SECTION 12

FUEL AND EXHAUST SYSTEM

SERVICE BULLETIN REFERENCE

NUMBER	DATE	SUBJECT	CHANGES

NOTES

FUEL AND EXHAUST SYSTEM

SERVICE STANDARDS

Model Designation →	1-08AD 1-08AF 1-08AS	2-26AD 2-26AF 2-26AS	2-33AD 2-33AF 2-33AS	3-59AD 3-59AF 3-59AS	6-71AD 6-71AF 6-71AS	8-65AD 8-65AF 8-65AS	8-71AD 8-71AF 8-71AS
Carburettor							
Type	Down draft	Down draft	Down draft	Down draft	Down draft	Down draft	Down draft
Distance from top edge of float chamber to top of float	$\frac{1}{4}$" * $\frac{5}{64}$"	$\frac{1}{4}$" * $\frac{5}{64}$"	$\frac{1}{4}$" * $\frac{5}{64}$"	$\frac{1}{4}$"	$\frac{1}{4}$"	$\frac{1}{4}$"	$\frac{1}{4}$"
Fuel pump							
Type	Diaphragm	Diaphragm	Diaphragm	Diaphragm	Diaphragm	Diaphragm	Diaphragm
Driven by	Camshaft	Camshaft	Camshaft	Camshaft	Camshaft	Camshaft	Camshaft
Pump pressure (pounds per square inch)	$3\frac{1}{2}$ to $4\frac{1}{2}$	$3\frac{1}{2}$ to $4\frac{1}{2}$	$3\frac{1}{2}$ to $4\frac{1}{2}$	$3\frac{1}{2}$ to $4\frac{1}{2}$	$3\frac{1}{2}$ to $4\frac{1}{2}$	$3\frac{1}{2}$ to $4\frac{1}{2}$	$3\frac{1}{2}$ to $4\frac{1}{2}$

* $\frac{5}{64}$ Carter Carburettor.

TIGHTENING REFERENCE

Part name	Torque (foot pounds)
Top cover screw	12 to 17
Fuel line nut	12 to 15
Fuel pump cap screw	12 to 17
Fuel pump inlet fitting (dry)	6 to 8
Intake manifold screw	25 to 30
Intake to exhaust manifold bolt nut	30 to 35
Manifold stud nut	15 to 20

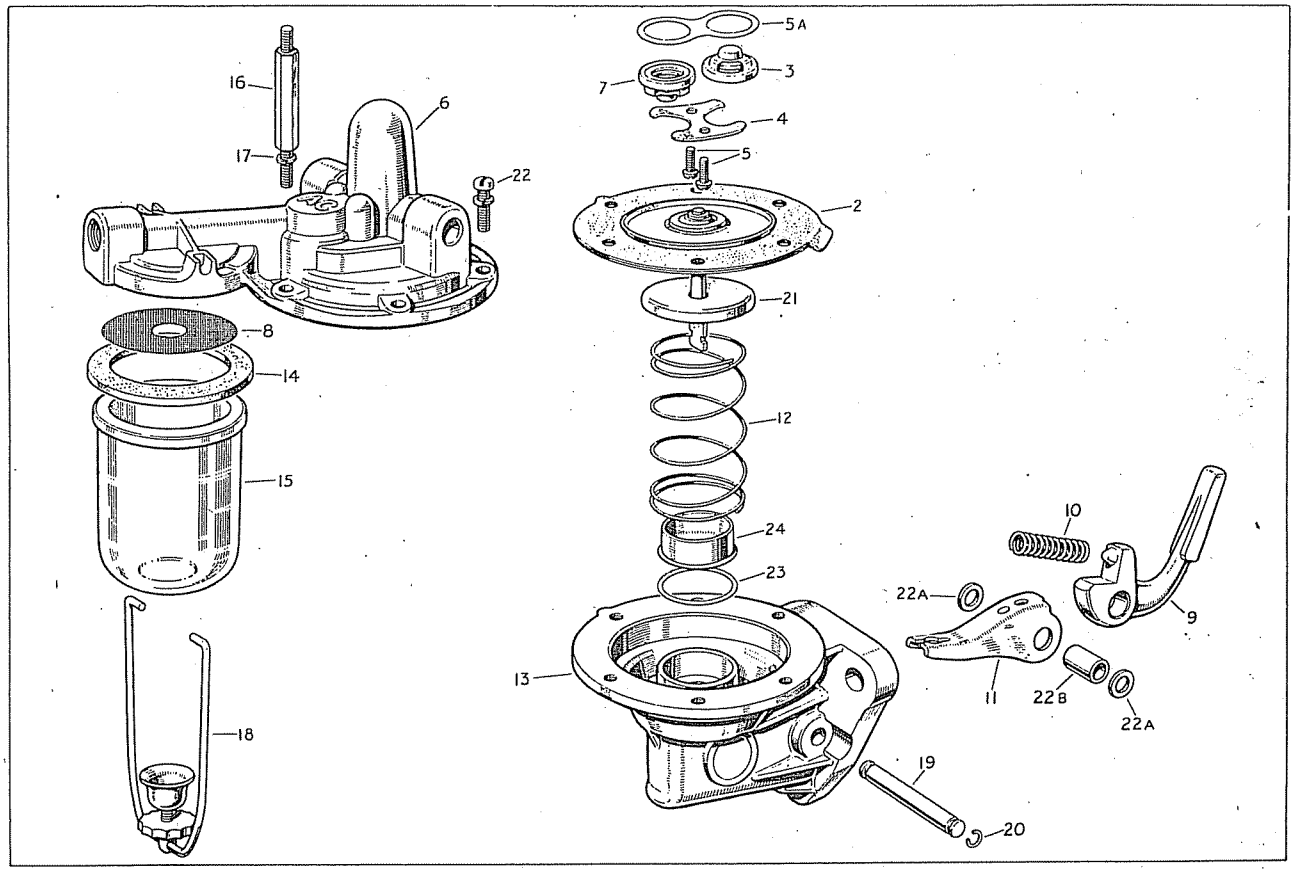


Fig. 1—Fuel Pump (disassembled).

2 — Diaphragm.
3 — Valve top cover.
4 — Valve retainer.
5 — Valve retainer screw.
5A - Valve gasket.
6 — Top cover.
7 — Valve top cover.
8 — Strainer screen.
9 — Rocker arm.
10 — Rocker arm spring.
11 — Rocker arm link.
12 — Push rod spring.
13 — Main body.
14 — Strainer bowl gasket.
15 — Strainer bowl.
16 — Heat shield stud.
17 — Heat shield stud washer.
18 — Stirrup.
19 — Rocker arm pin.
20 — Rocker arm pin clip.
21 — Push rod spring cap.
22 — Top cover screw.
22A - Rocker arm pin washer.
22B - Rocker arm pin bush.
23 — Oil seal.
24 — Oil seal retainer.

FUEL AND EXHAUST SYSTEM

FUEL PUMP—ALL MODELS EXCEPT 8-71A-D.

1. REMOVAL AND INSTALLATION OF FUEL PUMP.

(1) Remove heat shield.
(2) Remove fuel lines.
(3) Remove cap screws from pump body to cylinder block and pump from engine.

To instal, reverse the foregoing operations.

2. DISASSEMBLY AND ASSEMBLY OF FUEL PUMP (ALL MODELS).

(1) Mark the edge of cover and pump body so that they may be assembled in the same relative positions.
(2) Remove filter bowl screen and gasket.
(3) Remove top cover screws and separate the top cover from the fuel pump main body.
(4) Remove valve retaining screw, retainer valves and gasket.
(5) Remove rocker arm spring, remove diaphragm, spring cap, push rod spring, oil seal retainer and oil seal.
(6) Remove rocker arm pin, rocker arm link pins and rocker arm linkage.

To assemble and instal, reverse the foregoing operations. Make certain that the diaphragm and rocker arm springs are in proper location. Flex the diaphragm by pressure on the rocker arm when tightening cover screws.

Note: Always soak a new diaphragm in kerosene before installing. Care must be taken to prevent turning the diaphragm when tightening the pull rod nut.

Testing Fuel Pump (on truck).

If the pump fails to supply fuel properly to the carburettor, the following tests and checks should be made for locating the cause of the difficulty before removing the pump.

Fuel Lines.—Be sure the fuel lines are not blocked, leaking or have a stricture that would retard the flow of fuel to the pump, The flexible hoses should be carefully checked for deterioration or cracks.

Filter Bowl.—The filter bowl of the fuel pump should be removed and wiped clean, inside and outside frequently, to avoid excessive accumulation of dirt and water which might work its way to the carburettor and cause poor performance. Always replace gasket when fuel bowl has been removed.

Pump Pressure.—It is important that fuel pump pressure be checked. This can be done by inserting a "T" fitting into the fuel line at the carburettor. Connect the pressure gauge tool C-483 to the "T" and take pump pressure with the engine turning over. Refer Figure 2. The pressure should be between 3½ to 4½ pounds. If the pressure is too low, a weak diaphragm main spring, or improper assembly of the diaphragm may be the cause. If the pressure is too high, the spring is too strong. If such is the case, test with a new spring and replace the diaphragm.

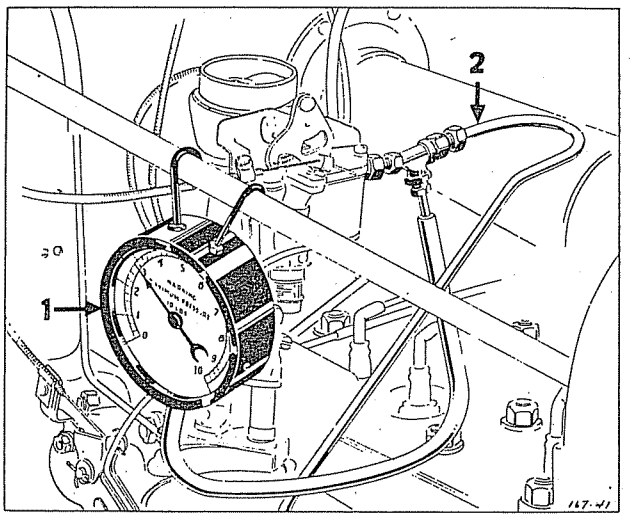


Fig. 2—Checking Fuel Pump.
1 — Gauge C-483 2 — Fuel pump to carburettor tube.

To test the inlet valve.—Place a finger over the inlet fitting while the line is disconnected. Start the engine or turn it over with the starting motor. There should be a noticeable suction, not alternated by blow back. If blow back is present, the inlet valve is not seating properly and must be replaced.

Check for leak at fuel pump diaphragm due to loose housing screws. Check fuel pump mounting bolts to prevent oil leakage around flange, tighten bolts to specified torque. Refer Tightening Reference.

Check the carburettor float needle valve seat for proper operation.

If fuel pump fails to operate satisfactorily remove pump and service as outlined in Paragraph 2.

Note.—Do not use shellac or any other adhesive on the diaphragm at assembly.

EXHAUST SYSTEM

ALL MODELS EXCEPT 8-71A-D.

1. INTAKE AND EXHAUST MANIFOLDS.

Heat resistant gaskets are used between the manifold and cylinder block, thus providing seals against air and exhaust leakage.

2. REMOVAL OF EXHAUST AND INTAKE MANIFOLDS.

(1) Disconnect exhaust pipe at manifold.
(2) Disconnect and remove all throttle and choke controls attached to manifold.
(3) Disconnect and remove the fuel line between fuel pump and carburettor.

(4) Disconnect booster brake line (if so equipped).
(5) Disconnect and remove carburettor fuel pump heat shield.
(6) Remove exhaust and intake manifold stud nuts and pull manifold straight out—away from cylinder block.

3. TO REPLACE GASKET BETWEEN INTAKE AND EXHAUST MANIFOLD (MANIFOLD REMOVED).

(1) Remove the bolts and nuts holding the exhaust manifold and intake manifold together and discard old gasket.
(2) Clean both manifolds in a suitable solvent. Blow dry using compressed air. Inspect for cracks or distortion. Intal new manifolds if either condition is evident.
(3) Instal new gasket.
(4) Tighten the exhaust and intake manifold connecting bolts and nuts, until they are snug, but not fully tightened.
(5) Instal manifold assembly on cylinder block using new gaskets. Tighten stud nuts uniformly with a torque wrench from 15 to 20 foot pounds, starting at the centre and working out to the ends. Then tighten the nuts that hold together the exhaust and intake manifolds.

This procedure will assure proper seating of the manifolds and prevent leakage of the mainfold flanges.

Complete the remainder of installation in reverse order of the disassembly procedure.

4. MANIFOLD HEAT CONTROL. "T" SERIES ENGINES.

The exhaust manifold is equipped with a thermostatically controlled heater valve (Figure 3) which regulates the amount of heat by-passed around the inlet manifold heater body. With the heat control valve in the closed position, the hot gases passing from the exhaust manifold strike the valve and are deflected around the inlet manifold.

The quantity of hot gases and consequently the amount of heat delivered to the inlet manifold, is automatically controlled by a thermostat which governs the position of the valve plate.

The thermostat holds the valve plate (11) Figure 3, closed under tension, but this tension is not enough to prevent the valve from opening when the engine is speeded up, therefore, excessive back pressure will not develop in the manifold. As the thermostat becomes heated, the valve gradually moves to the open position as indicated by the dotted lines in Figure 3, and when normal operating temperature is reached, the exhaust gases have an unrestricted passage from the engine through the exhaust manifold.

Should it be necessary to service the manifold heat control unit, the following information should be adhered to:

(1) Be sure the valve shaft and valve plate turn freely in the manifold.
(2) Should the thermostat be removed or replaced, the tightly wound end should be inserted in the slot in the valve shaft and the coil be given one full turn in a clockwise direction, and the free end be allowed to hook behind the valve stud stop.
(3) An occasional check should be made to ensure that the valve is free and not restricted in its operation.

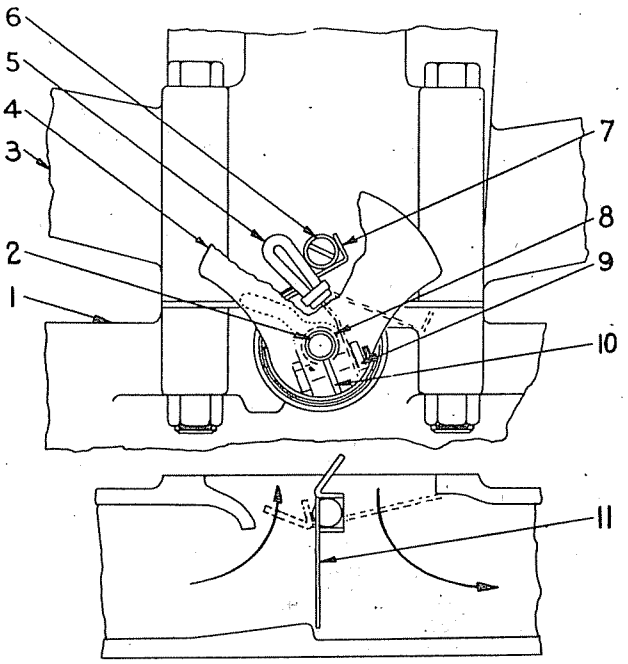


Fig. 3—Diagram Showing Thermostat Wrap.

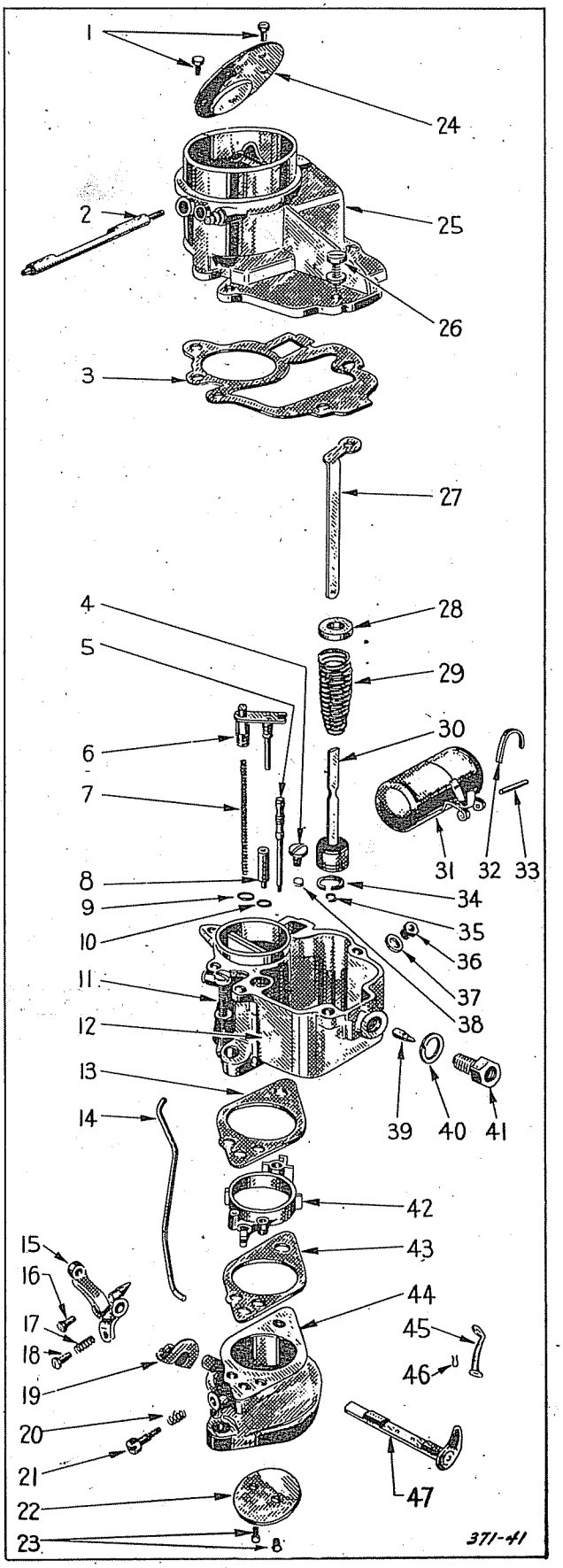
1 — Exhaust manifold.
2 — Valve shaft.
3 — Intake manifold.
4 — Thermostat shield.
5 — Valve stop assembly.
6 — Valve stop stud.
7 — Thermostat.
8 — Thermostat spacer.
9 — Shield bolt, nut and lockwasher.
10 — Shield lock.
11 — Valve plate.

5. ALIGNMENT OF EXHAUST PARTS.

Whenever any of the exhaust system has been replaced, allow the attaching bolts and clamps to remain loose and run the engine to permit all parts of the system to align themselves. Then, tighten all bolts and clamps securely and make certain there is no interference of the tail pipe and muffler with other parts of the truck.

6. SERVICING THE EXHAUST MUFFLER.

Inspect the exhaust system if leakage of exhaust gases is evident. If the muffler has become clogged with carbon (this will be evident by loss of engine power) replace the muffler.



1 — Valve attaching screws.

2 — Choke control lever and shaft.

3 — Body gasket.

4 — Pump check plug.

5 — Idle orifice tube and plug.

6 — Step-up piston, plate and rod.

7 — Step-up piston spring.

8 — Step-up jet.

9 — Step-up piston gasket.

10 — Step-up jet gasket.

11 — Flange attaching screw.

12 — Body.

13 — Flange gasket.

14 — Choker Connector rod.

15 — Throttle shaft lever.

16 — Throttle lever clamp screw.

17 — Throttle lever adjusting screw spring.

18 — Throttle lever adjusting screw.

19 — Throttle shaft dog.

20 — Idle adjustment screw spring.

21 — Idle adjustment screw.

22 — Throttle valve.

23 — Valve attaching screw.

24 — Choke valve.

25 — Air horn.

26 — Air horn attaching screw.

27 — Pump operating link.

28 — Pump spring retainer.

29 — Pump spring.

30 — Plunger and rod.

31 — Float and lever.

32 — Float lever pin retainer.

33 — Float lever pin.

34 — Pump retainer ring.

35 — Pump cylinder ball.

36 — Main metering jet.

37 — Main metering jet gasket.

38 — Pump check ball.

39 — Float needle.

40 — Float needle seat gasket.

41 — Float needle seat.

42 — Insulator.

43 — Flange gasket.

44 — Body flange.

45 — Pump connector link.

46 — Pin lock spring.

47 — Throttle valve shaft and arm.

Fig. 4—Carter Carburettor (Exploded View)

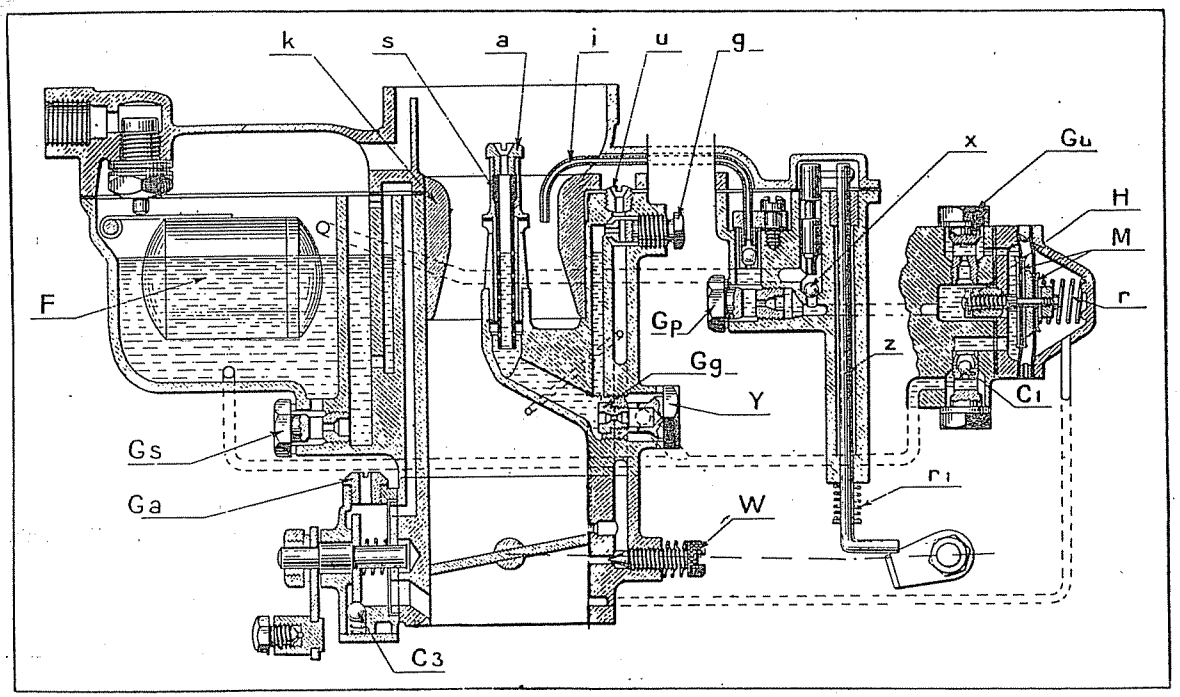


Fig. 5—Solex Carburettor as fitted to Kew Series Engines. With Bi-starter, Accelerating Pump and Economy Device.

a — Air correction jet.
C1 - Pump check ball.
C3 - Spring ball (bi-starter position).
F — Float.
Ga - Starter air jet.
Gg - Main jet.
Gp - Pump jet.
Gs - Starter petrol jet.
Gu - Economy jet.
g — Slow running jet.
H — Pump valve.
i — Pump injector.
k — Choke tube.
M — Pump membranes.
r — Pump spring.
ri — Safety device spring.
s — Emulsion tube.
u — Idling air bleed.
W — Volume control screw.
x — Safety device check ball.
y — Main jet carrier.
z — Safety device rod.

CARBURETTOR

NOTE.— Trucks are equipped with downdraft carburettor of two different types. For information regarding servicing, assembly and disassembly operations, refer to the paragraphs below, to which each type of carburettor applies.

1. SPEED AND ECONOMY TESTS.

Speed or fuel economy tests should be made on a hard surface road if possible. Speed or economy test results are most accurate when the test is made in one direction, and then in the opposite direction on the same road, immediately afterwards, to compensate for wind and road resistance. When determining results, take the average for the test runs.

2. REMOVAL AND INSTALLATION OF CARBURETTOR (ALL MODELS).

(1) Remove air cleaner and throttle control rod.
(2) Disconnect fuel line.
(3) Disconnect choke control.
(4) Disconnect vacuum control line at carburettor (Models 6-71A, 8-65A, 8-71A).
(5) Remove carburettor flange nuts and carburettor from engine.

When installing, follow the above procedure in the reverse order.

3. SERVICING THE CARBURETTOR. ALL MODELS.

When servicing the carburettor (all models) perform the following operations to ensure satisfactory carburettor operation.

(1) Disassemble the carburettor.
(2) Remove the various jet plugs.
(3) Clean all parts in a suitable solvent and inspect for wear or damage.
(4) Replace all parts that are in a questionable condition.
(5) Clean the various orifices and channels with compressed air.

Note.—Never clean carburettor jets with a wire or other mechanical means because such methods will enlarge the orifices, resulting in a mixture that is too rich for proper engine performance.

4. DISASSEMBLY AND ASSEMBLY OF CARTER CARBURETTOR.

(1) Remove float cover screws and raise the cover.
(2) Remove float pin retainer spring, float and float needle.
(3) Remove accelerator pump link.
(4) Push out the accelerator pump plunger assembly.
(5) Remove the idle orifice plug and tube and blow out with air.
(6) Remove economizer assembly.
(7) Remove main metering jet and blow out with air.

To assemble and instal, reverse the foregoing operations.

5. SERVICING THE FUEL FILTER (ALL MODELS).

If it becomes necessary to clean the fuel filter, remove the filter body with a socket wrench and screw the filter element out of the carburettor body. Wash element in dry cleaning solvent to remove all dirt and lint between the disc surfaces, but do not use compressed air or disassemble the element.

6. ADJUSTMENT.

(1) Idle Adjustments.

With the engine running at normal operating temperature (160°F) and the choke button all the way in, turn the idle mixture adjusting screw (See Figure 6) counter-clockwise for leaner mixture and maintain an engine idle speed of 450 to 600 r.p.m. by turning idle speed adjusting screw (Figure 6) in direction required.

The adjusting screw should be set to the leanest position that will provide maximum steady engine speed.

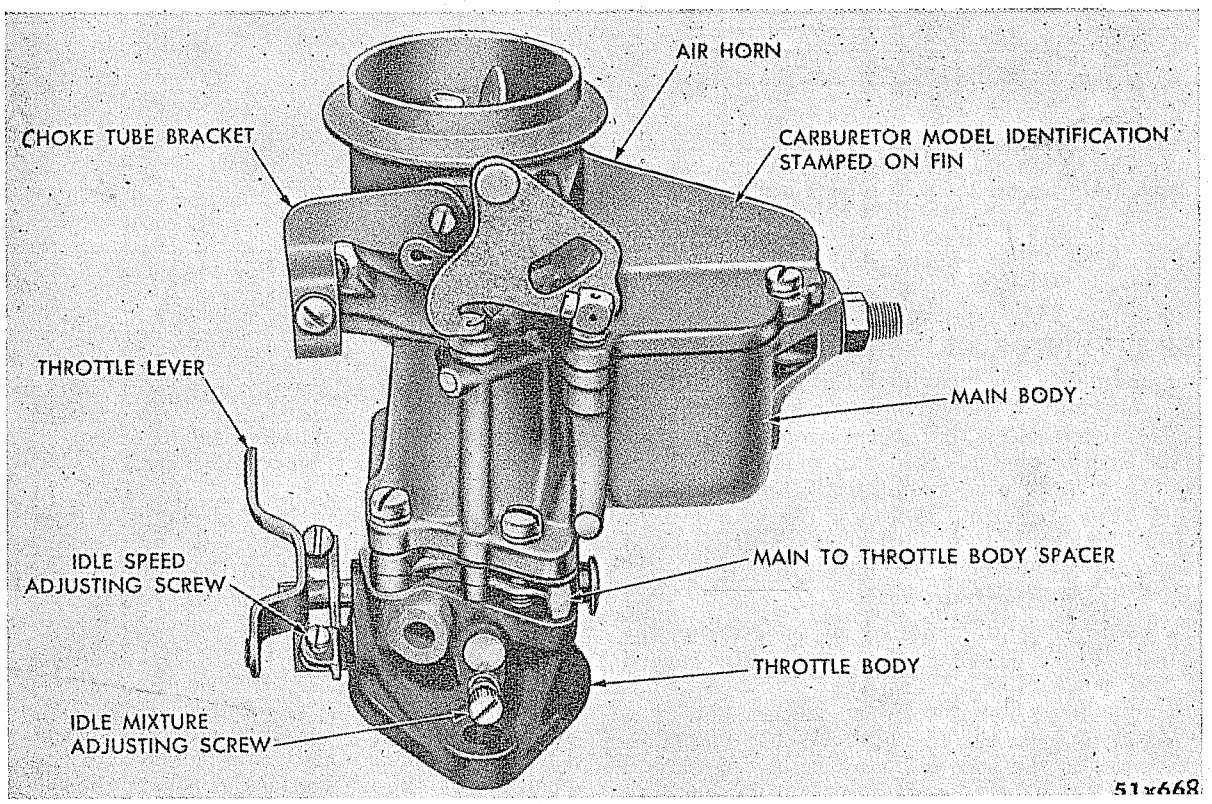


Fig. 6—Carter Carburettor (Assembled View).

If a vacuum gauge is available, position idle mixture adjusting screw for maximum steady gauge reading. If a satisfactory engine idle cannot be obtained by turning the idle mixture adjusting screw, check all other related engine adjustments before condemning carburettor.

7. ACCELERATING PUMP AND ADJUSTMENTS.

To provide additional fuel for rapid acceleration, the carburettor is equipped with an accelerator pump. The pump supplies an extra charge of fuel momentarily as the throttle is opened.

Three positions are provided on the accelerating pump lever (Figure 7) in order to give a greater or lesser discharge of petrol on quick acceleration, depending upon climatic conditions.

(1) Short stroke—(Hole in pump lever nearest throttle shaft). For extremely warm weather or for high altitudes above 3000 ft.
(2) Medium stroke—(Centre Hole). For normal summer temperatures.
(3) Long stroke—(Hole in pump lever farthest from throttle shaft). For cold weather operation.

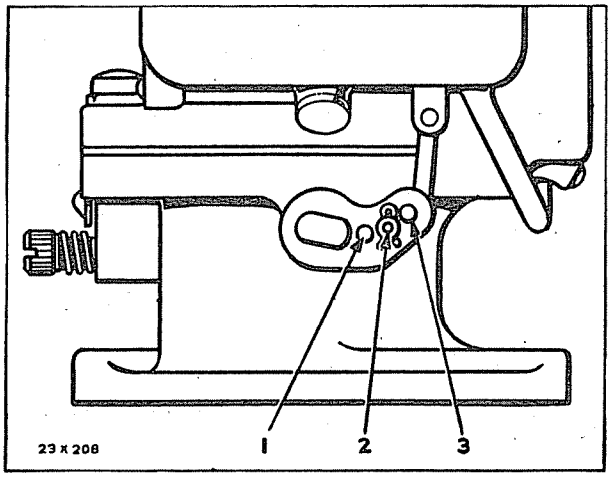


Fig. 7—Typical Accelerator Pump Adjustment Showing the Three Positions on the Accelerator Pump Lever.
1 — Summer setting (short stroke).
2 — Intermediate setting (medium stroke).
3 — Winter setting (long stroke).

8. STEP UP PISTON OR ECONOMISER.

No adjustments are provided for the step up or economizer circuit of the carburettor. Whenever the carburettor is disassembled, the piston and operating rods should be cleaned to remove foreign material that may have accumulated on them and to assure free operation of the piston. DO NOT DISTORT THE STEP UP PISTON SPRING.

9. FLOAT AND FUEL LEVEL.

The fuel level is determined by measuring the actual float level. To check the float level, proceed as follows:

(1) Remove float chamber cover and gasket.

The distance from the top of float chamber (gasket removed) to the top of float (Figure 8) should be 5/64in. and can be reset if necessary by bending lip of float lever away from needle to raise float, and towards needle to lower float. Bend vertical lip of float only.

10. SOLEX CARBURETTOR.

DESCRIPTION.

a. THE STARTER.

The starter provides starting and driving away from cold. It may be used as long as the engine has not reached its normal operating temperature and has two main positions.

(1) Fully open (starting position) the mixture is very rich and enables the engine to be started when dead cold.
(2) Half open position (located by a spring loaded ball) the mixture is weaker. This position is used when the engine is already slightly warm, either after a short time of operation on the previous position or after stopping when the engine is not quite cold.

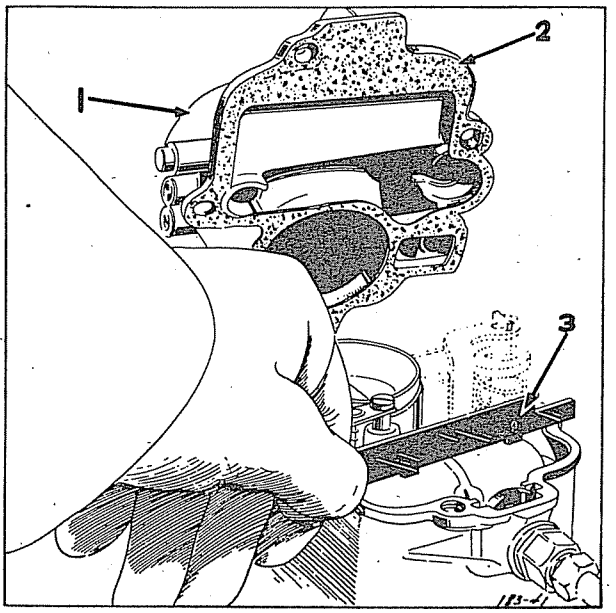


Fig. 8—Checking Float Level.
1 — Carburettor air horn.
2 — Carburettor body gasket.
3 — Checking gauge (Tool C-449) (T109-50).

b. THE ACCELERATING PUMP.

The accelerator pump discharges an additional quantity of petrol when accelerating as follows: Refer to Figure 5.

(1) When the throttle is closed, the high depression prevailing in the induction pipe acts on the membrane (M) of the pump, which, by its movement, forms a petrol reserve.

When depressing the accelerator the throttle opens, and the depression in the manifold being reduced, the spring (r) pushes the membrane (M) away, thus forcing the petrol through the valve (H) and the pump jet (Gp) into the pump injector (i) which opens out in the choke tube (k). The position of the valve (H) controls the volume of petrol discharged and the size of the jet (Gp) controls the rate of injection.

c. SAFETY DEVICE.

When the engine is switched off, the depression acting on the membrane (M) is destroyed and the spring (r) acts on the membrane (M) tending to make the petrol, held in reserve capacity of the pump, overflow into the induction pipe. To avoid this drawback a direct communication has been

provided between the pump reserve and the float chamber, which allows the petrol to return from the reservoir direct to the float chamber. This communication is always closed by a ball (x) held on its seating by the action of the spring (r). When the throttle nears its closed position, however, a lever located at the end of the throttle spindle pushes the rod (z) against the action of the spring (ri) and frees the ball (x). It follows that each time the pump operates with the throttle closed, i.e., in its idling position, the petrol held in the pump reserve is returned to the float chamber. When the throttle is open and the pump operates, however, the petrol held in the pump reserve must necessarily be discharged through the injector (i) opening out in the choke tube (k).

d. ECONOMY DEVICE.

When an engine is developing less power than the maximum of which it is capable, it may be run without risk on leaner mixtures. This weakening off, which enables the petrol consumption to be materially improved, is obtained automatically in the following manner:

When the maximum power is devoloped, the throttle is open and the depression in the manifold is low.

The spring (r) keeps the valve (H) open and the flow through the pump jet (Gp) is added to the flow through the main jet (Gg). The size of the pump jet has been determined with the object of obtaining the best possible acceleration.

When in order to reduce the power of the engine, the throttle opening is reduced, the depression in the manifold increases and acts on the pump membrane (M) counteracting the action of the spring (r), thus closing the valve (H) and cutting out the flow through the pump jet (Gp).

The jet (Gp) is chosen to provide the best possible acceleration in conjunction with the pump and full power at maximum throttle opening.

At part throttle, however, when the valve (H) is closed, the mixture may be on the weak side.

To avoid this drawback, an economy jet (Gu) has been provided, which, when the valve (H) is closed, maintains an exactly controlled flow of petrol to the pump jet (Gp) thus keeping the mixture at the most satisfactory strength for good running, coupled with lowest consumption.

11. DISASSEMBLY AND ASSEMBLY OF SOLEX CARBURETTOR.

(1) Remove float cover screws and remove cover.

(2) Take out float pin and remove float.

(3) Remove safety device rod and clean out passage and examine safety device check ball for free movement.

(4) Remove four corner screws attaching pump cover and remove cover. Replace gasket when assembling.

(5) Remove two retaining screws attaching outer plate to body on pump cover.

(6) Take out diaphragm spindle split pin and remove nuts.

(7) Part the pump cover from the inner plate and remove the diaphragm assembly and spring.

(8) Part the spacing piece and remove diaphragm. Inspect for wear and replace if necessary.

(9) Remove nut attaching easy starter lever and remove lever.

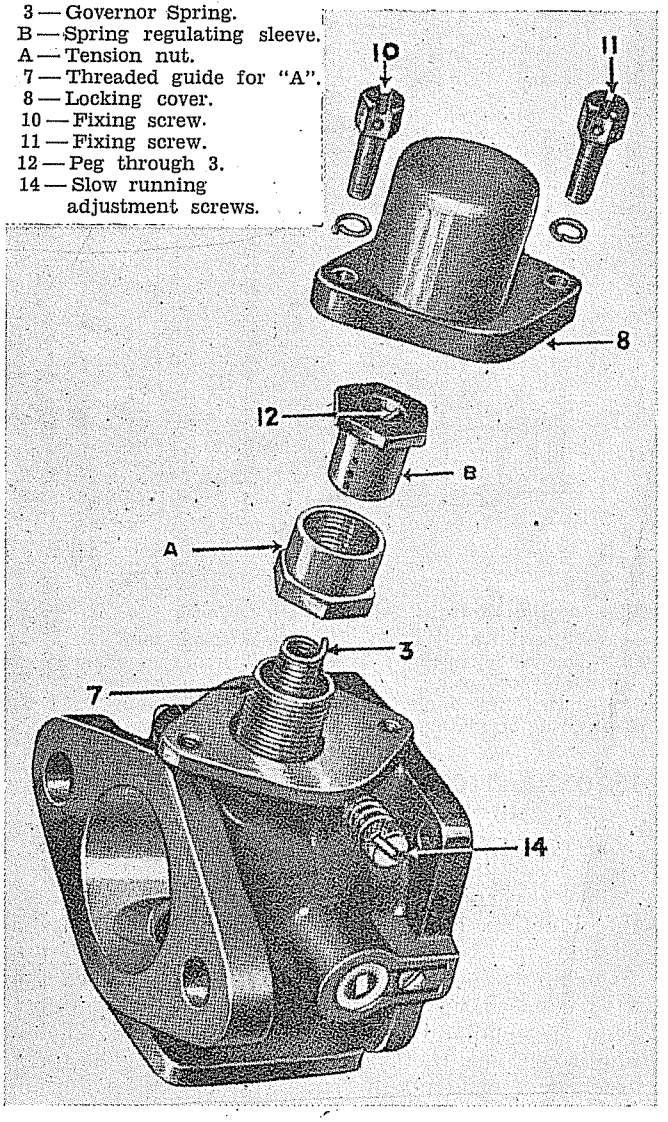


Fig. 9—Exploded View of the Throttle Tube and its Component Parts.

(10) Remove four screws attaching easy starter device cover and remove cover. Check the spring for tension. The bi-starter flange is held in position by a spring loaded ball. The

bi-starter air jet need not be removed, however, clean out thoroughly.

(11) Remove pump injector, test check valve by blowing, and drawing air through to ensure valve is operating satisfactorily.

(12) Remove volume control adjustment screw.

(13) Remove four screws holding float body to base and remove float body.

(14) On carburettors fitted with governor remove governor and refer to paragraph 12 below.

To assemble, reverse the foregoing operations.

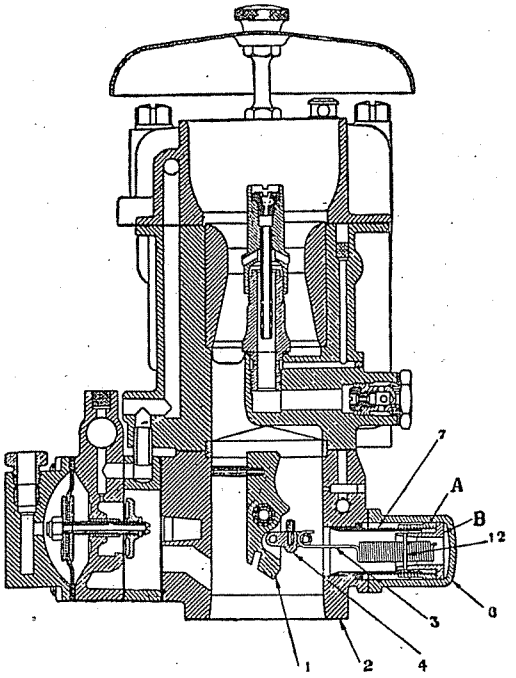


Fig. 10—Downdraught Solex Governor Carburettor in Section.

1 — Butterfly throttle.
2 — Throttle chamber.
3 — Governor spring.
4 — Spring link anchorage.
B — Spring regulating sleeve.
A — Tension nut.
7 — Threaded guide for tension screw.
8 — Locking cover.
12 — Steel peg.

12. OPERATION AND ADJUSTMENT OF VELOCITY TYPE GOVERNOR AS FITTED TO SOLEX CARBURETTOR.

The governor carburettor has one throttle only, the function of which is to control the mixture passage in exactly the same way as does that of an ordinary carburettor, but its design is such that it is coupled up with the components which have been especially evolved to comprise an efficient foolproof and tamper-proof governor. The parts used are few in number and simple to handle, and so compact that they add little to the overall dimensions of the carburettor itself.

a. MAIN OPERATING PRINCIPLE.

The governor has no mechanical connections whatsoever to any driving shafts.

It operates on the charge momentum principle. At a predetermined engine speed, the velocity of the ingoing air charge taking effect on the inclined face of the butterfly type of throttle, causes it to close to a limit stabilising the engine speed at the R.P.M. required.

Now refer to Figures 9 and 10. It will be seen that the throttle is mounted eccentrically on the spindle, i.e., the "tail" or that part of it which is first exposed to the incoming air stream, is longer than the "head" and inclined to present a surface sensitive to the varying velocity of the entering air. This air pressure on the tail has the closing effect mentioned. Resisting the closing effect of the air charge is a coil spring (3) Figure 9, anchored to a swivelling link which is part of the throttle design. Since the pressure of the air charge on the throttle or butterfly or vane, increases as the engine speed rises, it will be clear that by adjusting the pull of the spring, any required tension, the throttle will start to close when the pressure of the air charge—and therefore the engine revolutions—reaches an equivalent value. In other words, at the prescribed engine speed we adjust the pull of the spring to equal the pressure on the butterfly of the incoming air, and at that moment the throttle takes up the position limiting and stabilising the engine speed, and consequently the road speed.

b. THROTTLE CONSTRUCTION.

So that the throttle shall be properly sensitive to the opposing forces of air pressure and the spring tension, it floats on a hardened and ground spindle on needle roller bearings. The spindle in turn operates on bronze bearings with full provision for taking end thrust. It is coupled to the accelerator in the usual way, but the throttle is free to rotate on it independently.

This free movement is limited by a simple drive of dog formation, between spindle and throttle. The result is that the throttle is always positively closed by the dog when the accelerator pedal is released, but on pressing it down again, the throttle is opened by spring (3) as the dog recedes from it. Sufficient lost motion is allowed for throttle movement on the spindle during governing, so that the driver's foot can be kept right down on the pedal and the governor meantime will operate freely, controlled only by the speed of the engine.

Thus the sequence of operation is as follows:

(1) Throttle closed during idling by virtue of the usual exterior throttle pull off spring.

(2) Throttle opens to full limit when driver depresses accelerator pedal.

(3) Engine speed rises or falls to limit desired by foot accelerator control since the spindle and throttle dogs engage so locking the movement until—

(4) The governed speed is reached, when air pressure on the throttle takes control and partially closes the throttle to fix and stabilise the speed at the desired maximum in spite of the fact that the foot accelerator remains fully depressed.

c. DESIGN OF GOVERNOR. SPRING ADJUSTMENT.

The outer anchorage of spring (3) consists of a steel peg (12) housed in a sleeve (B) and passing through the spring coils. The sleeve itself has no lateral fixing device, but the inner face of its hexagon abuts against the end of the tension nut (A) as shown in the cross-sectional view (Figure 10). The tension nut (A) is threaded and screws on to the housing (7). By screwing (A) out or in, therefore sleeve (B) will also move with it, and increase or decrease as the case may be, the tension of the spring.

Here then is the means of adjusting the speed to which the engine shall be governed. This alone, however, is not sufficient. The governor in action might "hunt" or "surge" as a result of air pressure, or the throttle tending to over close it, the spring taking control with falling speed, followed immediately by the air pressure again overclosing it, and so establishing a continuous cycle of opening and closing unless the spring tension is regulated in such a way that any such "surge" is neutralised.

The tendency to "surge" as described is brought about by the difference of the charge momentum and the natural spring recoil at the cut off speed selected. The spring coil, or "rate" to use the correct technical term, must match the charge momentum to correct this tendency.

It will now be clear if we increase or decrease the number of "live" spring coils by winding sleeve (B) up or down the spring, so allowing the number of coils between the peg (12) and the spring hook, we can readily reach a position where "rate" matches the air pulsations and cancels their effect.

The successful tuning of the governor carburettor, therefore, centres in the adjustment of spring regulating sleeve (B) and tension nut (A) and this adjustment is described in the paragraph under the heading of "Adjustments".

d. THROTTLE LINK DETAILS.

An important adjunct to steady and sensitive governing lies in the method of attaching the spring hook to the throttle. Referring to Figure 10, the link (4) is seen pivoted to the throttle at its one end. The other extremity houses a bronze roller, over which the spring is hooked, this roller affording a wear free anchorage for it.

A small boss or distance piece fixed in the lower face of the link is shown as preventing it from meeting the platform shaped lip (or anvil) on the throttle, which lies immediately under the link. The action of this simple mechanism is rather subtle. With the throttle fully open, the link and spring are in a straight line, as shown in the illustration. As, however, the throttle closes, a point is reached where the boss of the link contacts the "anvil" and from that point onwards the increasing upwards tilt given to the outer end of the link results in a more rapidly increased loading of the spring. The necessity of this is explained as follows:

At low engine speed the pressure of air charge on the "tail" of the throttle is at first very light, and does not move it. As the selected governed speed is approached, the throttle commences to close, and the pressure builds up very rapidly indeed, as this closing movement progresses. To prevent the closing movement from taking place too rapidly, a corresponding increase in the building up of spring resistance is called for, without having to alter the already determined tension at the full open throttle position, hence the position of the link, boss and anvil, as described. The practical effect is that the throttle opens fully on depression of the accelerating pedal, and remains fully open until almost immediately before the governor speed is reached, so that the pick-up is not restricted. The whole of the closure to the prescribed limit takes place over the smallest possible number of engine revolutions.

13. ADJUSTMENTS.

a. LIMITS OF ACCURATE GOVERNING.

A correctly adjusted governor will cut off cleanly and quite definitely. At a speed of a mile or two an hour below the governed speed the note of the carburettor air intake will change to a hiss, the vehicle will settle down to the given speed, and hold it to within a variation of 5 per cent. to 10 per cent. This condition will remain unaltered until either a rising gradient causes a drop in speed, or a falling one causes the vehicle to gather speed under the influence of gravity.

b. ADJUSTMENT OF SPRING TENSION.

When the governor carburettor is fitted to a new vehicle any alteration to the governed speed desired by the operator can be carried out as follows:

(1) Governor operation satisfactory but speed too high.

Remove screws 10 and 11 (Figure 9) being careful not to lose the small spring washers and withdraw the cover cap (8). Hold the sleeve (B) immovably, and rotate the nut (A) in a clockwise direction, i.e., screw inwards. One facet or flat of the hexagon is approximately equal to one mile per hour. Any confusion between sleeve (B) and nut (A) will be avoided if it is remembered that nut (A) is always the inner hexagon.

It will be realised that the clockwise rotation of nut (A) allows the sleeve (B) and with it of course the spring peg (12) to move slightly inwards. This reduces the "pull" on the throttle, thus permitting it to close earlier, so reducing the governed speed.

(2) Governor operation satisfactory, but speed too low.

Again hold sleeve (B) immovable, and rotate nut (A) in an anti-clockwise direction, i.e., unscrew to increase spring tension, bearing in mind that one facet turn equals approximately 1 m.p.h. increase.

(3) After governing the speed rises by more than 10% when running steadily.

In this case it is almost certain that the "cut-off" of the governor will be too gradual and not sharp or definite enough.

Also, although not so important, the r.p.m. "light" i.e., full throttle, vehicle stationary in neutral, will be more than the accepted 10% above governed r.p.m. when under load.

The indication is that there are not enough coils in action. Remove cover cap screws and use the cap as a box spanner to rotate nut (A) and sleeve (B) both together in an anti-clockwise (unscrewing) direction. Peg (12) will thus move outwards through the spring and allow more coils to act or become "live". Do not rotate more than two or three facets of the hexagon at a time.

As a result of this adjustment, it may be found that although the "creep" is cured, the governed speed has altered. In this case, reset it as per (1) and (2).

(4) The opposite to (3), after governing the speed when running steadily falls by more than 10%.

Probably the cut-off will be extremely sudden, the r.p.m. "light" even lower than when under load, and, in extreme cases, a slow and repeated surge of the throttle from open to shut may be heard and felt during running under load. The cure is to rotate both sleeve (B) and nut (A) together in a clockwise direction two or three facets at a time, until stability is reached. If the governed speed is then found to have altered, reset as per (1) and (2) to whichever is applicable.

IMPORTANT.

Before making any adjustments previously described the following facts should be noted:

(5) Incorrect method.

Do not rotate sleeve (B) alone. This has a twofold effect, altering spring rate and also tension with confusing results.

(6) Idle movement of sleeve (B).

A certain amount of idle movement of this sleeve is present, amounting to roughly one-third of a facet either way. This represents the "rock" of the spring hook on the link pulley. After any adjustment of sleeve (B) take care to see that it rests when released from the hand midway through this idle movement. In this way a twofold benefit results. The spring hook does not bind sideways in the pulley groove, and also the sleeve will not rotate under the influence of the spring when the load is removed.

(7) Lining up sleeve (B) and nut (A).

Both sleeve and nut are provided with hexagon at one end to facilitate handling. Before replacing the governor cap, note that both hexagons must be in line to allow the locking flats inside the cap to pass over them.

If after adjustment of sleeve (B) and nut (A) it is found the hexagon facets are not quite parallel, line them up, the very small movement necessary will not disturb the governing.

(8) Extremes of Adjustment.

Cases occur occasionally where the sleeve (B) adjustment brings it outwards so far that it fouls the cap. Sometimes, too, the opposite condition is reached, and the tension nut (A) comes up against the face of the carburettor, whilst yet more clockwise rotation, to lower the engine speed, is required.

Correction for both conditions is obtained by altering the position of the peg (12) in the sleeve (B) to another pair of locating holes. There is a choice of four pairs in all as shown in Figure 9. Select one nearer the hexagon of the sleeve (B) to deal with the first case, and farther away from it in the second.

(9) Re-threading sleeve (B) into the spring.

It will be seen that the peg is tilted at an angle in relation to the bore of the sleeve. To avoid error when re-threading the sleeve on to the spring, it is most important to see that the tilt lines up with, instead of opposes, the pitch of the spring. To ensure this, make certain that the end of the peg, which is centred towards the spring, is inserted first into the coils.

(10) Sealing the Governor.

After completing adjustments, replace the cap and secure it by the screws 10 and 11 (Figure 9) and their spring washers. It should be sealed also by passing a wire through the drilled heads of the screws and securing the wire with a lead seal, so as to make it secure against tampering.

14. FLOAT AND FUEL LEVEL SOLEX CARBURETTOR.

The float level is determined by measuring the actual float level.

To check the float level, proceed as follows:

(1) Remove float chamber cover and gasket.

The distance from the top of the float chamber cover (gasket in place) to the top of the needle when in its closed position should be .250 in. and can be reset by the addition or deletion of gaskets on the underside of the needle valve.

15. AIR CLEANER.

To service the air cleaner, proceed as follows:

(1) Remove wing nut which holds top cover.

(2) Remove top cover and filter element.

(3) Clean filter element using kerosene.

(4) Empty the oil from reservoir and clean in kerosene.

(5) Refill the reservoir to the correct level (see Lubrication Section for proper viscosity oil).

(6) Instal filter element and cover.

The frequency for cleaning depends entirely upon the dusty condition of the air in which the truck operates.

SERVICE DIAGNOSIS

Conditions — Possible Causes — Remedies

FUEL PUMP

16. INSUFFICIENT FUEL DELIVERY.

Possible Causes.

(a) Restriction in vent of tank filler cap.
(b) Leaks in fuel fitting.
(c) Worn, ruptured, or torn diaphragm.
(d) Weak main spring.
(e) Improperly seating valves.

Remedies.

(a) Clean out vent of tank filler cap, or replace cap.
(b) Check fittings for leaks and tighten, or replace as necessary.
(c) Replace damaged diaphragm assembly.
(d) Test pump and replace spring as necessary.
(e) Check valves for operation and replace parts as required to correct condition.

17. FUEL PUMP LEAKS FUEL.

Possible Causes.

(a) Loose housing screws.
(b) Worn, ruptured or torn diaphragm.
(c) Loose diaphragm mounting plates.
(d) Loose inlet or outlet line fittings.

Remedies.

(a) Check diaphragm for possible damage and replace diaphragm assembly as necessary. Securely tighten loose housing screws.
(b) Test pump and replace damaged diaphragm assembly as necessary.
(c) Test pump and replace diaphragm assembly as necessary.
(d) Check inlet and outlet fittings for stripped, or cross threads. Tighten, or replace fittings as required.

18. FUEL PUMP LEAKS OIL.

Possible Causes.

(a) Cracked or deteriorated oil seal.
(b) Loose rocker arm pivot pin.
(c) Loose pump mounting bolts.
(d) Defective pump to block gasket.

Remedies.

(a) Replace diaphragm assembly as necessary. Oil leakage at breather hole in rocker arm housing indicates that the oil seal is defective.
(b) Replace rocker arm pin if loose. When removing old pin, do not enlarge the pin hole.
(c) Check the pump to block gasket and tighten loose mounting bolts. Always instal a new gasket when servicing the pump and tighten the bolts with a torque wrench to 15 to 20 foot pounds.
(d) Replace gasket if defective and tighten the mounting bolts (refer to (c) above).

19. FUEL PUMP NOISE.

Possible Causes.

(a) Loose mounting bolts.
(b) Scored or worn rocker arm.
(c) Weak or broken rocker arm follower spring.

Remedies.

(a) Instal new gasket and tighten mounting bolts to a torque of from 15 to 20 foot pounds. Check pump for leakage after tightening.
(b) Replace scored or worn rocker arm. Test spring load or arm follower spring and replace spring if weak.
(c) Replace weak or broken spring. A weak or broken follower spring will not permit the rocker arm to follow the eccentric cam on the camshaft and a rapping noise will result.

CARBURETTOR

20. POOR PERFORMANCE— MIXTURE TOO LEAN.

Possible Causes.

(a) Main metering jet damaged, worn, or wrong type or size used.
(b) Top shoulder seat of main discharge jet bad, or tip damaged.
(c) Vacuum piston worn or stuck.
(d) Power jet corroded or seating badly.
(e) Fuel level incorrect.
(f) Needle valve and seat corroded or worn.

Remedies.

(a) Disassemble carburettor. Inspect main jet and replace if necessary.
(b) Disassemble carburettor. Remove main discharge jet, clean, inspect and replace if necessary.
(c) Disassemble carburettor. Free piston if stuck. If piston is badly worn, replace air horn assembly.
(d) Disassemble carburettor. Clean the power jet and channels. Inspect. If seating is faulty, replace jet.
(e) Check fuel level in carburettor. If level is incorrect, adjust to obtain correct fuel level.
(f) Clean and inspect needle valve and seat. Replace assembly if necessary and check fuel pump pressure.

21. POOR IDLING.

Possible Causes.

(a) Idle tube carbonized, or shoulder seating poorly.
(b) Idle air bleed carbonized, or of incorrect size.
(c) Idle discharge holes plugged or gummed.
(d) Throttle body carbonized or throttle shaft worn.
(e) Idle needle damaged or worn.
(f) Fuel level incorrect.
(g) Main body to throttle body screws loose.

Remedies.

(a) Disassemble carburettor. Clean idle tube and check seating shoulder. Replace idle tube if necessary.
(b) Disassemble carburettor. Use compressed air to clear idle air bleed after soaking in a suitable solvent.
(c) Disassemble carburettor. Use compressed air to clear idle discharge holes after soaking main body and throttle body in a suitable solvent.
(d) Disassemble carburettor. Inspect throttle valve shaft for wear. If shaft is badly worn, replace throttle body assembly.
(e) Replace idle needle if worn or damaged. Adjust air mixture.
(f) Check fuel level in carburettor. If level is incorrect, adjust to obtain correct level.
(g) Tighten securely the main body to throttle body screws to prevent air leakage and cracking of housings.

22. POOR ACCELERATION.

Possible Causes.

(a) Seat on accelerator pump by-pass jet corroded or bad.
(b) Accelerator piston (or plunger) leather too hard, or worn, or loose on stem.
(c) Accelerator pump discharge faulty.
(d) Accelerator pump inlet check valve faulty.
(e) Fuel level incorrect.
(f) Needle valve or seat worn or corroded.
(g) Accelerator pump and throttle linkage worn.

Remedies.

(a) Disassemble carburettor. Clean and inspect accelerator pump by-pass jet. Replace jet if necessary.
(b) Disassemble carburettor. If accelerator pump piston (or plunger) leather is hard, cracked, or worn, replace. Test follow-up spring for compression.
(c) Disassemble carburettor. With compressed air, clean discharge nozzle and channels after soaking main body in a suitable solvent. Check pump capacity.
(d) Disassemble carburettor. Check accelerator pump inlet check valve for poor seat or release.
(e) Check fuel level in carburettor. If level is incorrect, adjust to obtain correct level.
(f) Clean and inspect needle valve and seat. If in bad condition, replace assembly and check fuel pump pressure.
(g) Disassemble carburettor. Replace worn accelerator pump and throttle linkage and check for correct position.

23. CARBURETTOR FLOODS OR LEAKS.

Possible Causes.

(a) Cracked body.
(b) Defective body gaskets.
(c) High float level.
(d) Worn needle valve and seat.
(e) Excessive fuel pump pressure.

Remedies.

(a) Disassemble carburettor. Replace cracked body and make certain main to throttle body screws are tight.
(b) Disassemble carburettor. Replace defective gaskets. Check for leaks. Be sure screws are tightened securely.
(c) Check fuel level in carburettor. If incorrect, adjust to obtain correct level.
(d) Clean and inspect needle valve and seat. If in bad condition, replace complete assembly and check fuel pump pressure.
(e) Test fuel pump pressure. If pressure is excessive, replace fuel pump.

24. POOR PERFORMANCE— MIXTURE TOO RICH.

Possible Causes.

(a) Restricted air cleaner.
(b) Excess oil in air cleaner.
(c) Leaking float.
(d) High float level.
(e) Excessive fuel pump pressure.
(f) Worn main metering jet.

Remedies.

(a) Remove and clean air cleaner.
(b) Remove and clean air cleaner. Refill oil chamber to required level.
(c) Disassemble carburettor. Replace leaking float. Check float level and adjust if necessary.
(d) Adjust to obtain correct float level.
(e) Check fuel pump pressure. If pressure is excessive, replace fuel pump assembly.
(f) Disassemble carburettor. Replace worn metering jet with a new one of the correct size and type.

SECTION 13
TRANSMISSION

SERVICE BULLETIN REFERENCE

NUMBER	DATE	SUBJECT	CHANGES

NOTES

TRANSMISSION

SERVICE STANDARDS

Model Designation →	* 1-08AD * 1-08AF * 1-08AS	* 2-26AD * 2-26AF * 2-26AS	* 2-33AD * 2-33AF * 2-33AS	3-59AD 3-59AF 3-59AS	6-71AD 6-71AF 6-71AS	8-65AD 8-65AF 8-65AS	8-71AD 8-71AF 8-71AS	8-71AD-D 8-71AF-D 8-71AS-D
Type	Standard Synchro-Shift	Standard Synchro-shift		Standard Spur Gear		Standard Spur Gear		
Number of forward speed...	3	3		4	4	5	5	5
Ratios								
5th	—	—		—	—	1 to 1	1 to 1	1 to 1
4th	—	—		1 to 1	1 to 1	1.478 - 1	1.478 - 1	1.478 - 1
3rd	1 to 1	1 to 1		1.69 - 1	1.69 - 1	2.395 - 1	2.395 - 1	2.395 - 1
2nd	1.78 - 1	1.78 - 1		3.09 - 1	3.09 - 1	4.38 - 1	4.38 - 1	4.38 - 1
1st	3.3 - 1	3.3 - 1		6.4 - 1	6.4 - 1	7.58 - 1	7.58 - 1	7.58 - 1
Rev.	4.3 - 1	4.3 - 1		7.82 - 1	7.82 - 1	7.51 - 1	7.51 - 1	7.51 - 1
Power take off								
Location				Right Side	Right Side	Right Side	Right Side	Right Side
Type				Standard SAE 6 Stud	Standard SAE 6 Stud	Standard SAE 6 Stud	SAE Standard 6 Stud	Standard SAE 6 Stud

* For vehicles fitted with 4 speed standard synchro-shift transmission as optional equipment refer to Models 3-59A and 6-71A for gear ratios.

TIGHTENING REFERENCE

Part name	Size (Inch and Number of Threads per In.)	Torque (foot pounds)
Companion flange nut.....	$\frac{3}{4}$ — 16	96 to 104
Transmission to clutch housing nut.....	$\frac{7}{16}$ — 20	45 to 50
Transmission to clutch housing screw...	$\frac{7}{16}$ — 14	45 to 50
Transmission cover screw.....	$\frac{5}{16}$ — 18	10 to 15
Transmission rear cover to case cap screw	$\frac{3}{8}$ — 16	30 to 35
Pinion bearing retainer cap screw.....	$\frac{5}{16}$ — 18	10 to 15

TRANSMISSION

1. LINKAGE ADJUSTMENT — 1-08A, 2-26A, 2-33A. (Refer Figure 2).

Make all gear shift control adjustments with the transmission in the neutral position.

GEAR SHIFT SELECTOR ROD.

To adjust, loosen the lock nut on the selector rod and tighten the nut until all play of the rod is taken up. Refer to Figure 2. Then back off the adjusting nut ½ a turn for clearance and tighten the lock nut.

GEAR SHIFT CONTROL ROD.

The only reason for changing the adjustment of the gear shift control rod would be to change the position of the gear shift lever at the upper end of the steering column.

The normal position of the lever is horizontal when the transmission is in neutral. To change the gear shift lever position, loosen the lock bolt on the upper lever. Locate the gear shift lever at the upper end of the steering column in the desired position, and tighten the lock nut.

NOTE.

Always make certain that there is no interference of the gear shift control with the toe board or with the steering gear to the dash bracket. Apply heavy engine oil or grease to the working joints of the linkage so that they will operate freely.

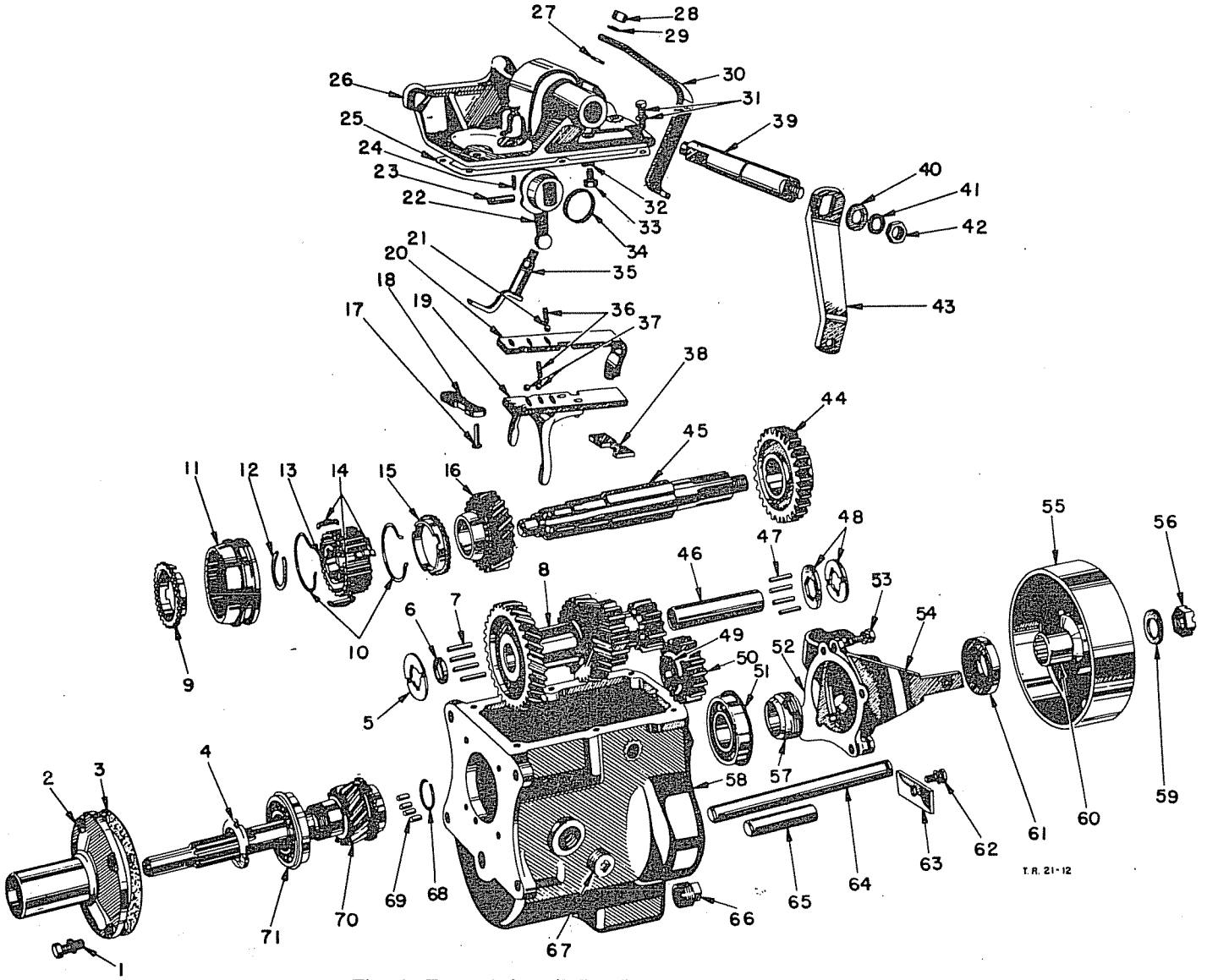


Fig. 1—Transmission (3-Speed). 1-08A, 2-26A, 2-33A.

KEY TO FIGURE 1.— TRANSMISSION (3 SPEED). 1-08A, 2-26A, 2-33A.

1 — Pinion bearing retainer screw and washer.
2 — Drive pinion bearing retainer.
3 — Drive pinion retainer gasket.
4 — Drive pinion bearing lock nut.
5 — Countershaft thrust washer.
6 — Countershaft bearing spacer.
7 — Countershaft bearing.
8 — Countershaft gear.
9 — Synchroniser stop ring.
10 — Synchroniser spring.
11 — Clutch gear sleeve.
12 — Clutch gear snap ring.
13 — Clutch gear.
14 — Synchroniser shift plate.
15 — Synchroniser stop ring.
16 — Second speed gear.
17 — Rail retainer rivet.
18 — Gearshift rail retainer—front.
19 — Second and direct shift rail.
20 — First and reverse shift rail.
21 — Rail selector ball.
22 — Gearshift lever—inner.
23 — Lever pin.
24 — Lever return spring.
25 — Gearshift housing gasket.
26 — Gearshift housing.
27 — Cam and shaft snap ring.
28 — Selector lever nut.
29 — Selector lever nut lockwasher.
30 — Selector lever.
31 — Housing bolt and lockwasher.
32 — Gearshift shaft screw lockwasher.
33 — Gearshift shaft screw.
34 — Inner lever pin lock spring.
35 — Cam and shaft assembly.
36 — Rail selector ball spring.
37 — Rail interlock ball.
38 — Gearshift rail retainer—rear.
39 — Gearshift shaft.
40 — Gearshift outer lever plain washer.
41 — Gearshift outer lever lockwasher.
42 — Gearshift outer lever nut.
43 — Gearshift outer lever.
44 — First and reverse gear.
45 — Mainshaft.
46 — Countershaft bearing spacer.
47 — Countershaft bearing.
48 — Countershaft end washers.
49 — Reverse idler gear bushing.
50 — Reverse idler gear.
51 — Mainshaft bearing.
52 — Brake support gasket.
53 — Brake support screw and lockwasher.
54 — Bearing retainer or brake support.
55 — Hand brake drum.
56 — Mainshaft flange nut.
57 — Speedometer drive gear.
58 — Transmission case.
59 — Mainshaft flange nut washer.
60 — Mainshaft flange.
61 — Mainshaft bearing oil seal.
62 — Lockplate screw and lockwasher.
63 — Countershaft and idler shaft lock plate.
64 — Countershaft.
65 — Idler gear shaft.
66 — Case drain plug.
67 — Case filler plug.
68 — Mainshaft pilot bearing snap ring
69 — Mainshaft pilot rollers.
70 — Drive pinion.
71 — Drive pinion bearing.

THREE-SPEED TRANSMISSION

2. REMOVAL AND INSTALLATION OF TRANSMISSION.

(1) Remove floor board and mat.

(2) Disconnect battery ground cable and speedometer cable, shift linkage, hand brake linkage.

(3) Disconnect universal joints.

(4) Remove nuts which hold transmission to clutch housing.

(5) Insert pilot studs in place of the two upper studs in clutch housing and withdraw transmission.

To instal, reverse the foregoing operation.

3. DISASSEMBLY OF TRANSMISSION (REMOVED) Refer Figure 1.

(1) Place the transmission in a fixture and drain the oil.

(2) Remove the transmission cover and gear shift assembly.

(3) Remove the nut on the end of the transmission main shaft and pull off the universal joint flange and brake drum, using Puller C-452.

(4) Remove the speedometer drive pinion and seal.

(5) Disconnect the handbrake rod at the band and remove the horseshoe clip which anchors the handbrake linkage to the transmission.

(6) Remove the cap screws which hold the brake support to the transmission case. Lift off the support, oil seal, and handbrake assembly.

(7) Remove speedometer drive gear.

(8) Remove the main drive gear bearing retainer.

(9) Pull the mainshaft and gear assembly out of the rear of the case far enough to remove mainshaft rear bearing (Figure 3).

(10) Lift out the mainshaft and gear assembly out of the case. (Figure 4).

(11) Slide the low and reverse gear off the mainshaft.

(12) Remove the clutch gear snap ring and slide it off the synchroniser and second speed assembly.

(13) Remove countershaft lock screw and lock plate.

(14) Drive the countershaft out of the rear end of case, using a special arbour and soft hammer. Drop the countershaft gear set to the bottom of case.

(15) Pull the main drive pinion out of the front of case.

(16) Remove the drive pinion bearing lock nut and bearing.

(17) Lift out the countershaft gear assembly and thrust washer. Remove the arbour and inspect the countershaft bearings and spacer for wear or damage and replace if necessary.

(18) Drive out idler gear shaft towards the rear of transmission and remove the idler gear.

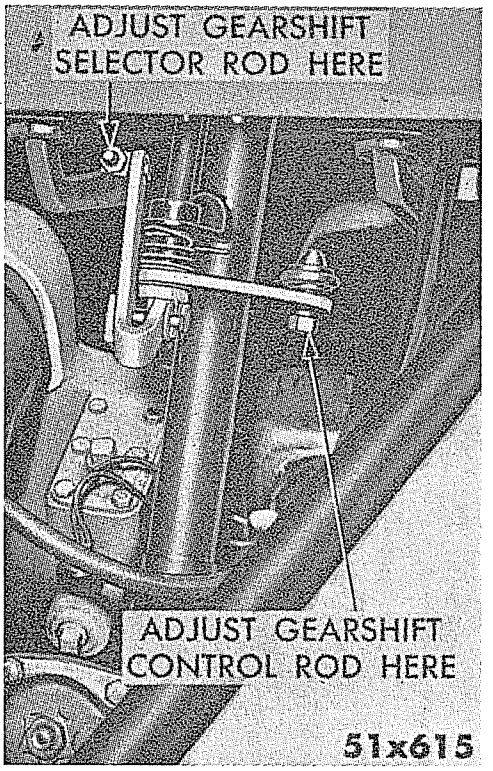


Fig. 2—Adjusting Gearshift Selector Rod and Gearshift Control Rod (1-08A, 2-26A, 2-33A).

The bearings on the rear ends of the main drive pinion and the mainshaft are held in place with snap rings. Whenever these snap rings are removed, instal new ones. The snap rings should not be used a second time.

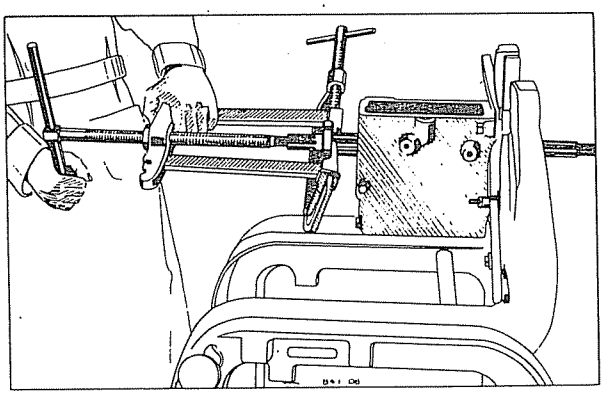


Fig. 3—Removing Mainshaft Rear Bearing with Puller C-549.

4. ASSEMBLY OF TRANSMISSION.

When assembling the transmission, follow in the reverse order the disassembly procedure, and perform the following operations:

(1) Make certain that the countershaft end play is from .002 to .008 inch.

(2) When inserting the bearing rollers in the ends of the countershaft gear, pack the ends of the countershaft gear with a high grade medium cup grease to hold the rollers in place. Place the countershaft gear thrust washers in correct position after they have been coated with cup grease. At the front end of the transmission place the small spacer between the bronze washer and the countershaft bearings.

(3) Tighten securely the countershaft and reverse idler gear shaft lock plate.

(4) When installing the main drive pinion bearing, securely tighten the lock nut and stake it at the notches provided on the pinion shaft.

(5) Lift the countershaft gear set and insert the countershaft from the rear end of the case. Drive it into position with a mallet, at the same time force the countershaft installing arbour out of the case.

Check the countershaft end play by prying the gears towards the front end and inserting a feeler gauge between the thrust washer and the case in the rear. This end play should not be less than .002 inch or more than .008 inch. Proper end play can easily be obtained by the use of different thickness washers.

(6) The synchroniser unit should be assembled exactly as shown in Figure 5. The slots of the stop rings (2), Figure 5, should engage the plates in the clutch rear sleeve.

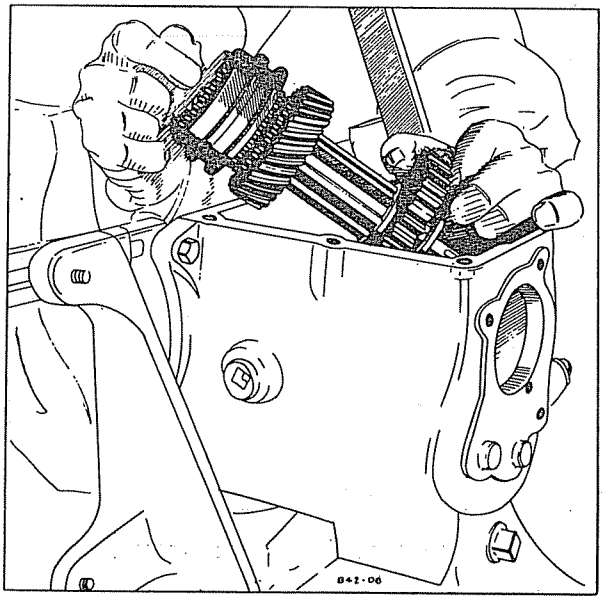


Fig. 4—Removing Mainshaft Assembly (3-Speed).

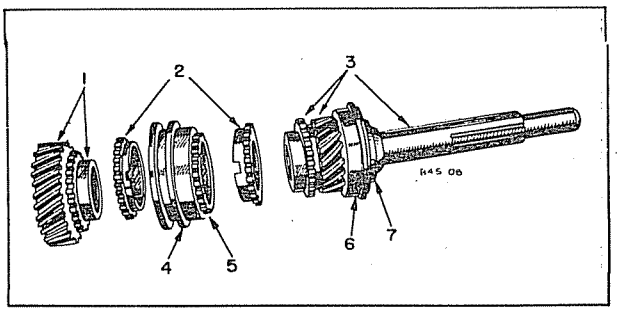


Fig. 5—Transmission Synchroniser and Second Speed Gear Assembly (Refer to Fig. 1).

1 — Transmission shaft seccnd speed gear.
2 — Synchroniser stop rings.
3 — Drive pinion.
4 — Clutch gear sleeve.
5 — Clutch gear.
6 — Drive pinion bearing.
7 — Drive pinion bearing lock nut.

(7) When installing the transmission cover, place the first and reverse sliding gear and clutch gear sleeve in neutral position.

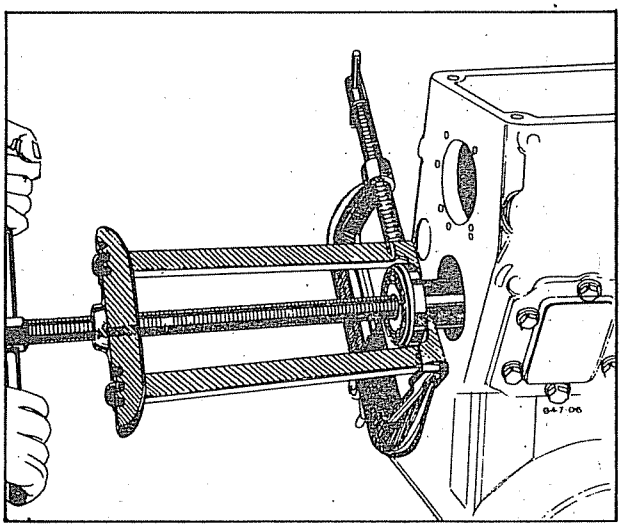


Fig. 6—Removing Countershaft Rear Bearing, Tool C-549.

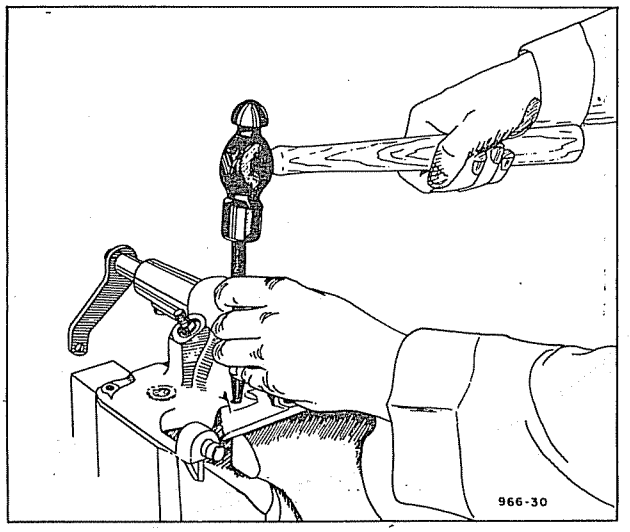


Fig. 7—Removing Shift Rail Retainer Rivets.

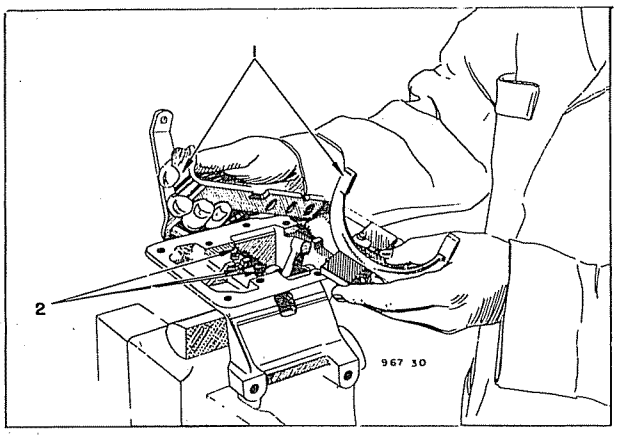


Fig. 8—Removing Shift Rails.

1 — Rails and Fork. 2 — Poppet Balls and Interlock.

5. DISASSEMBLY OF TRANSMISSION COVER (REMOTE CONTROL TYPE).

(1) Place cover assembly in vice. The cover is a casting. Tighten vice carefully to avoid damaging the casting.

(2) Centre punch the formed side of the four rivets that hold the shift rails in position. (Figure 7).

(3) Drill each rivet to permit easy removal and drive them out with a suitable punch.

(4) Lift off the shifter rail retainer brackets.

(5) Remove selector levers, being careful not to lose the small steel balls in the cover (Figure 8).

(6) With a screwdriver, remove the gear shift lever lock pin spring, as shown in Figure 9.

(7) Remove the gearshift lever lock pin spring with a pair of long nose pliers. (Figure 10).

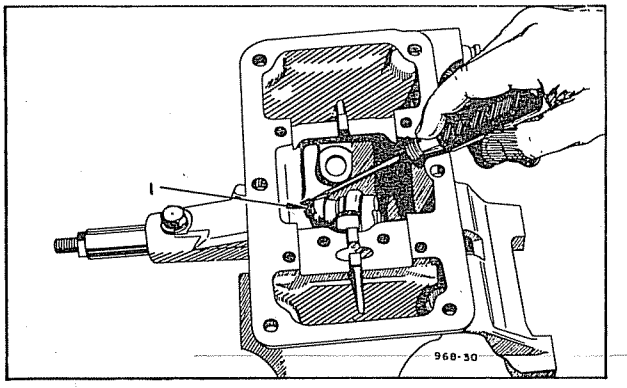


Fig. 9—Removing Gearshift Lever Lock Pin Spring.

1 — Retainer pin spring.

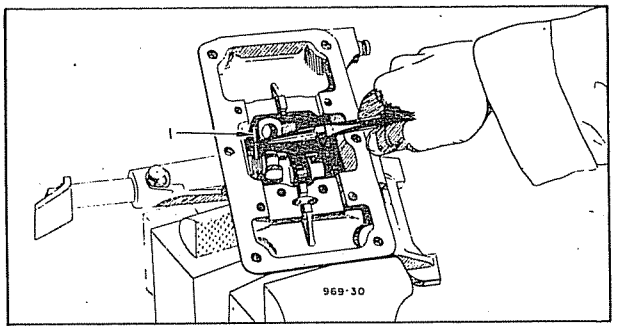


Fig. 10 — Removing Gearshift Lever Lock Pin.

1 — Pin.

(8) Pull out the gear shift lever shaft. At the same time lift the gear shift lever out of the cover. (Figure 11).

When assembling the cover assembly, check to see that the steel balls are installed in their respective places.

6. REMOVAL AND INSTALLATION OF REMOTE CONTROL GEARSHIFT ROD.

(1) Remove steering wheel as outlined in the steering section.

(2) Remove gearshift rod nut, rod end and rod lever.

(3) Remove gearshift lever by removing the lever bearing nut and pushing out the bearing. Grasp the gearshift lever, push down and pull out.

(4) Slide rod out.

When replacing the rod, apply a small amount of lubricant to the rod end.

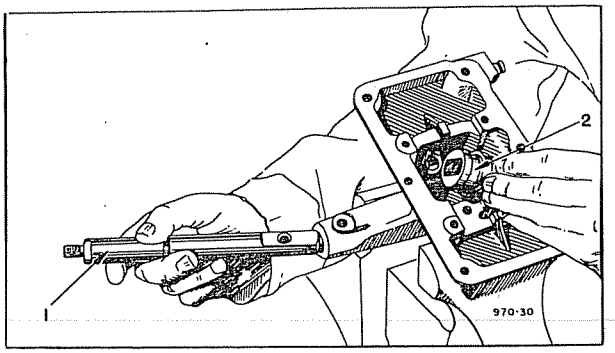


Fig. 11 — Removing Gearshift Lever Shaft and Lever.

1 — Shift shaft. 2 — Shift lever.

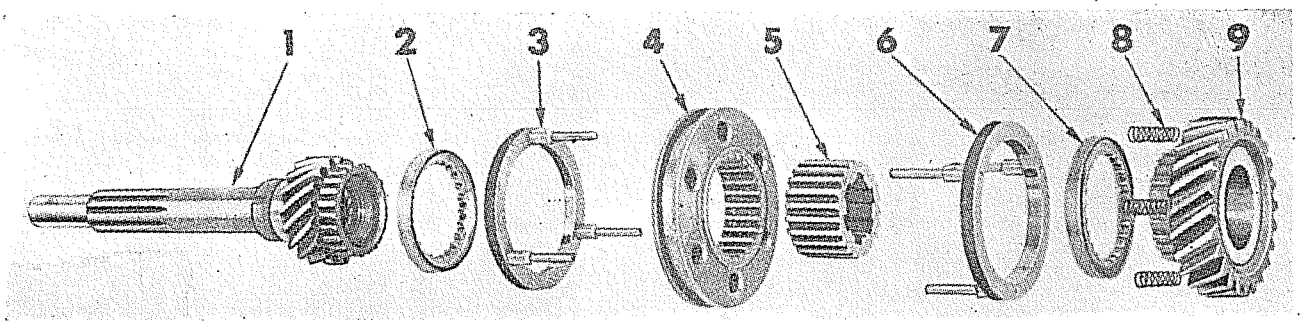


Fig. 12—Transmission Synchroniser and Second Speed Gear Assembly (4 speed).

1 — Main drive pinion.
2 — Direct speed synchroniser ring.
3 — Direct speed synchroniser stop ring.
4 — Clutch gear sleeve.
5 — Clutch gear.
6 — Second speed synchroniser stop ring.
7 — Second speed synchroniser ring.
8 — Coil spring.
9 — Second speed gear.

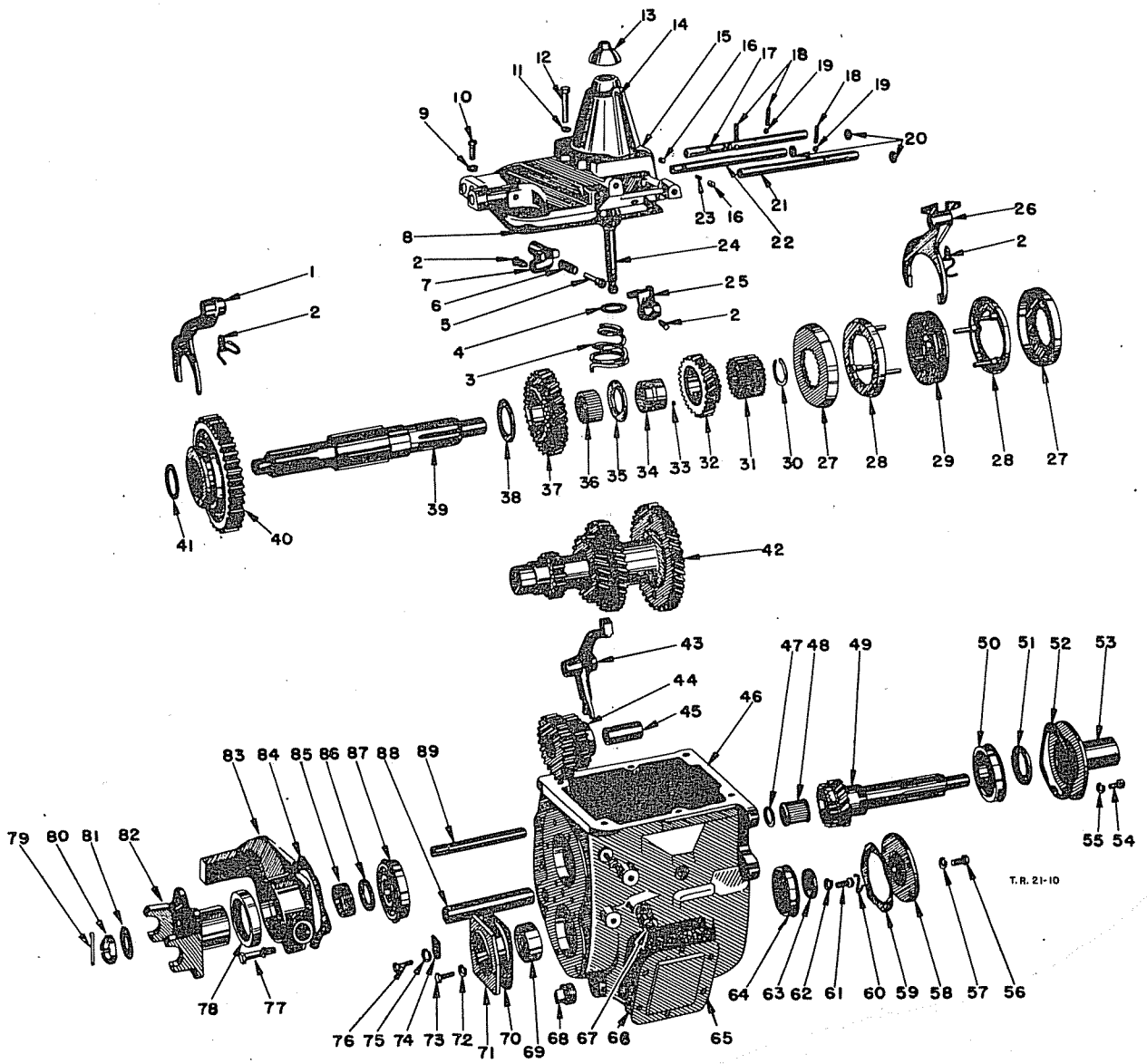


Fig. 13—Transmission (4-Speed).

KEY TO FIGURE 13.— TRANSMISSION (4 SPEED).

1 — First and second shift fork.
2 — Lockscrew and lockwire.
3 — Gearshift lever spring.
4 — Lever spring seat.
5 — Reverse rail shift latch plunger.
6 — Latch plunger spring.
7 — Reverse rail lug.
8 — Case cover gasket.
9 — Case cover screw lockwasher.
10 — Case cover screw—Short.
11 — Case cover screw lockwasher.
12 — Case cover screw—Long.
13 — Gearshift lever ball cap.
14 — Lever guide pin.
15 — Gearshift case cover.
16 — Rail interlock plunger.
17 — Reverse rail.
18 — Rail poppet ball spring.
19 — Rail poppet ball.
20 — Rail hole plug.
21 — Low and second rail.
22 — Third and direct rail.
23 — Rail interlock pin.
24 — Gearshift lever.
25 — Low and second rail lug.
26 — Third and fourth shift fork.
27 — Synchroniser stop ring—Outer.
28 — Synchroniser stop ring assembly.
29 — Synchroniser sliding clutch.
30 — Synchroniser snap ring.
31 — Synchroniser clutch gear.
32 — Mainshaft third speed gear.
33 — Bushing retainer pin.
34 — Third speed gear bushing.
35 — Third speed gear locating washer.
36 — Second speed gear rollers.
37 — Second speed gear.
38 — Gear locating washer.
39 — Mainshaft.
40 — Low and second sliding gear.
41 — Rear bearing shim.
42 — Countershaft.
43 — Reverse shift fork.
44 — Reverse idler gear.
45 — Idler gear bushing.
46 — Case.
47 — Pilot bearing spacer.
48 — Pilot bearing.
49 — Main drive pinion.
50 — Drive pinion bearing.
51 — Pinion bearing retainer nut.
52 — Pinion bearing retainer gasket.
53 — Pinion bearing retainer.
54 — Bearing retainer screw.
55 — Retainer screw lockwasher.
56 — Countershaft front bearing retainer screw.
57 — Retainer screw lockwasher.
58 — Countershaft front bearing retainer.
59 — Bearing retainer gasket.
60 — Retainer washer screw lockwasher.
61 — Retainer washer screw.
62 — Retainer washer screw lockwasher.
63 — Bearing retainer washer.
64 — Countershaft front bearing.
65 — Power take-off gasket.
66 — Take-off cover gasket.
67 — Case filler plug.
68 — Case drain plug.
69 — Countershaft rear bearing.
70 — Rear bearing retainer gasket.
71 — Rear bearing retainer.
72 — Retainer screw lockwasher.
73 — Retainer screw.
74 — Idler gear shaft lock plate.
75 — Lock plate screw lockwasher.
76 — Lock plate screw.
77 — Rear bearing retainer screw and lockwasher.
78 — Rear bearing oil seal.
79 — Flange nut cotter pin.
80 — Flange nut.
81 — Flange nut washer.
82 — Transmission end flange.
83 — Mainshaft rear bearing retainer.
84 — Rear bearing retainer gasket.
85 — Speedometer drive gear.
86 — Drive gear spacer.
87 — Mainshaft rear bearing.
88 — Reverse idler gear shaft.
89 — Gearshift reverse fork rail.

FOUR-SPEED TRANSMISSION

AS FITTED TO MODELS 1-08A, 2-26A, 2-33A AS SPECIAL EQUIPMENT

(Refer Figure 13)

7. REMOVAL AND INSTALLATION OF TRANSMISSION.

(1) Remove floor boards and mat.
(2) Disconnect speedometer cable.
(3) Disconnect universal joint.
(4) Remove cap screws which hold transmission to clutch housing.
(5) Insert pilot studs in place of the two upper cap screws in clutch housing and withdraw transmission.

To instal, reverse the foregoing operations.

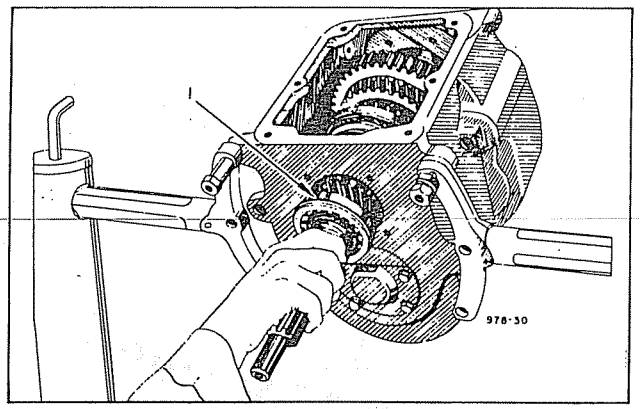


Fig. 14 — Removing Drive Pinion and Bearing.
1 — Main drive pinion.

8. DISASSEMBLY OF TRANSMISSION (TRANSMISSION REMOVED).

(1) Mount the transmission in a fixture, apply the hand brake and remove the large nut and cotter pin from the companion yoke and brake drum.
(2) Release the handbrake and remove the handbrake band assembly, drum and companion yoke.

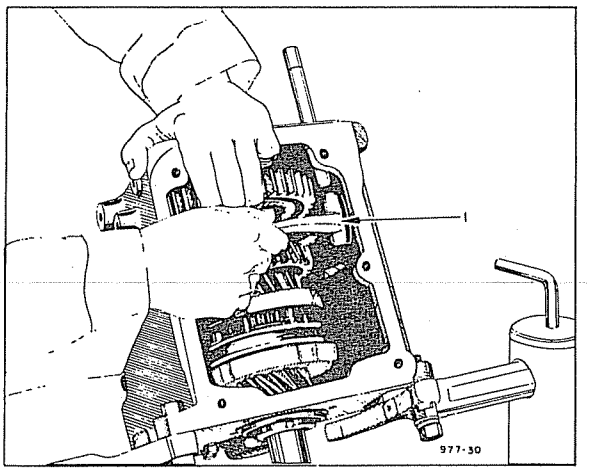


Fig. 15—Removing Reverse Gear Fork.
1 — Shift fork.

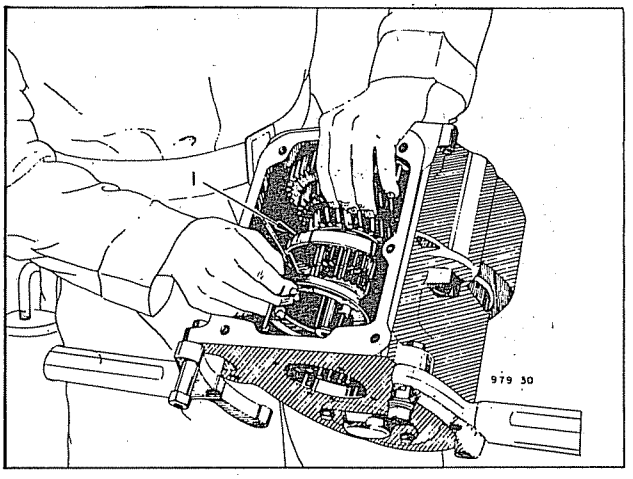


Fig. 16—Removing Synchroniser Drum.

1 — Synchroniser unit.

(3) Remove the transmission cover and shifter assembly.

(4) Remove the drive pinion bearing retainer, drive pinion and bearing (Figure 14).

(5) Remove the speedometer drive pinion.

(6) Remove the brake band support, oil seal and speedometer drive gear.

(7) Remove the reverse gear fork by driving the fork rail to the rear and lifting out the fork. (Figure 15).

(8) Slide the mainshaft to the rear of the case and remove the bearing. With the mainshaft in this position, remove the synchroniser drum assembly. To do this, remove each part separately, instead of removing the synchroniser drum assembly as a unit. (Figure 16).

(9) Remove the mainshaft from the case (Figure 17).

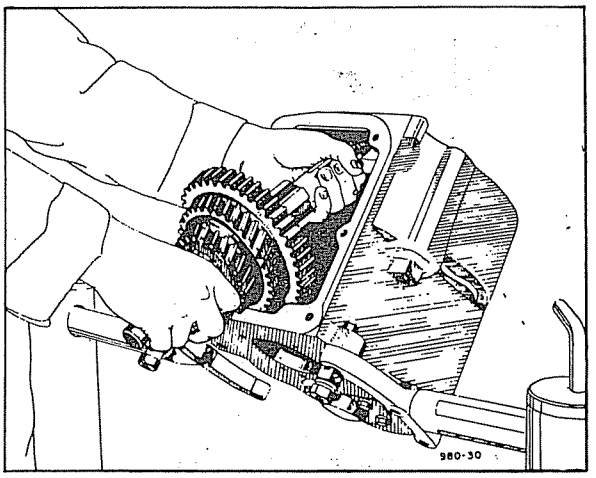


Fig. 17—Removing Mainshaft from Case.

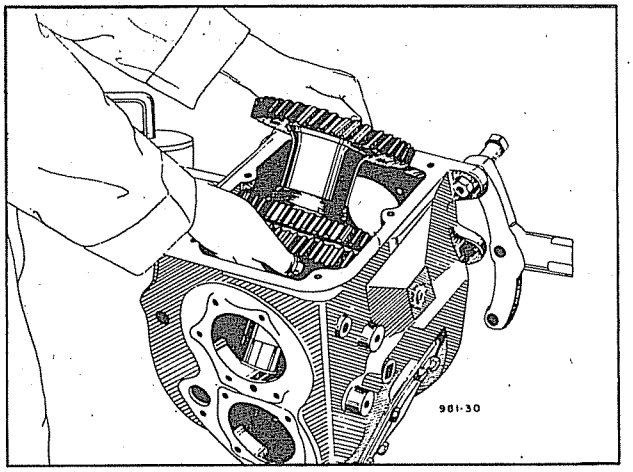


Fig. 18—Removing Countershaft from Case.

(10) Remove the countershaft front and rear bearing retainer, slide the bearing off and lift countershaft from case. (Figure 18).

(11) Remove the reverse idler lock and instal tool C-603. Remove the reverse idler shaft. (Figure 19).

(12) Drive out the reverse idler shaft through the rear of the case and remove the reverse idler gear and bushing.

9. ASSEMBLY OF TRANSMISSION.

To assemble, reverse the dis-assembly operations. If snap rings have been removed, always instal new rings and use new oil seals. Paper gaskets, .010 inch thick are used between the rear bearing retainer and the transmission case. When assembling the transmission, instal the rear bearing without the gaskets and measure with a feeler gauge between

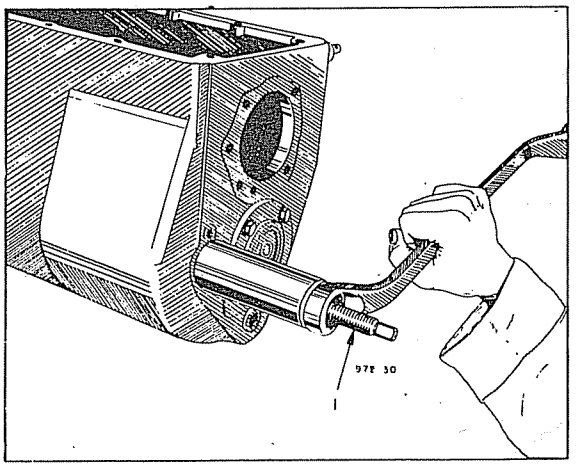


Fig. 19—Removing Reverse Idler Shaft (Tool C-603)

1 — Tool C-603

This figure illustrates the use of Tool C-603. The counter gear is removed before removing reverse idler gear.

the retainer and case. Then, instal sufficient paper gaskets to allow from .003 inch play to .003 tension on the rear bearing. For example, if the clearance between the retainer and case is .012 inch, instal one .010 inch paper gasket.

10. TRANSMISSION COVER. TO DISASSEMBLE COVER (COVER REMOVED).

(1) Place the shift lever in neutral and remove the shifter fork lock wires and lock screws.

(2) Drive the gear shift rails out through the rear of the cover, using a drift. At the same time, force out the expansion plugs.

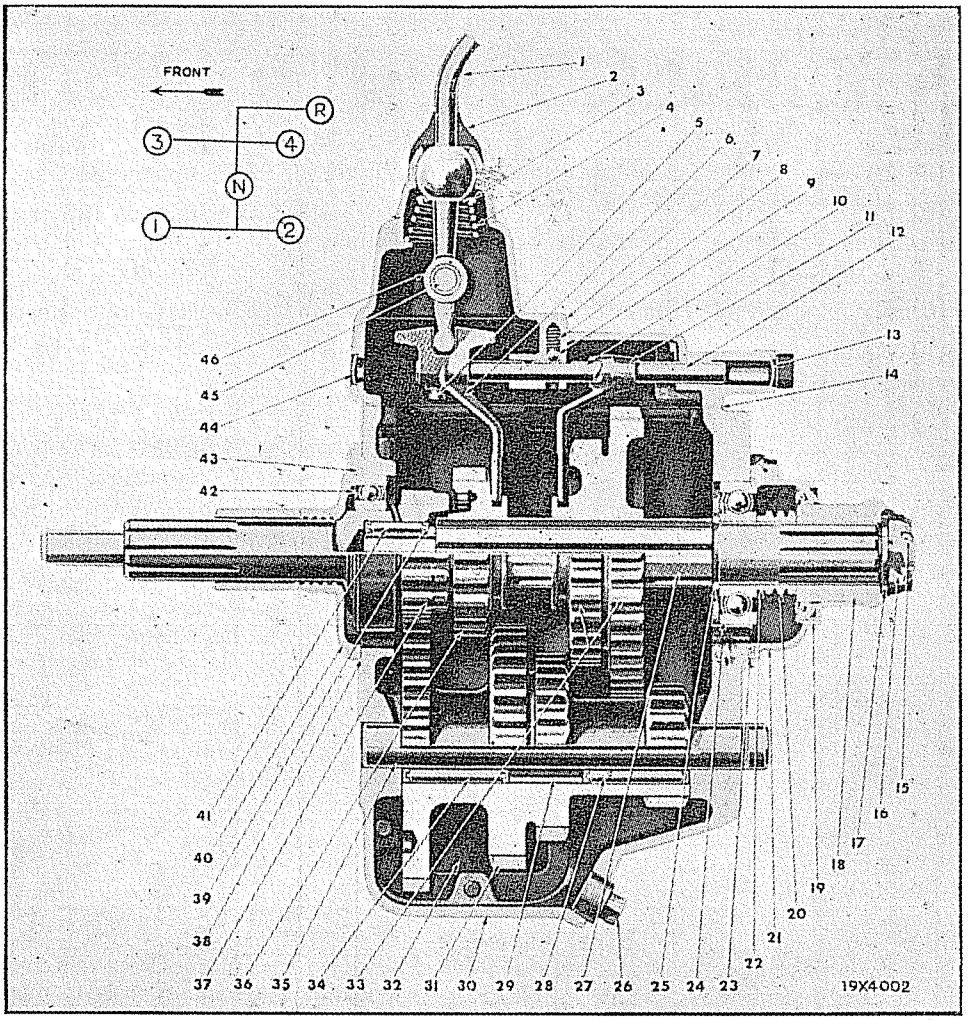
(3) When driving out the gear shift rails, be careful not to lose the poppet balls and springs which are held under spring tension.

(4) Remove the interlock plungers.

(5) Remove the gear shift lever ball cap.

(6) Remove the gear shift lever spring and pull the lever out through the bottom of the cover.

(7) Remove the guide pins from the gear shift lever housing. To assemble, reverse the operations and be careful to centre the guide pin in the gear shift lever so that the lever end is in line with the centre shifting rail. Use new expansion plugs for the shift rails.



1 — Gearshift lever.
2 — Gearshift lever dust cover.
3 — Gearshift lever spring seat.
4 — Gearshift lever spring.
5 — Gearshift fork lock screw.
6 — Gearshift fork—third and top.
7 — Gearshift lever housing.
8 — Selector shaft lock spring.
9 — Selector shaft lock ball.
10 — Selector shaft—third and top.
11 — Gearshift fork—first and second.
12 — Selector shaft—first and second.
13 — Selector shaft welch plug.
14 — Gearshift lever housing gasket.
15 — Mainshaft flange nut lock pin.
16 — Mainshaft flange nut.
17 — Mainshaft flange nut thrust washer.
18 — Mainshaft flange.
19 — Mainshaft rear bearing oil seal.
20 — Speedometer drive gear.
21 — Mainshaft rear bearing retainer.
22 — Speedometer drive gear spacer.
23 — Mainshaft rear bearing retainer gasket.
24 — Mainshaft rear bearing.
25 — Mainshaft rear bearing snap ring.
26 — Gearbox drain plug.
27 — Mainshaft.
28 — Countershaft bearing.

Fig. 20—4-Speed Gearbox.

29 — Countershaft bearing spacer.
30 — Gearbox casing.
31 — Countershaft gear set (integral).
32 — Power take off cover.
33 — First and second speed sliding gears.
34 — Countershaft bearing.
35 — Countershaft.
36 — Third and top speed idler gear.
37 — Clutch shaft gear.
38 — Clutch shaft bearing retainer gasket.
39 — Mainshaft pilot bearing spacer.
40 — Clutch shaft bearing retainer.
41 — Mainshaft pilot bearing.
42 — Clutch shaft bearing.
43 — Clutch shaft bearing snap ring.
44 — Selector shaft welch plug.
45 — Gearshift lever reverse latch plunger.
46 — Gearshift lever reverse latch plunger spring.

FOUR-SPEED TRANSMISSION

MODELS 3-59A, 6-71A

11. REMOVAL AND INSTALLATION OF TRANSMISSION.

(1) Remove floor boards and mat.

(2) Disconnect front end universal joint.

(3) Remove the hand brake lever to rod clevis pin and dismount the lever from the gear box casing.

(4) Disconnect speedometer cable.

(5) Unscrew the four set screws which secure the transmission casing to the clutch housing.

(6) Insert pilot studs in place of the two upper cap screws in the clutch housing and withdraw transmission.

NOTE.

Care must be taken to ensure the clutch plate is retained in its correct position. Therefore, do not depress the clutch pedal while the transmission is dismounted, otherwise this will allow the clutch plate to move out of its correct position for receiving the clutch shaft when the gear box is installed.

To instal, reverse the foregoing operations.

12. DISASSEMBLY OF TRANSMISSION (TRANSMISSION REMOVED)

Refer Figure 20.

(1) Mount the transmission in a suitable fixture, remove the gear shift housing complete and shifter assembly.

(2) Remove the mainshaft retaining nut cotter pin. Unscrew the nut and withdraw the flange.

(3) Unscrew the set screws holding the clutch shaft bearing retainer and remove the retainer shaft and bearing complete.

(4) Remove the speedometer drive pinion assembly.

(5) Unscrew the mainshaft rear bearing retainer set screws and remove the retainer.

(6) Withdraw the mainshaft, at the same time take out the sliding gears through the top of the gear box casing.

(7) Unscrew the countershaft and reverse idler gear shaft lock plate screw and remove the lock plate.

(8) Remove the cotter pin, reverse fork and shaft.

(9) Drive the countershaft out through the rear of the gearbox casing, using a hammer or soft drift.

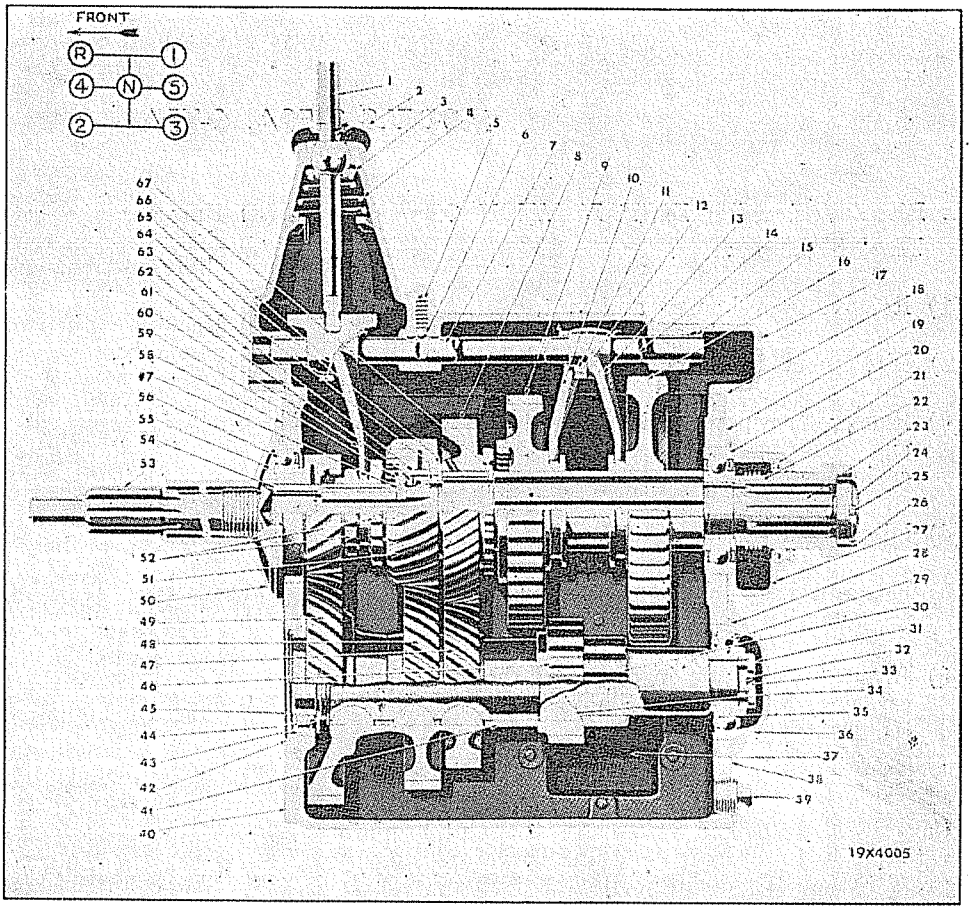
(10) The countershaft cluster gear assembly and bearings can now be lifted out through the top of the gearbox casing. (Figure 18).

(11) Drive the reverse gear idler shaft out through the rear of the casing and remove the idler gear and bushing.

13. ASSEMBLY OF TRANSMISSION.

To assemble, reverse the disassembly operations, using new snap rings and oil seals.

Paper gaskets .010 inch thick are used between the rear bearing retainer and the transmission case to eliminate any possible play on the bearings. The retainers should, therefore, be fitted without gaskets and measured with a feeler gauge between the retainer and the case. Then instal sufficient paper gaskets to give slight tension on the bearings.



1 — Gearshift lever.
2 — Gearshift lever dust cover.
3 — Gearshift lever spring seat.
4 — Gearshift lever spring.
5 — Selector shaft lock spring.
6 — Selector shaft lock ball.
7 — Selector shaft—fourth and fifth.
8 — Third speed mainshaft gear.
9 — Second and third speed sliding gear.
10 — Gearshift fork—second and third.
11 — Gearshift fork lock screw.
12 — Gearshift fork lock screw lock wire.
13 — Gearshift fork—first and reverse.
14 — Selector shaft—first and reverse.
15 — Selector shaft — second and third.

Fig. 21—5-Speed Gearbox.

16 — First and reverse sliding gear.
17 — Gearshift lever housing.
18 — Gearshift lever housing gasket.
19 — Mainshaft rear bearing retainer gasket.
20 — Mainshaft rear bearing.
21 — Mainshaft rear bearing oil seal.
22 — Speedometer drive gear.
23 — Mainshaft.
24 — Mainshaft flange nut.
25 — Mainshaft flange nut cotter pin.
26 — Mainshaft flange.
27 — Mainshaft rear bearing retainer.
28 — Countershaft rear bearing spacer.
29 — Countershaft rear bearing.
30 — Countershaft.
31 — Countershaft rear bearing retainer plate screw.
32 — Countershaft rear bearing retainer plate.
33 — Countershaft rear bearing retainer plate screw washer.
34 — Countershaft gear key.
35 — Countershaft rear bearing washer.
36 — Countershaft rear bearing retainer.
37 — Power take off cover.
38 — Countershaft rear bearing retainer gasket.
39 — Gearbox drain plug.
40 — Gearbox casing.
41 — Countershaft second and third gear spacer.
42 — Countershaft front bearing retainer ring.
43 — Countershaft front bearing.
44 — Countershaft front bearing washer.
45 — Countershaft front bearing retainer cap.
46 — Countershaft second and reverse gear.
47 — Countershaft third speed gear.
48 — Countershaft fourth speed gear.
49 — Countershaft drive gear.
50 — Clutch shaft bearing retainer.
51 — Mainshaft fourth speed gear.
52 — Fourth and fifth sliding gear.
53 — Clutch shaft.
54 — Mainshaft spigot bearing.
55 — Clutch shaft bearing retainer nut.
56 — Clutch shaft bearing
57 — Fourth speed gear shims.
58 — Clutch shaft bearing retainer gasket.
59 — Fourth speed gear retainer ring.
60 — Gearshift fork—fourth and fifth.
61 — Fourth speed gear bush retainer pin.
62 — Selector welch plug.
63 — Fourth speed gear roller.
64 — Fourth speed gear roller bush.
65 — Fourth speed gear location washer.
66 — Gearshift fork lock screw lock wire.
67 — Third speed gear locating washer.

FIVE-SPEED TRANSMISSION

MODELS 8-65A, 8-71A, 8-71A-D

13. REMOVAL AND INSTALLATION OF TRANSMISSION.

(1) Remove floor boards and mat.

(2) Disconnect front end universal joint.

(3) Remove the hand brake lever to rod clevis pin and dismount the lever from the gear box casing.

(4) Disconnect speedometer cable.

(5) Unscrew the four set screws which secure the transmission casing to the clutch housing.

(6) Insert pilot studs in place of the two upper cap screws in the clutch housing and withdraw transmission.

NOTE.

Care must be taken to ensure the clutch plate is retained in its correct position. Therefore, do not depress the clutch pedal while the transmission is dismounted, otherwise this will allow the clutch plate to move out of its correct position for receiving the clutch shaft when the gear box is installed.

To instal, reverse the foregoing operations.

14. DISASSEMBLY OF TRANSMISSION (REMOVED) Refer Figure 21.

(1) Mount the transmission assembly in a suitable fixture and remove gear shift lever housing complete with the shifter assembly.

(2) Remove the mainshaft flange retaining nut cotter pin. Unscrew the nut and withdraw the flange.

(3) Unscrew the set screws holding the clutch shaft bearing retainer and remove retainer and bearing complete.

(4) Remove the speedometer drive assembly.

(5) Unscrew the mainshaft rear bearing retainer set screws and remove the retainer.

(6) Pull the mainshaft and gear assembly far enough out of the rear of the case to facilitate the removal of the mainshaft rear bearing. Instal tool C-293 and remove bearing. Refer Figure 22.

(7) Lift the mainshaft and gears out through the top of the casing. (Figure 23).

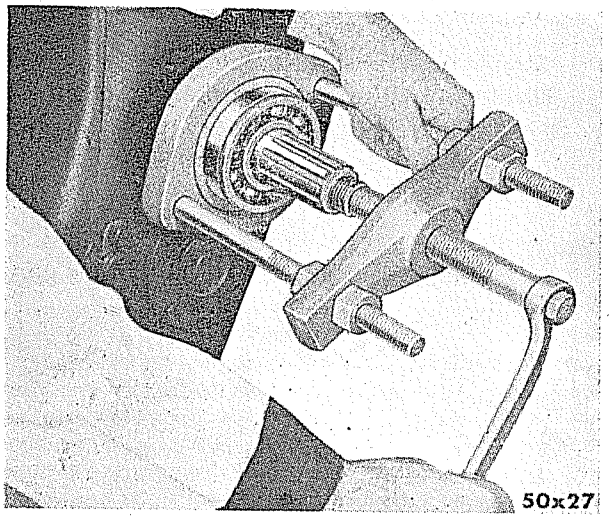


Fig. 22—Removing Mainshaft Rear Bearing.

(8) Remove fourth gear retainer ring, shims, retainer washer and bush retainer pin and slide the fourth speed gear, bearings, bush and locating washer from the shaft.

(9) Remove third speed gear, locating washer.

(10) Remove second and third speed sliding gear.

(11) Remove first and reverse sliding gear.

(12) Remove the countershaft front bearing retainer ring and retainer cap.

(13) Remove countershaft rear bearing retainer lock screws, remove retainer gaskets and washers. Move the countershaft to the rear of the case sufficiently to enable the countershaft rear bearings to be withdrawn. Refer Figure 6.

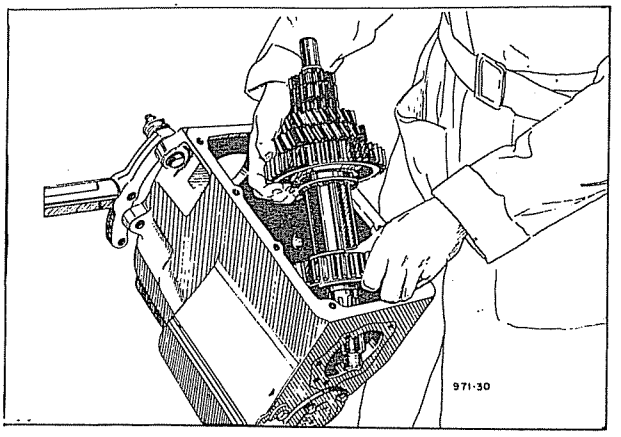


Fig. 23— Removing Mainshaft and Gears. (Typical view).

(14) Lift the countershaft up and out of the case. Refer Figure 24.

(15) Remove the reverse idler gear shaft lock plate screw and plate and drive the shaft out through the rear of the case, using a hammer and soft drift.

(16) Lift out the gears, bearing and bearing spacer.

(17) Place the countershaft assembly in an arbour press and press the gears off the shaft. Figure 25.

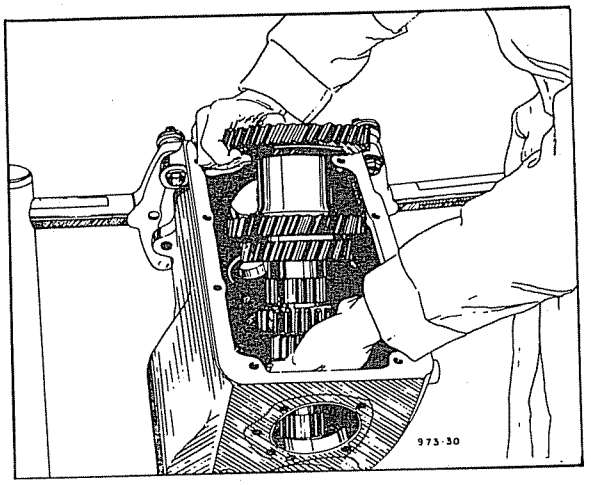


Fig. 24—Removing Cluster Gears. (Typical view).

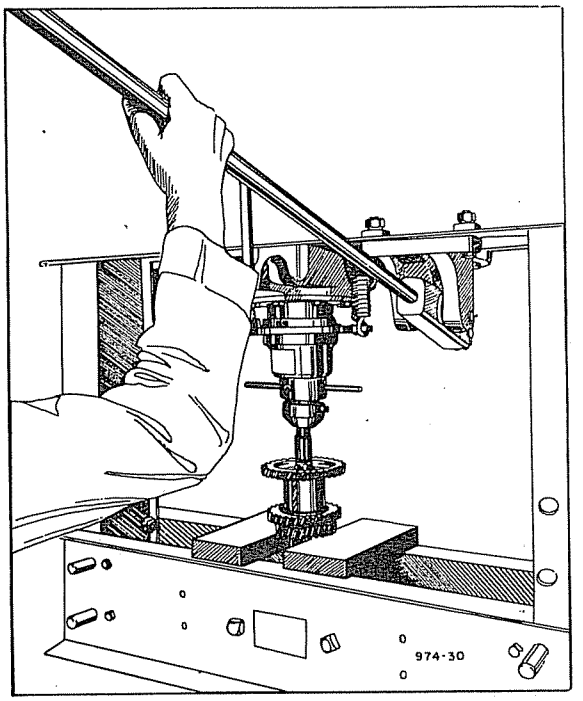


Fig. 25—Removing Gears from Countershaft.

15. ASSEMBLY OF TRANSMISSION.

When assembling the transmission, perform all operations in the reverse order to that given for disassembling. In addition, make sure that the following end plays are within the recommended limits and the following operations done carefully.

(1) Fourth speed end play should be .001 inch to .007 inch. This end play is controlled by shims which are available in .003 inch and .005 inch thicknesses.

(2) The third gear end play should be zero to .009 inch.

(3) Use new snap rings and oil seals.

(4) To provide clearance, the lower bolts for the clutch shaft bearing retainer have thinner heads than the upper bolts. Be sure to fit the thin head screw at the bottom of the retainer to allow clearance for the clutch cross shaft.

MAINTENANCE

16. CHECKING CLUTCH HOUSING ALIGNMENT (TRANSMISSION REMOVED).

(1) Instal clutch plate aligning arbour in the flywheel and tighten the wing nut.

(2) Instal clamp on aligning arbour, placing a dial indicator against clutch housing. Turn the indicator dial face until the needle points to zero. Then, turn the engine until the indicator circles the clutch housing and a correct reading can be obtained. The runout should not exceed .003 inch.

The clutch housing bore can be checked in the same manner, except that the indicator plunger should be placed on the inside of the bore. The amount of out-of-round of the bore should not exceed .005 inch total indicator reading.

SERVICE DIAGNOSIS

Conditions — Possible Causes — Remedies

17. NOISES.

Before seeking a cause of a transmission noise, note what position the gearshift lever is in when the noise occurs. If the noise is evident in only one gear position, the cause of the noise is generally traceable to the gears in operation. Sometimes, due to abnormal conditions in other parts of the truck, noises are transmitted from the engine, power train, frame or body to the transmission and will appear to originate there. Such noises may be caused by the following:

Possible Causes.

(a) Out-of-balance or bent fan.
(b) Out-of-balance crankshaft.
(c) Out-of-balance flywheel.
(d) Unbalanced clutch assembly.
(e) Loose engine mountings.
(f) Worn universal joints.
(g) Spring drive shaft.
(h) Use of incorrect drive shaft assembly.

Remedies.

(a) Instal a new fan.
(b) Inspect crankshaft for out-of-balance condition. Balance crankshaft or replace as necessary.
(c) Inspect flywheel for out-of-balance condition. Balance or replace flywheel as necessary.
(d) Check the prick punch marks on the clutch cover and the flywheel and make sure they line up. These parts are balanced when originally installed.
(e) Inspect engine mountings and tighten to the proper torque.
(f) Check universal joints, replace parts or instal a new unit as necessary.
(g) Inspect drive shaft. If sprung, replace with a new unit.
(h) Check drive shaft assembly. If necessary, instal new parts that are recommended for use with particular truck model.

18. NOISE IN NEUTRAL.

Possible Causes.

(a) Misalignment of transmission.
(b) Worn transmission pinion bearing.
(c) Worn, or scored countershaft bearings.
(d) Defective second speed mainshaft gear bushing.
(e) Unmatched constant mesh gears.
(f) Worn, or rough, reverse idler gear.
(g) Eccentric countershaft gear assembly.
(h) Sprung, or worn, countershaft.
(i) Excessive backlash in constant mesh gear.
(j) Excessive end play in countershaft, reverse idler pinion.
(k) Worn mainshaft pilot bearing.
(l) Scuffed gear tooth contact surface.
(m) Insufficient lubrication.
(n) Use of incorrect grade of lubricant.

Remedies.

(a) Check clutch housing alignment (Refer to Clutch Section). Misalignment between transmission and clutch housing may be caused by chips, dirt, buckled gasket or burrs. Check to determine cause and correct.
(b) Disassemble transmission and check pinion bearing. Replace as necessary.
(c) Dissassemble unit. Inspect countershaft bearings and replace as necessary.
(d) If bushing is defective, instal a new one.
(e) Inspect. If constant mesh gears are unmatched, replace with a matched set.
(f) Check reverse idler gear for wear or roughness and replace as necessary.
(g) Inspect. If assembly is eccentric, instal a new assembly.
(h) Replace countershaft if sprung or worn.
(i) Inspect backlash. If excessive, check bushings for wear and replace parts as necessary.
(j) Check end play. Refer to Service Standards for tolerances. If excessive, adjust to specifications.
(k) Inspect mainshaft pilot bearing for wear or damage and replace parts as necessary.
(l) Inspect gear tooth contact surfaces. If scuffed or worn, replace as required.
(m) If truck has been operated with insufficient lubricant in transmission, parts may be worn or damaged. Disassemble unit and replace parts as necessary. Fill transmission with proper grade and correct amount of lubricant. Refer to Lubrication Section.
(n) If incorrect grade of lubricant has been used in transmission, parts may have become worn or damaged. Disassemble transmission and check parts for wear or damage. Replace as necessary. Fill transmission with proper grade of lubricant. Refer to Lubrication Section.

19. NOISE-IN GEAR.

Possible Causes.

(a) Worn or rough mainshaft rear bearing.
(b) Rough, chipped, or tapered, sliding gear teeth.
(c) Noisy speedometer gears.
(d) Refer to Conditions listed under Paragraph 18.

Remedies.

(a) Inspect mainshaft rear bearing. Replace if rough or worn.
(b) Check sliding gear teeth. If rough, chipped or tapered, replace sliding gear. Also, check teeth of mating gears for wear or damage and replace as required.
(c) Check speedometer gears for wear or damage and replace parts as required.
(d) Refer to Remedies listed under Paragraph 18.

20. HARD SHIFTING.

Possible Causes.

(a) Improperly operating clutch.
(b) Sliding gear tight on shaft splines.
(c) Insufficient chamfer of sliding gear teeth.
(d) Burred mainshaft splines.
(e) Damaged synchronising unit.
(f) Improper adjustment of shifting linkage (if truck is so equipped).
(g) Worn or sprung shifter rails.

Remedies.

(a) Check clutch for proper operation. Refer to Clutch Section. Correct as necessary to remedy condition.
(b) Inspect gear and shaft and replace as necessary.
(c) Inspect chamfer of sliding gear teeth. If chamfer is insufficient, replace sliding gear.
(d) Inspect mainshaft splines for burring. If splines are burred, remove burrs or replace shaft as necessary.
(e) Inspect synchronizing unit for damage and replace as necessary.
(f) Inspect shifting linkage (if truck is so equipped) and correct adjustment as required.
(g) Check for worn or sprung shifter rails and replace rails as necessary.

21. STICKING IN GEAR.

Possible Causes.

(a) Improperly operating clutch.
(b) Sliding gear tight in mainshaft splines.
(c) Improper adjustment of linkage (if truck is so equipped).

Remedies.

(a) Check clutch for proper operation. Refer to Clutch Section. Correct as necessary to remedy condition.
(b) Check gear for wear and replace if required. Check splines for wear or burring. If burred, clean up with a file. Replace as necessary.
(c) Check adjustment of linkage (if truck is so equipped) and re-adjust as necessary.

22. SLIPPING OUT OF HIGH GEAR.

Possible Causes.

(a) Misaligned transmission.
(b) Worn pinion gear teeth.
(c) Worn clutch sleeve gear teeth.
(d) Insufficient tension on detent balls.
(e) Improper linkage adjustment.

Remedies.

(a) Check clutch housing alignment. Refer to Clutch Section. Misalignment between transmission and clutch housing may be caused by chips, dirt, buckled gasket or burrs. Check to determine cause and correct.
(b) Inspect pinion gear teeth for wear or damage. Replace pinion gear as necessary.
(c) Inspect clutch sleeve gear teeth for wear or damage and replace parts as required.
(d) Check tension of detent ball springs. If weak, instal new springs.
(e) Check linkage (if truck is so equipped) for proper operation and adjustment. Correct adjustment as necessary.

23. SLIPPING OUT OF SECOND GEAR.

Possible Causes.

(a) Worn second speed clutch gear teeth.
(b) Weak detent ball springs.
(c) Improper linkage adjustment.

Remedies.

(a) Inspect clutch gear teeth for wear and replace parts as necessary.
(b) Check tension of detent ball springs. If springs are weak, instal new ones.
(c) Check linkage (if truck is so equipped) for proper operation and adjustment. Correct adjustment as necessary.

24. SLIPPING OUT OF FIRST GEAR.

Possible Causes.

(a) Worn or tapered sliding gear teeth.
(b) Worn mainshaft splines.
(c) Worn countershaft first speed gear.

(d) Excessive end play of reverse idler.
(e) Improper linkage adjustment.

Remedies.

(a) Inspect sliding gear teeth for wear or taper and replace as required.
(b) If mainshaft splines are worn, replace mainshaft.
(c) If countershaft first speed gear is worn, replace countershaft.
(d) Check end play of reverse idler. If more than .015 inch, instal thrust washers of the required thickness to allow end play of .004 to .005 inch.
(e) Check linkage (if truck is so equipped) for proper operation and adjustment. Correct as necessary.

25. LOSS OF LUBRICANT.

Possible Causes.

(a) Lubricant level too high in transmission.
(b) Damaged or improperly installed gaskets.
(c) Damaged or defective oil seals.
(d) Loose drain plug in transmission cover.
(e) Cracked transmission housing.
(f) Use of excessively foaming lubricant.
(g) Plugged transmission breather.
(h) Worn mainshaft bearings.

Remedies.

(a) If lubricant is too high, drain to proper level. Refer to Lubrication Section.
(b) If gaskets are damaged or improperly installed, replace and instal correctly.
(c) If oil seals are damaged or defective, instal new oil seals.
(d) Tighten drain plug.
(e) Instal a new transmission housing.
(f) Drain transmission and refill with correct lubricant. Refer to Lubrication Section. Check gaskets and oil seals and replace as necessary.
(g) Clean out breather.
(h) If mainshaft bearings are worn, replace parts as necessary.

26. BEARING FAILURES.

Possible Causes.

(a) Use of wrong type or grade of lubricant.
(b) Bearings adjusted too tight or loose.
(c) Improper assembly of transmission.
(d) Lack of cleanliness in overhaul of transmission.
(e) Overloading of truck.

Remedies.

(a) Disassemble transmission. Inspect bearings for damage and wear and replace parts as necessary. Fill transmission with proper lubricant. Refer to Lubrication Section.
(b) Disassemble transmission. Inspect bearings and other parts for wear or damage and replace parts as required. Fill transmission with proper lubricant. Refer to Lubrication Section.
(c) Disassemble transmission. Inspect for damaged or worn parts and make necessary replacements. Re-assemble properly and fill with correct lubricant.
(d) Disassemble transmission and check all parts for wear or damage and make the necessary replacements after cleaning all parts and transmission housing thoroughly. Fill with proper lubricant.
(e) Disassemble transmission. Check all parts for wear or damage and make the necessary replacements. Fill with proper lubricant.

NOTES