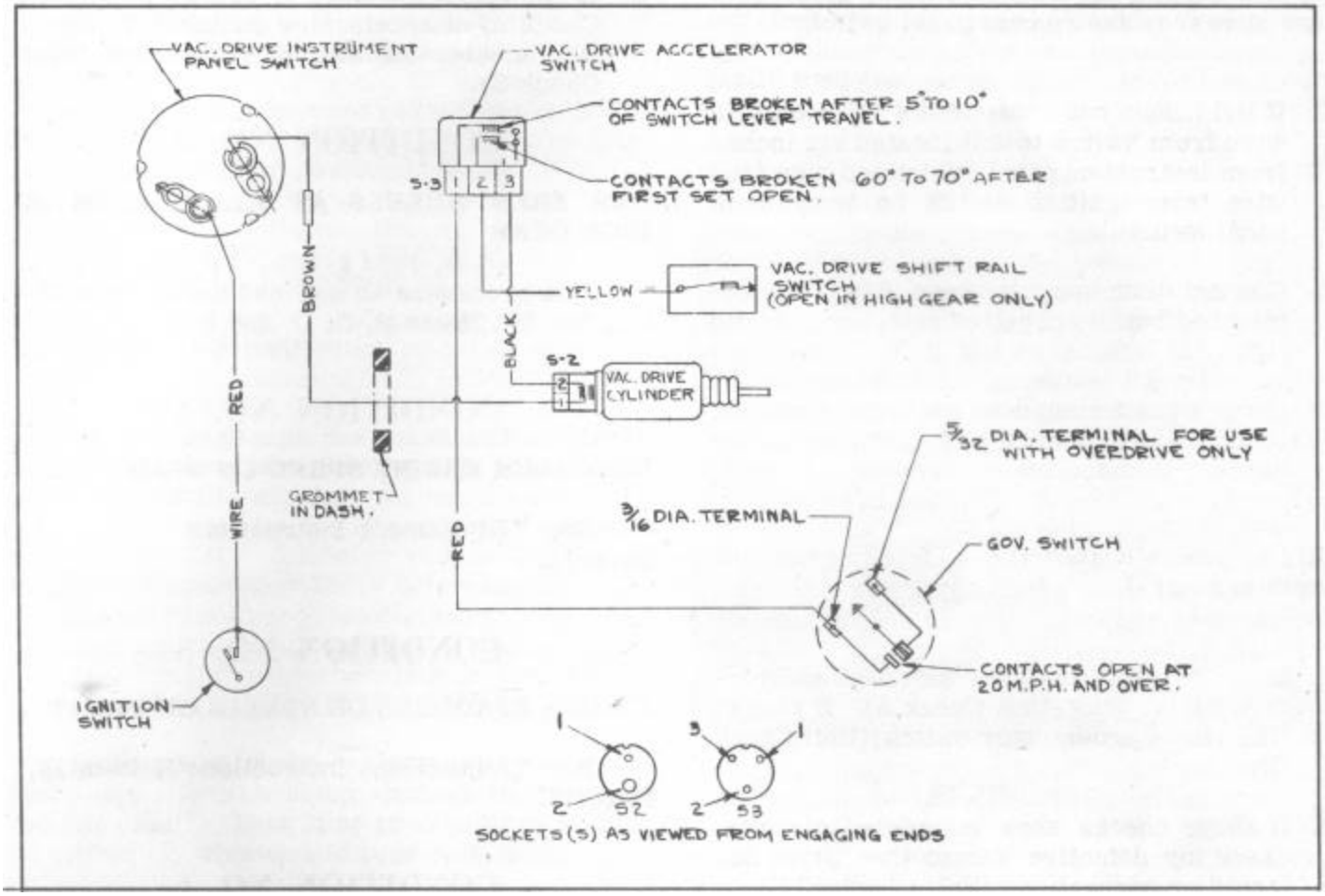

FIGURE 13

10,000 MILES

At intervals of 10,000 miles, remove pipe plug (Z), Figure 12 in rear end of power cylinder, and spray one ounce of Hudson Shock Absorber Fluid through plug opening.

TROUBLE SHOOTING

CONDITION NO. 1

CLUTCH DOES NOT DISENGAGE

A. Check vacuum lines for leaks or collapsed hose.

B. Remove plug (2 contact) at Vacumotive Drive Solenoid Figure 14 and connect test lamp between No. 1 socket of plug and ground. When ignition and Vacuum Drive switches are turned "ON", lamp should light.

C. If light does not light, check instrument panel switch (Unit Check B) "UNDER UNIT CHECKS", Pages 15 and 16.

FIGURE 14

NOTE: On H.D.M. equipped cars, also check fuse at rear of instrument panel switch.

D. If light does not light, check connector in wire from switch to unit located six inches from instrument panel switch and also feed wire from ignition switch t o instrument panel switch.

E. Connect test lamp between #2 socket of plug and battery negative post; lamp should light. If lamp does not light, move test lamp t o # 2 socket of accelerator switch plug. Now if lamp does not light, shift rail switch (Unit Check f) or the wire in the harness is defective.

NOTE: Above check to be made with gear shift lever in neutral.

F. If lamp lights, check for defective accelerator switch plug (Unit Check A). If plug is OK, check accelerator switch (Unit Check
C).

G. If above checks show completed circuits, check for defective Vacumotive Drive Solenoid or connections (Unit Check E).

CONDITION NO. 2

CLUTCH DOES NOT DISENGAGE WHEN COMING TO A STOP

A. See adjustment instructions #2, #4, and #5.

B. If above adjustments are OK, remove plug at accelerator switch and connect t e st lamp between #1 socket of plug and battery negative post. Lamp should light.

C. If lamp does not light, check plug (Unit Check A) or connections at governor switch.

D. If plug connections at governor are OK, ground wire at governor switch. With test lamp still connected as indicated above, a light indicates a defective governor (Unit Check F), no light indicates a defective harness.

E. If lamp lights, (in test B), check plug (Unit Check A) at accelerator switch. If plug is OK, accelerator switch is defective (Unit Check C).

CONDITION NO. 3

CAR FREE WHEELS AT ALL SPEEDS IN HIGH GEAR

Use procedure as outlined under "Condition No. 2", Items B, C, D, and E.

CONDITION NO. 4

TOO MUCH ENGINE SPEED ON START

See "Adjustment Instructions", Item 14, Page 12.

CONDITION NO. 5

ENGINE STAGGERS OR STALLS ON START

See "Adjustment Instructions", Item 14, Page 12.

CONDITION NO. 6

CLUTCH CHATTERS ON ENGAGEMENT

See "Adjustment Instructions", Item 14, Page 12.

NOTE: Less engine speed as c a r starts to move will reduce chatter. If chatter persists, check clutch operation in manual drive

CONDITION NO. 3

ENGINE STALLS ON FAST STOP

A. Tune up engine and if necessary, follow instructions under "Condition No. 2" A through E, Page 14.

B. Check to see that car starts to free wheel at not less than 16 M.P.H. If car does not free wheel at less than 16 M.P.H. when in high gear, check drive pinion for proper number of teeth. If pinion is OK, check governor (Unit Check F).

CONDITION NO. 8

HARD SHIFTING AND GEAR CLASH

Above complaint is due to incomplete clutch disengagement. See "Vacumotive Drive Adjustments", Items 8 and 11, Page 12.

UNIT CHECKS

A. PLUG CHECK

Insert 1/8" diameter rod successively into each socket of plug for a distance of 1/4". Socket should grip tightly enough to make a good electrical contact.

Use a 5/32" diameter rod in the No. 2 socket of Vacumotive Drive Solenoid.

B. INSTRUMENT PANEL SWITCH -VACUMOTIVE DRIVE

Ignition switch on. Ground long lead of test lamp. Switch button turned to "Vacumotive Side". Test lamp prod to Vacumotive Terminal (1) wire should light test lamp.

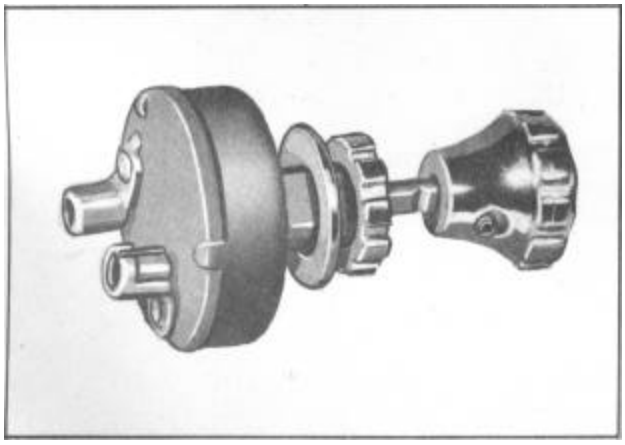

FIGURE 15

C. ACCELERATOR SWITCH

Remove connector plug. Ground one lead of jumper wire, other lead to #2 prong of accelerator switch. Long lead of test lamp to negative terminal of battery. Test lamp prod to #1 prong of accelerator switch, should light test lamp. Moving lever 10 degrees from stop, light should go out. Test lamp prod to #3 prong, should light test lamp. Moving lever 2/3 from stop, light should go out.

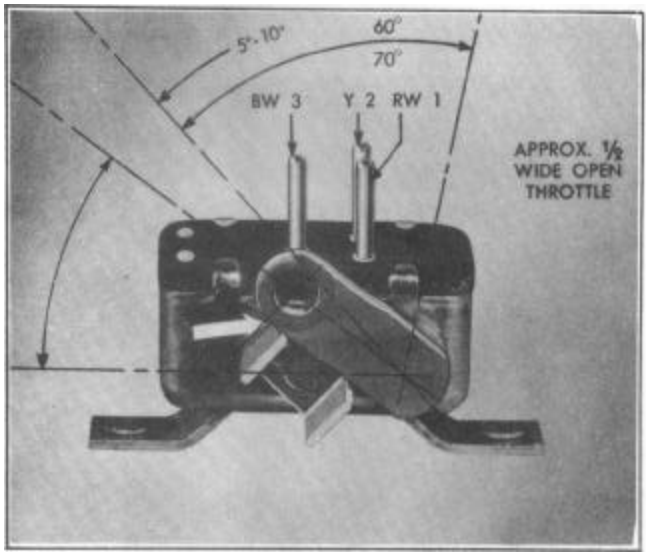

FIGURE 16

D. SHIFT RAIL SWITCH

Long lead of test lamp to negative terminal of battery. Prod of test lamp to #2 socket of accelerator switch. Shift handy shift. No light on high gear, lamp lights on all others. Replace connector socket.

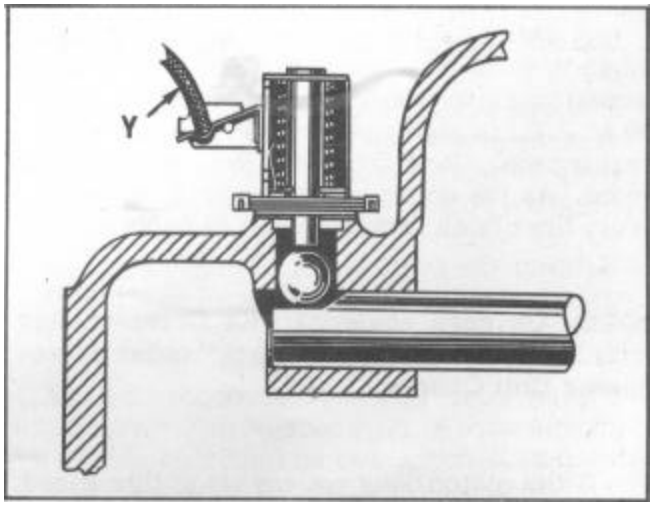

FIGURE 17

E. VACUMOTIVE DRIVE SOLENOID

Remove connector socket. Ground one lead of jumper wire, other lead to #2 prong of solenoid. Long lead of test lamp to negative terminal of battery. Test lamp prod to #1 prong of solenoid, valve should operate, test lamp should 1ight dim. Replace connector socket.

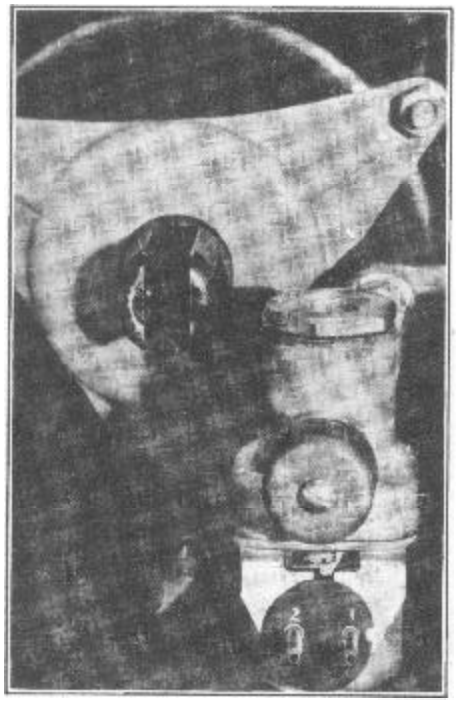

FIGURE 18

F. GOVERNOR SWITCH

A check of the governor switch c an b e made in road-test. Be sure (R.W.) wire is attached to the governor. Accelerate to speed of 30 M.P.H. in high gear and release the accelerator pedal. Rest the foot lightly on the clutch pedal. As the speed drops to 16 to 21 miles per hour, the clutch should be felt to release.

NOTE: On cars equipped with Drive-Master refer to "Governor Switch Check" under Drive-Master Unit Checks.

If the clutch does not engage at this speed, or if the clutch disengages at all times in high gear, replace governor switch.

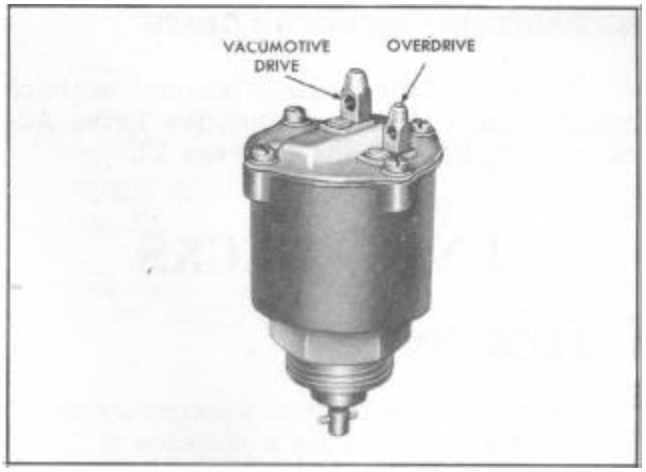

FIGURE 19

A separate terminal for use with overdrive, should light test lamp at speeds above 16 to 21 miles per hour.