The

Hudson Electric Hand

- Transmission Control -

TECHNICAL INFORMATION

1935 - 1938

I n d e x

BENDIX

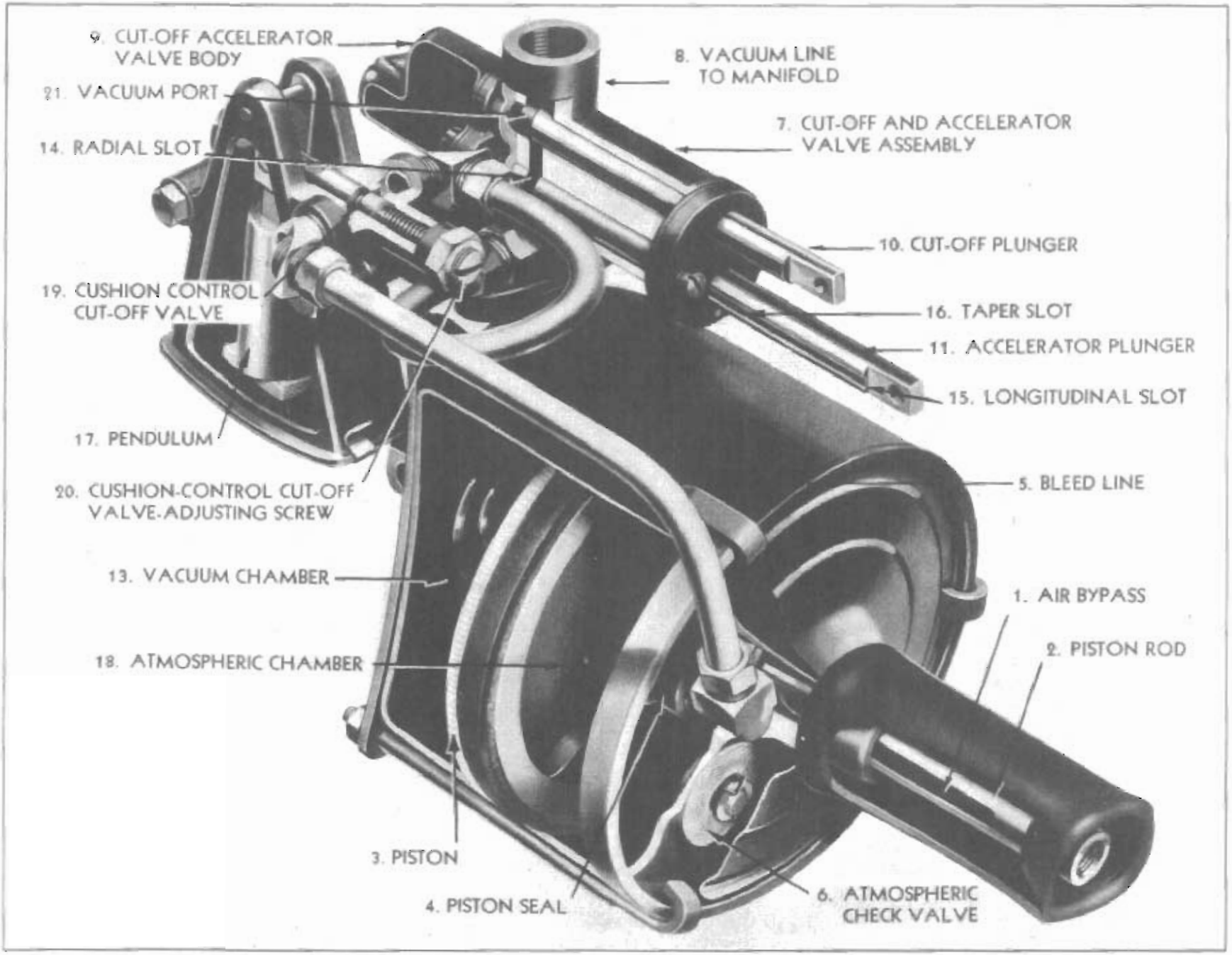
Automatic Clutch Control

HUDSON and TERRAPLANE
1935 MODELS

.

ADJUSTMENT *and*
MAINTENANCE
INSTRUCTIONS

Bendix Products Corporation
South Bend, Indiana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How Automatic Clutch Control Operates

The principle of operation is very simple. The accelerator is permitted to overtravel its idle, or release position. This overtravel opens the valve 11, creating a direct vacuum passage 14 from the power cylinder to the engine intake manifold causing the piston to be drawn forward which disengages the clutch. Since the clutch is not disengaged until after the accelerator has passed its idle position, it is still possible (1) to use the engine compression for braking purposes and (2) to drive normally with clutch engaged and engine running at idling speed. The accelerator must be relieved of all pressure before clutch disengaging action will take place.

As the accelerator is depressed to speed up engine, the valve is again closed, cutting off the vacuum connection, and the clutch returns to engagement through the force of the clutch springs as with foot usage of the clutch. The speed of the engagement travel of the clutch, how-ever, is automatically controlled by the cushion control ; a rapid movement is allowed up to the point where the clutch starts to take up the load of the car. From this point until the moment of full engagement, the speed is slowed down - perfectly controlled - to effect a smooth, ideal engagement. The desirability of this velvety engaging action is always stressed by car makers, but seldom accomplished by the use of the unsteady human foot and leg.

A very apt comparison with the Bendix Clutch Control action is that of the common pneumatic door check which allows the door to start its return rapidly but then checks its speed and gently closes the door.

A cut-off plunger 10 is included in the control valve. This is connected to a cut-off button conveniently mounted on the dash or toe board. When the plunger is pushed in the clutch control system is completely cut out and the clutch is operated physically in the conventional manner.

Power Cylinder

The Power Cylinder has a conventional piston 3 which divides the housing into two chambers. The rear or atmospheric chamber 18 is open to the atmosphere through three passages: (1) the by-pass 1 in the piston rod (2), the bleed line 5 through the cushion control valve 19 to the accelerator valve and, (3) the atmospheric check valve 6 in the cylinder head.

The air by-pass in the piston rod is formed by slots milled in opposite sides of the piston rod. The by-pass permits a rapid discharge of air from beneath the piston during the initial movement of clutch engagement, be-fore the clutch plates have come into actual contact. This point of contact or initial engagement, is known as the cushioning point. The power cylinder is so designed and installed that the end of the by-pass reaches the piston rod seal, just at the point of initial clutch plate contact, so that all further air escape from beneath the piston must be accomplished through the bleed line. This en-trapped volume of air beneath the piston serves as a perfect check or cushion, against which the clutch is being engaged by the action of the clutch springs.

The atmospheric check valve is a small spring loaded poppet valve located in the cylinder head which permits a free access to the atmosphere when the piston is drawn into the vacuum chamber, during clutch disengagement.

Cutoff and Accelerator Valve

The cutoff and accelerator valve 7 is interposed in the vacuum line between the intake manifold and the power cylinder and consists of a valve body with three connections and two valve plungers. The cutoff plunger 10 is operated by a suitable control as previously described. Its function is to completely connect or disconnect the power system from the intake manifold.

The accelerator plunger 11 is connected to the foot accelerator and is operated positively therefrom. It performs two functions, (1) opens the vacuum chamber to the intake manifold by means of a radial slot 14, or to the atmosphere through a longitudinal slot 15, (2) regulates the amount of air bled out of the air chamber after the cushioning point has been reached. The air is bled through a tapered slot 16 which is proportioned to accelerator pedal travel and increases in area as the accelerator is depressed.

Cushion Control

The cushion control which is included in some installations is essentially a very simple cutoff valve, operated by a pendulum 17, and inserted in the bleed line from the atmospheric end of the clutch control cylinder. With the car standing still, the pendulum hangs approximately 12° ahead of the vertical position, and the piston type of cut-off valve, which it controls, is wide open. When the driver steps on the accelerator to start the car, the clutch can be allowed to move into engagement at a more rapid rate than would normally be permissible for an easy start. As soon as the plates make initial contact, the car begins to move forward, the slight initial acceleration, which is of so small a magnitude as to hardly be noticeable, causes the pendulum to swing toward the rear, completely closing the valve, and arresting the movement of the clutch operating lever at a point corresponding to a partial clutch engagement.

As soon, of course, as the car stops accelerating, and attains any uniform speed, the pendulum operating valve immediately is returned, by gravity, to its wide open position. The engagement of the clutch is completed gently and positively, and any pressure is relieved from the throw out bearing or clutch collar just as before the installation of the cushion control valve. Adjustment of the cushion control is provided for by means of a light adjustable spring and screw 20 incorporated in the body of the valve.

Adjustment

Before attempting automatic clutch control adjustment the engine should be adjusted to proper idling speed, and must idle smoothly.

Clutch adjustment should also be checked for normal backlash or pedal play.

There are three possible adjustments on the automatic clutch control, (1) piston rod length, which synchronizes the cushioning point of the piston stroke with initial con-tact of the clutch plates, (2) lost motion, which synchronizes clutch engagement with engine speed, (3) cushion control valve which synchronizes clutch engagement with car acceleration.

Piston Rod Adjustment

If piston rod is too long, clutch plates will engage be-fore cushioning point of stroke is reached, and clutch engagement will be rough or harsh. If piston rod is too short, cushioning point will be reached before initial con-tact of clutch plates, and clutch engagement will lag with excessive slippage regardless of other adjustments.

This adjustment is most readily accomplished by shortening the piston

shortening piston rod, by means of adjustable clevis, one turn at a time, until rough engagement of clutch with low throttle is just eliminated. Lock nut should be tightened after adjustment.

Lost Motion Adjustment

Normal setting of the accelerator valve is 7/32" lost motion measured at the valve from its full open position to the point where the carburetor just picks up. This will usually provide smoothest operation.

Too much lost motion is indicated by full clutch engagement before engine speed picks up, resulting in stalling or jerky start. Too little lost motion will prevent driving with clutch engaged at closed throttle, and may also cause excessive clutch slippage, since engine speed becomes too high in comparison with clutch engagement. Correct lost motion is essential to smooth operation. Usually lost motion just sufficient to permit closed throttle driving will be found most satisfactory.

Cushion Control Valve Adjustment

The effect of the cushion control valve is most notice-able on fast starts, and it should be adjusted last after normal adjustments have been made. With car in first gear make a wide open start. If too much slippage is noted, tighten adjusting screw, which increases spring pressure against closure of pendulum valve. If start is rough and jerky, loosen adjusting screw. Tighten lock nut after adjustment.

Lubrication

All clevis pins, and accelerator control valve plungers should be kept clean and lubricated with light oil periodically.

The cylinder should be lubricated with approximately one ounce Bendix Vacuum Cylinder Oil every 5000 miles, introduced by removing the bleed tube connection in the cylinder head.

The cushion control valve should be lubricated at 5000 mile intervals with light oil, introduced by removing the adjusting screw and spring.

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MAINTENANCE

Power Cylinder

Any leakage of air around the leather piston packing or around the small leather piston rod seal (4) in the end plate will cause the piston to move the full length of the cylinder on the clutch engagement stroke without stop-ping at the cushioning point, that point where the end of the slot in the piston rod just passes the leather piston rod seal in the end plate. This condition may also be caused by the small poppet valve in the end plate not seating properly. Grit or sand may be under the leather holding it open and allowing air to escape.

To properly service the Power Cylinder it should be dismantled as follows: Remove the hook bolts clamping the end plate to the cylinder. Remove end plate from cylinder. Check piston leather for wrinkles or distortions. The piston assembly is furnished complete for service, and any replacement of the piston leather will require a new piston assembly.

See that piston rod leather seal in end plate is snug around the piston rod and spring band is around leather. Lubricate the leather with Bendix Vacuum Cylinder Oil before reassembly of unit. Any distortion of the leather, causing a leakage of air will require replacement of the end plate assembly which includes the leather and the retainer, which is assembled under pressure and peened or staked in place.

The small spring steel band around piston rod leather seal is not a part of the end plate assembly. When replacing this band

placing this band for service, insert the piston rod through leather seal before placing the band around the leather. Care should be taken so as to not distort the leather.

Parts of the poppet valve are furnished separately for service and replacement of the leather washer under the head of the valve is necessary if any leak is noticed and not attributed to sand or foreign particles.

The fine screen over the poppet valve holes should be cleaned.

Other parts, including the piston rod guard, the dust cover over the end plate and the felt and felt retainer are furnished separately for service, and may be ordered accordingly.

The felt piston rod wiper on outer end of end plate should be checked for fit. The function of this wiper is to keep piston rod free from grit which would wear the leather piston rod seal, causing leaks and grabbing condition of the clutch.

Check rubber piston rod guard to see that it fits properly in grooves and that there are no torn places in the rubber. Any guard which becomes hard and is full of small cracks should be replaced.

In the reassembly of the cylinder to the end plate, use a new gasket and permatex or paste sealing compound. There should be no leaks here. The hook bolts should be drawn up snug, but without excessive straining of the end plate. Lubricate cylinder with one ounce Bendix Vacuum Cylinder Oil when reassembling.

Accelerator Control Valve

Little, if any, trouble in the clutch control unit should be attributed to the Accelerator Control Valve. How-ever, care should be taken to see that both the cut-off and the control plungers are free and work smoothly. Re-move and wipe off all grit or foreign accumulations when servicing any other portion of the clutch control unit.

If clutch will not hesitate momentarily at the cushion point and the cylinder has been checked and found OK it may be that the accelerator plunger is badly worn, allowing rapid escape of air, causing clutch to engage too severely. A leak around the plungers may also create an uneven idle of the engine. Owing to the close fits necessary, a complete new valve will be required for service.

Cushion Control Valve

Any valve which does not choke off the supply of air thru the bleeder line, long enough to slow the clutch action at the cushioning point of the clutch, should be re-placed. Test for leakage may be made by removing cover plate on bottom of bell and swinging pendulum over enough to slide plunger across the bleeder ports. Now with one of the fittings in the mouth, draw or suck in and place the tongue across the opening, next try to pull away from the tongue. A slight pull will be noticed if the plunger has the proper fit in the bore. If valve pendulum swings hard, the plunger is probably sticking, due to some accidental distortion of the valve body. A new Cushion Control valve will be required as the close fits required in the machining of plunger bore in the valve make it necessary that a complete valve assembly be furnished for service.

General

Remember that satisfactory operation of the Clutch Control Unit depends on the care with which it was serviced.

See that all moving parts are well lubricated and working properly. This applies to the cylinder as well as the cushion control valve and the accelerator control valve.

If these instructions are followed carefully and also those regarding the adjustments of the unit, Clutch Control operation should be very satisfactory.

The Electric Hand

Transmission Control
(1935)

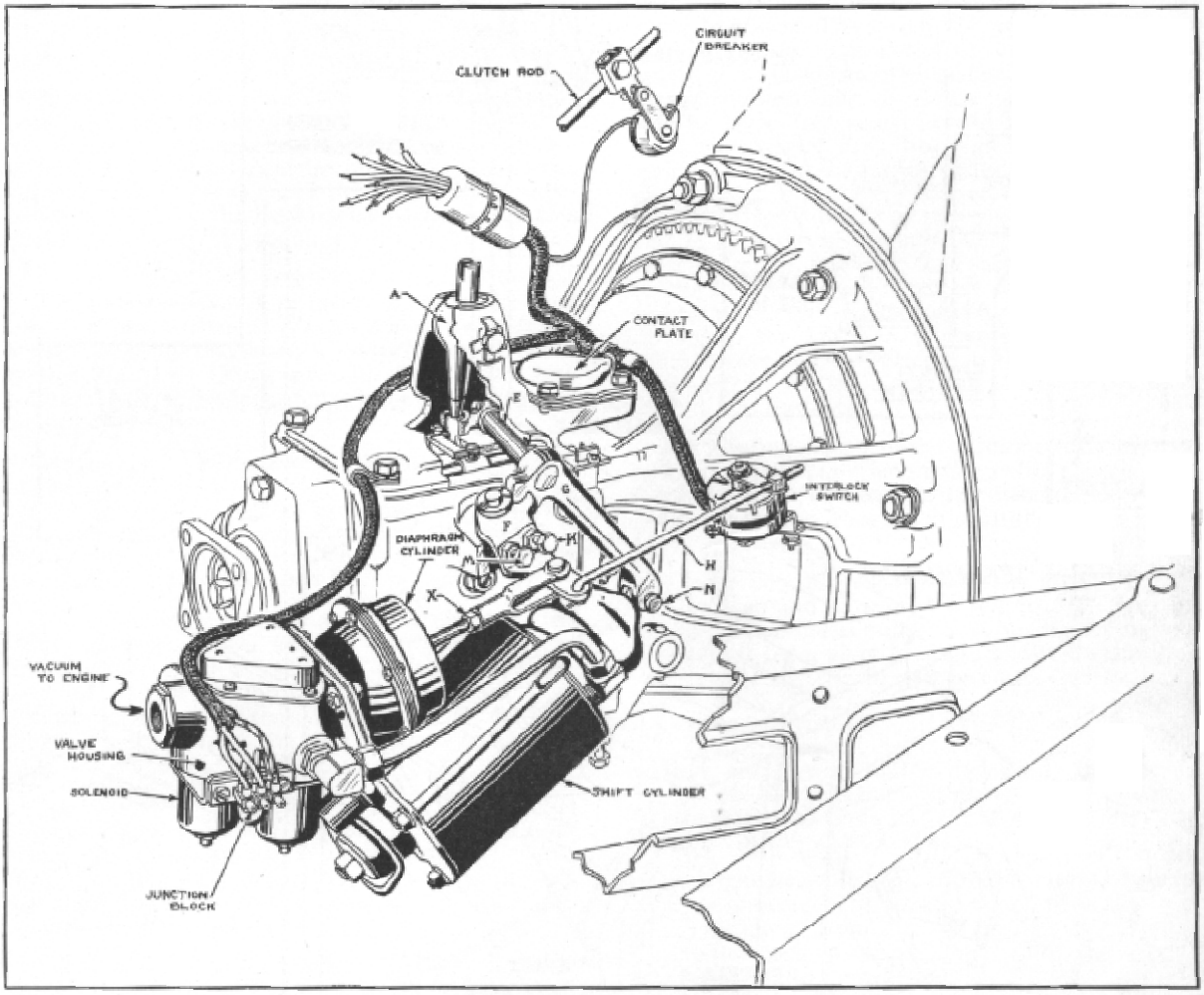

Figure 1

The Electric Hand provides a means of mechanically performing shifting operations formerly done manually.

The conventional selective type transmission has two shifting rails, each having a neutral, a forward, and rearward position. The selection of. the proper rail is obtained by moving the shifting lever sideways to engage a slot in the fork of the rail desired after which movement of the rail and gear engagement is obtained by moving the shifting lever forward or backward. These same operations are performed by the Electric Hand.

The diaphragm cylinder contains a spring which presses forward holding bellcrank F in the position shown so that the shifting lever is held to the left in engagement with the slot in the fork of the high and second shifting rail. By admitting vacuum to the rear of the diaphragm it is moved backward, rotating F clockwise, drawing lever G to the right and also the shifting lever into engagement with the slot in the fork of the low and reverse shifting rail. Referring to Fig. 2, the vacuum connection is shown from the diaphragm cylinder to the valve controlled by solenoid No. 3. The Plunger 22 is held in the upward position by its return spring, the vacuum from the engine is cut off and the atmospheric vent is connected below the plunger to the diaphragm cylinder line allowing the spring Y to force the diaphragm forward.

When the solenoid is energized, plunger 22 is drawn down, cutting off the atmospheric vent and connecting the engine vacuum around the reduced diameter of the plunger, to the diaphragm cylinder (Fig. 3).

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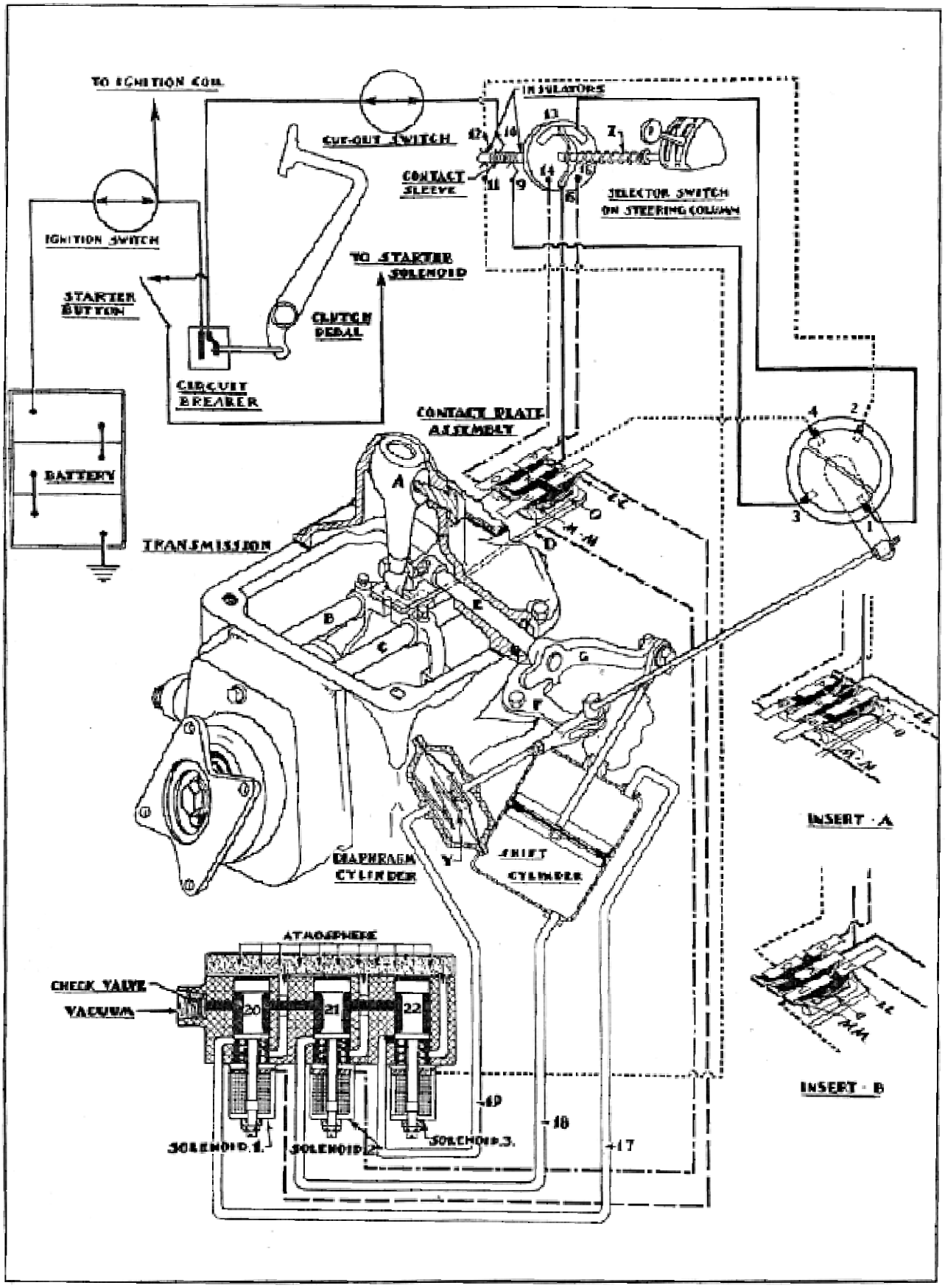
TO IGNITION COIL
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IGNITION SWITCH
TO STARTER SOLENOID
STARTER BUTTON
CLUTCH PEDAL
CIRCUIT BREAKER
CONTACT PLATE ASSEMBLY
BATTERY
TRANSMISSION
INSERT - A
INSERT - B
DIAPHRAGM CYLINDER
SHIFT CYLINDER
ATMOSPHERE
CHECK VALVE
VACUUM
SOLENOID 1.
SOLENOID 2.
SOLENOID 3.

Figure 2

When solenoid No. 3 is not energized the spring Y holds the shifting lever "A" engaged with the high and second shift rail (Fig. 2).

When solenoid No. 3 is energized the vacuum draws the diaphragm backward, holding the shift lever "A" engaged with the low and reverse rail (Fig. 3) .

The Shift Cylinder has a vacuum line connected to both the front and rear of the piston. The connection to the front is connected to the valve controlled by solenoid No. 1 and the connection to the rear to the valve controlled by solenoid No. 2. The linkage between the Shift Cylinder Piston and the lower end of the shift lever "A" requires both to move in the same direction.

When solenoid No. 1 is energized, the piston and lever "A" move forward. When solenoid No. 2 is energized, the piston and lever "A" move backward. When neither No. 1 nor No. 2 solenoid are energized both sides of the shift cylinder are open to the atmosphere and the piston is at rest:

Solenoid No. 1 is connected to the stationary bar T of the contact plate and will be energized whenever the circuit from the battery is completed to T. Likewise, solenoid No. 2 is connected to stationary bar U of the contact plate and will be energized by completing the battery circuit to U.

The sliding contacts LL and MM are insulated from each other as well as from their mounting and are moved forward or backward with the transmission lever movement through the connecting bar D. Sidewise movement of the shifting lever "A" does not affect the position of the sliding contacts LL and MM.

The circuit from the battery to T can be completed through the three fingers of sliding contact LL, from either the stationary bar W or P; while the circuit from the battery can be completed to bar U through the three fingers of sliding contact MM from stationary bars 0 or W.

The connection from solenoid No. 3 is direct to contact 11 on the shaft of the selector switch.

From the preceding explanations the following facts have been established:

(1) *Where the circuit is completed from the battery to T the shifting rail movement will be forward.*

(2) *When the circuit is completed from the battery to U the shifting rail movement will be to the rear.*

(3) *When the circuit to 11 is open, the shifting lever "A" will be pressed toward the notch in the high and second shifting rail, B.*

(4) *When the circuit 11 is closed, the shifting lever "A" will be drawn toward the low and reverse shifting rail, C.*

The selector switch, in conjunction with the contact plate and the interlock switch (Fig. 1), controls the circuits to these points.

The selector switch Fig. 2 has five positions arranged in the form of the letter H. The cross bar represents the neutral position while the four ends of the uprights of the H correspond to the four gear positions of the transmission and are arranged in the same order as the positions of the conventional transmission shifting lever.

In Fig. 2 the selector switch is shown in its normal neutral position. The spring "Z" holds the shaft and the lever to the right end of the cross bar of the H in line with the high and second gear positions. Note that this corresponds to the normal position of the shifting lever "A" which is held in proper engagement for a direct shift into high or second by the spring "Y" of the diaphragm cylinder. It is, therefore, unnecessary to provide a contact for 11 for shifting to high or second gear as no cross shift is required and 11 rests on an insulated sleeve on the selector switch shaft. If, however, the control lever is pushed to the left of the cross bar, in line with low and reverse positions, it is necessary to have a cross shift to engage the low and reverse shifting rail. The contact sleeve on the selector switch shaft is moved to the left by the left movement of the control lever so that it is contacted by 11.

The rotating motion of the selector switch lever rotates a contact bar which is always in contact with sector 13 and also contacts 14 when the lever is in reverse or second, 1.5 when in neutral and 16 when in high or low.

Having now provided the means of shifting the transmission and a switch for selecting the gear required, the actual circuits for obtaining the desired movements for a given position of the transmission and selector switch will now be considered.

The circuit from the battery leads to the ignition switch to the circuit breaker on the clutch pedal, (circuit closed with clutch depressed) the cut off switch an the selector switch housing to contact 10 which is at all times in contact with the sleeve on the shaft of the selector switch.

With the selector switch in the normal neutral position and the transmission in neutral as shown in Fig. 2 the circuit from 10 is completed to 9 to 3 and 1 on the interlock switch to 13 and 15 on the selector rotary switch to contact bar W. (Circuit shown in solid lines.)

With the transmission in neutral, neither LL nor MM contact W, so that the circuit is broken at this point and no movement of the shift rails is obtained.

If, however, the transmission were in high gear, the shifting lever "A" would be forward holding LL and MM forward as shown in Insert A. This would bring the middle finger of MM in contact with W closing the circuit to U and solenoid No. 2, and the shifting lever "A" would be moved backward to neutral at which point contact would be broken as in the main diagram of Fig. 2 and movement would cease.

With the transmission in second gear the contacts LL and MM would be moved backward (Insert B) and contact would be made from W to LL to solenoid No. I and the shifting lever would move forward to neutral breaking the contact.

It is readily seen that moving the selector switch down into high

(Continued on Pag 4)

gear position would not affect the circuit except from 13 to 16 which would connect (circuit in broken line) to P through LL to solenoid No. 1 and shift rail B would be moved forward from neutral engaging high gear. As the shifting lever and rail moved forward LL and MM would also move forward and the contact between P and LL would be broken, as shown in Insert A. Note that contact is made from P to LL to T with the contact plate either in neutral or the backward position; and the shift would be made to high gear if the transmission was in either second or neutral when the selector switch was moved to high gear position.

Now, moving the selector switch over to the second gear position completes the circuit (dash dot lines) from 13 to 14 to Q through MM to solenoid No. 2, moving the shift rail B backward from neutral to second gear position at which point the contact between Q and MM is broken (Insert B).

Note that contact is completed from Q to MM to U both with the contact block in neutral and the forward position so that the shift would have been made to second gear if the transmission were in either high or neutral when the selector switch was moved to the second gear position.

Fig. 3 shows the selector switch in neutral but moved to the left of the cross bar of the H and the transmission in neutral. With the left movement of the selector switch lever, the contact sleeve has also moved to the left, breaking contact with 9 and contacting 11 and 12. (Completed circuits shown in solid lines.) Solenoid No. 3 having been energized from contact 11 has moved the shifting lever into contact with the fork of shifting rail C so that forward and back-ward movement will now engage low or reverse gears. Note also that the interlock switch has been turned by the backward movement of the diaphragm.

The circuit from 12 is to 2-1 on the interlock switch to 13 to 15 to W. This duplicates the condition in Fig. 2 so that the transmission will be returned to neutral from either low or reverse. Turning the selector to contact 14 now corresponds to reverse and 16 to low gear and forward or backward movement of the shifting lever will engage and disengage low and reverse in the same manner that high and second were controlled in Fig. 2. (Circuit for low shown in broken lines, circuit for reverse in dot and dash.)

Fig. 4 shows the transmission in low gear and the selector switch in high. The shifting lever is held to the right as the spring Y cannot force it to the left until the shifting rail has moved to neutral, and the interlock switch is still held in the low and reverse position as in Fig. 3.

When the clutch pedal is depressed the circuit (solid lines) is closed through 10-9 to 3-4 on the interlock switch to W. As shown previously, a completed circuit to W caused the transmission to move to neutral. In this instance the controlling circuit (solid lines) is from W through MM to U to solenoid No. 2 and the first part of the shift will be from low to neutral.

As soon as the shifting lever "A" reaches the neutral position, the spring Y forces it to the left to engage in rail B. This cross movement also turns the interlock switch back to the high and second position as shown in the insert, so that the circuit from 9 is changed (changed circuit shown in broken lines) to 3 to 1 on the interlock switch to 13 and with the selector switch set for high gear, to 16 to P-LL to T and a normal shift from neutral to high is made.

Had the selector switch been set in second gear the connections would be the same until neutral is reached when the circuit will be completed (circuit in dot and dash) from 13 to 14 to Q-MM to U, causing a normal neutral to second shift.

Fig. 5 shows the transmission in high gear and the selector switch set for low. The interlock switch is in the high and second position.

When the clutch pedal is depressed (completed circuits in solid lines) the circuit is completed from 10 to both 11 and 12. The circuit from 11 energizes solenoid No. 3, but since the shifting lever "A" cannot move to the right until shift rail B reaches the neutral position, no movement is caused and the interlock switch remains in the high and second positions.

The circuit from 12 is completed to 2-4 on the interlock switch to contact bar W through MM to U, causing the shift rail B to be moved backward to neutral. Here the movement is arrested by breaking contact between W and MM and the vacuum acting on the diaphragm causes the shift lever "A" to move to the right rotating the interlock switch to the low and reverse position.

The circuit from 12 has now been changed as shown in the insert and is completed (circuit in broken line) through 2-1 of the interlock switch to 13 to 16 to P through LL to T causing a normal neutral to low shift.

Had the selector switch been set to reverse, connecting 13 and 14, the circuit (circuit in dot and dash) would then have been completed to Q through MM to U, causing a normal neutral to reverse shift.

In this discussion it has been seen that the interlock switch has no function so long as the selector switch and the gear shift lever are set so that a straight forward or backward movement of the shift lever "A" is required; however, if a cross movement of the shifting lever "A" is required to complete the desired shift, it requires the transmission to come to neutral and will not permit any further movement of the shifting rails until the cross movement is completed.

As a safety factor the circuit breaker makes it impossible to make a shift until the clutch has been disengaged.

Due to the fact that the selector switch lever can be moved to any position after the engine has been stopped without a shift being made, it is impossible to tell by the position of the selector switch lever whether or not the car is in gear when the engine is dead. To prevent starting the engine with the car in gear a circuit breaker on the clutch pedal requires the disengagement of the clutch before the starter switch circuit is complete.

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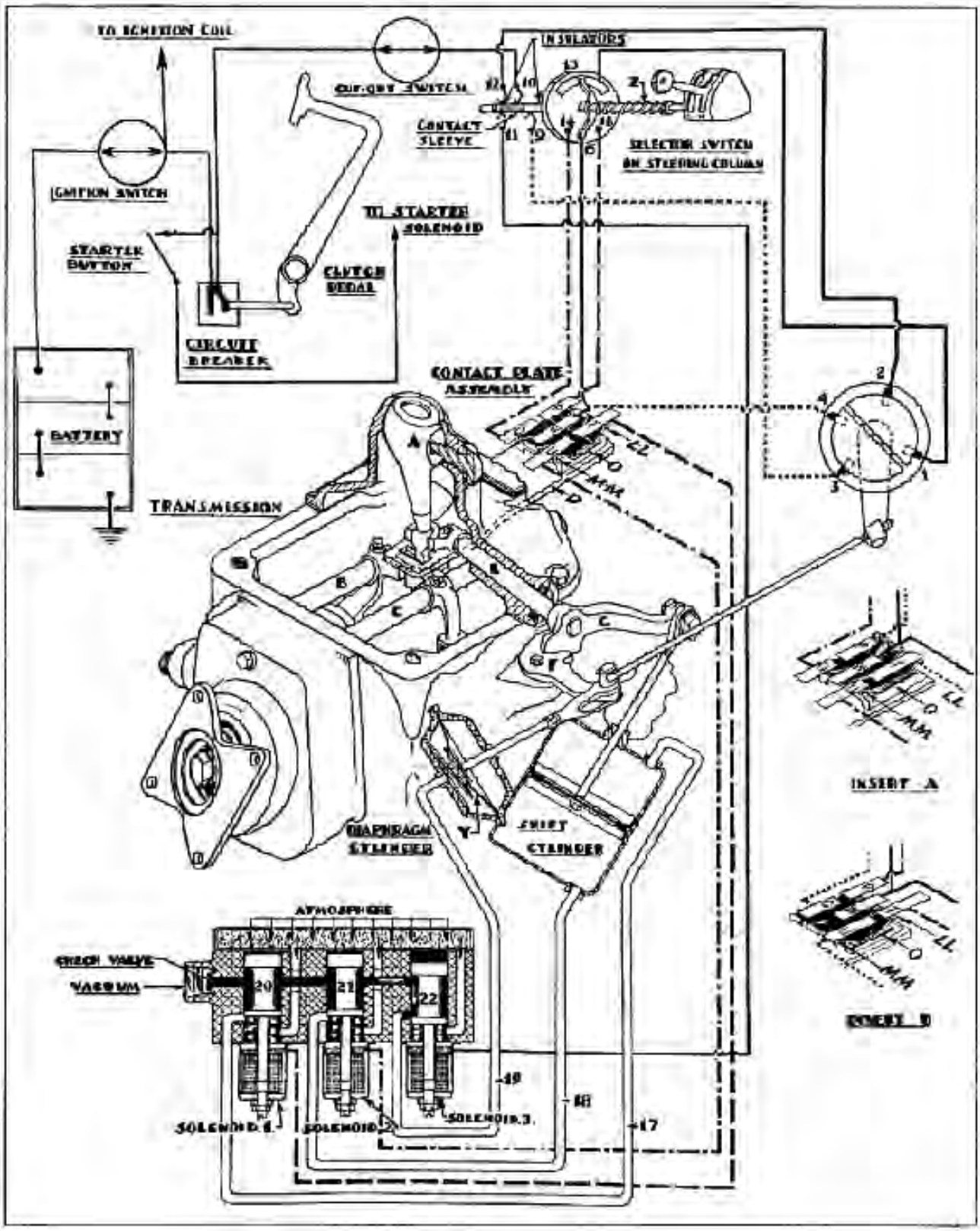
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CIRCUIT BREAKER
CONTACT PLATE ASSEMBLY
BATTERY
TRANSMISSION
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SHIFT CYLINDER
ATMOSPHERE
VACUUM
SOLENOID 1
SOLENOID 2
SOLENOID 3

Figure 5

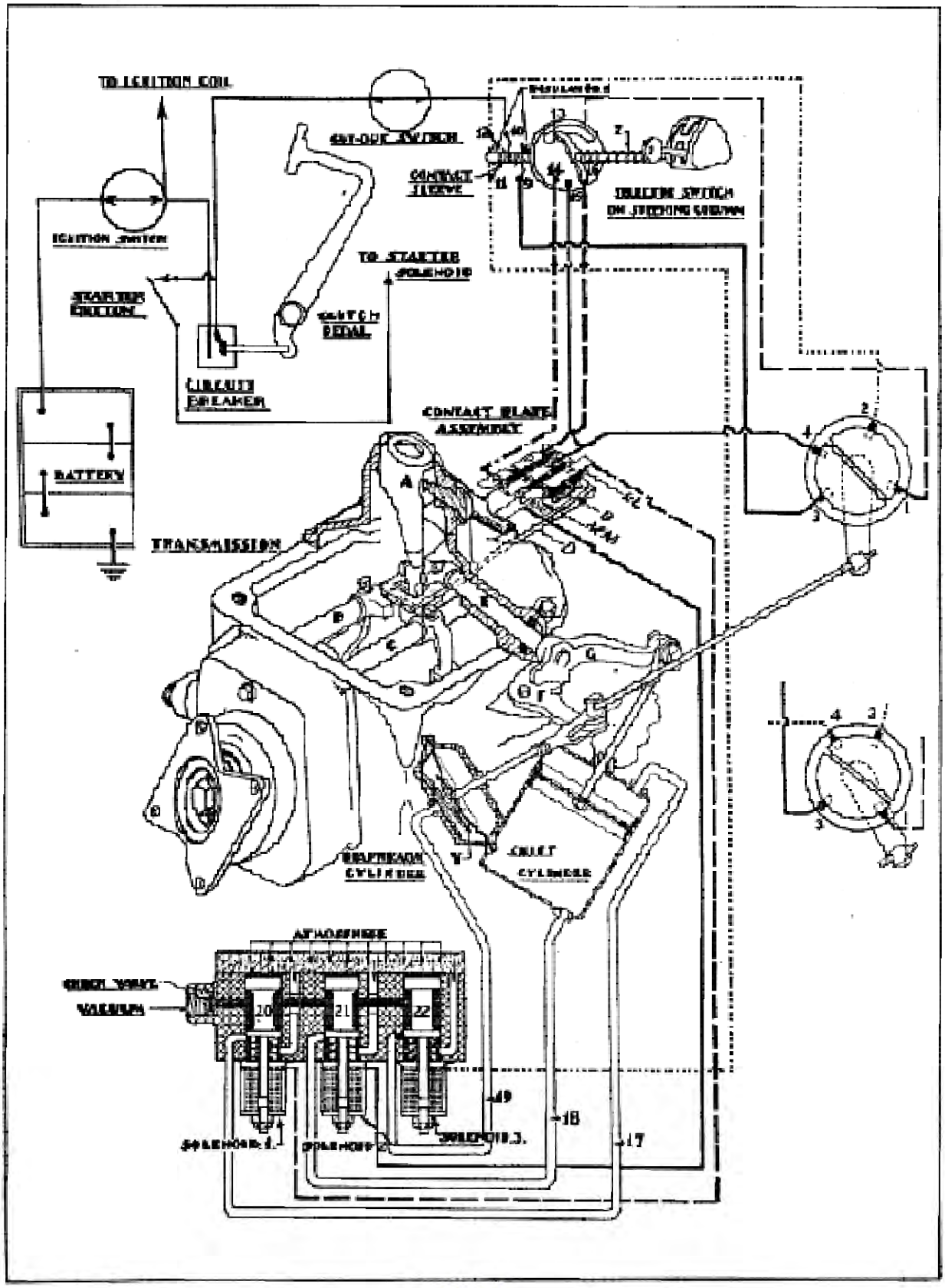
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Figure 4

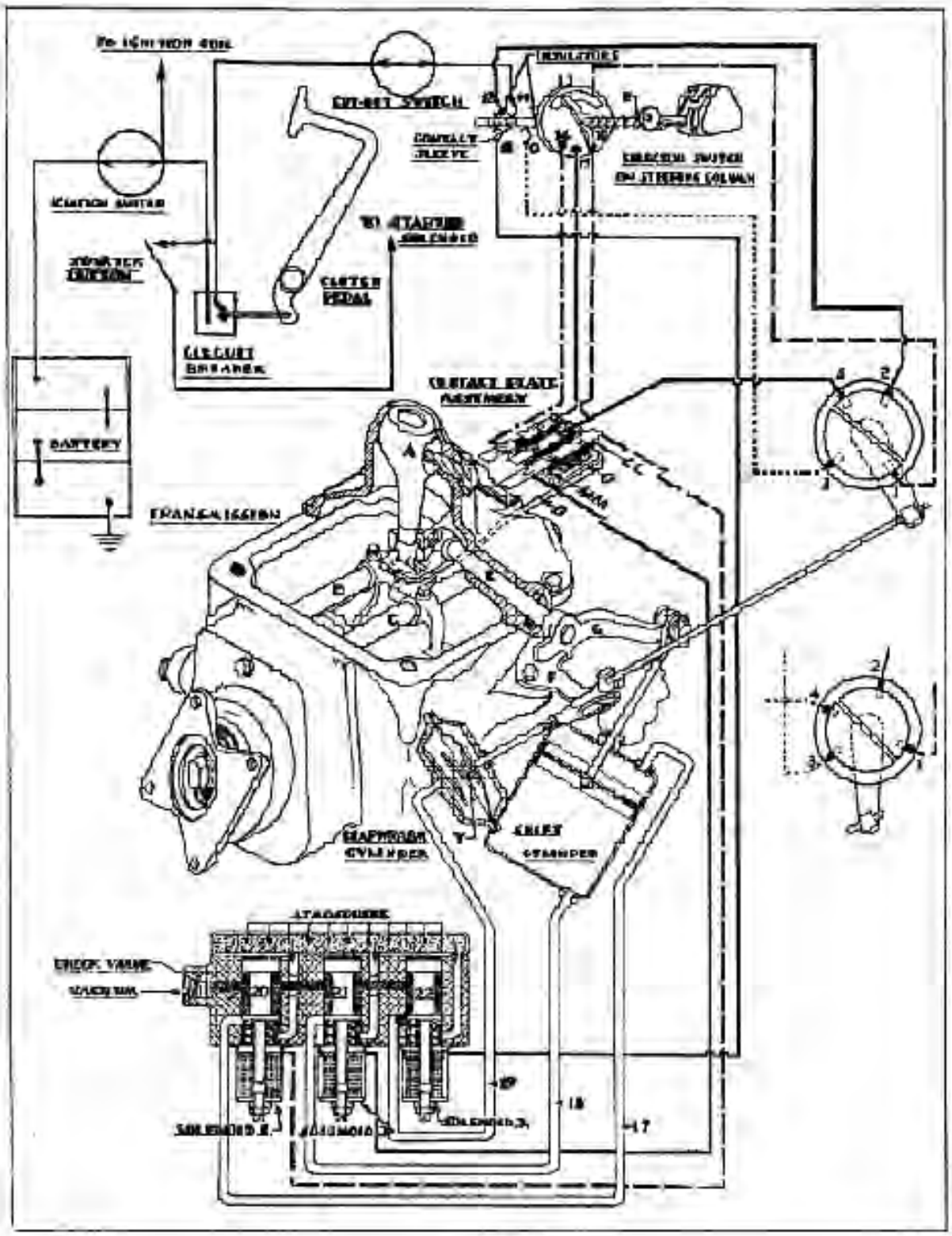
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Figure 3

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Mechanical Adjustments

(A) - Adjustment of Cross Shift Stop Screws (Figure 1, Page 1)

1 - Shift transmission into high gear.

2 - Back off stop screw K until it does not touch the stop.

3 -Turn stop screw K in until it just touches stop, then turn in an additional 1/4 turn and tighten lock nut. After this adjustment is made a .004" feeler should just pass between the outside face of the lug on lever G and the outside finger of bell crank F.

4 - Shift transmission into low gear, using power unit.

5 - Back off stop screw M until it does not touch the stop.

6 - Turn stop screw M in until it just touches the stop, then turn an additional 1/4 turn and tighten lock nut. After this adjustment is made a .004' feeler should just pass between the inner face of the lug on lever G and the inner finger of bell crank F.

(B) Adjustment of Length of Diaphragm Cylinder Shaft (Figure 1, Page 1)

1 - Remove clevis pin from diaphragm cylinder rod clevis.

2 - Loosen lock nut X.

3 - With bell crank lever F pushed forward so that stop screw K is against its stop, turn the clevis until the clevis pin hole is 1/4" ahead of the hole in the lever when the diaphragm cylinder rod is in its extreme forward position. Tighten lock nut X.

4 - Push diaphragm cylinder rod back to align holes and replace clevis pins.

(C) Adjustment of Interlock Switch

1 - Shift transmission into low gear and then into high gear. The pointer on the interlock switch lever should register with the line on the interlock switch cover. If not, adjust as follows:

2 - Loosen front stop; then turn rear stop until alignment is obtained while interlock switch lever is held back against rear stop. Then tighten front stop.

3 - Shift transmission into low gear, then to high and recheck to see that pointer registers with line on interlock switch cover.

(D) Adjustment of Power Cylinder Piston Rod (Figure 1, Page 1)

1- Shift transmission into high gear. Remove clevis pin N from lever G.

2 - Push rubber piston rod guard back and loosen lock nut on piston rod.

3 - Turn rod end until clevis pin N can be reinserted with the piston rod pulled to its extreme forward position.

4 - Push piston rod back and lengthen four threads by turning clevis. Tighten lock nut.

5 - Reinsert clevis pin N.

(E) Adjustment of Clutch Circuit Breaker

With clutch fully engaged, the pointer on the lever should be in line with the arrow on the top of the circuit breaker housing. To adjust:

1 - When equipped with automatic clutch control - loosen clamp bolt nut on bracket mounted on vacuum clutch rod and slide clip until pointer is in line with arrow on housing. Insert cotter pin and tighten lock nut.

2 - When not equipped with automatic clutch control-remove cotter key from circuit breaker lever pin. Loosen lock nut on operating rod and remove rod end from lever pin. Turn rod end until it will slip on pin with pointer in line with arrow on housing. Insert cotter pin and tighten lock nut.

The position of the circuit breaker lever is important. If the contact is made with too little clutch pedal movement, the clutch will still be engaged when the shift is made and if a gear has been pre-selected the shift will be made while the engine is driving the car. If the contact requires too much pedal movement, the shift will not be completed should the gears butt teeth. It is necessary to have a slight clutch drag before the circuit is broken to turn the gears and insure engagement. It may be necessary, therefore, to set circuit breaker slightly ahead of indicating arrow.

Service Parts Assemblies

47739-Selector Switch - wires and Jacket Tube Assembly. Used on all Terraplane and Hudson models, except Hudson Custom.

48137-Selector Switch Wires and Jacket Tube Assembly - Hudson Custom models.

(Continued on Page 9)

47327 - Switches and Wires Assembly. All models.

47322 - Transmission Control Power Unit Assembly. All models.

47250 - Clutch Circuit Breaker. All models.

47944 - Interlock Switch. All models.

Testing Equipment
Kit No. 47898

1-Master Selector Switch.

2-Lower Harness Test Set.

3--Power Unit Test Cable.

Service Operations

Preliminary Service Check

The following are to be checked before attempting to make any repairs to the gear shift control mechanism, regardless of the nature of the failure:

1 - Be sure Cutout Switch on selector housing is “on.”

2 - Be sure that transmission is free and can be moved into all its positions manually with clutch pedal depressed just enough to close circuit through clutch circuit breaker. (Check by pressing starter button.) Adjust interlock straps on transmission if necessary.

3 - If temperatures are encountered low enough to cause the recommended transmission lubricant to retard gear shifting excessively, replace 3 ounces of the lubricant with kerosene.

4 - Inspect vacuum line and fittings.

5 - Check wire connections on Interlock Switch.

6 - Make certain that all clevis pins and cotter pins are in place.

7 - Inspect junction block on power unit to see that all six wires are in place.

8 - Make certain that all soldered connections are intact in both portions of steering column jack. (To remove covers, twist, with jack assembled.)

9 - Check wiring harness for breaks or damaged insulation.

Quick Test for Short Circuit

With instrument panel lamp lighted, shift into all positions with Electric Hand. Any appreciable dimming of instrument lamp indicates short circuit in that position.

Gears are Shifted with Clutch Engaged

Probably short circuit in clutch circuit breaker or improper position of circuit breaker arm.

1 - Check and if necessary adjust clutch circuit breaker.

2 - Turn on ignition switch and press starter button-if starter operates with clutch fully engaged, replace circuit breaker.

Complete Failure of Electric Hand to Function

After setting pointer and arrow on circuit breaker in line, turn on ignition switch, depress clutch pedal and press starter button. If starter functions, circuit is closed through circuit breaker. If starter does not function, attach grounded test lamp to yellow wire terminal of circuit breaker. No light indicates open circuit from ignition switch to circuit breaker. Light indicates circuit breaker circuit open. Replace circuit breaker.

Failure of Electric Hand to Function in Any or All Positions

If a proper circuit is proven through the circuit breaker and operation is still faulty, disconnect the separable jack on the bottom of the steering column and insert the jack from a Master Selector Switch and wire assembly. (This unit does not require any ground.) If the system functions properly when using this selector switch instead of the one mounted on the car, replace the complete selector switch and wire assembly. This includes all parts on the steering column, including the upper part of the separable jack.

Testing the Shifting Mechanism

1 - Connect Power Unit Test Cable to the terminal on the clutch circuit breaker to which the red wire is attached. This wire should be "hot" only when the clutch is disengaged.

2 - With the engine running and the clutch disengaged (Rear wheels of car jacked up) touch the front post (YB) of the junction block on the shifting unit with test prod. The transmission should shift into high gear. Touch rear post (Y) and the transmission should shift to second gear.

3-Shift the transmission to neutral manually. First touch center post (W) with the test prod and the cross shift should be made. Still contacting "W," touch front post "YB" with second test prod. The transmission should shift into low. Touch rear post (Y) still contacting (W), and the shift should be made to reverse.

If a shift is not made when one of the posts is contacted, connect an accurate ammeter to the hot wire and to the terminal. A current draw of approximately 2.5 amperes indicates the solenoid is O. K. A higher amperage indicates a short and a low amperage an open circuit.

Caution: A dead short circuit in a solenoid will burn out ammeter if permanent connection is made.

(Continued on Page 10)

the hot wire and to the terminal. A current draw of approximately 2.5 amperes indicates that the solenoid is 0. K. A higher amperage indicates a short and a low amperage an open circuit.

If the current draw is correct, the trouble may be due to the valve plunger sticking in its upward position, a vacuum leakage in the lines or units or a mechanical drag in the mechanism.

Disconnect the shifting cylinder piston rod from the shifting lever or the diaphragm cylinder from the cross shift bell crank. If these do not function after disconnecting the linkage, the entire power unit should be replaced.

Testing Circuits in Lower Harness and Switches

If only partial functioning or complete failure is experienced after the Master Selector has been plugged in, test the complete circuits at the solenoid junction block with lower harness test lamp set. (This test must be performed with a Selector Switch known to be 0. K.)

(a) - Remove the three wires on end of wiring harness from junction block on selector valve.

(b) - Insert these three wires into jack fitting on Lower Harness Test Set, in correct position according to color.

(c) - Attach ground clip to a clean metal ground on car.

(d) - Turn ignition switch "on," turn cutout switch "on," and hold clutch fully disengaged.

(e) - Place Selector Level in neutral. Place transmission in neutral manually.

When shift lever is moved a short distance toward "second," test lamp "YB" should light. When shift lever is moved a short distance toward "high," test lamp "Y" should light.

(f) - With transmission in neutral, move Selector Lever to "low." Test lamp "W" only must light.

(g) - Transmission remains in neutral. When Selector Lever is moved into "second" position, test lamp "Y" should light. When Selector Lever is moved into "high" position, test lamp "YB" should light. Selector in low or in reverse lamp "W" only should light.

(h) - As the transmission is shifted manually to correspond to any position chosen at the selector switch, the proper lamps, as indicated in "g," should remain lighted during the shift. However, lamp "Y" or "YB," whichever is lighted, should go out when the shift is completed. Lamp "W" alone will remain lighted in "low" or "reverse" position. If, in any of the above test, the correct lamps do not light or additional lamps are lighted, replace 47327 Switches and Wires Assembly.

Test to detect improper contact plate adjustment. If, after a new lower harness assembly has been installed, either lamp "Y" or "YB" remains on when transmission is in neutral, in test (e) above, the contact plate is incorrectly adjusted. To adjust contact plate, loosen the four screws holding contact plate assembly, then see if plate is free to move back and forth through movement permitted by elongated holes. If not, remove plate from transmission cover and carefully cut off or remove locating dowel pins. Replace contact plate as nearly as possible in its original position and partially tighten the four screws so that plate may be moved to its proper position.

If test lamp "YB" remains lighted when transmission is in neutral, move plate very slightly to the rear until lamp "YB" goes out. (If lamp "Y" remains lighted, move block forward. The proper setting is obtained when the movement of shift lever forward from neutral necessary to bring lamp "YB" on, is equal to the backward movement required to bring lamp "Y" on.

To Check Position of Interlock Switch

1 - Place the transmission in low gear and the selector switch in high gear and depress the clutch. Lamp "Y" should light and remain lighted until the transmission is shifted (manually) to neutral. Lamp "YB" should be lighted when cross shift to second and high side is completed. If lamp "YB" is lighted before the cross shift is practically completed, the interlock switch is not in proper position and should be adjusted so that the pointer on its lever is in line with the mark on the housing when the transmission is in high gear. If adjustment does not give proper operation, replace the interlock switch.

If the above tests show that some circuits are not correct, replace the wires and switches assembly (lower harness with interlock switch and contact plate).

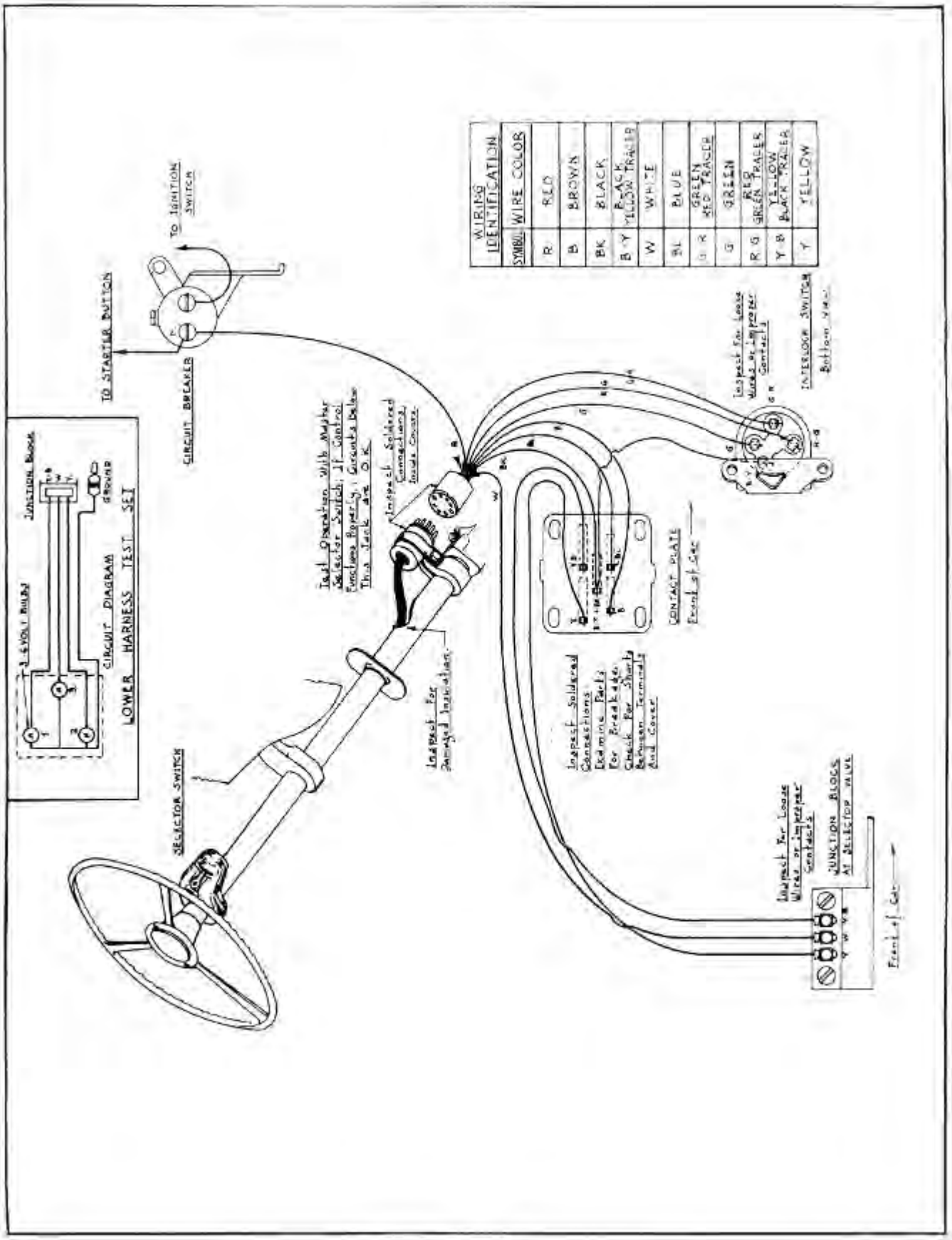

WIRING IDENTIFICATION
SYMBOL WIRE COLOR
R RED
B BROWN
BK BLACK
B-Y BLACK YELLOW TRACER
W WHITE
BL BLUE
G-R GREEN RED TRACER
G GREEN
R-G RED GREEN TRACER
Y-B YELLOW BLACK TRACER
Y YELLOW
LOWER HARNESS TEST SET
CIRCUIT DIAGRAM
6 VOLT RELAY
JUNCTION BLOCK
GROUND
CIRCUIT BREAKER
TO STARTER BUTTON
TO IGNITION SWITCH
SELECTOR SWITCH
Inspect Soldered Connections Inside Cover.
Inspect For Damaged Insulation.
Inspect Soldered Connections For Broken Parts. Check For Breakage Between Terminals And Cover
CONTACT PLATE
Front of Car
Inspect For Loose Wires or Improper Contacts
JUNCTION BLOCKS At Selector Valve
Front of Car
INTERLOCK SWITCH
Bottom View

Figure 6

Electric Hand Test Equipment

Kit No. 47898

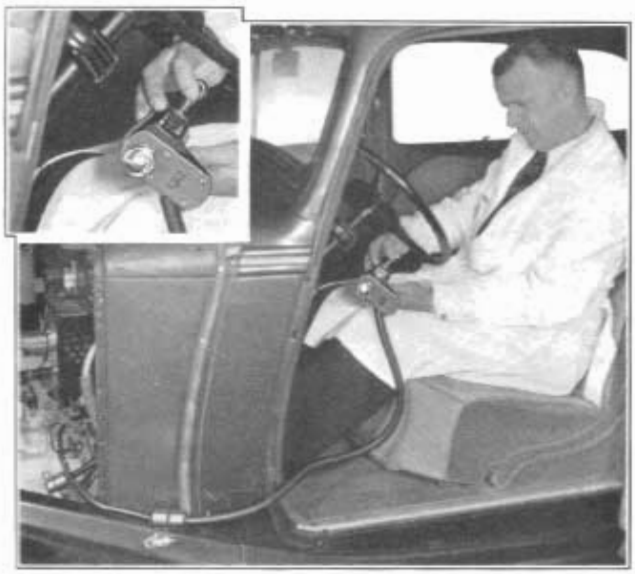


Figure 7
Using Master Selector Switch to make comparative check of Selector Switch and testing for "shorts"

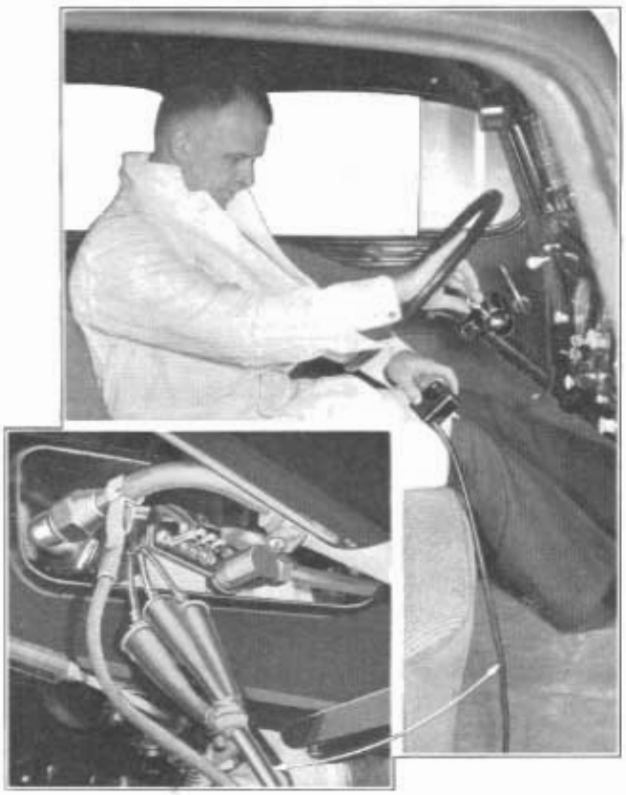


Figure 10
Testing circuits in lower harness and switches
Insert shows connection of test lamps to lower harness

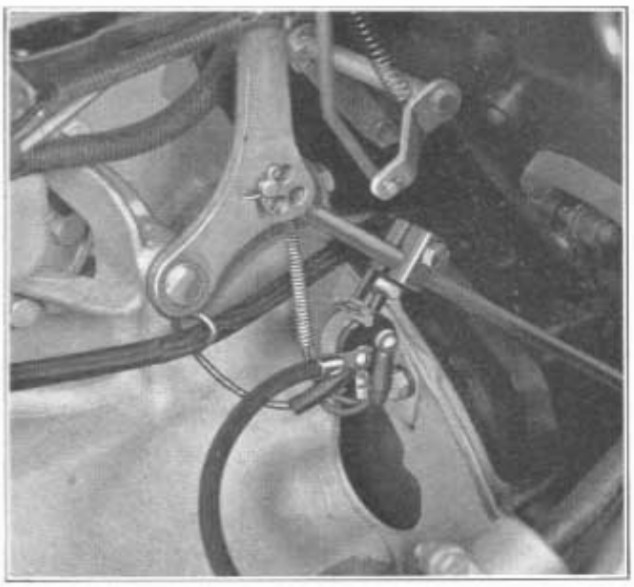


Figure 8
Connection of test cable to clutch circuit breaker

Figure 9
Using prods at solenoid terminals

Testing the power unit operation and mechanical adjustments

These three tests made in the above order quickly and positively locate electrical or mechanical troubles in the Electric Hand system

Failures Resulting from Faulty Circuits

See Wiring diagram, Fig. 6. A faulty selector switch may cause any of the failures listed below. A master selector switch should be used when checking the control. If control operates perfectly with master selector switch, an investigation of the other units is unnecessary.

Transmission fails to move into:	Faulty circuit through: (See Note)	Transmission fails to move out of
Any position	Red Wire	Any position
Any position	Green Wire with Red Tracer	Any position - except that transmission may be brought to neutral by moving Selector Switch to opposite side of gate*
Low* Reverse*	White Wire or Green Wire**	
Low High	Blue Wire	
Neutral - except when Selector Switch is moved to opposite side of gate***	Black Wire	
Second Reverse	Brown Wire	Low High
Second Reverse	Yellow Wire	Low High
Low High	Yellow Wire with Black Tracer	Second Reverse
Second High	Red Wire Green Tracer	
Certain positions unless started manually	Transmission contact plate assembly. Surface of contact bars *must be* carefully cleaned.	Certain positions unless started manually
Transmission fails to follow a fast or "pre-selective" shift from a position on one side of the gate to a position on the other side (from low to second, or from high to low, for example	Black Wire with Yellow Tracer	Transmission will follow when selector switch is moved very slowly.

NOTE:-Faulty circuit may be caused by either a short or an open circuit. In most cases, failure will be due to an open circuit, but when a short is encountered, Master Selector Switch fuse will blow. When this occurs, lamp adjacent to fuse should burn at full brilliance. (A 6-8 volt, 32 CP, single contact bulb must, be used. Allow Master Switch to remain in position which caused fuse to blow (i.e., in a position in which bulb burns at full brilliance). Then check faulty circuit for a short. When short is located and eliminated, bulb will burn at approximately half brilliance-which is normal. After short has been eliminated, insert new 7-1/2 ampere fuse and check operation of control in all positions.

(*) If green wire with red tracer is damaged, transmission will not move out of neutral position into any other position, but if it is placed in high position manually, it may be brought to neutral by moving Selector Lever into "Low." If placed in low position manually, it may be brought to neutral by placing Selector Lever in "high."

(**) If green wire is damaged, shift lever will still move back and forth with Selector Lever as the latter is moved from left to right.

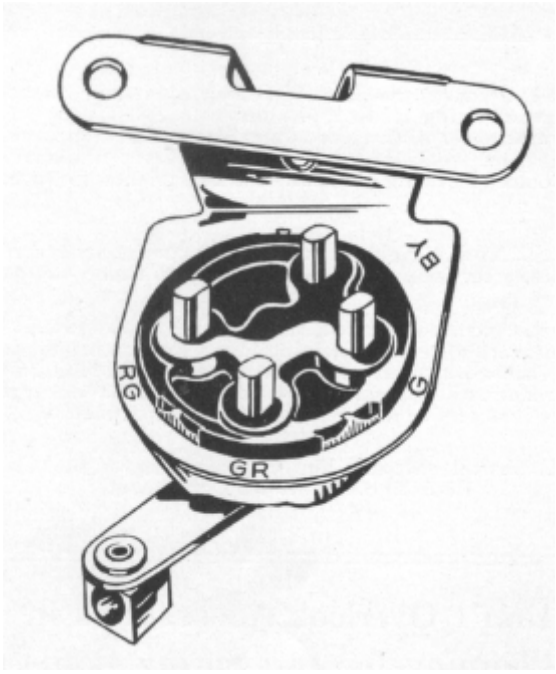
If white wire is damaged, shift lever will remain on the second and high side, even though Selector Lever is moved back and forth from right to left.

(***) If black wire is damaged, it is impossible to place transmission in neutral by merely moving Selector Lever to "Neutral." However, if transmission is in either second or high position, it may be placed in neutral by moving Selector Lever to "Neutral" and then as far to the left as possible. Transmission may be moved into and out of every position, except neutral, in the normal manner.

Electric Hand Notes

Interlock Switch Marking

The first interlock switches used in production did not have the terminals marked to indicate what wire should be attached to each. The illustration shows the markings now being used. BY indicates black wire with yellow tracer; G, green wire; GR, green wire with red tracer; RG, red wire with green tracer.



If a switch without the markings is removed from a car, it should be marked as shown in the illustration to aid in reassembling the wires.

Using Testing Equipment

Paragraph (g) on page 10 of Reference Sheet No. 3 should read the same as (g) on page 32 of the January issue of Terraplane Hudson Service. When the transmission is in "normal" neutral and the selector switch is moved to low or reverse, only lamp W of the lower harness testing set should light.

In some cases, light Y or YB will flash as the selector switch is moved only slightly from neutral. This is due to the selector switch contact touching the switch point to which the shift is being made before breaking contact with the neutral point of the selector switch. Disregard this flashing of the light, as the condition causing it does not interfere with the correct functioning of the Electric Hand.

Adjusting Clutch Circuit Breaker

Reread the instruction under (E) on page 30 of the January issue. The adjustment of the clutch circuit breaker is important. To test f or the correct position of circuit breaker, shift into low gear and allow the clutch pedal to come back slowly until the clutch just begins to drag. This is indicated by a slight vibration in the engine, but should not cause the car to move. While holding the clutch pedal in this position, move the selector to neutral. The transmission should shift to neutral. If it does not shift, move the clutch pedal down slightly. The amount the pedal has to be depressed to complete the shift is an indication of the amount the clutch circuit breaker arm pointer must be adjusted forward from the normal position mark.

If too much downward pedal movement is required to close the Electric Hand circuit, the shift will not be completed if an end to end condition of gears is encountered. This happens only when the car is standing still and is usually noticed only in attempting to shift into low or reverse.

If insufficient pedal travel is necessary to close the Electric Hand circuit, the gears will grate if a gear is pre-selected, due to the clutch not being sufficiently disengaged when the shift is made.

Manual Gear Shift Lever

All electric hand equipped cars now have the manual shift lever held in a socket and a strap with a snap fastener located just ahead of the right front door.

Installation of Electric Hand Air Filter

When installing Air Filter Kit No. 48250 (Distributor Bulletin No. 14, Dealer Bulletin No. 6), follow the instructions carefully. Particular care should be given to the following operations:

(1) Remove all traces of oil from all parts of the valves and valve housing and rub flake graphite into the surfaces of the pistons and cylinders. Use only dry flake graphite and blow off all excess.

(2) After assembling the solenoids and lower plate to the valve housing, put the valves in place and see that they do not bind. Binding may be caused by drawing the lower plate screws unevenly or improper installation of the cork gasket.

(3) Be sure the 2460-A Dolphinite forms a complete seal around each solenoid and fill the opening in the solenoid cup through which the wires pass.

(4) When assembling the filter hose and elbow, carry the hose directly under the solenoids. If it is carried to right of the solenoids. If it is carried to the right of the solenoids, the metal elbow No. 48254 will strike the frame "X" member and cause a rattle.

(5) Be sure all dirt is blown out of the hose and tubing before installation.

(Continued on page 15)

Transmission Lubricant.

Don't overlook the necessity of replacing 3 ounces of the regular SAE-80 gear lubricant in the transmission with 3 ounces of kerosene in cars operated at zero temperature.

Contact Plate Adjustment

The testing of the position of the contact plate is covered under (c) and the paragraphs following (h), page 32 of the January issue of Terraplane Hudson Service. The dowel pins on the contact plate have been removed in cars of later production and the location is made positive by drilling through the contact plate into the transmission control housing and dropping a dowel pin into the hole. This dowel is a precaution necessary only for handling in our Assembly Department.

When servicing cars it is not necessary to replace this dowel pin as the position can be held permanently by drawing down the four screws which hold the contact plate in position.

After removing a contact plate for servicing or when installing a new plate, test the position using the lower harness test set as covered on page 32 of the January issue, keeping in mind the changes that have been made in the method of doweling. **If the contact plate is not in proper position, the transmission will not come to true neutral and the cross shift cannot be made.**

Electric Hand Testing Equipment

The Factory Service Department has attempted to supply complete information and instructions for the servicing of the Electric Hand. Detailed information is contained in the December and January issues of this publication. Additional information is contained in this issue under the heading of Electric Hand Notes.

In order to make use of this information it is essential that the Electric Hand Test Kit No. 47898 be used. This kit has been so developed that it makes testing of the Electric Hand a simple routine matter. No Terraplane Hudson Service Station can afford to be without this Test Kit particularly since it is being supplied at absolute cost. If you do not already have a kit place your order with your distributor immediately.

Electric Hand - Circuit Breaker 1936

The circuit breaker operated by the clutch pedal on the 1936 Hudsons and Terraplanes equipped with the Electric Hand is of new design and incorporates a built-in "lost motion."

If the operating fork is set so that contact is made when the clutch pedal has been depressed approximately half way, a free shift will be made as the clutch will he completely disengaged before the shift is started.

The transmission shifting rail locks should be adjusted so that they release the shafts slightly before the circuit breaker contact is made.

With the circuit breaker adjusted to give contact with half pedal travel, the clutch will be partially engaged before the circuit is broken to insure completing the shift in ease the transmission gear teeth move into an end to end position.

Any lost motion in the operating linkage in addition to that built into the switch may require too much pedal travel to make contact or contact may not be broken when the clutch is fully engaged. The slot in the operating fork which is attached to the vacuum clutch operating rod is narrower than in 1935 as there should be no lost motion at this point or at any other point in the linkage.

Electric Hand and Vacuum Clutch Lubrication (1936)

The pistons in both the Electric Hand shifting cylinder and the vacuum clutch cylinder are fitted with two leather cups to seal against leakage. These cups must be kept. pliable by proper lubrication. Oil introduced into the cylinder will saturate the felt wick which is located between the leather cups and keep the leather pliable.

One ounce of Hudson Shock Absorber Fluid should be injected in the cylinder every 15,000 miles.

The suction line, from the Electric Hand valve housing to the front end plate of the power cylinder, should be disconnected and the oil injected into the cylinder through the fitting in the end plate.

The oil can be injected into the vacuum clutch cylinder by removing the piston rod rubber boot and squirting oil into the slot in the piston rod while the clutch is being disengaged by the vacuum.

As the piston moves forward it will create a vacuum in the rear of the cylinder and draw the oil in.

If the operation of either of these units becomes sluggish. lubricate the pistons and operate them several times to distribute the oil. A few minutes spent lubricating the units may save the time and expense of removing the unit.

USE ONLY GENUINE HUDSON SHOCK ABSORBER FLUID

Electric Hand
For 1936 Hudson and Terraplane with Serial Numbers Above:

Terraplane Deluxe	6151381	Exceptions 6151401 to 6151779 Inclusive
Terraplane Custom	6213759	Exceptions 6213901 to 6213963 Inclusive
Hudson 6 Custom	638319	Exceptions 6381351 to 638470 Inclusive
Hudson 8 Deluxe 120" W.B	644398	Exceptions 644439 to 644464 Inclusive
Hudson 8 Custom 120" W.B	652078	Exceptions 6521.59 to 652160 Inclusive
Hudson 8 Deluxe 127" W '.B	663201	Exceptions None
Hudson 8 Custom 1.27' W.B	674286	Exceptions None

The changes in the Electric Hand which became effective with the above serial numbers are confined to the power unit, lower harness and transmission control cover.

The Selector and upper harness, clutch circuit breaker and interlock switch remain unchanged and are covered in 1936 Reference Sheet No. 11.

The diaphragm cylinder has been increased in size but has not otherwise been affected.

The power cylinder has been increased in size and a neutral switch and the necessary driving mechanism has been incorporated in the power cylinder head. This neutral switch eliminates the need for the contact plate.

The contact plate has been removed from the transmission control cover simplifying the linkage in this unit and eliminating the wiring in the lower harness which was required for the contact plate.

Functioning

Figure 1 shows the mechanism and wiring of the complete Electric Hand installation. With the selector and transmission in neutral as shown, the circuit is complete to the center terminal of the neutral switch. Since neither point (P) or (Q) contacts the center terminal (W), the circuit is broken at this point and the transmission will remain in neutral.

If the transmission is shifted manually toward high gear, the power cylinder piston will move forward moving the rod (D) which will move point (P) further away from the central contact (W) and allowing point (Q) to come into contact with the central contact. This will close the circuit to solenoid 2, which will pull the valve down admitting vacuum to the rear of the power cylinder. The piston will move backward until contact (Q) is moved away from the central contact (W) which is the neutral position of the transmission.

It will be seen that had the transmission been moved toward second, contact (P) would have closed the circuit with the central contact (W) energizing solenoid No. 1 and moving the piston forward to the neutral position where the circuit would be broken by contact (P) moving away from the central contact.

If high or low gear is selected with the transmission in neutral, the circuit is direct from the selector contact (16) to solenoid No. 1. If second or reverse gear is selected with the transmission in neutral, the circuit is direct from the selector contact (14) to solenoid No. 2.

If the transmission is in high gear and low is selected, the circuit will be direct from (11) on the selector to solenoid No. 3 to obtain the cross shift when neutral is reached.

The circuit from (12) on the selector switch will be to (2) and (4) on the interlock switch and then to the central contact (W) of the neutral switch. Since the transmission is in high gear (piston forward) contact (Q) will close the circuit from the central contact to solenoid No. 2 and the transmission will move to neutral where the contact with the central contact (W) will be broken, the cross shift will take place, turning the interlock switch so that the circuit is from 2 to 1 to the selector switch (13) and 16 to solenoid No. 1 and the shift will be completed to low gear.

Had the transmission been in second gear when low was selected, the contact (P) would have been closed with the central contact (W) so that solenoid No. 1 would have been energized bringing the transmission to neutral when the contact would have opened and the shift made to low as before.

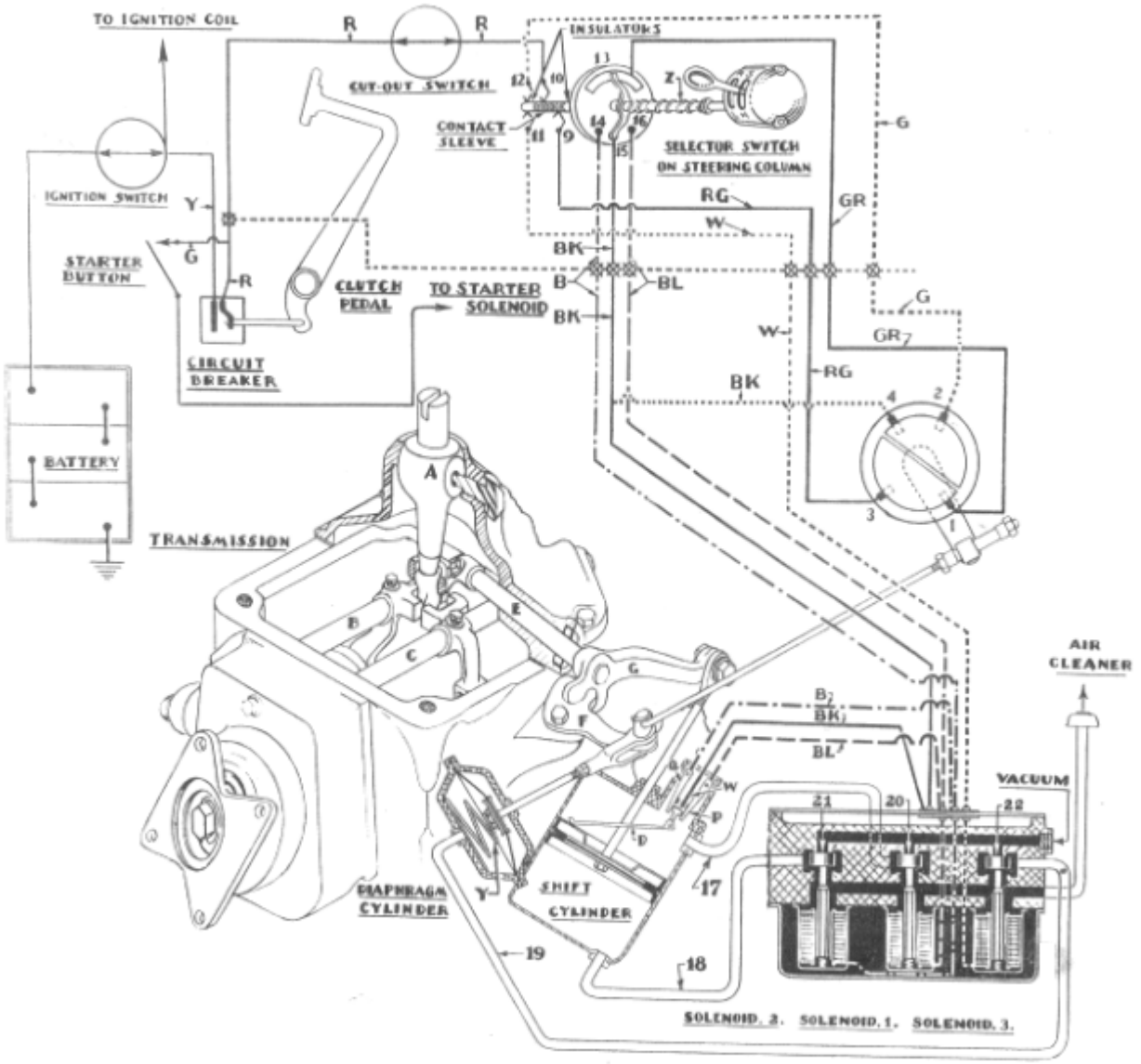
Mechanical Adjustment

All instructions on pages 8 and 9 of reference sheet No. 11 apply to the new equipment except the paragraphs on page 9 under the heading of Power Cylinder Piston Rod Adjustment.

The paragraphs on page 10 under the heading Main Contact Plate do not apply to the new equipment while only the first paragraph on the same page under the heading Transmission Shifting Rail Lock applies.

Power Cylinder Piston Rod Adjustment

To check the adjustment, disconnect the wires of the lower harness from terminals BL, W and B at the solenoid valve cover. Attach the lower harness test lamp with the YB clip to the BL wire, the W clip to the W wire and the


TO IGNITION COIL
R
R
INSULATORS
CUT-OUT SWITCH
CONTACT SLEEVE
SELECTOR SWITCH ON STEERING COLUMN
IGNITION SWITCH
Y
G
STARTER BUTTON
R
CLUTCH PEDAL
TO STARTER SOLENOID
CIRCUIT BREAKER
BATTERY
TRANSMISSION
RG
GR
W
BK
B
BL
GR
BK
RG
AIR CLEANER
VACUUM
DIAPHRAGM CYLINDER
SHIFT CYLINDER
SOLENOID 2.
SOLENOID 1.
SOLENOID 3.

Y clip to the B wire. (See Figure 1 for wire color code). Attach ground wire to chassis.

Put the selector in neutral, turn on ignition and depress clutch {engine not running).

With the manual shift lever shift, move the transmission toward high gear until the Y lamp of the test set lights. Now move the lever toward second gear until the YB lamp lights. The movement from neutral required to light the lamps should be the same.

Lengthening the piston rod will cause the YB lamp to light with less movement while shortening will cause the Y lamp to light with less movement of the shifting lever.

While adjusting the piston rod length the test lamps can be used and the adjustment made so that the clevis pin can be inserted with the transmission in neutral without either the Y or YB lamps lighting.

An alternate method is to run the engine and hold the clutch pedal down. With all wiring in place and the clevis pin re-moved from the rod, the piston will be held in the neutral position. The rod can then be adjusted so that the clevis pin can be reinserted with the transmission in neutral.

Testing Equipment

The Electric Hand Testing Kit - No. J-813 which is available through the Hinckley-Myers Co., of Jackson, Michigan, is adaptable to testing this equipment as well as the previous type.

The lamps and clips of the lower harness test kit are lettered to correspond to the original Electric Hand equipment, however BL on the new equipment corresponds to BY on the old as does B to Y while all other markings remain the same.

Testing the Shifting Mechanism

1. Connect power unit test cable to the terminal on the clutch circuit breaker to which the red wire is attached. This wire should be hot only when the clutch is disengaged. Remove the wires from the wire terminals at the selector valve junction block.

2. With the engine running and the clutch disengaged (rear wheels of car jacked up) - touch the (BL) post of the junction block on the shifting unit with test prod. The transmission should shift into high gear. Touch rear post (B) and the transmission should shift to second gear.

3. To shift the transmission to neutral touch front post (BK) with the test prod.

4. Now touch post (W) with the test prod and the cross shift should be made. Still contacting (W), touch post (BL) with second test prod. The transmission should shift into low. Touch rear post (B), still contacting (W), and the shift should be made to reverse.

If the shift is not made when one of the posts is contacted, connect an accurate ammeter to the hot wire and to the terminal. A current draw of approximately 2.5 amperes indicates that the solenoid is O. K. A higher amperage indicates a short and a low amperage an open circuit.

CAUTION: A dead short circuit in a solenoid will burn out ammeter if permanent connection is made.

If the current draw is correct, the trouble may be due to the valve plunger sticking in its upward position, dirt under the valve, a vacuum leakage in the lines or units or a mechanical drag in the mechanism.

Disconnect the shifting cylinder piston rod from the shifting lever or the diaphragm cylinder from the cross shift ball crank. If these do not function after disconnecting the linkage, the entire power unit should be rebuilt.

Testing Circuits in Lower Harness and Switches

If only partial functioning or complete failure is experienced after the Master Selector has been plugged in and the shifting mechanism is proven O. K., test the complete circuits at the solenoid junction block with lower harness test lamp set. (This test must be performed with a Selector Switch known to be O. K.)

A. Remove the three wires of wiring harness from junction block terminals on selector valve marked BL, W and B. Do not remove the wire from the terminal marked BK.

B. Insert these three wires into clips on lower harness test set, in correct position according to color. (BL to YB - B to Y - W to W).

C. Attach ground clip to a clean metal ground on car.

D. Turn ignition switch "on". Turn cut-out switch "on" and hold clutch fully disengaged.

E. Place selector lever in neutral. Place transmission in neutral manually. When shift lever is moved a short distance toward "second," test lamp (YB) should light. When shift lever is moved a short distance toward "high," test lamp (Y) should light.

F. With transmission in neutral, move selector lever to low or reverse. Test lamp (W) only must light.

G. Transmission remains in neutral. When selector lever is moved into "second" position, test lamp (Y) should light. When selector lever is moved into "high" position, the test lamp (YB) should light.

H. As the transmission is shifted manually from neutral to a position chosen at the selector the lamps should light as follows and remain lighted until the clutch pedal is released.

High gear - YB - Second gear - Y - Low and Reverse - W - when cross shift is completed YB lamp will light for low and Y for reverse.

I. With the transmission in high Or low gear and the selector in neutral the Y lamp should light. With the transmission in second or reverse and the selector in neutral the YB lamp should light.

If in the above tests, the correct lamps do not light or additional lamps light check (1) the neutral switch operation.

(2) the interlock switch position. (3) the lower harness circuits.

To Check Position of Interlock Switch

1. Place the transmission in low gear and the selector switch in high gear and depress the clutch. Lamp (Y) should light and remain lighted until the transmission is shifted (manually) to neutral. Lamp (YB) should be lighted when. cross shift to second and high side is completed. If lamp (YB) is lighted before the cross shift is practically completed, the interlock switch is not in proper position and should be adjusted so that the pointer on its lever is in line with the mark on the housing when the transmission is in high gear. If adjustment does not give proper operation, replace the interlock switch.

CIRCUIT TESTS

Selector Switch and Upper Harness

- Tests made at Jack Prongs -

Selector Position	*Current Supply to -*	*Test lamp should light when conected to -*
(1) Neutral High or Second	R	RG
(2) Low or Reverse	R	G-W
(3) Low or High	GR	BL
(4) Second or Reverse	GR	B
(5) Neutral	GR	BK

Test No. 1 and 2

No light on test 1 or 2 - cheek "off on" switch, red wire in harness and contact in selector switch.

No light on one but not both tests 1 and 2 - check wire to which test lamp is connected and contact in selector to which that wire is attached.

If lamp lights when connected to terminals other than those indicated - look for short in wiring.

If light flickers as selector is moved from one of the positions to another indicated in test 2, the contact sleeve in the selector is rough or the contact fingers do not have sufficient tension.

Test No. 3, 4 and 5

No light on tests 3, 4 or 5 check GR wire and its connection in the selector.

No light on one of tests (3, 4 or 5) check wire being tested and its connection to selector.

If lamp lights when connected to terminal other than one indicated in table - look for lost motion between selector shaft and contact rotor or short in wires.

Lower Harness

When a "Hot" prod is connected to the female jack terminal as indicated in the left column, the test lamp should light when connected from the terminal or terminals indicated in the other columns (one terminal of test lamp must be grounded).

Plug Jack (Female)	*Interlock Switch*	*Solenoid Terminal*	*Clutch Circuit Breaker*
R			R
BK	BY*	BK	
G	G		
RG	RG		
W		W	
GR	GR		
B		B	
BL		BL	

*The wire is Black (BK), however the terminal on the interlock switch is marked BY.

Failures Resulting From Faulty Circuits

See Wiring diagram. A faulty selector switch may cause any of the failures listed below. A master selector switch should be used when checking the control. If control operates perfectly with master selector switch, master selector switch, an investigation of the other units is unnecessary.

Trans. fails to move into:	*Faulty Circuit through: (See Note)*	*Trans. fails to move out of:*
Any position	Red Wire	Any position
Any position	Green Wire with Red Tracer	Any position - except that transmission may be brought to neutral by moving Selector Switch to opposite side of gate*
Low*	White Wire or Green Wire**	
Low High	Blue Wire	
Neutral - except when Selector Switch in moved to opposite side of gate***	Black Wire Brown Wire	Low High
Second Reverse Low High	Blue Wire	Second Reverse
Second High	Red Wire Green Tracer	
Transmission fails to follow a fast or "pre-selective" shift from a position on one side of gate to a position on the other side (from low to second, or from high to low,	Black Wire	Transmission will follow when Selector Switch is moved very slowly.

NOTE: Faulty circuit may be caused by either a short or an open circuit. In most cases, failure will be due to an (pen circuit, but when a short is encountered, Master Selector Switch fuse will blow. When this occurs, lamp adjacent b fuse should ,burn at full brilliance. (A 6-8 volt, 32 CP, single contact bulb must be used.) Allow Master Switch to remain in position which caused fuse to blow (i. e., in a position in which bulb burns at full brilliance). Then check faulty circuit for a short. When short is located and eliminated, bulb will burn at approximately half brilliance - which is normal. After short has been eliminated, insert new 7-1/2 ampere fuse and check operation of control in all positions.

(*) If green wire with red tracer is damaged, transmission will not move out of neutral position into any other position, but if it is placed in high position manually, it may be brought to neutral by moving Selector Lever into "Low." If placed in low position manually, it may be brought to neutral by placing Selector Lever in "high".

(**) If green wire is damaged, shift lever will still move hack and forth with Selector Lever as the latter is moved from left to right.

If white wire is damaged, shift lever will remain on the second and high side, even though Selector Lever is moved hack and forth from right to left.

(***) If black wire is damaged, it is impossible to place transmission in neutral by merely moving Selector Lever to "Neutral." However, if transmission is in either sector high position, it may be placed in neutral by moving Selector Lever to "Neutral" and then as far to the as possible. Transmission may be moved into and out of every position, except neutral, in the normal manner.

Removal, Installation and Repair

The details of these operations are covered on page 15 of 1936 Reference Sheet No. 11 except as follows:

(1) A rubber grommet is assembled in the power cylinder pilot pin hole in the mounting bracket before the power unit is mounted.

(2) The lower harness is clipped to the right front and rear and left rear transmission cover screws only.

(3) Before removing the power cylinder end plate - (operation 104, page 19 - 1936 Reference Sheet No. 11) remove the two screws from the neutral switch cover and withdraw the switch. (See illustration - page 2).

After the end plate has been moved the two screws can be removed from the neutral switch operating bracket and the mechanism removed. When reinstalling the mechanism be sure the gasket is in good condition.

Both the inner and outer piston rod seals can be removed and replaced.

When reinstalling the neutral switch in the end plate the operating lever must lie between the two bakelite arms carrying the movable points of the neutral switch.

Electric Hand Transmission Control
1936 Hudson and Terraplane

DESCRIPTION: - Similar to equipment used on 1935 models except for minor differences in design of units as follows:

Selector Switch - Housing design and mounting on steering column changed but internal circuits and operation identical with previous model.

Clutch Pedal Circuit Breaker - New type push-pull switch replacing rotary type used previously. Switch provides `lost-motion' necessary for correct closing and opening of circuit and adjustment is not the same as 1935 type (see adjustment below).

Transmission Shifter Rail Lock Bars - New feature on 1936 type. Consists of spring loaded plunger and ball detent which engages notch in shifter rail and prevents shifter rail movement until clutch is disengaged which raises lock bar and releases ball plunger. One lock bar mounted on each side of transmission case and operated by adjustable linkage from clutch throw-out shaft. See adjustment below.

Contact Plate Assembly - Contact plate sliding block now operated by rod connected to plate at lower end of shift lever (first type sliding block mounted directly on this plate). Sliding block has been redesigned and consists of six contact fingers pivoted individually on block and held in contact with plate by coiled springs on pivot rod.

NOTE - Similar type sliding block (Part No. 48745) available for replacement on 1935 models equipped with first type block. Replacement block has all con-tact fingers of equal thickness and may be distinguished from 1936 standard type (Part No. 152197) which has two fingers which are thicker than the others.

Interlock Switch - Same as for 1935 models.

Diaphragm Cylinder Linkage - Cross shift stopscrews (K and M on 1935 illustration not used on 1936 model.

Power Unit Solenoid Valves - Valves have been redesigned and are now poppet type. Valves are held at upper end of stroke (cutting off vacuum and admitting air to cylinder) by spring at lower end of valve plunger when solenoid is not energized, and are pulled down (cutting off air and opening vacuum port) when solenoid is energized. Air cleaner element in valve assembly cover has been discontinued and air connection is by means of a separate tube connected to the lower end of the carburetor air cleaner.

ADJUSTMENT: - Mechanical adjustments provided for each unit. All adjustments should be checked, in order given below, whenever Electric Hand is serviced or when settings are disturbed by work on engine, clutch or transmission.

`Clutch Pedal Circuit Breaker - Circuit through switch should not be completed until clutch is disengaged with pedal depressed half way to floor board (to avoid gear clash caused by engine driving car when shift is made). To adjust, take out clevis pin in linkage at circuit breaker, loosen locknut on rod, turn clevis. With correct setting, notch on forward end of circuit breaker rod should be flush with housing. Transmission shifter rail locks must be released when circuit breaker makes contact (see shifter rail lock adjustment below). Circuit breaker contact must not be broken until clutch has started to engage to insure gears meshing when car is not in motion and gear teeth strike). Check by running engine, shifting transmission into low or reverse, engaging clutch slowly. Car should start to move before `click' of cross shift linkage, which indicates circuit breaker contact broken, is heard.

Transmission Shifter Rail Locks - Shifter rail locks (on each side of transmission case) must be released when circuit breaker contact made. Check by depressing clutch pedal to point where circuit completed through circuit breaker (halfway to floor - see paragraph above). Shifter rail lock bar link should be raised so that notch in link is opposite end of plunger in transmission case. Adjust by turning nut on link operating rod at lever on throw-out shaft (this adjustment provided at each lock link. Check to see that lock link drawn down so that plunger is held in when clutch is engaged. This is important to prevent transmission jumping out of gear. If lock links not drawn down with transmission in gear and clutch engaged, recheck lock setting (above), check power cylinder piston rod length, check circuit breaker contact opening point. If this does not correct lock action, use Lower Harness Test Lamp Set and check contact plate position to determine whether power cut off before shift completed (see Testing below).

Power Unit Mounting - Power unit must have sufficient clearance so that it does not strike frame `X' member and must be lined up so that power cylinder piston rod enters fork of shifting lever freely with transmission in high (for-ward) or second (rearward) position. Maximum clearance secured by pushing up on unit while tightening nuts on studs which hold mounting bracket on transmission. Power unit cylinder mounting stud nut should be tightened just enough to insert cotter pin. This will insure maximum flexing of rubber mounting blocks for alignment.

Power Cylinder Piston Rod Adjustment - Piston rod movement must be sufficient to complete shifts in either direction. To adjust, place transmission in high gear, hold shift lever forward to take up all lash, take out pin linking piston rod to shift lever, pull piston all the way forward, loosen locknut on piston rod, turn rod eye out until it is 1/4" farther forward than hole is in shift lever, tighten locknut. Check adjustment by placing transmission in second gear, hold shift lever backward to take up all lash, push piston all the way in, see that piston rod eye is 1/4" farther back than hole in shift lever. Line up eye and shift lever hole by pulling piston out slightly, insert pin.

Diaphragm Cylinder (Cross Shift Control Mechanism) Adjustment - With transmission in high or second gear, remove clevis pin from diaphragm cylinder rod yoke at cross shift bell-crank. Spring in diaphragm cylinder should move rod and yoke 1/4" farther forward. Loosen locknut and turn yoke until rod must be moved 1/4" back in order to insert clevis pin. Hold clevis from turning while tightening clevis locknut to avoid damaging diaphragm. Shift transmission to all gear positions, see that bell-crank contacts lobe on shift lever only at outer end of bell-crank fork and that mechanism does not bind. Check action of stub shift lever on transmission case cover to see that fulcrum dowel screw does not bind in lever ball groove. First type dowel

(Continued on Page 17)

screw (Part No. 35442) was 23/32" long and a 1/16" plain washer was assembled under the head in addition to the lock. Dowel screw later changed to Part No. 151787 which is 21/32" and washer omitted. Washers must be used with first type screw to prevent binding.

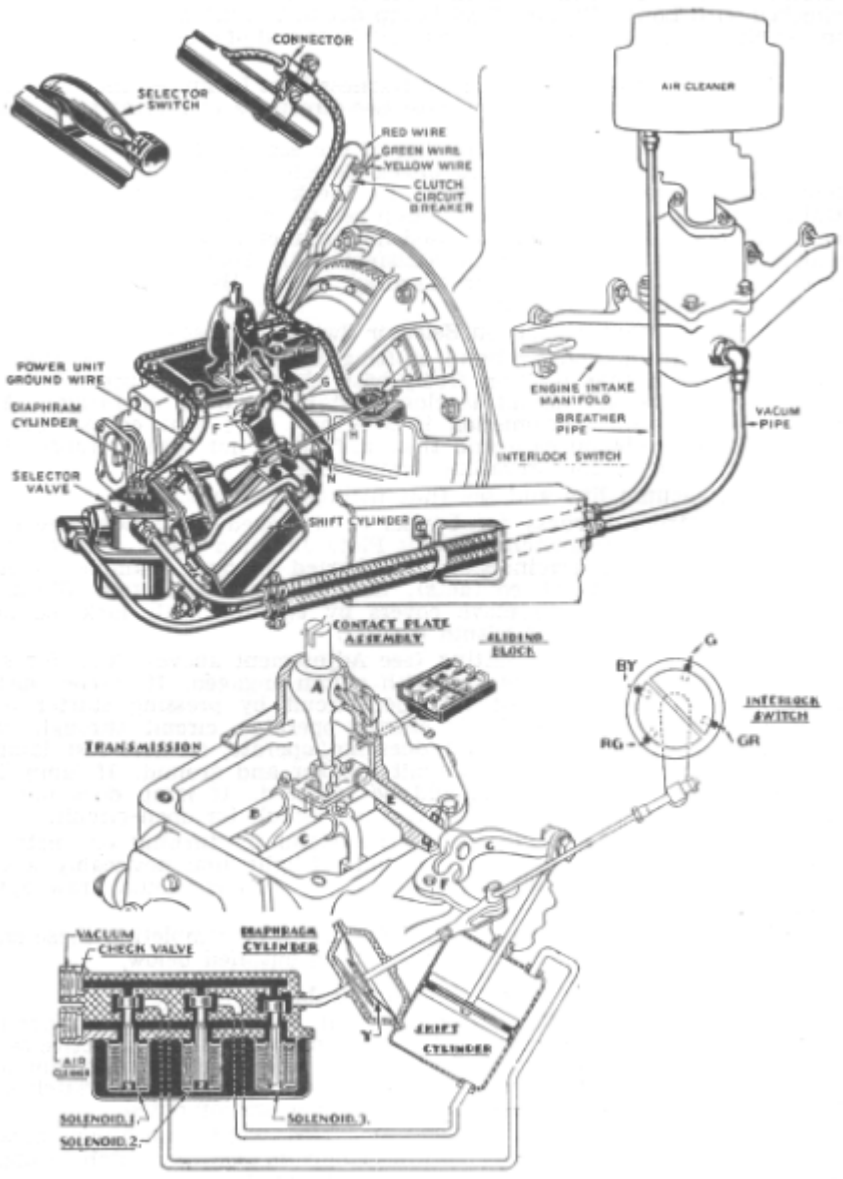
Interlock Switch Adjustment - Check by using Electric Hand to shift transmission into low and then into high or second. Interlock switch lever must line up with reference line on switch cover marked 'S/H' when these shifts completed. To adjust, loosen jam nut on forward end of switch rod, turn adjusting sleeve (head of sleeve directly behind switch lever), tighten jam nut. Shift transmission to low, back to high, recheck switch. Operation of switch can be checked with Lower Harness Test Lamp Set in Testing section below (circuit in switch should change at same distance from end of cross shift travel in each direction).

Contact Plate Adjustment - Lower Harness Test Lamp Set must be used to check operation of main contact plate. See directions in Testing section below.

TROUBLE SHOOTING: - Complete testing of the Electric Hand requires the use of a Master Selector Switch to check Selector Switch and upper wiring harness, a Power Unit Test Cable to check shift mechanism or Power Unit, and a Lower Harness Test Lamp set to check the lower wiring harness and switches (this must be used in conjunction with a Selector Switch which is known to be operating satisfactorily). Directions for use of this test equipment is given under `Testing' below. Before making complete tests, check following points:

1. See that Cutout Switch on Selector Switch is closed or 'on'.
2. Check transmission by hand shifting in all positions, See that lever moves into each gear position freely with clutch pedal depressed to point where circuit breaker circuit is closed (starter will be operative). Adjust Interlock straps on transmission if necessary. See that correct lubricant is used in transmission case and that shifting is not being retarded by oil which is too heavy for prevailing temperatures.
3. Check vacuum line and see that fittings are tight.
4. Check wiring harness for breaks or damaged insulation, check connections on Interlock switch, Contact Plate Junction

(Continued on Page 18)



Block (check soldered connections, see that terminals are not shorted to cover, examine for broken parts, note condition of contacts), Selector Valve Junction Block, and Steering Column Jack (remove covers by twisting with jack assembled, check soldered connections within covers).

5. Check Circuit Breaker setting (see Adjustment above). Test for short-circuit by pressing starter button with clutch engaged. If starter operates, replace circuit breaker. Test for open-circuit by pressing starter button with clutch pedal depressed. If starter operates, circuit through circuit breaker is satisfactory. If starter does not operate, connect test lamp between yellow wire terminal on circuit breaker and ground. If lamp lights, circuit breaker is open and should be replaced. If lamp does not light, check wire from circuit breaker to ignition switch for open-circuit.

6. Check for short-circuits in Electric Hand by turning on instrument light and shifting into each gear position. If light, dims noticeably, a short circuit is indicated for that position (valve solenoids should draw approximately 2.5 amperes each).

If Electric Hand operation is unsatisfactory after completing these checks, use test equipment and make complete tests outlined below.

Trouble Shooting Table

If transmission fails to shift into or out of any of the gear positions noted below, check the wire indicated for open or short-circuits. A defective selector switch may cause any of the conditions noted and selector switch should first be checked by substituting a master selector switch or a selector switch known to be operating correctly and the Electric Hand operation noted.

1. In or out of any position - Check Red Wire (feed from circuit breaker). If transmission will shift into neutral by moving selector switch to opposite side at neutral, check Green Wire with Red Tracer.

2. Into Low or Reverse - Check White Wire and Green Wire. If transmission shifts to neutral instead of low, check Green Wire with Red Tracer. If cross-shift is still correctly made, check Green Wire.

3. Into Low or High - Check Blue Wire. If transmission also fails to shift out of Second or Reverse, check Yellow Wire with Black Tracer.

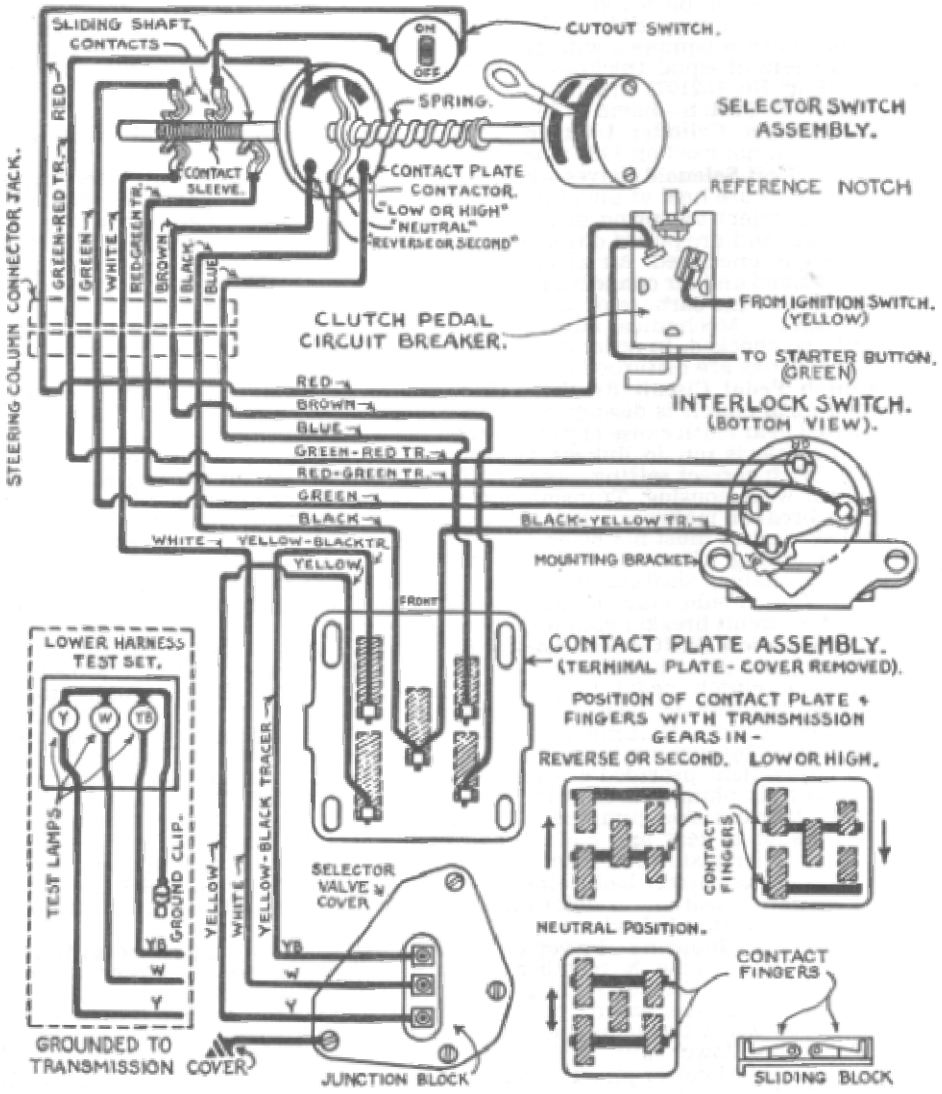
4. Into Second or Reverse - Check Brown Wire. If transmission also fails to shift out of Low or High, check Yellow Wire.

5. Into Second or High - Check Red Wire with Green Tracer.

6. Into Neutral - Check Black Wire. Transmission will shift to neutral from Second or High by moving selector switch to left at neutral for the cross-shift.

7. Into or out of some positions except when started by hand. Examine contact plate assembly and see that contact surfaces are clean.

(Continued Page 19)



8. Transmission is slow in making any shift involving a cross-shift - Check Black Wire with Yellow Tracer.

TESTING ELECTRIC HAND: - Selector Switch and Upper Wiring Assembly - Disconnect Selector Switch jack at lower end of steering column, plug in Master Selector Switch (no ground required). Operate Master Selector Switch to shift into all gear positions. If Electric Hand operates satisfactorily, replace complete Selector Switch and upper wiring assembly (all parts down to and including the upper half of the jack). Test lamp on Master Selector Switch (6-8 volts, 32 cp., must be single contact type) should burn at half - brilliance if circuits are normal. A short - circuit will cause fuse (71/2 ampere) to blow and lamp to burn at full-brilliance. When this occurs leave Selector Switch in this position and check all circuits involved for short-circuits. Do not replace fuse until short-circuit has been located and corrected. Use only 7½ ampere fuse for replacement.

Shift Mechanism (Power Unit) - Connect power unit test cable to red wire terminal on circuit breaker. Operate engine with clutch disengaged and rear wheels jacked up so that shifts can be made. Touch the test prod of the test cable to the points indicated and note whether transmission shifts properly (some tests require contacting two terminals on the Selector Valve junction block at the same time). Terminals are designated by the color of the wires attached as follows: 'YB' - terminal toward front of car (Yellow wire, black tracer), 'W' - center terminal (white wire, no tracer), 'Y' - terminal toward rear of car (Yellow wire, no tracer).

1. Test Prod on YB - Transmission should shift into high gear.

2. Test Prod on Y - Transmission should shift into second gear.

3. Test Prod on W - With transmission in neutral, cross-shift or left-right movement of lever should be made.

4. Test Prod on W and YB - Transmission should shift into low gear.

5. Test Prod on W and Y - Transmission should shift into reverse gear.

If any of these shifts are not made, check valve solenoid by connecting accurate ammeter between terminal and circuit breaker lead (ammeter lead should be merely touched to terminal to avoid damage if solenoid dead short-circuited). Current draw should be approximately 2.5 amperes. Larger current indicates that solenoid is shorted, smaller current indicates an open-circuit. If current draw is satisfactory, examine valve to see that it is free and not sticking in upper position, check for vacuum leakage in valves, lines or shift units. Check units for mechanical drag by disconnecting shift cylinder from lever (G) and Diaphragm Cylinder from bell-crank (F). If units do not operate when disconnected, entire Power Unit (Shift Cylinder, Diaphragm Cylinder, Selector Valve Assembly) must be rebuilt or replaced.

Switches and Lower Wiring Harness - Disconnect wires on selector valve junction block and connect these wires to clips on Lower Harness Test Set in accordance with wire color (see illustration). Attach Test Set ground clip to clean place on engine for good ground connection. Make tests by manipulating selector switch (selector switch must be known to be OK) and shift lever and noting whether correct test lamps light (lamps designated by color of wire connected to leads as for shift mechanism test above). See that ignition is turned on, Cutout switch turned on, and clutch held completely disengaged and make following tests:

1. Place selector lever in neutral (right end of slot). Shift transmission to neutral manually. Lamp 'YB' should light when shift lever moved short distance toward second gear. Lamp 'Y' should light when shift lever moved equal distance toward high gear.

2. Place transmission shift lever in neutral. Move selector lever to low gear position. Lamp `W' only should light.

3. Place transmission shift lever in neutral. Move selector lever to each gear position in turn. Lamps should light as follows: High gear - 'Y', Second gear - 'YB'. Low or Reverse - 'W' only.

4. With selector lever in each gear position in turn as above (3), complete shift by moving shift lever to same position. Lamps should go out when shift completed except that lamp `W' will remain lighted with transmission in low or reverse (lamp 'Y' will light momentarily when transmission shifted to low, and lamp 'YB' during shift to reverse - these lamps do not light during test (3) since no vacuum available to operate Diaphragm Cylinder and Interlock Switch which occurs when transmission shifted manually).

If above tests indicate that proper circuits are not being completed (correct lamps do not light or go out at the right time, or additional lamps light), replace Lower Harness. After replacing lower harness, check Contact Plate Assembly adjustment as directed below.

Contact Plate Assembly Adjustment - If lamp 'Y' or 'YB' are lighted with transmission shift lever in neutral (Test 1 above) or if lever movement forward to light lamp 'YB' and rearward to light lamp 'Y' are not equal, contact plate requires adjustment. To adjust, loosen four screws holding contact plate assembly, shift plate slightly to rear (if 'YB' lighted in neutral) or to front if (if 'Y' lighted in neutral) until lamp goes out, tighten screws. With correct adjustment, movement forward and backward to light each lamp should be equal. Screw holes in contact plate are slotted to permit this movement. If plate is not free to move, remove from transmission and carefully cut off locating dowel pins.

Transmission Shifter Rail Lock Action - If correct lock action cannot be secured, connect Lower Harness Test Lamp Set (as directed above), move selector lever to low gear position, depress clutch pedal. Lamps 'W' and 'YB' should be lighted. Shift transmission manually toward low gear until lamp 'YB' goes out, release clutch pedal. Shifter rail lock bars should both drop down. If right hand lock bar is not down, leave clutch engaged and pull shift lever to complete shift, noting movement necessary. If more than slight movement required before lock bar moves down, adjustment of contact plate, replacement of contact plate sliding block, or replacement of transmission cover linkage is required. To determine whether adjustment will correct condition, move selector lever to reverse, depress clutch pedal. Lamps 'W' and 'Y' will be lighted. Move shift lever toward reverse until lamp 'Y' just goes out. Release clutch. If lock bar at right of transmission goes down, contact plate can be moved back slightly for longer contact in low. If lock bar does not go down and considerable shifting lever movement necessary before lock bar goes down, sliding block or linkage in transmission cover must be replaced.

Interlock Switch Setting - Shift transmission to low gear manually, place selector lever in high gear, depress clutch pedal. Lamp 'Y' should light and remain lighted until transmission is shifted manually to neutral. Lamp 'YB' should light when cross shift to second-high side is completed. If lamp 'YB' lights before cross shift is practically completed, interlock switch adjustment is incorrect (see

(Continued on Page 20)

adjustment above). With correct adjustment shift lever travel in either direction at neutral to light lamp should be equal. To check, place selector lever in low, move shift lever to left in neutral, note travel before lamp 'YB' lights. Then place selector lever in high, and shifter lever at extreme left in neutral, move shifter lever to right, note travel before lamp 'YB' lights. Travel in either direction should be equal.

REMOVAL AND INSTALLATION: - Selector Switch Assembly - To remove, disconnect connector jack at lower end of steering column by lifting cap from jack until lug is out of groove in jack base, then turn cap 1/4 turn. Separate jack halves, unsolder wires on upper half, pull off jack and loom on cable. Take off end cap and washer on selector switch, loosen selector housing mounting bolt nut inside housing, slide selector housing downward and remove, withdraw wires from steering column.

To Disassemble - Take out cutout switch cover screws, remove switch plate, lift switch up and unsolder wires, pull wires out of end of housing from which end cap previously removed, insert cotter pin puller through hole to right of cutout switch and press lock ring out of groove in switch base, pull wires and switch base out of housing, remove switch rotor and spring. Remove two screws in 'H' plate cap (selector lever segment), hold cap to right and remove washer retainer, washer, spring, and lever, turn selector switch shaft ¼ turn to right (clockwise facing selector lever end) and withdraw.

To Assemble - Assemble in reverse order as above. See that rotor is inserted with side with three contacts to left and that it slides over tongue on shaft. See that switch base tongue engages groove in bottom of housing, and that locking ring engages groove in housing.
To Install - See that eight wires of selector switch harness are laid out flat side-by-side and do not cross (clips can be used to hold wires). Feed wires down through steering column tube. Install selector switch on steering column so that head of mounting bolt enters wire hole in column, move selector up so that bolt shank engages slot, tighten nut inside selector housing. Pull wires down in steering column so they do not project through end cap hole on selector, install loom on lower end, solder wires to upper half of connector jack. In making connections, designated wire colors must be connected to marked terminals as follows: 'R' - red wire, 'BK' - black, 'G' - green, 'RG' - red with green tracer, 'W' - white, 'GR' - green with red tracer, 'B' - brown, 'BL' - blue.

Contact Plate Assembly: - To remove, take out four cap screws in cover, lift up cover and plate, remove sliding block. Unsolder wires on contact plate if plate to be removed from harness.
To Install - When soldering wires on contact plate lugs, designated wire colors must be connected to marked lugs as follows: `YB' - yellow wire with black tracer, `Y' - yellow, `BY-BK' - black wire with yellow tracer and black wire, `BL' - blue, `B' - brown. When inserting sliding block into contact plate guides make certain that driving block on lug is to rear when assembled. Insert one ounce of contact plate grease (No. 48705) in cavity in transmission cover in which sliding block operates before installing assembly.

Power Cylinder: - To remove power cylinder from power unit assembly (with assembly off the car), disconnect vacuum lines, remove three end plate stay-bolts, remove cylinder from assembly.

To Disassemble - Use special tool HMO-12-1 to remove cylinder end plate, remove end plate inner seal, pull out piston and rod assembly, take off piston rod nut, disassemble pistons.

To Assemble - Put felt retainer and piston plate on rod, wrap packing ring around retainer with the felt ring over it, put leather cup packing and center plate on rod to hold felt and packing ring in place, then put second leather cup packing and second plate on rod. Wrap packing ring and felt around second felt retainer, install in place in packing on rod, install piston rod nut, tighten securely and stake in place.

To Install - Saturate leather packing cups and felts in Hudson shock absorber oil until leather is soft and pliable, then install piston assembly in cylinder being careful not to turn edges of packing cups back when inserting. Use new end-plate inner seal and end plate gasket, install end plate, draw down in to place by tightening stay bolt nuts evenly and securely when attaching cylinder to bracket. Test seal by holding thumb on front vacuum line connection and pulling on piston rod. Rod should move out only slightly and air compressed in cylinder should resist further movement.
NOTE - Vacuum line should be disconnected at front of cylinder and one ounce Hudson Shock Absorber Fluid injected in cylinder at 15000 mile intervals to maintain piston seal.

Diaphragm Cylinder: - Mounted on mounting bracket by mounting plug and washer at vacuum connection and can be disassembled without being removed from bracket.

To Disassemble - Remove rod yoke, locknut and rod guard, take out six bolts in flange, remove housing cover and diaphragm assembly. Take off rod nut and disassemble diaphragm.
To Assemble - Reverse operations above. See that spring is seated in flanged plate, and hold diaphragm rod in while tightening flange bolts to avoid distortion of diaphragm. Tighten all bolts evenly and securely to insure tight seal. Check by pushing rod in and then holding finger over vacuum connection in mounting bracket. The rod should not move out.

Selector Valve Unit: - Mounted on mounting bracket by four screws. Wash unit with gasoline (brush off only, do not dip in gasoline) before disassembling.

To Disassemble - Take out four screws in cover plate, lift cover slightly and unsolder wires from terminal block. Remove solenoid cover stud, washer and gasket, remove cover. Remove three screws in solenoid retainer, remove retainer and solenoid being careful not to loosen springs from bottom of valve plunger. Remove valve seats and valve assemblies from body (if necessary tap seats out with blunt bar inserted through center holes in housing, do not attempt to pull on valve plunger). Remove rubber valve heads from valve plunger washer. Take out check valve nut and check valve in vacuum connection.

Servicing - Wash all parts except solenoids and rubber valve heads in gasoline. See that all dirt removed from valve body passages.
To assemble - Reverse disassembly operations. Use new rubber valve heads if old heads swollen or spongy from gasoline, or worn or cut. When reassembled, valve travel up and down should be 1/32-1/16". Movement must not be less than 1/32" or performance will be sluggish. Use new cover gasket and solenoid retainer gasket and see that cover screws fastened securely to keep out water and dirt.

1936 Electric Hand
Mechanical Adjustment

The adjustment of the linkages contained in the 1936 electric hand is largely the same as the 1935 unit. However, there is a difference in the construction of the clutch circuit breaker which requires different adjustment.

Since. however, the entire mechanical adjustment is so important, it should be made carefully with every servicing of the electric, hand. The recommended procedure is as follows:

The Clutch Circuit Breaker

The 1936 clutch circuit breaker has lost motion built into the switch so that the clutch pedal must be depressed far enough to disengage the clutch before the electric hand circuit is closed, but the circuit will not he opened until the clutch is almost fully engaged. If the clutch is not disengaged before the shift is made, it will cause the gears to clash. Opening of the electric hand circuit before the clutch has started to engage will result in failure of the gears to mesh, if the car is not in motion and the gear teeth strike end to end.

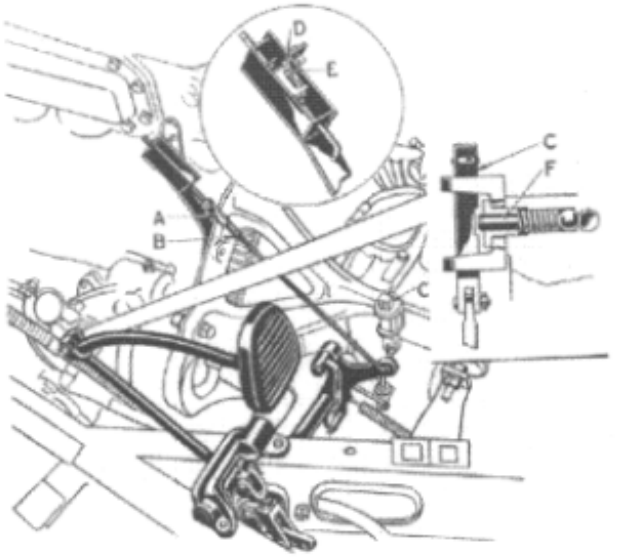


Figure 1

The lock nut. (B) should he loosened and yoke (A) (Figure 1) on the rod, which operates the clutch circuit breaker, should be adjusted so that the clutch pedal must be depressed half way to the toe board before the circuit is closed. The upper insert in Figure 1 shows the position of the parts inside the circuit breaker at the point where the circuit is closed. (I)) is the stationary contact and (E) the sliding contact.

At the time the circuit is closed the transmission *shifting rail locks must be released so that the shift can be made*. The lower insert in Figure 1 shows the proper position of the lock bar link (C) and plunger (F).

After adjusting the circuit breaker for point of closing, check to he sure that the clutch has begun to take hold before the circuit is opened.

This check is most readily made by running the engine and putting the transmission in low or reverse gear. Allow the clutch pedal to come up slowly.

The car should start to move before the "click" of the cross shaft linkage is heard, indicating that the electric hand circuit as,. been opened.

The insert of the circuit breaker in Figure 2 shows the position of the parts at the point where the circuit is opened while the *shifting rail lock bars must be down*, as shown in the lower insert (Figure 2) to insure the transmission being locked in gear before the electric hand power is rut off. *This is important to prevent the transmission jumping out of gear*.

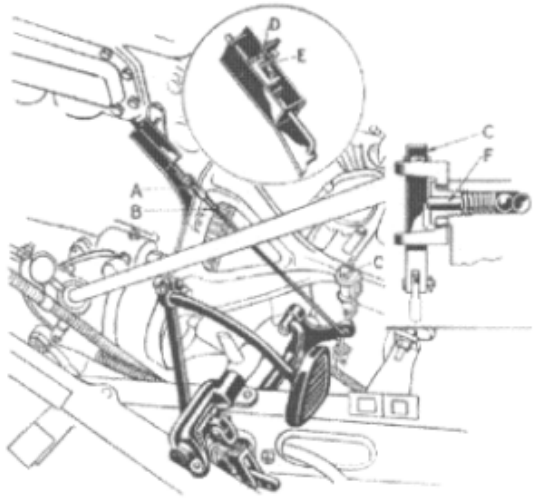


Figure 2

Power Unit Mounting

The power cylinder piton rod (B) (Figure 3) should enter the fork (A) in the shifting lever easily when the transmission is in either its forward (high) or rearward second) position. The power unit should also have sufficient clearance to prevent striking the frame X member. Maximum clearance is obtained by pushing upward on the unit while tightening the nuts on the studs which hold the mounting bracket to the transmission.

The nut on the power cylinder mounting stud should be drawn up just enough to permit the insertion of the cotter key. This provides maximum flexing of the rubber locks for alignment.

Power Cylinder Piston Rod Adjustment

Remove the clevis pin from the rod eye. With the transmission in high gear and the shifting lever held forward to take up lash, it should be possible to pull the piston rod (B) through the lever fork (A) 1/4" farther than the position where the clevis pin can be inserted. The length of the rod can be adjusted by loosening the locknut (C) and turning the eye.

The piston rod should then be pushed back and the transmission

(Continued on page 22)

shifted into second gear. While pushing backward on the shift lever to take up lash in the linkage, the piston rod should be farther hack than the position where the clevis pin can be inserted. *These checks are important to insure sufficient travel of the piston in both directions to complete the shifts.*

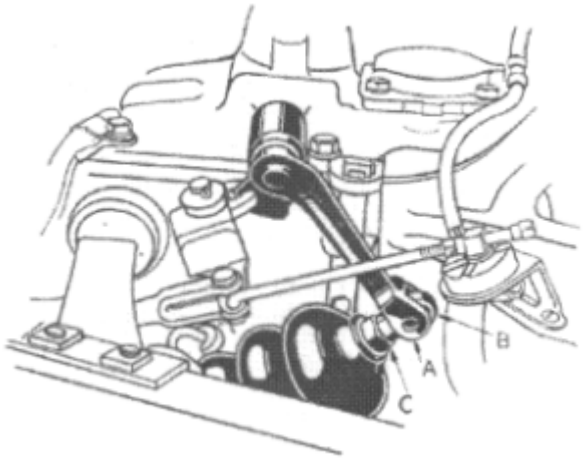


Figure 3

Cross Shift Control Mechanism

The transmission should be shifted to all gear positions and the contact between the cross shift bell-crank and the lobe

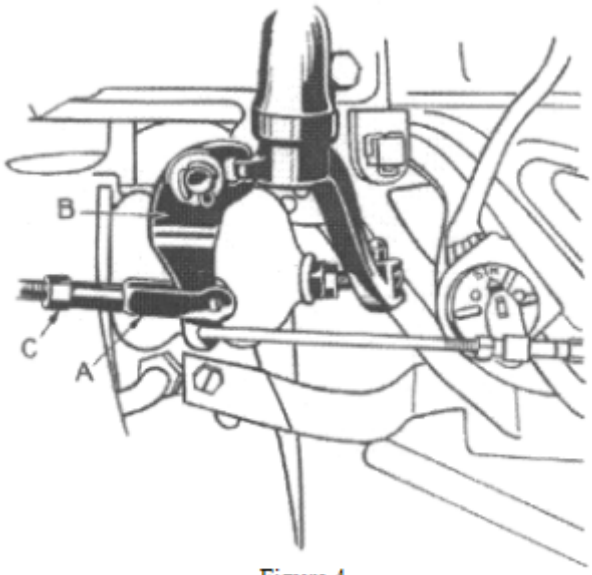


Figure 4

on the power cylinder shifting lever checked to see that there is no binding due to contact at points other than the ends of the bell-crank fork (B) (Figure 4).

The movement of the lower shifting lever should also be checked to see that the fulcrum dowel screw does not bind in the groove in the lever hall. Early 1936 production used a dowel screw (35442) which was 23/32" long under the head and a 1/16" plain washer in addition to the lock. Later production used a screw (151787) which is 21/32" long. and the plain washer is omitted. If no plain washer is in the assembly, be sure the screw is only 21/32" long.

Cross Shift Mechanism Adjustment

With the transmission in high or second gear, remove the clevis pin from the diaphragm cylinder rod yoke (A) (Figure 4), The spring in the cylinder should hold the yoke farther forward than the position in which the clevis is pin can be inserted.

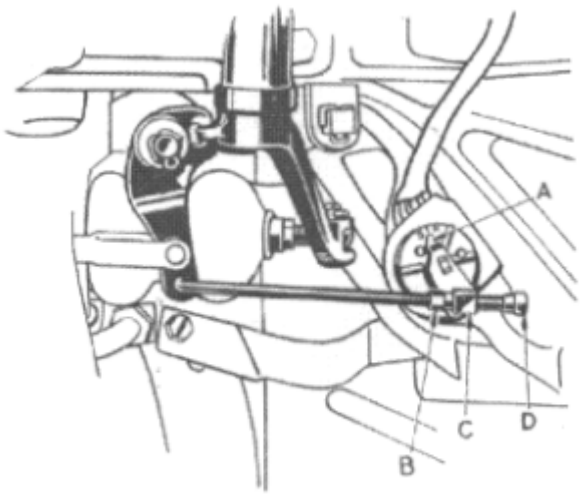


Figure 5

When loosening or tightening the nut (C) on the diaphragm cylinder rod, be sure the yoke is in place on the bell-crank so that the diaphragm is note twisted and distorted.

Interlock Switch

After the transmission is shifted from low to high or second gear, the pointer (A) (Figure 5) on the interlock switch lever should come to rest in line with the mark between the letters S and H on the switch cover. To adjust loosen the jam nut (D) on the front end of the interlock switch rod and turn the adjusting sleeve (B) then retighten the jam nut

When the rod length is correct. the circuit will change in the interlock switch at the same distance from the end of cross shift travel in both directions. This can be tested by using the lower harness test lamps.

To test, connect the test lamps to the three wires at the power unit junction block and ground the fourth lamp lead. (See Figure 6 for connection of test lamps.) Put, the selector lever in low gear and move the manual shifting lever to the left and note the amount of travel before the YB lamp lights.

Now put the selector lever in high gear. pull the manual shifting lever to the left and move back to the right slowly and note where the YB lamp lights. The amount of travel of the manual lever to complete the cross shift: after the lamp has lighted should be the same in both tests.

(Continued on page 23)

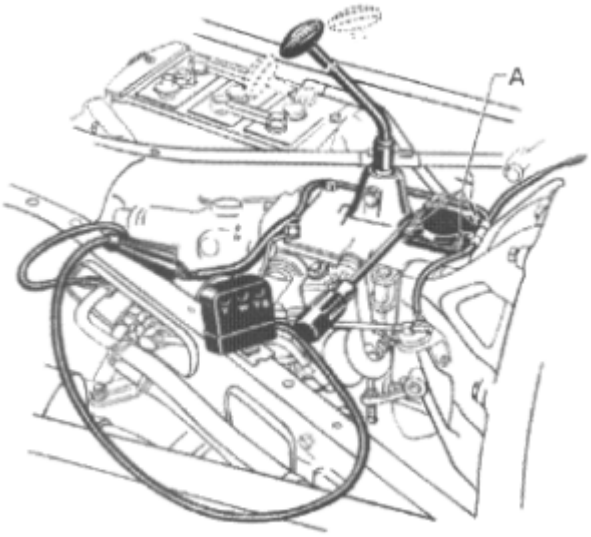


Figure 6

Main Contact Plate

With the lower harness test lamps connected as before, put the selector lever in neutral. Move the manual shifting lever forward toward second until the YB lamps light. then backward toward high until the Y lamp lights. The movement from neutral should be the same before either lamp lights,

To equalize the movement loosen the contact plate screws (A) and slide the plate forward to shorten the movement required to light the YB lamp and backward to shorten the movement required to light the Y lamp.

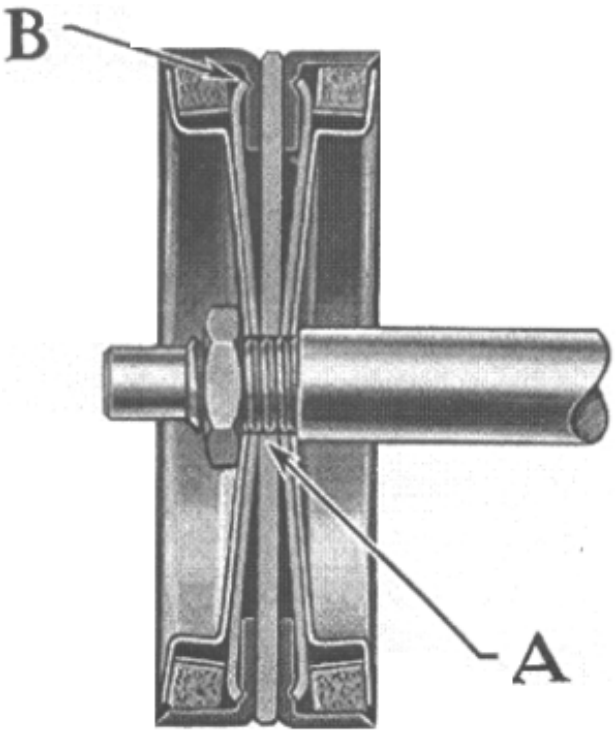
Transmission Shifting Rail Lock

The locks on both shifting rails will definitely present the transmission from jumping out of gear if they are in the locked position when the shift is complete d and the clutch is engaged. If the locks are improperly adjusted or the shift. is not complete. the locks cannot perform their normal function and damage to the gear teeth will result. As a final cheek of your mechanical adjustment, shift the transmission into each gear and engage the clutch and see that the lock bars are both down in the locked position. If the locks are not down. first check the lock adjustment. then the power cylinder piston rod length. then the point of breaking contact in the clutch circuit breaker.

The electrical tests of the electric hand covered in The Electric Hand - Transmission Control (page 2) and the Electric Hand - Mechanical Adjustments (page 9) also apply to the 1936 Electric Hand.

Electric Hand Pistons

The testing of the piston seal in the Electric Hand Power Cylinder is very simple and no cylinder should be disassembled until a test has been made.



After disconnecting the vacuum lines at the front and rear of the power cylinder, the piston should move freely throughout its limit of travel. When a finger is placed over either the front or rear fitting the piston should be locked in position.

If the piston moves forward but not backward when either the front or rear fitting is covered, the forward leather packing is not seating properly; if it moves backward, the rear leather packing is not seating.

If the piston is locked in position when the rear fitting is covered and moves in both directions when the front fitting is covered, a leak exists either between the cylinder and the end plate or between the end plate and the piston rod.

Leather packing rings which do not seal, if not damaged, can be reconditioned by soaking them in Hudson Shock Absorber Fluid and working with the fingers to make them pliable; however, it is recommended that such packings be replaced with new ones.

Recently a new process of treating the leather has been put into use which makes them more pliable and maintains the original condition over a longer period. The insertion of Hudson Shock Absorber Fluid into the power cylinder every 15,000 miles is still recommended with the new packings.

The piston felts have had a staple added to hold the ends together. This gives contact with the entire circumference of the leather, so that oil is fed to it uniformly to further help in maintaining its pliable condition.

When reassembling the piston, put a light coating of shellac on both sides of the center plate at "A" to insure a seal around the shaft.

The piston plates should be installed with the edge of the flange against the leather packing, as shown at "B" so that the leathers are held securely in place.

Care should be taken to get the leathers concentric with each other and the center plate. This can best be done by drawing up the rod nut finger tight and inserting the piston in the cylinder and working it back and forth, The nut should then be tightened and secured with a prick punch.

Leather packing: and felts taken from stock should be allowed to soak in Hudson Shock Absorber Fluid before they are installed and an ounce of fluid should be inserted in the cylinder after it is assembled.

The seal of the diaphragm cylinder can be checked only after the cylinder has been removed from the selector valve housing. The test is made by pushing the rod in and placing the finger over the opening in the rear of the cylinder. If the rod is held in until the finger is removed the seal is O. K.

When checking for leaks in the diaphragm be sure the gasket under the diaphragm cylinder mounting nut is good and, the nut tight. Also check to see that the gasket between the mounting bracket and selector valve housing is in good condition and the four bolts are tightened securely. Leakage at any of these points will cause failure of the cross shift, so that a check particularly to see that the bolts are tight should be made before disassembling the unit.

Electric Hand Harness

The value of a voltmeter for testing electrical circuit losses was very dearly brought out in testing an Electric Hand which had become sluggish in its operation and occasionally failed to complete a shift. The unit had been checked and found to be in good order and the alignment and mechanical adjustments were correct. The electrical circuits were tested with the test lamps and appeared to be good.

When the unit failed to shift it was noticed that the shift would be completed if the accelerator pedal was depressed to open the throttle while the clutch pedal was held in the disengaged position. Since opening the throttle reduces the vacuum and also the power available to make the shift it was concluded that the trouble could not be mechanical, so the electrical system was rechecked.

By using an accurate voltmeter it was found that there was only 3.95 volts available at the terminals of the power unit. The voltmeter was then moved to the bullet terminal and the voltage reading was unchanged. When the voltmeter was connected from the wire just back of the bullet terminal the reading was five volts. This definitely proved a poor electrical connection between the terminal and the wire. To correct this condition the lower harness was removed and all terminals dipped in solder to make a good electrical bond. When the harness was reinstalled the voltage at the various power unit

(Continued on Page 25)

terminals was from 5.0 to 5.5 volts and the operation of the unit was entirely satisfactory.

There are a number of these bullet type terminals used in the Electric Hand circuit as well as other wiring circuits and if any show poor electrical connections or are even suspected, they should be solder-dipped before any further tests or repairs are made.

Test lamps are not accurate enough to locate a small loss of voltage as they will light on less than half their rated voltage. The only method of detecting such losses is by an accurate volt meter.

After this trouble was located the failure to operate on full vacuum (closed throttle) with operation occurring on low vacuum (open throttle) was explained as follows:

The selector valves, being of the poppet type, are held against their seat in the upward position by the intake manifold vacuum as well as the spring. With only 3.95 volts at the solenoid, the magnetic pull on the valve was not enough to move it until the vacuum was decreased by opening the throttle.

This is only one of many conditions which every service man may encounter in any part of an auto-mobile electrical system. When such cases arise an accurate voltmeter and experience in its use will be an ace in the hole.

1936-1937 - Improved Type

Optional Equipment On:

Hudson Custom Six, Model 63 (1936) After No. 638319 - See Note.
Hudson Deluxe Eight, Model 64 (1936) After No. 644398 - See Note.
Hudson Custom Eight, Model 65 (1936) After No. 652078 - See Note.
Hudson Deluxe Eight, Model 66 (1936) After No. 663201.
Hudson Custom Eight, Model 67 (1936) After No. 674296.
Terraplane Deluxe, Model 61 (1936) After No. 6151381 - See Note.
Terraplane Custom, Model 62 (1936) After No. 6213759 - See Note.
Hudson Six, Model 73 (1937) - All Cars.
Hudson Eight, Custom & Deluxe Models 74, 75, 76, 77 (1937) All Cars.
Terraplane, Models 70, 71, 72 (1937) All Cars.

NOTE: - Serial numbers for 1936 models apply with the following exceptions: (63) 638351 to 638470 inc., (64) 644439 to 644464 inc., (65) 652159 to 652160 inc., (61) 6151401 to 6151779 inc., (62) 6213901 to 6213963 inc.

DESCRIPTION: - Same as type used on previous models except for the following changes:

Selector Switch - Special high gear lock-out switch or solenoid gear ground strap added for Automatic Clutch control (see separate article for Automatic Clutch data). Extra wire (yellow) added in Selector switch harness and extra terminal (Y) provided on jack for this circuit. On cars without Automatic Clutch, extra wire not provided in lower harness and standard 8-wire harness used. This line and lock-out switch do not enter into Electric Hand operation.

Contact Plate Assembly - Discontinued. New `Neutral Switch' mounted in end of power cylinder used to return piston to neutral position (see Power Cylinder) . High Gear Ground Switch and Governor Switch on transmission case are part of Automatic Clutch Control and do not enter into Electric Hand operation (see article on Automatic Clutch),

Diaphragm Cylinder - Same as previous model but larger.
Power Cylinder - Same design as previous model except for larger size and new Neutral Switch located on rear end plate.

Neutral Switch - Consists of stationary central contact and two movable contact arms each connected to one of the power cylinder solenoid valves. Neutral switch operating lever in cylinder is linked to contact arms so that both sets of contacts are open when piston centralized in cylinder (transmission neutral position). Movement of piston in either direction from center allows one set of contacts to close and, whenever center contact is live (as will be the case with Selector Switch and Transmission in neutral) solenoid valve will be opened and vacuum connection completed to one end of cylinder so that piston will be drawn back toward center. At center neutral position, circuit will be broken by operating lever.

ADJUSTMENT: - Mechanical adjustments for Clutch Pedal Circuit Breaker, Trans-mission Shifter Rail Locks, Power Unit Mounting, and Diaphragm Cylinder same as for previous model (see 1936 article - disregard Contact Plate instructions). Power Cylinder Piston Rod adjustment is new.

Power Cylinder Piston Rod Adjustment - Run engine, hold clutch pedal de-pressed. See that all wiring in place and Selector Switch Cut-out Switch 'on'. Remove clevis from piston rod, loosen locknut, adjust piston rod length so that clevis pin can just be inserted with Selector Switch and Transmission in neutral. For more exact setting, use Lower Harness Test Set. Disconnect wires on terminals on solenoid valve cover, attach Lower Harness Test Set (YB clip to BL wire, W clip to W wire, Y clip to B wire, ground clip to chassis). Place Selector Switch in neutral, depress clutch, turn on ignition but do not start engine (engine must not be running for this test). Use manual shift lever, shift trans-mission toward high gear until `Y' lamp lights, then toward second until 'YB' lamp lights. Movement in each direction must be equal and lamps should not be lighted in neutral position. Adjust by lengthening piston rod (Lamp YB will light sooner) or shortening rod (Lamp Y will light sooner).

TESTING: - All tests made in same manner as on previous model. Terminal markings and wire colors have been changed in some cases so that some test instructions are new as given below.

Selector Switch and Upper Wiring Harness: - Use Master Selector Switch plugged in at jack at lower end of steering column (adapter required for new 9 prong jack if old type 8 prong Selector Switch jack used). Make tests in same manner as previously (see 1936 data). To check switch circuits, disconnect jack at lower end of steering column, test by touching test lamp prods to prongs on upper half of jack as follows (test lamp should light in each case) :

Selector Switch Position	Current Supply	Test Lamp Prod.
1. Neutral, High or Second	R	RG
2. Low or Reverse	R	G-W
3. Low or High	GR	BL
4. Second or Reverse	GR	B
5. Neutral	GR	BK

If lamp does not light for Test #1 or #2, check Selector Switch Cut-out Switch, red wires in harness, and contact in selector switch. If lamp lights for one test but not for the other, check wire to which lamp connected (see table) and contact in selector switch to which wire is connected. If lamp flickers as selector switch moved from one position to another in Test #2, check contact sleeve for roughness and check contact finger tension. If lamp does not light for Tests #3, 4, 5, check GR. wire and connection at selector switch. If lamp does not light for one test only, check wire to which lamp connected (see table) and connection at Selector switch. If lamp lights when test prod touched to any other terminal than ones indicated, check for play in selector shaft rotor and short circuits.

Shift Mechanism (Power Unit) :—Connect Power Unit Test Cable to Red Wire terminal on circuit breaker. Operate engine with clutch disengaged and rear wheels jacked up so that shifts may be made. Touch test prod of the test cable to points indicated (two points simultaneously in some cases) and note whether shifts made properly. Terminals on solenoid valve cover (at which tests made) are labeled as follows: #1 (front) EL, #2 W, #3 E, #4 EKE, (rear - junction only, not used in making this test) .

1. Test Prod on BL - Transmission should shift into High Gear.
2. Test Prod on B - Transmission should shift into Second Gear.
3. Test Prod on W - With transmission in neutral, cross-shift or left-right movement of lever should be made.
4. Test Prod on W & BL - Transmission should shift into Lower Gear.
5. Test Prod on W & B - Transmission should shift into Reverse Gear. If any shifts not made, check valve solenoid by connecting accurate ammeter between terminal and circuit breaker lead (merely touch ammeter lead to terminal to avoid damage if solenoid dead short circuited). Current draw should be 2.5 amperes. Larger current indicates solenoid short-circuited, smaller draw open-circuits. If

(Continued on Page 27)

current draw satisfactory, examine valve to see that it is free and not sticking, check for vacuum leaks in valves, lines, or shift units. Check units for mechanical drag by disconnecting shift cylinder and diaphragm cylinder rods. If units do not operate when disconnected, Power Unit (Shift Cylinder, Diaphragm Cylinder, Selector Valve assembly) must be rebuilt or replaced.

Switches & Lower Wiring Harness: - Disconnect all wires (except those on BK terminal) on solenoid valve cover, connect these wires to clips on Lower Harness Test Set (YB clip to BL wire, W clip to W wire, Y clip to B wire, ground clip to chassis). Make tests by manipulating Selector Switch (Selector switch must be OK) and shift lever and noting if correct test lamps light. Turn on ignition, hold clutch disengaged, see that Selector switch Cut-out switch 'on'.

1. Place selector switch in neutral. Shift transmission to neutral manually. Lamp YB should light when shift lever moved short distance toward second gear, lamp Y when shift lever moved equal distance toward high gear (see Power Cylinder Piston Rod Adjustment above).

2. Place transmission shift lever in neutral. Move selector switch to low gear. Lamp W only should light.

3. Place transmission shift lever in neutral. Move selector switch to second gear, Lamp Y should light. Move selector switch to high. Lamp YB should light.

4. With selector switch in each gear position in turn, complete shift by moving transmission shift lever to same gear position. Lamps should light (and remain lighted until clutch pedal released) as follows: High Gear - YB. Second Gear - Y. Low & Reverse - W and when cross-shift completed, YB for low or Y for reverse.

5. With transmission in high or low gear, move selector switch to neutral.

Lamp Y should light. With transmission in second move selector switch to neutral. Lamp YE should light.

If lamps do not light as indicated, or if additional lamps light, check or replace lower wiring harness and Interlock switch.

Lower Wiring Harness - Disconnect jack at lower end of steering column. Use test prod connected to hot lead to supply current to terminal designated on lower half of jack, ground one test lamp lead.

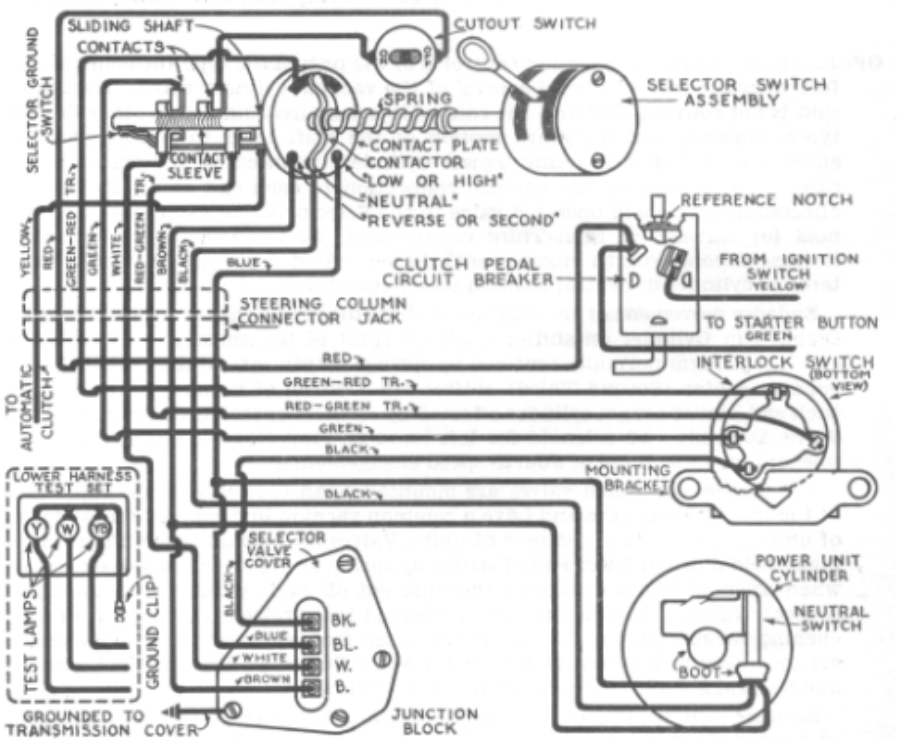
Test lamp should light when other lead touched to designated terminal on Interlock Switch, Solenoid Valve Cover terminals, or Circuit Breaker.

Hot Prod on Jack	Lamp Connected to:
R	R on Clutch Circuit Breaker.
BK	BY Interlock Sw. & BK Solenoid Valve.
G	G on Interlock Switch.
RG	RG on Interlock Switch.
W	W on Solenoid Valve Cover.
GR	GR on Interlock Switch.
B	B on Solenoid Valve Cover.
EL	BL on Solenoid Valve Cover.

TROUBLE SHOOTING: - Same as for previous model (see 1936 Section). Yellow wire, and Yellow wire with Black tracer are no longer used and need not be checked. If transmission is slow in making any shift involving a cross-shift, check the Black wire (was Black wire with Yellow tracer).

REMOVAL & INSTALLATION: - Same as for previous model (see 1936 article) with exception of Neutral Switch in Power Cylinder which is new.

Neutral Switch - Remove two screws in neutral switch cover and withdraw the switch before taking off power cylinder end plate. After end plate has been removed, take out two screws in neutral switch operating bracket and remove operating mechanism. When re-installing Neutral Switch, see that gasket is in good condition, and that the operating lever is between the two bakelite arms on which the movable contacts of the switch are mounted.



SELECTIVE AUTOMATIC SHIFT

1938 Hudson Models

In our continued effort to improve the selective automatic shift, we have made a careful study of the shortcomings of previous units and how they could be overcome.

The matter of adjustments was given extensive consideration and as a result many of these have been eliminated, while others have been simplified, making them less critical to adjust.

A need was found for an indicating device that would inform the operator whether or not a shift was completed before he engaged his clutch. A simple device of this nature has been added which gives the operator the impression of "feeling" the gears engaging or not engaging as the shift takes place.

The automatic clutch control used with the new selective automatic shift is entirely new in principle, control and construction.

These improvements can he divided into six general headings as follows:

TOOTH ABUTMENT INDICATOR
SELF CONTAINED INTERLOCK SWITCH
SELF ADJUSTING CIRCUIT BREAKER
BALANCED VACUUM POWER CYLINDER
CLUTCH COMPENSATOR
THROTTLE OPERATED ACCELERATOR SWITCH

Abutment Indicator

This is a simple and positive mechanism for the indication to the operator whether or not the transmission shift has been completed into low or reverse gear before the clutch is engaged.

Interlock switch

A new interlock switch of the breaker contact type is mounted in the cross shift diaphragms housing and operates directly from the cross shift diaphragm rod. No adjustments are necessary for this switch.

Circuit Breaker

The new circuit breaker switch is mounted on the transmission case in such a manner as to make it self-adjusting to compensate for any clutch wear or linkage age changes. No adjustments are required for this switch.

Power Cylinder

A new power cylinder and control valve unit for the automatic clutch, is used. It is of a new design based on the balanced vacuum principle which is used in power brake cylinders.

Clutch Compensator

A clutch compensating mechanism is incorporated, which changes the cushion point to give a faster engagement for a cold oily clutch disc, and a slower engagement after the first engagement in high gear has taken place.

Accelerator Switch

An accelerator switch controls the new :automatic clutch. It operates from the throttle linkage and controls all circuits to the automatic clutch solenoid valve. It provides positive clutch engagement for rapid acceleration in any gear selected.

ABUTMENT INDICATOR

Components

The abutment indicator is composed of two new units in the selector assembly, a shift rail switch for electrical control, and a change in the length and shape of the inner end of' the selector switch shaft "C," Fig. 1.

A rigidly mounted solenoid "A" is assembled in the end of the selector switch housing and a detent rotor assembly "H" rotates and slides freely on the end of the selector switch shaft "C."

The solenoid is controlled from the "hot" or feed end of the winding by the cross shift contact "K" in the selector. The ground circuit is controlled by a shift rail switch "H"' mounted on the clutch housing directly over the front end of the low-reverse shift rail "J." Two notches are cut in the shift rail and located so that the operating ball "I" will drop into the notches and allow the switch contacts to open when a shift into low or reverse gear is three-quarters completed.

Operation

With the transmission in neutral, move the finger tip control to the left through the neutral slot. The solenoid "A" becomes energized when the cross shift contact "K" closes and a circuit is completed through solenoid "A" to ground by means of the shift rail switch "H"" which is closed with the transmission in neutral.

The detent rotor "B," guided by the spring loaded plungers "G" sliding along the flat sides of the shaft "C," is drawn against the solenoid "A"" with the two detent pins "D" engaging slots "F" in the face of the solenoid. This magnetically operated clutch action prevents the detent rotor "B" from turning while the solenoid "A" is energized.

If the finger tip control is moved into low or reverse verse position with rotor "B" rigidly held by the solenoid. the rotation of the flat portion of selector shaft "C" within the rotor will spread the plungers "G" against the spring "E." which passes over their outer ends.

Gear Abutment

If a gear abutment has taken place in the transmission, the shift rail "J" has not moved far enough from its neutral position to allow the ball "I" to drop and release the plunger of switch "H." This causes the solenoid "A" to remain energized and hold rotor "B" rigidly. Spring "E" then reacts back through the rotor plungers "C" causing a torque in shaft "C." This tendency to rotate can be felt through the finger tip control and if released, the control will snap to its neutral position.

Completed Shift

If. however, the shift is three-quarters completed in the transmission, the ball "I" will drop into the shift rail slots, allowing the shift rail switch "H" to open the ground circuit to solenoid "A" aaid the detent rotor "B" will he released. When released from the solenoid "A," the detent rotor will rotate to take its normal position on the shaft "C" where the plungers "G" will rest flat on the sides of the shaft and rotor "B" will then turn freely with the selector shaft.

(Continued on page 30)

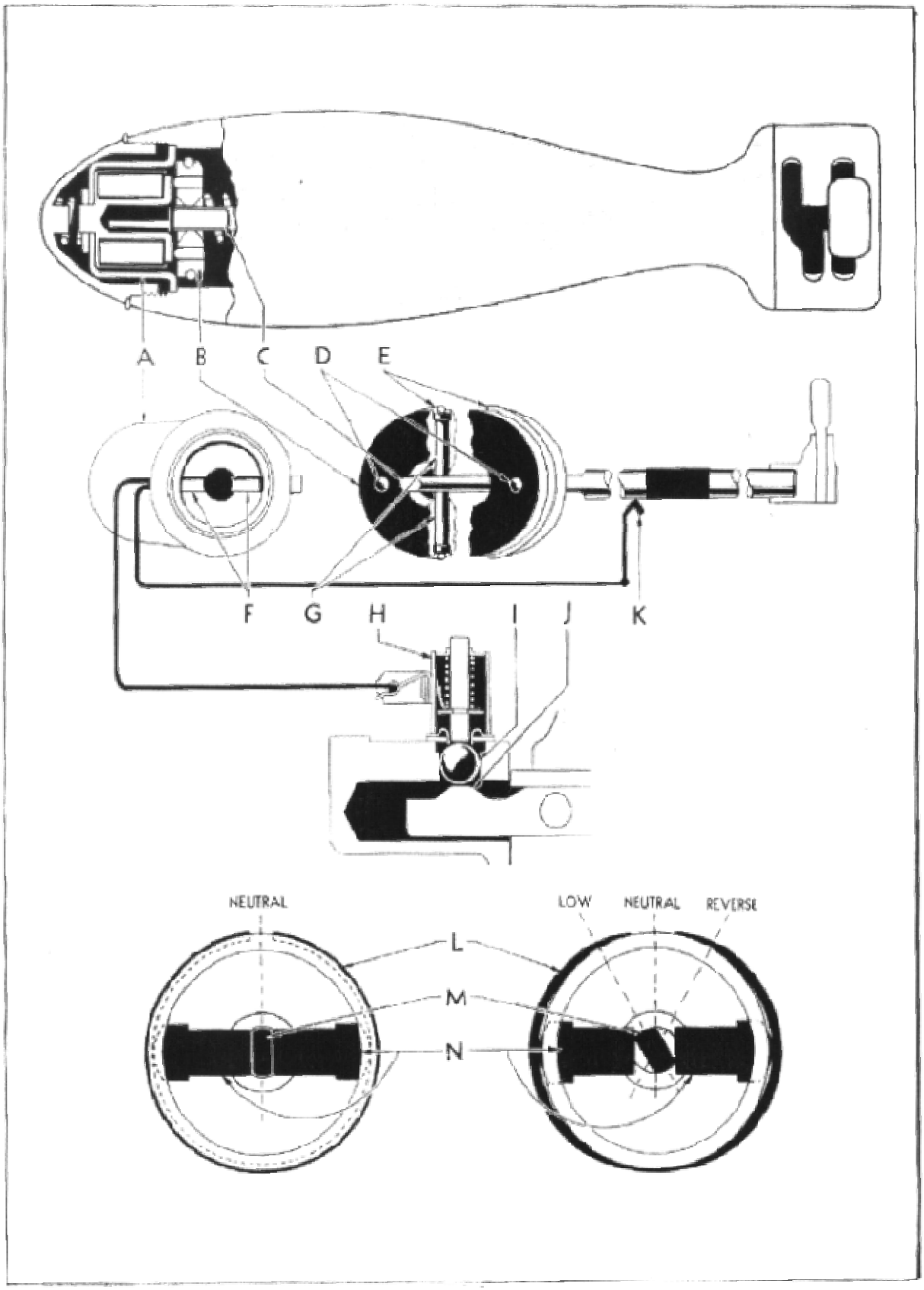


Fig. 1

This arrangement allows the operator to engage and disengage the clutch to change gear position when he feels opposition to a shift into low or reverse gear just as he would when using a manual shift.

Rotor Action

The turning effect of the spring loaded plungers on the flat sides of the selector haft will he more clearly understood after a study of the two lower diagrams in Fig. 1. The lower left diagram shows the plungers "N" resting against the flat sides of shaft "M" in a neutral selector position. The lower right diagram shows shaft "M" forcing the plungers "N" outward against the restraining spring "L" increasing its tension, If, from this position, shaft "M" is released, it will he snapped to a neutral position. while if the complete rotor assembly is released with the shaft held rigidly, the rotor will turn in a counterclockwise direction to the new position of the shaft.

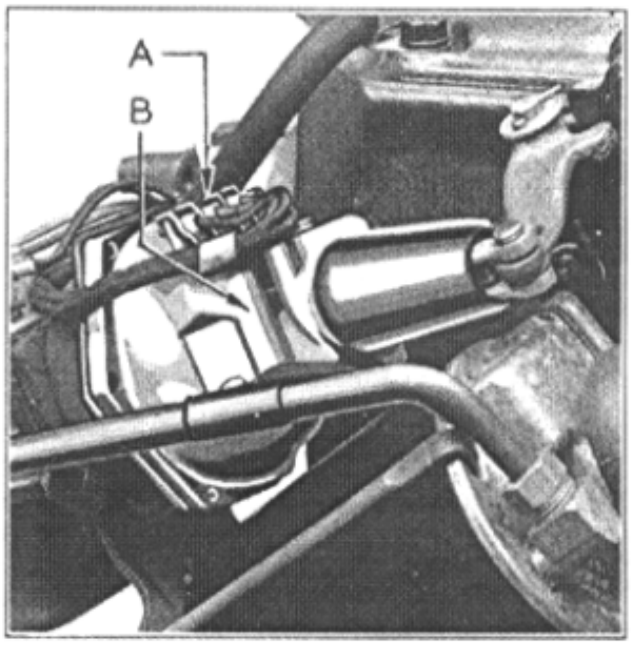


FIG. 2

Interlock Switch

The new interlock switch "A." Fig. 2, is of the breaker contact type and is mounted in a new die east housing "B," cast integral with the cross shift diaphragm cover. The switch is composed of two sets of contact fingers "C," Fig. 3. page 31, similar to those used in the I937 neutral switch. These. two sets of swift h fingers are operated into proper sequence by a rotating camshaft "E" which has two cams cut near its end. This camshaft is rotated by an arm "F" connected to a floating sleeve "B" on the diaphragm rod by a link "H." The two stops "G" limit the forward travel of the sleeve, while the rod flange at the diaphragm limits the rearward travel.

Operation

When assembled in the die cast housing, the spring "J" acts against the bakelite washer "K" providing sufficient friction to hold the switch points open while the lost motion is being taken up between the stop "G" and the rod and floating sleeve "B." This delayed action is necessary for proper timing of the switch contacts.

This method of switch operation eliminate all need of adjustment.

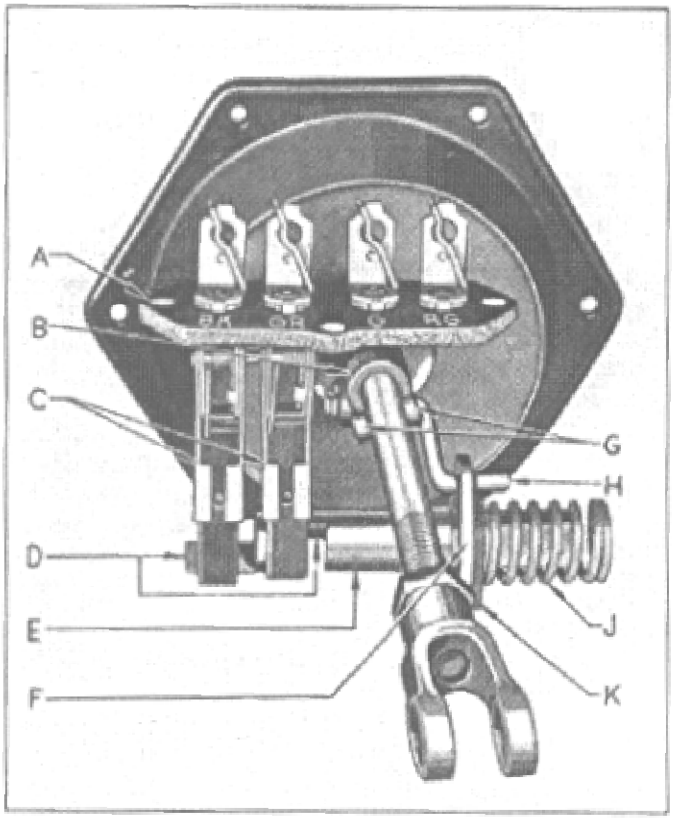


FIG. 3

All wiring under the terminal plate "A" is of the flat bus-bar type.

Clutch Circuit Breaker

The clutch circuit breaker switch "E," Fig. 4, is mounted on two bosses located on the left side of the transmission case in such a way that a fork "H" in the lower end of the lengthened clutch shaft operating lever "K" engages the switch plunger "F" for positive operation. This lengthened clutch shaft lever is used on all cars to facilitate field installations of the Selective Automatic Shift.

Operation

The switch is held in position by two coil springs "D" pressing against the switch mounting plate "C." These springs are secured by two cap screws "A." switch is free to move up and down within limits of the two slots "B" when a positive pressure is applied to the top or bottom of the recess "G" cut in the switch mounting plate. This operating force is supplied by a projection "J" on the lower end of clutch shaft operating lever "K" engaging the recess and pulling the switch downward as the engagement point of the clutch changes. This compensation for clutch wear maintains a fixed relationship between the clutch engagement point and the clutch circuit breaker contact. point.

(Continued on Page 31)

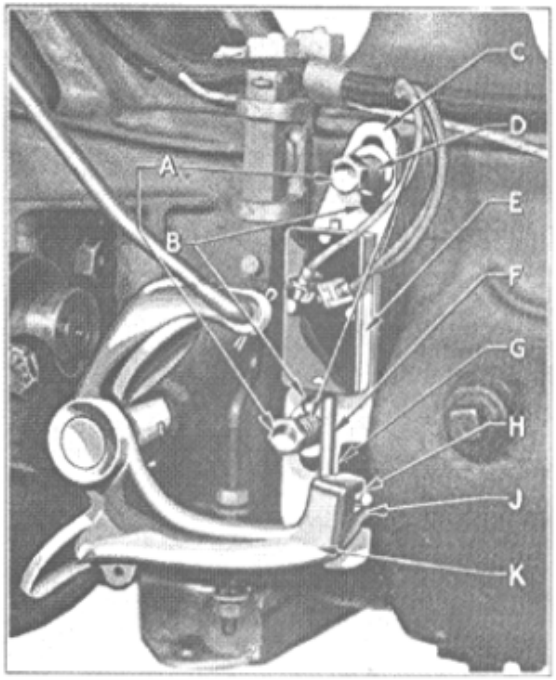


FIG. 4

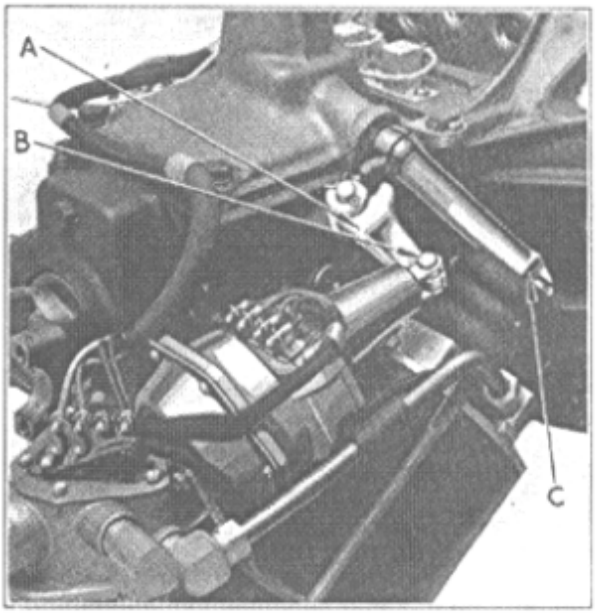


FIG. 5

Electric Hand Adjustments

All adjustments, but two, have. been eliminated from the electric hand. These are the adjustments of the power cylinder piston rod "C," Fig. 5, which does not change from previous models, and the adjustment of the cross shift diaphragm rod.

Cross Shift Rod Adjustment

This adjustment is made by lengthening the clevis at `B," Fig. 5, until only 1/16 inch of light can be seen through the clevis pin hole with clevis is slipped over bell crank "A." This will require 3/16 inch compression on the piston rod before clevis pin "B" will go into place.

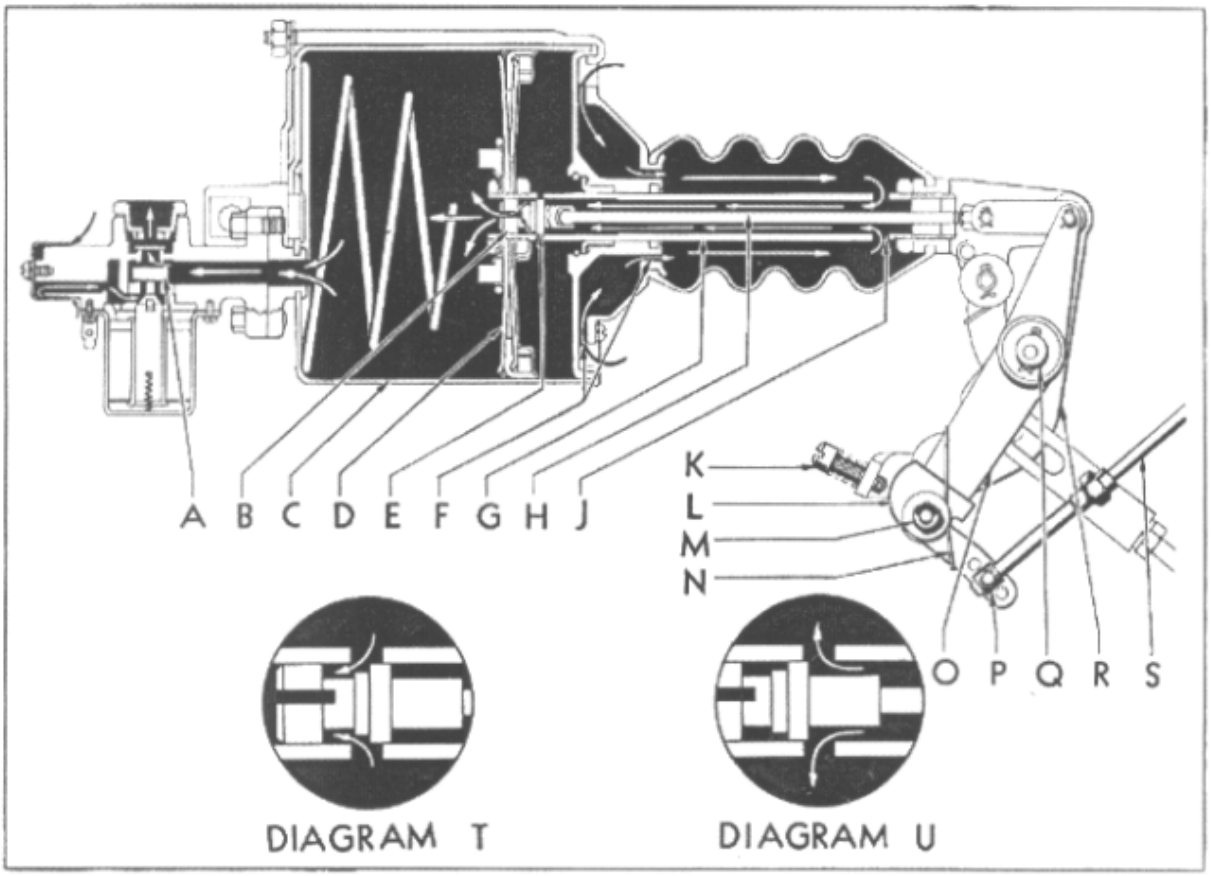


Fig. 6

(Continued on Page 32)

Automatic Clutch Control

The automatic clutch is entirely new in design, operation and control. The power cylinder is of the balanced vacuum type and is controlled by an internal piston valve. The electrical control has been changed slightly to accommodate the operating characteristics of the new valve arrangement.

Operation

When the ignition switch is turned on, the solenoid valve "A," Fig. 6 opens connecting the forward end of the cylinder "C" to the manifold through a vacuum pipe. When the engine starts. a vacuum is created in the forward end of the cylinder "C" and the piston "D" moves forward to disengage the clutch. To permit this, the vacuum has drawn the valve "B" forward allowing air to enter the air filter and passages "F," piston rod ports "J," back along the valve rod "H" to the valve "B" and out into the rear end of the cylinder through the valve ports "E" in the hollow piston rod. Diagram "U" shows the valve moved forward opening the ports to the atmosphere.

Clutch Engagement

To engage the clutch. accelerator movement is transmitted to the valve lever cam "L." at the lower end of the valve lever "U" through the threaded sleeve rod "S" acting against the guide block "P." The valve lever "O" is pivoted at "Q" to the bell crank "R" about 2/3 of the way up from its bottom end and as the lower end of' the valve lever "O" moves forward, the top end moves rearward and the attached valve rod "H" moves rearward. This moves the valve "B" rearward and opens the ports "E" to connect the front and rear ends of the cylinder. Diagram "T" shows the valve moved rearward opening the ports to vacuum. Air is drawn from the rear side of the piston and as the vacuum on each side begins to equalize, the clutch will pull the piston "D" rearward. As the piston rod "G" moves rear-ward it overtakes the valve "B" and the ports "E" are closed off thus checking the piston movement. This follow up action is continuous and takes place during the entire engaging cycle.

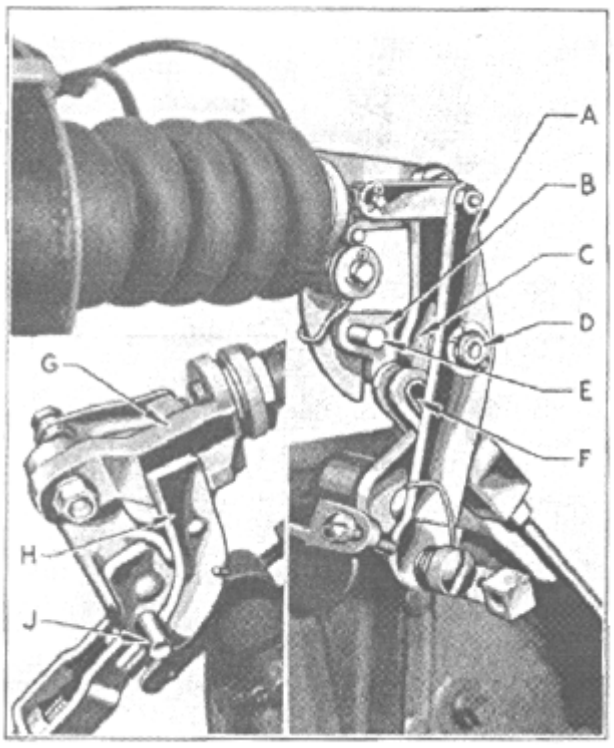


FIG. 7

Valve Action

In order to obtain quick travel to the cushion point, the valve lever "O" is allowed to move rapidly with the accelerator travel until the valve lever cam "L" comes against the end of the cushion point stop screw "K." At this point all lost motion in the throttle linkage should he taken up and the throttle beginning to open. Also at this point the valve lever cam "L" stops in its forward travel and starts rotating about its pivot "M" on the valve lever "O" against against the tension of the spring "N." This cam action causes the lower end of the valve lever "O" to move forward slowly during engagement period antl still allows the accelerator to push the threaded sleeve rod "S" and the guide block "P" downward at the same rate of travel as before.

Compensator

In order compensate for reduced friction during the initial clutch engagements, while the clutch fluid is heavy and the corks are well saturated the relationship is changed between the valve lever pivot "D," Fig. 7, on bell crank "C" and the valve lever "A."

Eccentric Pivot

This pivot is eccentric and is controlled by the two pins on the compensator lever "B." When the clutch is manually disengaged to start the engine, the operating rod yoke "F" strikes the outer pin "E" and swings the lever "B" and the eccentric pivot "D" forward, throwing the top end of the valve lever "A" forward and a harsher engagement is secured.

With the first clutch engagement in high gear, the trip arm "H" mounted on the piston rod end "G" strikes the inner pin "J" and rotates the eccentric pivot "D" back to its normal driving condition.

Accelerator Switch Control

When the throttle is opened rapidly to a wide position for acceleration in any gear, it is desirable to have a quick and positive clutch engagement. To accomplish this it is necessary for the solenoid valve to release, closing off vacuum and opening the forward end of the power cylinder to the atmosphere.

Circuits Controlled

This is done by a throttle operated accelerator switch (see Fig. 8). This switch has two sets of contacts and controls three circuits. The first set of contacts opens the circuit from the "RW" terminal of the switch to the governor switch from 5 to

(Continued on Page 33)

10 degrees of switch lever travel. This releases the solenoid

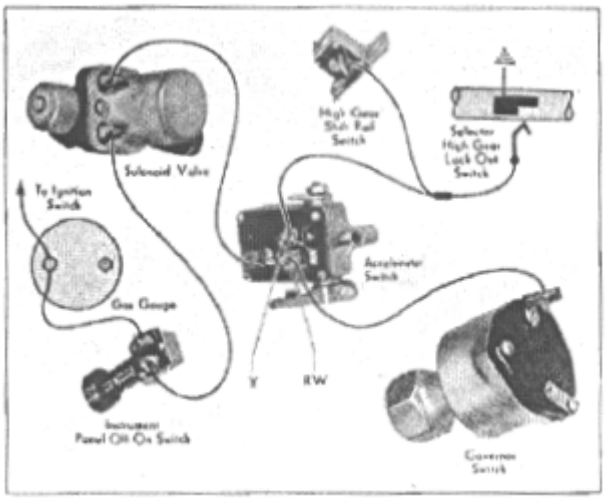


FIG. 8

valve in high gear. A second set of contacts opens the circuit from the "Y" terminal of the switch to the high gear shift rail switch and to the selector switch high gear lock out contact. This releases the solenoid valve in reverse, first, and second gears with a switch lever movement of from 60 to 75 degrees.

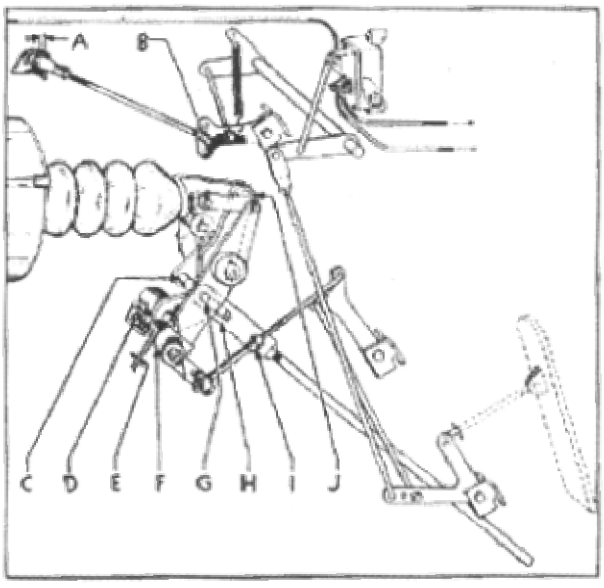


FIG. 9

Mechanical Adjustments

The following simple adjustments are necessary for satisfactory operation of the automatic clutch.

Operating Rod Yoke

Adjust yoke "H"" to establish a 1/8 inch dimension between the clevis pin "G" and the front end of the slot in yoke "H."

Throttle Adjustment

Adjust the lost motion in the throttle play link us follows - (See "A" and "B," Fig. 9):

Model	Location of "B"'	Dimension "A"
81	Bottom Hole	0
82-83	Top Hole	1/8
84-85-87	Middle Hole	1/8

Piston Travel

To adjust for maximum piston travel, have the engine running, the clutch disengaged, and the compensator pin "C" in its extreme rearward position. Screw the threaded sleeve "I" toward the dash until the piston rod 1" just readies its extreme forward position. Then screw the threaded sleeve "I" away from the dash until the piston rod "J" moves rear-ward 1/4 inch. This gives a correct adjustment.

Cushion Point

To adjust for the cushion point, have the motor running, the clutch disengaged and the compensator pin "C" at its extreme rear-ward position. Then adjust the cushion point stop screw "I)" to have a 5/32 inch gap "E" between the valve lever cam "F"' and the end of screw "D"

If, after this adjustment, the clutch engagement is slow accompanied by excessive , motor speed, turn the cushion point stop screw "D" outward; if too fast, thereby stalling engine, screw inward. Do not turn screw more than 1/2 turn at a time. If several full turns either way are required, recheck the throttle play link adjustment and cheek all throttle linkage for binding or tightness that would hold the accelerator switch lever away from its stop on the side of the switch housing.

Abutment Indicator Testing
1938 Models

Since the selector and shifting circuits of the Electric Hand are the same for I938 as they have been in previous models. they can be tested with your present Electric Hand Test Kit by adding Adapter No. J-813-5. This adapter is available through the Hinkley-Meyers Company of Jackson, Michigan. This adapter connects the 9-wire upper harness of the J-813-B Master Selector to the 10-wire lower harness of the new models. This arrangement does not provide for the testing of the abutment indicator.

Test Lamp

Prepare a test lamp as shown in Figure I. Place a Mazda No. 63 bulb or equivalent irk a standard bayonet type socket. Attach 2 wires

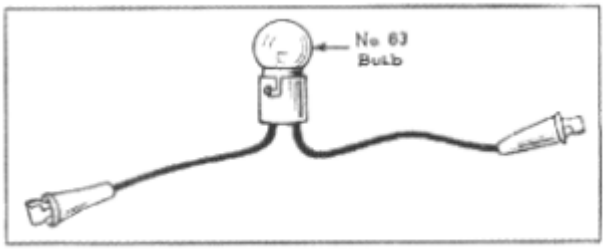


Fig. 1

about 3 feet long and tape all metal parts of socket and terminal to prevent grounding or shorting. Attach a small test clip to the grounding end of each wire. The small, narrow alligator type is preferable for test work in attaching the clip to terminals located in close places.

Circuit

The abutment indicator is very simple in its testing since it is composed of a single circuit consisting of solenoid and a switch in series. This circuit is shown in Figure 2.

Current for the solenoid is taken from the cross shift solenoid circuit at the plug jack. The cross shift circuit has a white wire (w) and a white wire (w) is also connected bark to the abutment indicator solenoid. A white with red tracer wire (WR) connects the solenoid winding with the shift rail switch through the plug jack.

Analysis

A study of the following preliminary test procedure will help to isolate an' trouble that may occur with the abutment indicator.

1 - If the standard selector (1938 car equipment) refuses to still in low or reverse gear positions after the shift has been completed in the transmission, hold finger tip control in gear position with clutch disengaged, and slide "off-on" switch to "off" position.

(a) If a click is heard in the selector, indicating that the solenoid has released the rotor, check for a short circuit in the wiring of a defective shift rail switch.

(b) If a click is not heard, replace the detect rotor assembly in the selector housing, since this indicates that the detent balls are sticking in the solenoid slots.

2 - With transmission in neutral turn on ignition and depress clutch pedal without starting the engine. Move the finger tip control

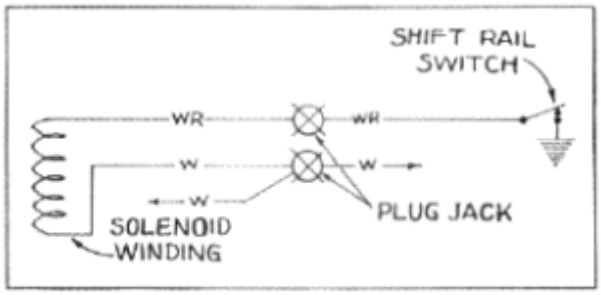


Figure 2

to low or reverse position and release.

(a) If the finger tip control will not return to neutral from either position, check for open circuit or defective shift rail switch.

(b) If it returns to neutral from one position and not the other, check for excessive friction in "H" slot, or drag or binding on selector switch shaft.

Test of Solenoid

1 - Disconnect upper harness plug jack and ground (WR) prong, see

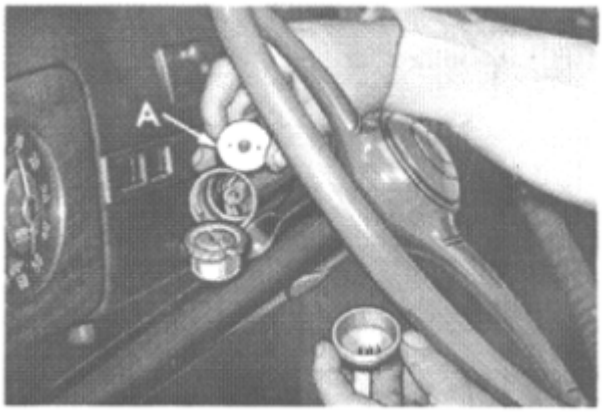


Figure 3

Figure 2. Connect one clip of test lamp (using No. 63 bulb or equivalent) to battery cable terminal and touch other clip to the (W) prong of jack. This places the No. 63 bulb in series with the abutment indicator solenoid winding and the bulb will burn with a red glow if the circuit is normal. No light indicates an open circuit and a bright light indicates a short circuit.

2 - The abutment indicator solenoid and its upper harness circuit can also be readily tested with an ohmeter. Balance the ohmeter on the 0-1000 scale or smaller and connect its leads to the (W) and (WR) prongs of the upper harness plug jack. A normal circuit should read approximately 10 ohms.

(Continued on Page 35)

Testing of Shift Rail Switch

Disconnect the (WR) wire from the low and reverse shift rail switch. Connect one clip of test lamp to the battery cable terminal and the other clip to the shift rail switch terminal. Attach the manual shift lever and shift from neutral to low and to reverse. The lamp should remain lighted 3/4 of the distance each way from neutral and then go out. If the light acts differently, replace the switch after first snaking certain that the switch operating ball between the switch plunger and the shift rail, is free to operate and is not stuck by chips or burrs in its pilot hole. This ball can be lifted from its seat by a small hose connected to the manifold vacuum.

Testing of Abutment Indicator Wiring

Shift the test light clip from the switch terminal to the (WR) wire terminal which was removed from the switch. With the finger tip control in neutral, a lighted lamp indicates a short circuit in wiring.

(a) If the light goes out when the plug jack is parted, a short in upper harness is indicated.

(b) If the lamp remains lighted when the plug jack is parted, a short in the lower harness is indicated.

Detent Rotor Replacement

1 - Remove end cap of selector housing by turning counter-clockwise.

2 - Remove solenoid retaining spring and solenoid assembly by pulling outward and rotating downward at the same time. Observe how solenoid leads are placed around solenoid

3 - The rotor can he slid outward along the selector shaft by pulling with a small bent wire or hook.

4 - Replace rotor by sliding over end of selector shaft. The face of the rotor containing two steel balls should be outward.

5 - Turn solenoid back into place, placing lug on solenoid into slot in housing. Do not pinch or damage the solenoid leads.

6 - Replace end cap after making sure that the solenoid retaining spring is in plate in the center of the cap.

Solenoid Replacement

7 - Remove end cap and solenoid as sin rotor replacement.

8 - Part the plug jack and remove the upper cover by bending back the cover lugs.

9 - Unsolder the white and white-red tracer wires.

10 - Fasten length of small iron wire (4 ft.) to unsoldered wires and pull it into steering post tube from the bottom as the solenoid leads are pulled out at the top.

11 - Fasten upper end of iron wire to wires of new solenoid and pull them into tube. The wires should be carefully straightened and laid parallel. NOTE: Splicing of solenoid leads is not recommended.

12 - Resolder wire ends to their corresponding jack lugs and replace jack cover.

13 - Place solenoid in housing anal replace retainer spring and cap.