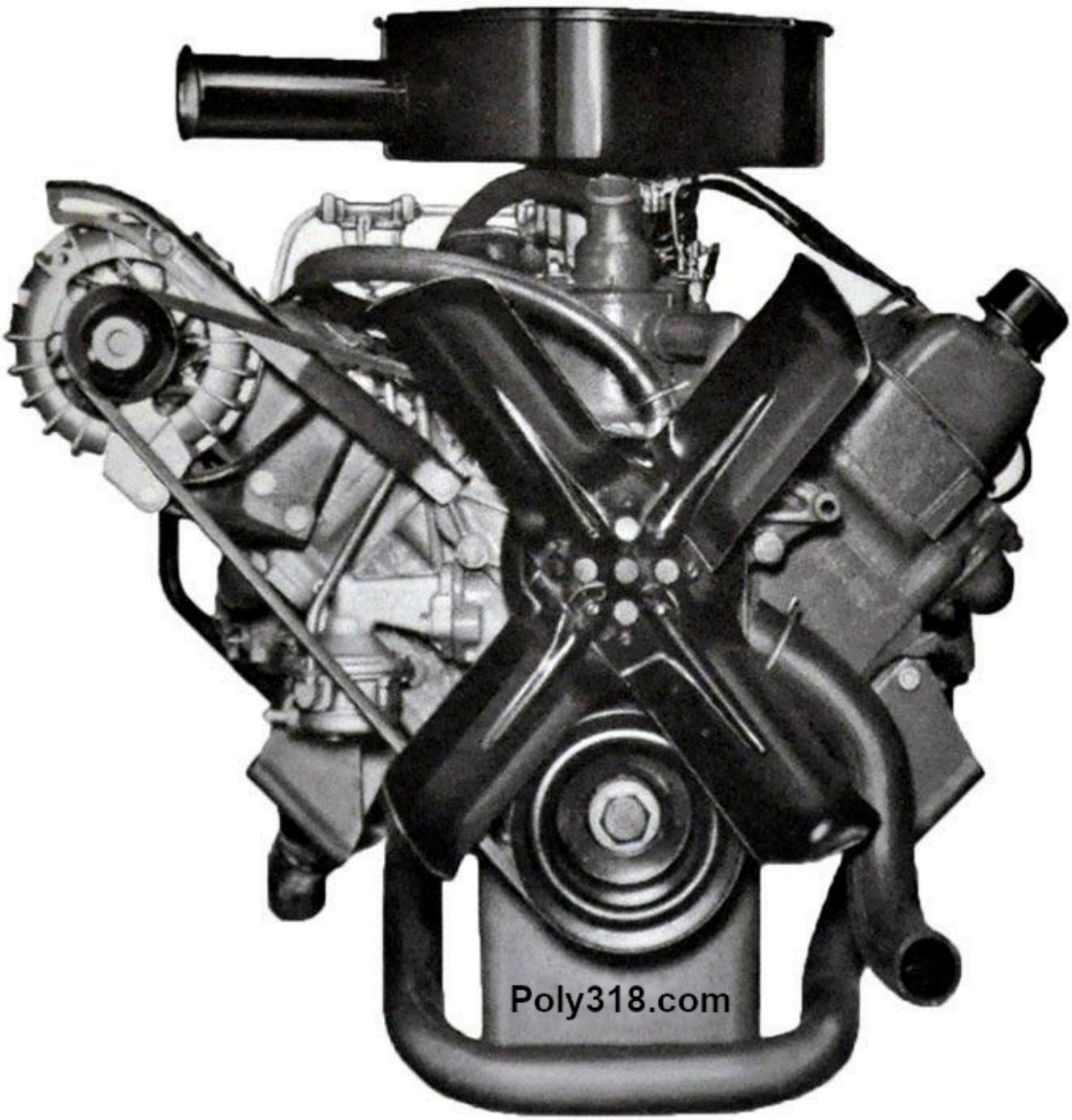
A-block Engine & Components Service Manual

Edited for Engine Information Only
Applicable to 1962 - 1967 A313 and A318
(Good Supplemental for 1956 - 1961 A-blocks)



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COOLING SYSTEM

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Description

In order to provide satisfactory protection for the wide variety of corporation models the cooling system of each must be tailored to specific needs. To do this effectively the Corporation offers three basic systems:

1. Standard
2. Air Conditioning
3. High Capacity

The standard system consists of a tube and spacer type radiator, 14 psi radiator pressure cap, centrifugal water pump, 180°F. thermostat, and a four, six or seven blade fan (Fig. 1). See specifications for application.

The cooling system for air conditioned vehicles generally requires a greater capacity radiator along with a fan shroud, 16 psi radiator pressure cap, special centrifugal water pump, larger fan, and thermostatically controlled fan drive (in some installations). See specifications for applications.

The high capacity system, available as optional equipment to the standard vehicle, is a combination of the standard and air conditioning systems as necessary to provide protection against overheating for unusually severe operation requirements.

For internal cooling system protection each cooling system is factory equipped with sufficient permanent type anti-freeze for —20°F. protection. It is recommended that the coolant be changed annually to insure adequate anti-freeze and corrosion protection. In areas where anti-freeze is not required, MOPAR rust inhibitor must be added to the water coolant for normal corrosion protection. Air conditioned vehicles require year round protection with permanent type anti-freeze with a minimum of +15°F. protection for summer operation and additional anti-freeze in the winter according to the prevailing temperatures.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
EXTERNAL LEAKAGE	(a) Loose hose clamp.	(a) Replace the hose clamp.
	(b) Hose Leaking.	(b) Replace the hose.
	(c) Leaking radiator.	(c) Repair or replace the radiator as necessary.
	(d) Worn or damaged water pump seal.	(d) Replace the water pump seal.
	(e) Loose core hole plug.	(e) Install new core hole plug.
	(f) Damaged gasket, or dry gasket, if engine has been stored.	(f) Replace gaskets as necessary.
	(g) Cylinder head bolts loose, or tightened unevenly.	(g) Replace the cylinder head gasket and torque head in correct sequence.
	(h) Leak at heater connection.	(h) Clean the heater connections and replace the hoses and clamps if necessary.
	(i) Leak at water temperature sending unit.	(i) Tighten the water temperature sending unit.
	(j) Leak at water pump attaching bolt.	(j) Tighten the water pump attaching bolts 30 foot-pounds torque.
	(k) Leak at exhaust manifold stud.	(k) Seal and re-drive the stud.
	(l) Cracked thermostat housing.	(l) Replace the thermostat housing.
	(m) Dented radiator inlet or outlet tube.	(m) Straighten the radiator inlet or outlet tube as necessary.
	(n) Leaking heater core.	(n) Repair or replace the heater core.
	(o) Cracked or porous water pump housing.	(o) Replace the water pump assembly.
	(p) Warped or cracked cylinder head.	(p) Replace the cylinder head.
	(q) Cracked cylinder block.	(q) Replace the cylinder block.
	(r) Sand holes or porous condition in block or head.	(r) Replace the cylinder block or cylinder head as necessary.

7-2 COOLING SYSTEM—DIAGNOSIS

Condition	Possible Cause	Correction
	(s) Faulty pressure cap.	(s) Replace pressure cap.
	(t) Loose or stripped oil cooler fittings.	(t) Tighten or replace as necessary.
INTERNAL LEAKAGE	(a) Faulty head gasket.	(a) Install a new head gasket.
	(b) Refer to causes (f), (g), (p), (q), (r) and (t) listed under External Leakage.	(b) Refer to corrections (f), (g), (p), (q), (r) and (t) listed under External Leakage.
	(c) Crack in head into valve compartment.	(c) Pressure test cooling system, replace the cylinder head.
	(d) Cracked valve port.	(d) Pressure test cooling system, replace the cylinder head.
	(e) Crack in block into push rod compartment.	(e) Pressure test cooling system, replace the cylinder block.
	(f) Cracked cylinder wall.	(f) Pressure test cooling system, replace the cylinder block.
	(g) Leaking oil cooler.	(g) Repair or replace the oil cooler.
POOR CIRCULATION	(a) Low coolant level.	(a) Fill radiator to correct level.
	(b) Collapsed radiator hose. (A bottom hose with faulty spring may collapse only at medium or high engine speeds.)	(b) Replace the hose and spring.
	(c) Fan belt glazed, oil soaked, or loose.	(c) Tighten or replace the fan belt as necessary.
	(d) Air leak through bottom hose.	(d) Reposition hose clamps or replace the hose.
	(e) Faulty thermostat.	(e) Replace the thermostat.
	(f) Water pump impeller broken or loose on shaft.	(f) Replace the water pump impeller assembly.
	(g) Restricted radiator core water passages.	(g) Flush the radiator thoroughly.
	(h) Restricted engine water jacket.	(h) Flush the engine cooling system thoroughly.
OVERHEATING OR APARENT OVERHEATING (refer to Causes listed under "Poor Circulation")	(a) Low coolant level.	(a) Fill radiator to proper level.
	(b) Blocked radiator air passages.	(b) Blow out the radiator air passages.
	(c) Incorrect ignition timing.	(c) Time the engine ignition system.
	(d) Low engine oil level.	(d) Add engine oil to the correct level.
	(e) Incorrect valve timing.	(e) Correct the engine valve timing.
	(f) Inaccurate temperature gauge.	(f) Replace the temperature gauge.
	(g) Restricted overflow tube.	(g) Remove restriction from the overflow tube.
	(h) Faulty radiator pressure cap or seat.	(h) Replace the radiator cap.
	(i) Frozen heat control valve.	(i) Free up the manifold heat control valve.
	(j) Dragging brakes.	(j) Adjust the brakes.
	(k) Excessive engine idling.	(k) Stop engine.
	(l) Frozen coolant.	(l) Thaw out cooling system, add antifreeze as required.
	(m) Faulty fan drive unit.	(m) Replace the fan drive unit.
	(n) Faulty temperature sending unit.	(n) Replace the sending unit.
OVERFLOW LOSS	(a) Refer to causes listed under "Poor Circulation and Overheating."	(a) Refer to corrections under "Poor Circulation and Overheating."
	(b) Overfilling.	(b) Adjust coolant to the correct level.
	(c) Coolant foaming due to insufficient corrosion inhibitor.	(c) Flush the radiator and add MoPar antifreeze or rust inhibitor as required.
	(d) Air leak at bottom radiator hose.	(d) Reposition hose clamps or replace the hose.
	(e) Blown head gasket.	(e) Replace the head gasket.
CORROSION	(a) Use of water containing large concentration of lime and minerals.	(a) Use only clean soft water.
	(b) Low coolant level.	(b) Fill the cooling system to the correct level.

Condition	Possible Cause	Correction
	(c) Insufficient corrosion inhibitor.	(c) Use MoPar antifreeze or rust inhibitor as required.
	(d) Use of antifreeze for extended length of time.	(d) Drain cooling system and replace with new antifreeze.
	(e) Failure to use corrosion inhibitor in summer.	(e) Flush radiator and refill with clean soft water and rust inhibitor.
	(f) Air leak at bottom radiator hose.	(f) Reposition hose clamps or replace the hose.
TEMPERATURE TOO LOW—SLOW ENGINE WARM UP	(a) Faulty thermostat.	(a) Replace the thermostat.
	(b) Inaccurate temperature gauge.	(b) Replace the temperature gauge.
	(c) Faulty temperature sending unit.	(c) Replace the sending unit.
WATER PUMP NOISY	(a) Seal noisy.	(a) Add 202 MoPar Water Pump Lube.
	(b) Bearing corroded.	(b) Replace bearing seal and impeller.

ACCESSORY DRIVE BELTS

INSUFFICIENT ACCESSORY OUTPUT DUE TO BELT SLIPPAGE	(a) Belt too loose.	(a) Adjust belt tension.
	(b) Belt excessively glazed or worn.	(b) Replace and tighten as specified.
BELT SQUEAL WHEN ACCELERATING ENGINE	(a) Belts too loose.	(a) Adjust belt tensions.
	(b) Belts glazed.	(b) Replace belts.
BELT SQUEAK AT IDLE	(a) Belt too loose.	(a) Adjust belt tension.
	(b) Dirt and paint imbedded in belt.	(b) Replace belt.
	(c) Non-uniform belt.	(c) Replace belt.
	(d) Misaligned pulleys.	(d) Align accessories (file brackets or use spacers as required).
	(e) Non-uniform groove or eccentric pulley.	(e) Replace pulley.
BELT ROLLED OVER IN GROOVE	(a) Broken cord in belt.	(a) Replace belt.
	(b) Belts not matched (A/C).	(b) Install matched belts.
BELT JUMPS OFF	(a) Belt too loose.	(a) Adjust belt tension.
	(b) Belts not matched (A/C).	(b) Install matching belts.
	(c) Misaligned pulleys.	(c) Align accessories.

SERVICE PROCEDURES

FAN

There are no repairs to be made on the fan. If the fan is bent or damaged it should be replaced.

Removal

Remove the upper half of the shroud (if so equipped). Loosen the fan belt and remove the four bolts attaching the fan to its pulley. On models so equipped, the fluid fan drive unit must be removed with the fan.

Installation

Use the correct spacer, if required, so that clearance between the fan blades and the radiator is from ⅝ inch to 1¼ inches. The fan should be installed so that the portion of each blade nearest the radiator is almost parallel to the radiator core. Installing the fan backwards (with the forward portion of the fan blade sharply angled away from the radiator core), will cause low air flow. Install the upper half of the shroud on vehicles so equipped. Tighten the fan belt as outlined in "Accessory Belt Drives."

FLUID FAN DRIVES

Torque Control Drive

The Torque Control Drive (Fig. 2) is a silicone

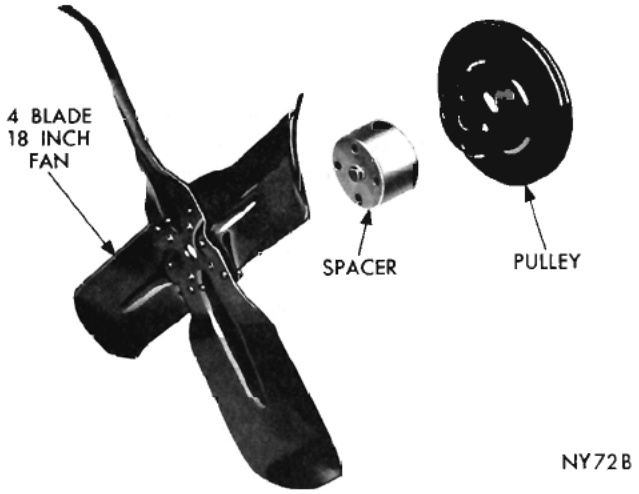

Fig. 1—Standard Fan Drive

Fig. 2—Torque Control Fan Drive

fluid filled coupling connecting the fan to the fan pulley. The unit allows the fan to be driven in a normal manner at slow vehicle speeds while limiting the top speed of the fan to a pre-determined level.

Thermal Control Drive

The Thermal Control Drive (Fig. 3) is essentially the same as the Torque unit except for a thermal spring on the drive face. The thermal spring senses the heat from the radiator and engages the drive for normal fan operation when required.

In case of engine overheating during slow vehicle speed or idle operation, increase the engine speed to approximately 1000 rpm in neutral gear. If the condition is not corrected by increasing the engine speed, replace the fan drive unit with a unit known to be operating properly and test by operating the vehicle under the same conditions. Replace the original drive unit assembly if the trouble was corrected with the test unit.

Fig. 3—Thermal Control Fan Drive

WATER PUMP

Removal

(1) Drain the cooling system and remove the fan shroud (air conditioning equipped vehicles). Loosen the fan drive belt by loosening the alternator mounting bracket and swing the alternator in towards the water pump (on vehicles equipped with air conditioning, loosen the idler pulley).

(2) Remove the fan, spacer and pulley.

(3) Remove the water pump to housing retaining bolts and washers and remove the water pump from the vehicle. Discard the gasket.

Installation

(1) Use a new gasket and install the water pump. Tighten the bolts to 30 foot-pounds.

(2) Install the pulley spacer, fan and shroud (when so equipped). Fill the cooling system and test for leaks. Test the belt tension as outlined in "Accessory Belt Drives."

Disassembly (170,225 cubic inch engines) (Fig. 4).

(1) Break the plastic impeller and remove it from the metal insert.

(2) Remove the separator plate and gasket.

(3) Split the sintered metal insert of the plastic impeller with a chisel and hammer.

(4) Remove the rubber portion of the shaft seal and the spring.

(5) Using puller Tool C-3753 (Fig. 5) remove the retainer portion of the seal.

(6) Remove the fan hub using puller Tool C-412.

(7) Support the pump body on the front face (fan hub end) and apply pressure to the rear end of the shaft to press the shaft and bearing assembly out through the front of the pump. If an attempt is made to remove the shaft in the opposite direction damage to the pump body may result.

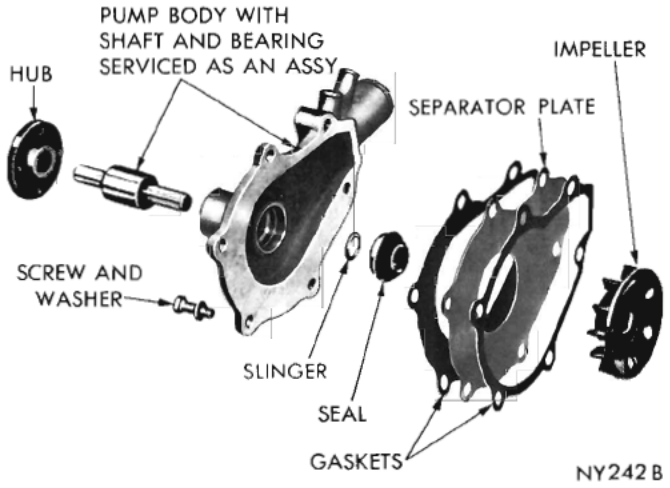

Fig. 4—170-225 Cubic Inch Engine Water Pump

(8) Use a wire brush to remove all rust from the separator plate. Clean all parts with a suitable solvent and dry with compressed air. **Bearing assemblies removed from water pumps should not be reused,** as damage to the bearing will usually result during removal.

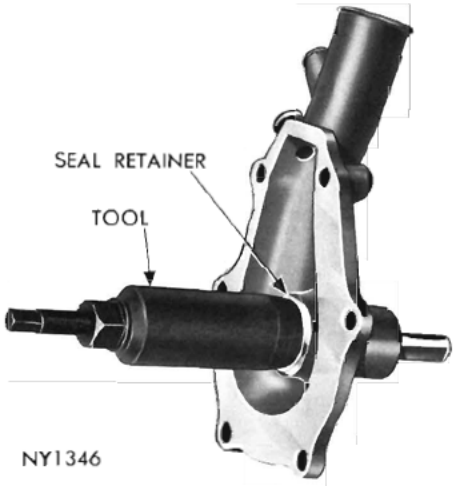

Fig. 5—Removing Seal Retainer

Assembly (170,225 Cubic inch Engines)

NOTE: Inspect seal surface of the impeller hub to be sure it is free of nicks, burrs, scratches and rust. If necessary remove these blemishes using crocus cloth on a flat plate.

(1) Apply a thin coat of Mopar Perfect Seal Sealing Compound, Part Number 1057794 to the seal pocket in the pump body.

(2) With the pump housing supported at the hub end, use a 1¼ inch (12 point) socket to apply pressure against the outer lip of the seal retainer and press the seal assembly into the body until the retainer lip is against the pump body.

(3) With the slinger ring in position on the long end of the pump shaft (approximately ⅛ inch from the bearing assembly) start the shaft and bearing assembly into the fan end of the pump body bore.

(4) Use a 1¼ inch (12 point) socket and support the pump body at the seal end, and with Tool C-3468, positioned against the outer bearing race only, press the shaft and bearing into the pump body so the end of the bearing is flush with the body hub end.

(5) While supporting the pump, on the impeller end of the shaft, press the fan hub onto the shaft (flat surface out) so the shaft extends $^{13}/_{32}$ inch beyond the fan hub.

(6) Position new gaskets on each side of the separator plate and install the plate on the pump body.

(7) Clean the seal face and impeller hub seal surface.

(8) Support the pump on the fan hub end of the shaft and position the new impeller on the pump shaft (blade portion down). Using a tool that will press against the impeller insert only, press the impeller onto the shaft until it is flush with the end of the shaft.

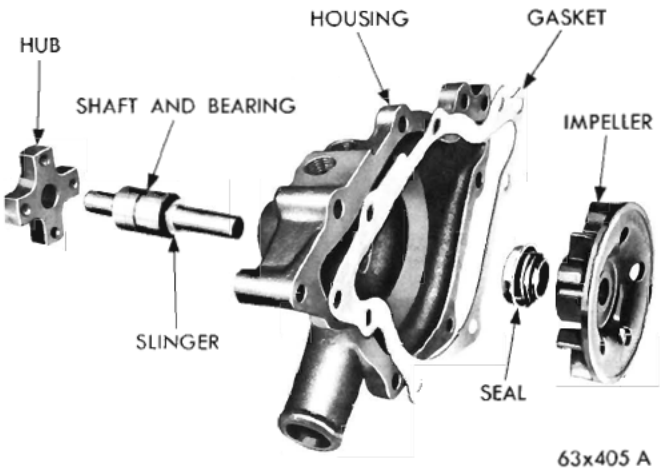

Fig. 6—273-318 Cubic Inch Engine Water Pump

Disassembly (273,318 Cubic Inch Engines) (Fig. 6).

(1) Break the plastic impeller and remove it from the metal insert.

(2) Split the sintered metal insert of the plastic impeller with a chisel and hammer.

(3) Remove the rubber portion of the shaft seal and the spring.

(4) Using puller Tool C-3753 remove the retainer portion of the seal.

(5) Remove the fan hub using puller Tool C-412 (Fig. 8).

(6) Support the pump body on the front face (fan hub end) and apply pressure to the rear end of the shaft to press the shaft and bearing assembly out through the front of the pump. If an attempt is made to remove the shaft in the opposite direction, dam-

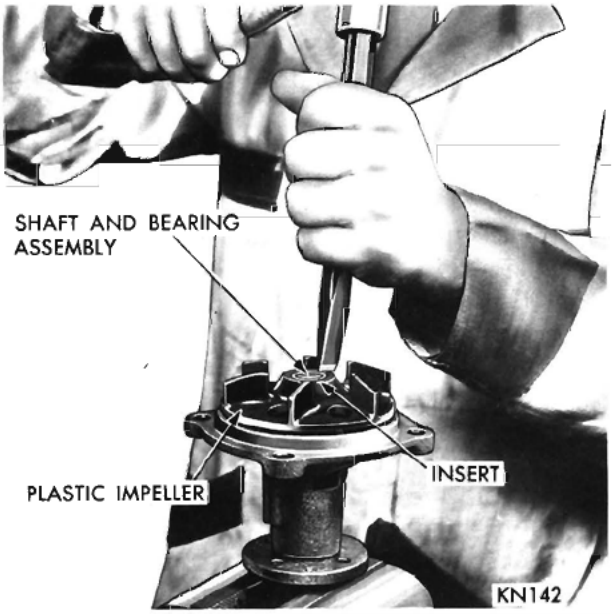

Fig. 7—Removing Plastic Impeller and Metal Insert

age to the pump body may result.

(7) Use a wire brush to remove all rust from the housing. Clean all parts with a suitable solvent and dry with compressed air. **Bearing assemblies removed from water pumps should not be reused,** as damage to the bearing will usually result during removal.

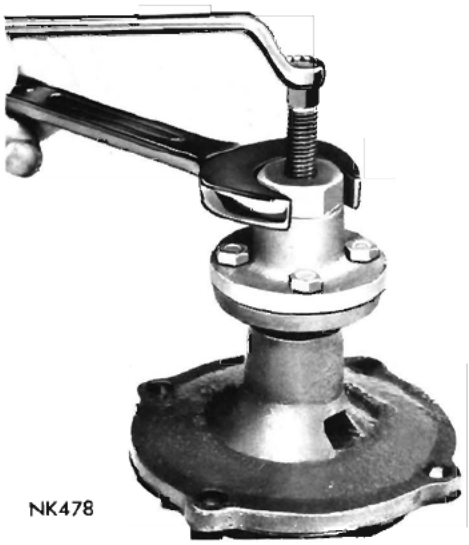

Fig. 8—Removing Fan Hub

Assembly (273,318 cubic inch engines)

NOTE: Inspect the seal surface of the impeller hub to be sure it is free of nicks, burrs, scratches and rust. If necessary remove these blemishes using crocus cloth on a flat plate.

(1) Apply a thin coat of Mopar Perfect Seal Sealing Compound, Part Number 1057794 to the seal pocket in the pump body.

(2) With the pump housing supported at the hub end, use a 1¼ inch (12 point) socket to apply pressure against the outer lip of the seal retainer and press the seal assembly into the body until the retainer lip is against the pump body.

(3) With the slinger ring in position on the long end of the pump shaft (approximately ⅛ inch from the bearing assembly) start the shaft and bearing assembly into the fan hub end of the pump body bore.

(4) Use a 1¼ inch (12 point) socket and support the pump body at the seal end, and with Tool C-3468, positioned against the outer bearing race only, press the shaft and bearing into the pump body so the end bearing is flush with the housing.

(5) While supporting the pump on the impeller end of the shaft, press the fan hub onto the shaft so the shaft extends $^{11}/_{32}$ inch through the fan hub.

(6) Support the pump on the fan hub end of the shaft and position the new impeller on the pump shaft (blade portion down). Using a tool that will press against the impeller insert only, press the impeller onto the shaft until it is flush with the end of the shaft.

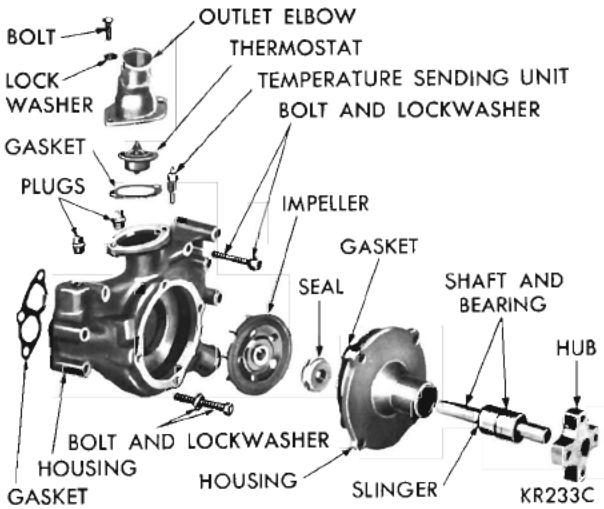

Fig. 9—361-383-426 Cubic Inch Engine Water Pump

Disassembly (361,383,426 cubic inch engines) (Fig. 9).

(1) Remove the fan hub from the shaft using puller, Tool C-412 as shown in Figure 8.

(2) Support the pump on the hub end and remove the plastic impeller by breaking it away from the metal insert (Fig. 7).

(3) Split the sintered metal insert of the plastic impeller with a chisel and hammer.

(4) Remove the rubber portion of the shaft seal and the spring.

(5) Using Tool C-3753, remove the seal retainer from the housing.

(6) Support the body on the front face (fan hub end) and apply pressure to the rear end of the shaft to press out the shaft and bearing assembly through

the **front** of the pump. **If an attempt is made to remove the shaft in the opposite direction, damage to the water pump body will result.**

Assembly (361,383,426 cubic inch engines)

Before assembling, clean all parts thoroughly in a suitable solvent and dry with compressed air.

CAUTION: Bearing assemblies removed from water pumps, for any reason should not be reused as damage to bearings will usually result during removal.

NOTE: Inspect the seal surface of the impeller hub to be sure it is free of nicks, burrs, scratches and rust. If necessary remove these blemishes using crocus cloth on a flat plate.

(1) Apply a thin coat of Mopar Perfect Seal Sealing Compound, Part Number 1057794 to the seal pocket in the pump body.

(2) With the pump housing supported at the hub end, use a 1¼ inch (12 point) socket to apply pressure against the outer lip of the seal retainer and press the seal assembly into the body until the retainer lip is against the pump body.

(3) With the slinger ring in position on the long end of the pump shaft (approximately ⅛ inch from the bearing assembly) start the shaft and bearing assembly into the fan hub end of the pump body bore.

(4) Use a 1¼ inch (12 point) socket and support the pump body at the seal end. With Tool C-3468 positioned against the outer bearing race, press the shaft and bearing into the pump body so the end of bearing is exactly flush with the end of the pump body.

(5) While supporting the pump on the impeller end of the shaft, press the fan hub onto the shaft (flat surface out) so the shaft extends inch through the fan hub.

(6) Support the pump on the fan hub end of the shaft and position the new impeller on the pump shaft (blade portion up). Using a tool that will press against the impeller insert only, press the impeller onto the shaft until it is flush with the end of the shaft.

RADIATOR

Removal

(1) Drain the cooling system.

(2) On vehicles with automatic transmission, disconnect the oil cooler lines at the radiator bottom tank.

(3) Remove upper and lower radiator hoses (using pliers Tool C-3250).

(4) On vehicles with fan shroud, remove lower half of fan shroud.

(5) Remove radiator attaching screws.

(6) The radiator can now be lifted free from the engine compartment. Care should be taken not to damage the radiator cooling fins or water tubes during removal.

Installation

(1) Slide the radiator down into position behind the radiator support and install the attaching bolts.

(2) Install the fan shroud connect the hoses, and connect the transmission oil cooler lines.

(3) Fill the cooling system to 1¼" below the filler neck seat with water and rust inhibitor or water and coolant level.

(4) On vehicles with automatic transmission, measure the transmission oil level after warm-up and add oil as required.

Cleaning

(1) Drain the cooling system and refill with clean SOFT water and add the contents of one can (No. 1 top-compartment) of MoPar Cooling System Cleaner.

(2) Operate the engine at a fast idle for ½ to ¾ hour.

(3) Drain the cooling system and refill with clean water.

(4) Pour the conditioner (No. 2 bottom-compartment) into the radiator and run engine for ten minutes.

(5) Flush the entire cooling system until water runs clean.

(6) Refill the radiator with clean SOFT water.

(7) Use MoPar Radiator Rust Inhibitor during the summer months.

TRANSMISSION OIL COOLER

The transmission oil cooler is located in the bottom radiator tank, which is an integral part of the radiator.

In case of a leak, the engine coolant may become mixed with the transmission fluid, also, the transmission fluid may enter the cooling system. Both the cooling system and the transmission should be inspected in the event the cooler is leaking.

Testing Oil Coolers for Leaks

(1) Disconnect both oil lines at the radiator.

(2) Attach a pressure gauge to one radiator fitting and an air line equipped with a shut-off valve to the other fitting.

(3) Coat all fitting joints with oil.

(4) Apply air pressure (up to 100 psi). Oil bubbles will identify any fitting joint leaks which should be corrected before proceeding with the test.

(5) Close the valve and note pressure gauge reading. If pressure drops off, the oil cooler leaks.

Repairing the Oil Cooler

(1) Remove the radiator.

(2) Remove the radiator bottom tank.

(3) Melt the soft solder holding the cooler to the tank.

(4) Remove the stamped retainer nuts holding the cooler fittings to the bottom tank and remove the cooler.

(5) Install a new cooler or repair the old cooler with **silver solder** and reinstall as follows:

(6) Position the oil cooler in the bottom tank and install the stamped retainer nuts on the oil cooler

(7) Use soft solder to secure the cooler in the tank.

(8) Attach the bottom tank to the radiator using soft solder.

(9) Install the radiator as described in Paragraph "RADIATOR."

(10) Fill the cooling system and test for leaks.

If the transmission operates properly after repairing the leak, drain the transmission and torque converter while hot, remove the transmission oil pan and inspect for sludge, rust, dirty or plugged inlet filter. If none of these conditions are found, reconditioning may not be necessary. Reassemble, using Transmission Fluid Type "A," Suffix "A."

PRESSURE FLUSHING THE COOLING SYSTEM

(1) Clean the system using the recommended Cooling System Cleaner according to the directions on the label.

(2) Drain the radiator and engine block and remove both radiator hoses.

(3) Remove the thermostat and reinstall the housing.

(4) Connect a flushing gun, Tool C-3514, to the engine thermostat housing, using a length of rubber hose.

(5) Install a drain hose on the water pump inlet.

(6) Connect a flushing gun to sources of water and air pressure.

(7) Fill the cylinder block with water by restricting the drain hose. Leave the water valve open.

(8) Open and close the air valve to agitate and force away any foreign material. Continue the operation until the water runs clear.

(9) For the final block flushing, fill the block with water and remove the drain plugs. Use air pressure until the water from the block drains runs clear.

(10) To reverse flush the radiator, disconnect the two hoses from the engine and attach them to the radiator. Attach the flushing gun hose to the lower radiator tank and the drain hose to the top tank.

(11) Fill the radiator with water, leave the water valve open, and open and close the air valve. Continue the operation of the air valve until the water runs clear.

(12) For the final radiator flushing, attach a flushing gun to the top hose and repeat the flushing operation.

(13) Test the thermostat as described in Paragraph "THERMOSTAT." If satisfactory, install with the pellet towards the engine, using a new gasket.

(14) Install the hoses and fill the cooling system to 1¼ inches below the filler neck, using water and rust resistor or water and antifreeze, depending on the season.

(15) Operate the engine until the temperature gauge indicates normal operating temperature and continue an additional five minutes to release any air trapped in the system. Inspect the coolant level and if necessary, add additional water.

THERMOSTAT

The thermostat is actuated by a pellet containing a copper-impregnated wax (Fig. 10). As the temperature of the pellet increases, the wax expands and opens the valve. A 180° thermostat is standard equipment.

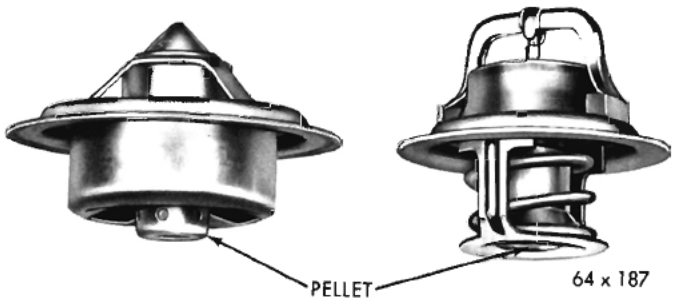

Fig. 10—Thermostats

If the thermostat does not close completely when cold, the engine will warm up slowly or not at all, and heater performance will also be impaired. Poor heater performance may also be due to the valve opening at too low a temperature. Too high a valve opening temperature or a valve that will not open can cause overheating.

Removal

(1) Drain the cooling system down to the thermostat level or below.

(2) Remove the upper radiator hose from the thermostat housing using pliers Tool C-3250.

(3) Remove the thermostat housing bolts and remove the thermostat and housing.

Testing the Thermostat

(1) Visually inspect the thermostat to make sure the valve closes tightly. If the valve does not close completely due to dirt, sand or other foreign material, carefully clean the sealing edge making sure the sealing edge is not damaged. If the valve does not close tightly when clean, install a new thermostat.

(2) Immerse the thermostat in a container of warm water so that the pellet of the thermostat is completely covered. The pellet must not touch the bottom or sides of the container.

(3) Heat the water and stir it continuously (to insure uniform temperature) and test the water temperature with a thermometer at the point when a .003" feeler gauge can be inserted into the valve opening. The feeler gauge should pass freely into the valve opening at a water temperature of 175° to 185°F. If outside of this range, replace the thermostat.

(4) Continue heating the water to approximately 200°F. The thermostat valve should be fully open at this temperature. If it does not, replace the thermostat.

Installation

(1) Using a new gasket, position the thermostat so the pellet end is toward the engine and attach with bolts through the thermostat housing.

(2) If removed, reinstall or replace the upper hose using Tool C-3250.

(3) Fill the cooling system to 1¼ inches below the filler neck with water and rust resistor or water and antifreeze.

RADIATOR HOSES

The hoses are removed and installed using hose clamp pliers Tool C-3250.

A hardened, cracked, swollen or restricted hose should be replaced.

The reinforcement spring inside the lower hose is necessary to prevent collapsing of the hose due to suction at medium or high engine speeds. If this spring is weak or broken, it should be replaced.

RADIATOR PRESSURE CAP

A 14 psi pressure-vent type radiator cap (Fig. 11) is used as standard equipment (16 psi for air conditioned vehicles).

When removing the pressure cap, turn the cap counter-clockwise to the stop permitting any pressure to be released through the overflow tube. This will prevent hot water from spraying out of the radiator filler opening after pausing at the stop, continue turning counter-clockwise until the cap is released.

The brass vent valve at the bottom of the cap should hang freely. If the rubber gasket has swollen and prevents the vent valve from hanging loosely, the cap should be replaced.

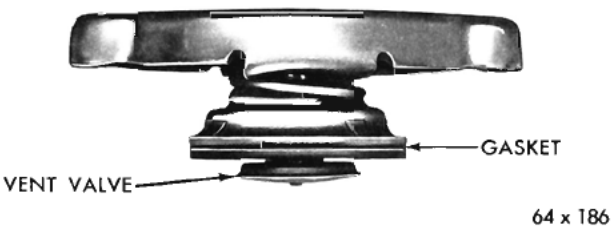

Fig. 11—Radiator Pressure Cap

Pressure Testing the Radiator Cap (Fig. 12)

(1) Attach the neoprene seal and adapter to tester, Tool C-3499.

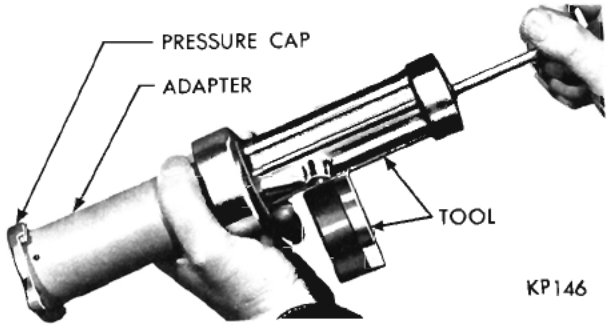

Fig. 12—Testing the Pressure Cap

(2) Dip the pressure cap in water and install the cap on the tester adapter.

(3) Apply pressure to the cap. If the pressure cap fails to hold pressure within a range of 12 to 15 psi, replace with a new tested cap. (Air conditioned vehicles caps should test between 15 and 16 psi.)

PRESSURE TESTING THE COOLING SYSTEM

(1) For testing purposes only, fill the radiator to within ½ inch of the filler neck.

(2) Wipe the filler neck sealing surface clean.

(3) Attach a tester Tool C-3499 to the filler neck and apply 15 psi pressure (Fig. 13).

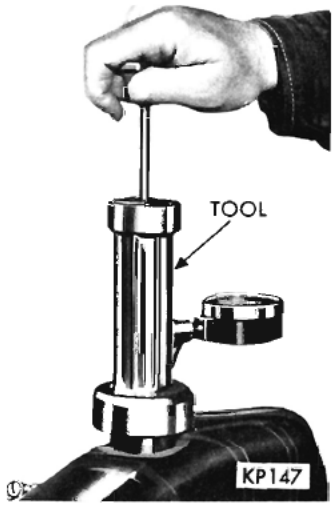

Fig. 13—Pressure Testing the Cooling System

(4) If the pressure gauge reading holds steady, the system is satisfactory. If the pressure drops, continue the test as follows:

(5) Test all points for external leaks. If no external leaks are found after the gauge dial showed a drop in pressure, continue the test.

(6) Remove the tester and run the engine until normal operating temperature is reached.

(7) Re-attach the tester, apply 7 psi pressure and increase engine speed to half throttle.

(8) If the needle on the dial fluctuates, it indicates a combustion leak, generally at the head gasket. On V-8 engines, detach spark plug leads from one bank and operate the engine on the opposite bank. If the needle continues to fluctuate, the bank in operation leaks. If the needle stops fluctuating, the bank not in operation leaks.

(9) If the needle on the dial did not fluctuate in step 7, sharply accelerate the engine several times. If an abnormal amount of water emits from the tail pipe, it indicates a head gasket leak, cracked block, or cracked head.

ENGINE WATER TEMPERATURE GAUGE

For Removal, Installation and Testing procedures of the water temperature sending and receiving units, refer to Group 8, Electrical system, "Gauges."

PROPER BELT TENSION

The satisfactory performance of the belt driven accessories depends on the maintenance of the proper belt tension. If the specified tensions are not maintained, belt slippage may cause engine overheating, lack of power steering assist, loss in air conditioning capacity, reduced alternator charging rates, and greatly reduced belt life. To avoid any such adverse effects, the following service procedure should be followed:

(1) Retighten all belts to the specified **used belt** tension at the new vehicle preparation.

(2) Retighten all belts at the 2 month service inspection.

(3) Measure all belts by the deflection method at servicing and retighten if needed.

(4) The new belt tension specifications should be used on all belt replacements, and the above procedure followed thereafter.

There are two methods by which belt tensions can be properly established.

Belt Deflection Method

The belts may be adjusted by measuring the deflection of the belt at the mid-point between two pulleys under a five-pound push or pull. A small spring scale can be used to establish the five-pound load. See Figure 14 for correct locations at which to measure deflection.

This method should be used only when it is not possible to use the torque method, as it is a less accurate substitute. To adjust the belts by the deflection method, loosen all the mounting bolts and use a bar to apply tension to the belts being careful not to damage the accessory. Tighten the mounting bolts and measure the deflection. (See Belt Tension Specifications.) It may be necessary to repeat this procedure several times to establish the correct tension.

Any belt that has operated for a minimum of a half-hour is considered to be "used."

Torque Method

The alternator and power steering pump belts may be adjusted to the specified tension, by the use of a torque wrench. (Refer to Belt Tension Specifications.) The alternator belts are adjusted by using Tool C-3841 along with a torque wrench.

The power steering belts are adjusted by inserting the square shank of the torque wrench into the hole provided in the pump bracket.

To tighten the belts by the torque method, loosen all the mounting bolts, then apply the specified torque to the accessory, as shown in the Specifications. Tighten all the mounting bolts while the torque is applied to the accessory.

Other belts may also be tightened by this method if the adjusting bracket has a square hole. If it is not possible to use the torque wrench, because of clearance, use an extension.

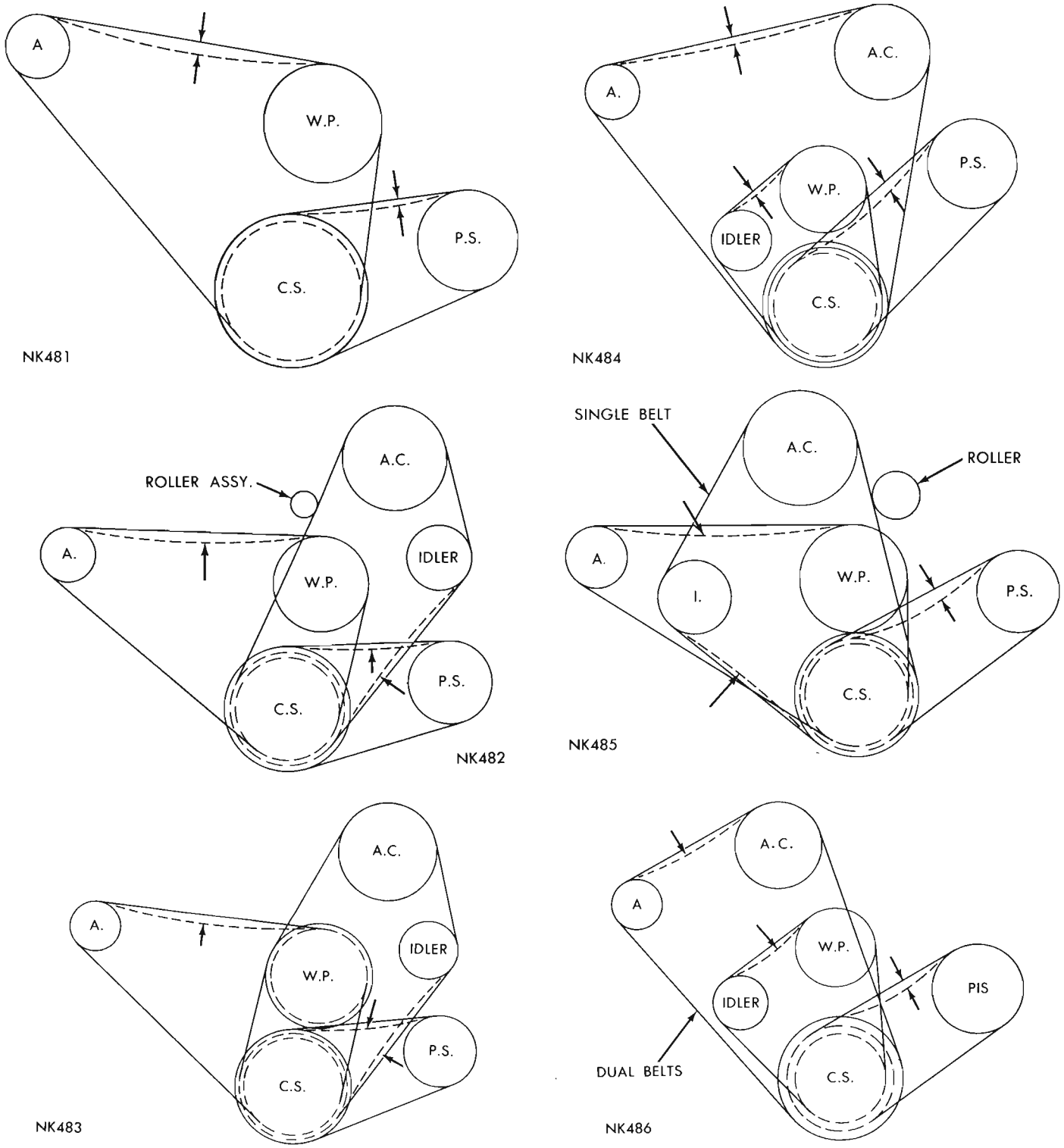

Fig. 14—Belt Deflection Locations

ELECTRICAL AND INSTRUMENTS

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PART 1

BATTERY

SERVICE DIAGNOSIS

BATTERY TESTING CHART

Hydrometer Test (Corrected to 80° F.) See Paragraph 2	State of Charge or Battery Condition	Correction
LESS THAN 1.220 SP. GR.	Battery low.	Recharge battery. Make a high rate discharge test for capacity. If cells test O.K., recharge and adjust gravity of all cells uniformly. Test voltage regulator setting. Thoroughly test electrical system for short circuits, loose connections and corroded terminals.
CELLS SHOW MORE THAN 25 POINTS (.025 Specific Gravity) VARIATION	Short circuit in low cell. Loss of electrolyte by leakage or excessive overcharge. Natural or premature failure. Cracked case.	Try to recharge the battery. See "Charging the Battery." See Adjustment of Acid Gravity." Test battery for capacity. Install new battery if necessary.
CELLS SHOWING MORE THAN 1.220 SPECIFIC GRAVITY.	Satisfactory.	No correction required. Make a high rate discharge capacity test; if cells test O.K., adjust gravity of all cells uniformly.

Cranking Test	Possible Cause	Correction
IF THE VOLTAGE DROP IS MORE THAN 0.3 VOLTS (3/10) BETWEEN THE STARTING MOTOR CABLE AND THE VEHICLE FRAME WHILE CRANKING LOOK FOR:	Poor contact between the cable terminal and the vehicle frame or between the cable clamp terminal and the battery post or the starter switch contacts. Frayed, corroded or broken cable.	Locate the high resistance: repair or replace as necessary.

SERVICE PROCEDURES

BATTERY VISUAL INSPECTION

(1) Protect the paint finish with fender covers.

(2) Disconnect the battery cables at the battery.

(3) Remove the battery hold-down clamp and remove the battery from the vehicle.

(4) Inspect the battery carrier and fender side panel for damage caused by loss of acid from the battery.

(5) Clean the top of battery with a solution of clean warm water and baking soda. Scrub areas with a stiff bristle brush being careful not to scatter corrosion residue. Finallly wipe off with a cloth moistened with ammonia or baking soda in water.

CAUTION: Keep cleaning solution out of battery cells to eliminate weakening the electrolyte.

(6) Inspect the cables. Replace damaged or frayed cables.

(7) Clean the battery terminals and the inside surfaces of the clamp terminals with the Cleaning Tool MX-75.

(8) Examine the battery case and cover for cracks.

(9) Install the battery.

(10) Tighten the battery hold-down screw nuts to 3 foot-pounds.

NOTE: Observe the polarity of the terminals of battery to be sure the battery is not reversed.

(11) Connect the cable clamps to the battery posts and tighten securely. Coat all connections with light mineral grease or petrolatum after tightening.

(12) If the electrolyte level is low, fill to recommended level with mineral-free water.

SPECIFIC GRAVITY TEST

A hydrometer Tool 40-B is used to measure the specific gravity of the electrolyte in the battery cells. This gives an indication of how much unused sulphuric acid remains in the solution.

A hydrometer should be graduated to read from 1.160 to 1.320, in graduations of .005 specify gravity. The graduated markings should be not less than $^1/_{16}$ inch apart and accurate to within .002 specific gravity. The graduated portion of the stem should be about two inches long. Clearance between the float and glass barrel, at the smallest diameter, should be a minimum of ⅛" around all sides and the barrel must be clean.

NOTE: Hydrometer floats are calibrated to indicate correctly only at one fixed temperature.

The liquid level of the battery cell should be at normal height and the electrolyte should be thoroughly mixed with any battery water which may have just been added by charging the battery before taking any hydrometer readings. See "Adjustment of Acid Gravity."

In reading a hydrometer, the barrel must be held vertically and just the right amount of fluid be drawn up into the gauge barrel with the pressure bulb fully expanded to lift the float freely so that it does not touch the sides, top or bottom of the barrel. Take a reading with eye on level with liquid in barrel. **DO NOT TILT** hydrometer.

The specific gravity of the battery electrolyte strength or density varies not only with the quantity of the acid in solution but also with temperature. As temperature increases, the volume of the electrolyte expands and the specific gravity is reduced. As temperature drops, the electrolyte contracts and specific gravity increases.

Specific gravity variations caused by temperatures must be considered in the analysis of the battery, otherwise specific gravity readings will not give a true indication of the state of charge.

Use a battery immersion type thermometer of the mercury-in-glass type, having a scale reading as high as 125°F and designed for not over a 1-inch bulb immersion. A suitable dairy type thermometer may prove satisfactory for the purpose.

Draw electrolyte in and out of the hydrometer barrel several times to bring the temperature of the hydrometer float to that of the acid in the cell and then measure the electrolyte temperature in the cell.

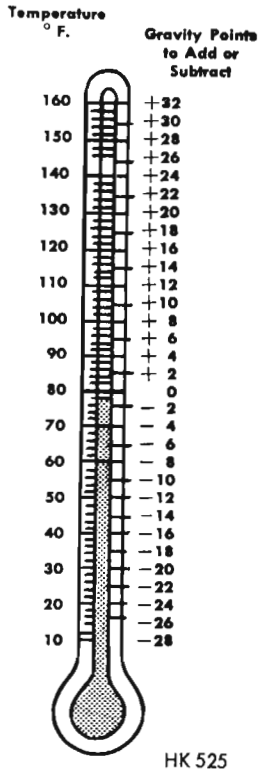

Fig. 1—Hydrometer Reading Correction Chart

The temperature correction in specific gravity reading at 80° Fahrenheit is zero. Add .004 specific gravity points for every 10 degrees over 80°F and subtract .004 specific gravity points for every 10 degrees under 80°F. All readings must be corrected to 80 degrees Fahrenheit. Refer to Figure 1 and examples one and two as follows:

Example 1—

Hydrometer Reading 1.260
Acid Temperature ..... 20 degrees Fahrenheit
Subtract Specific Gravity ..... .024
Correct Specific Gravity is 1.236

Example 2—

Hydrometer Reading 1.255
Acid Temperature ..... 100 degrees Fahrenheit
Add specific Gravity ..... .008
Corrected Specific Gravity is 1.263

A fully charged relatively new battery has a specific gravity reading of 1.260 plus .015 minus .005 (all batteries for use in temperate climates).

ADJUSTMENT OF ACID GRAVITY

Hydrometer floats usually are not calibrated below about 1.160 specific gravity and cannot indicate the condition of a battery in a very low state of charge. Therefore, it may be necessary to give the battery several hours charge before a hydrometer reading will indicate that the battery is taking a charge.

If the specific gravity of all cells are not within .015 points of the specified value, corrected to 80°F, at the end of a full charge, remove some of the electrolyte with the hydrometer and add a like amount of distilled water to reduce the gravity if too high, or add 1.400 Specific Gravity acid to raise the specific gravity, if too low. Continue the charge so as to give the electrolyte a chance to mix and then read the gravity after another hour of charge to note the effect of the additions. Continue this adjusting procedure until the gravity is brought to the desired value by charging for one hour after each adjustment.

Never adjust the specific gravity of any battery cell which does not gas freely on charge. Unless electrolyte has been lost through spilling or leaking, it should not be necessary to add acid to a battery during its life. Acid should never be added unless one is certain that the cell will not come up to normal gravity by continued charging. Always make the temperature correction for hydrometer readings, as warm electrolyte will read low and this might be mistaken for failure of the battery to rise normally in gravity. It could also be falsely concluded that the battery would not take a full charge.

HIGH RATE DISCHARGE TEST OF BATTERY CAPACITY

Satisfactory capacity tests can be made only when the battery equals or exceeds 1.220 specific gravity at 80 degrees Fahrenheit. If the reading is below 1.220 the battery should be slow charged until fully charged in order to secure proper test results.

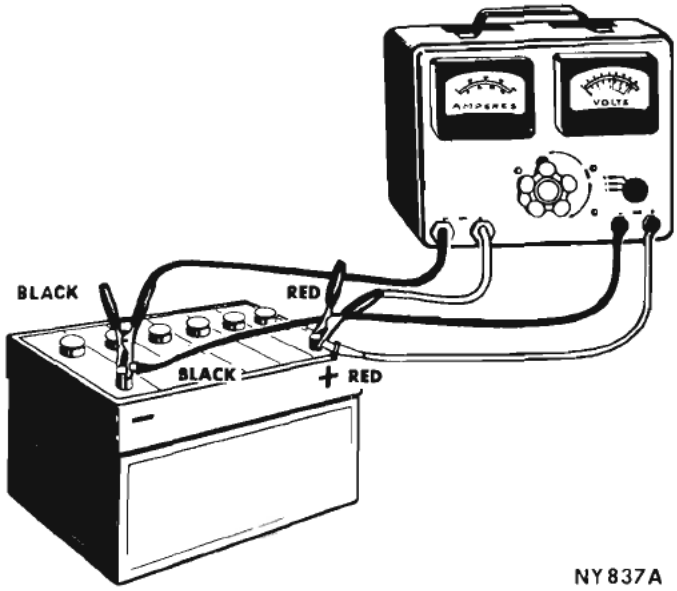

Fig. 2—High Rate Discharge Test

Test Procedure

(1) Turn the control knob of the battery starter tester to the **OFF** position.

(2) Turn voltmeter selector switch to the 16 volt position on test units so equipped.

(3) Connect the test ammeter and voltmeter positive leads to battery positive terminal. Connect the ammeter and voltmeter negative leads to the battery negative terminal (Fig. 2).

NOTE: The voltmeter clips must contact the battery posts or cable clamps and not the ammeter lead clips.

(4) Turn the control knob clockwise until the ammeter reading is equal to three times the ampere hour rating of the battery.

(5) Maintain this load for 15 seconds; the voltmeter should read 9.5 volts or more, which will indicate that the battery has good output capacity.

(6) After the 15 second test, turn control knob to the OFF position.

If the voltage in the "High Rate Discharge Test" was under 9.5 volt, the battery should be test charged to determine whether the battery can be satisfactorily charged.

Charging The Battery

Three Minute Charge Test (Fig. 3)

NOTE: This test should not be used if battery temperature is below 60 degrees F.

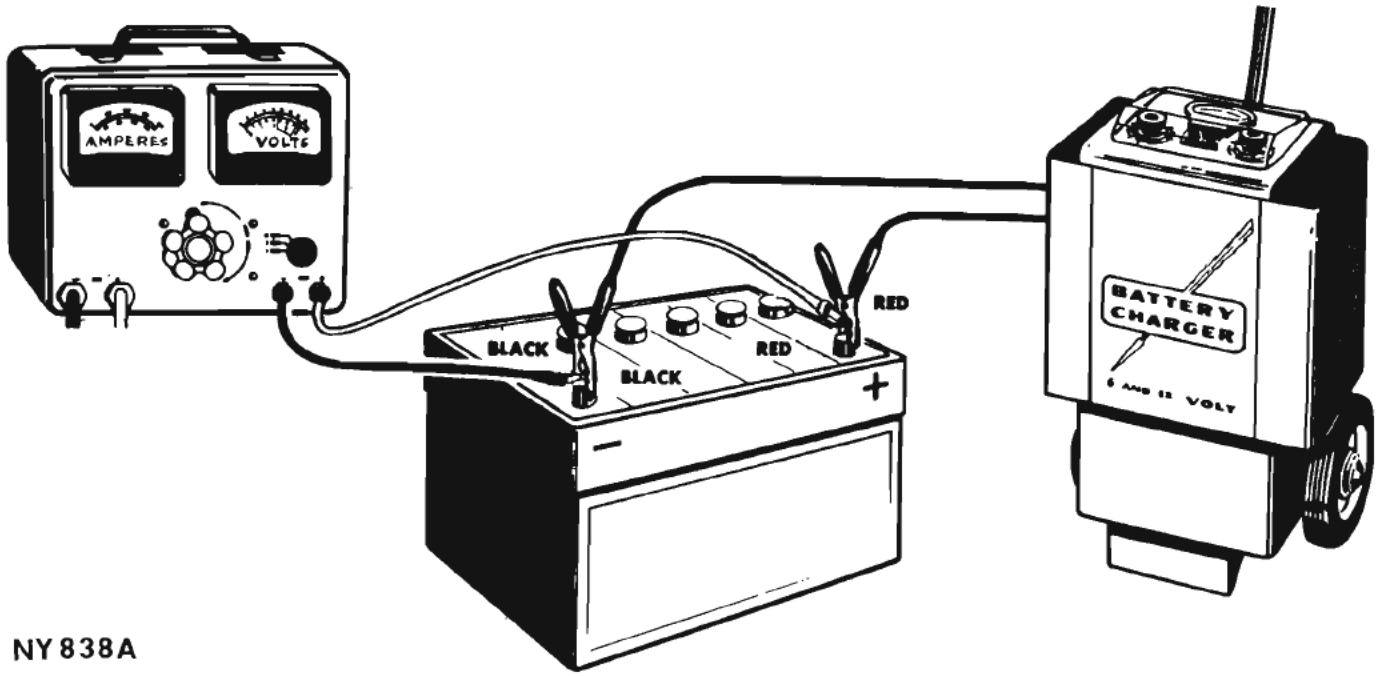

Fig. 3—Three Minute Charge Test

(1) Connect the positive (+) battery charger lead to the battery positive terminal and negative (—) battery charger lead to the battery negative terminal.

IMPORTANT: Be sure of correct polarity when charging batteries.

(2) Trip the battery charger power switch to the **ON** position. Turn the charger timer switch past the three minute mark then back to the three minute mark.

(3) Adjust the charge switch to the highest possible rate not exceeding 40 amperes.

(4) When the timer switch cuts off at the end of 3 minutes, turn the timer switch back to fast charge.

(5) Use the 4 volt scale of the battery starter tester voltmeter on test units so equipped and quickly measure the voltage across each cell while the battery is being fast charged. A faulty cell or cells will be detected by a cell voltage variation of more than .1 volt.

(6) If the cell voltages are even within .1 volt, use the 16 volt scale of the battery starter tester and measure the total voltage of the battery posts while battery is being fast charged. If the total voltage during charge exceeds 15.5 volts, the battery is sulphated and should be cycled and slow-charged until specific gravity reaches 1.260 (See "Slow Charging").

NOTE: A slow charge is preferable to bring the battery up to a full charge.

If the specific gravity remains constant after testing the battery at one hour intervals for three hours, the battery is at its highest state of charge.

(7) Make another capacity test. If the capacity test does not meet specifications, replace the battery.

Fast Charging the Battery (Fig. 4)

If adequate time for a slow charge is not available, a high rate (FAST) charge is permissible and will give a sufficient charge in one hour enabling the battery and alternator to continue to carry the electrical load.

Connect the positive (+) battery charger lead to the battery positive terminal and the negative (—) charger lead to the battery negative terminal. If the battery is not removed from the vehicle, **BE SURE** the ignition switch is turned off and all electrical accessories are off during charging.

CAUTION: The battery can be damaged beyond repair unless the following precautions are taken:

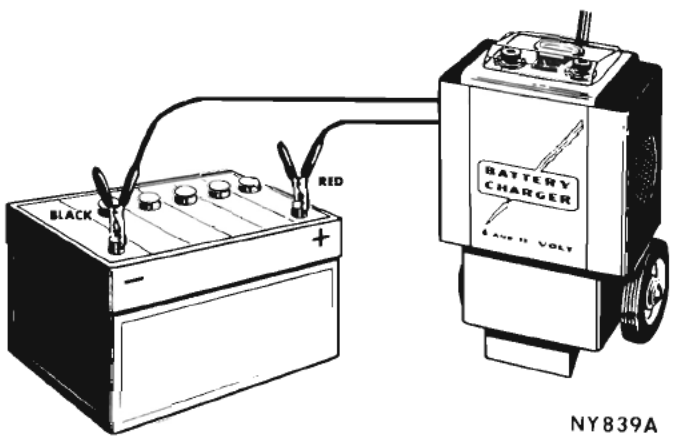

Fig. 4—Fast Charging the Battery

(1) The battery electrolyte temperature must **NEVER** exceed 125 degrees Fahrenheit.

If this temperature is reached, the battery should be cooled by reducing the charging rate or remove the battery from the circuit.

(2) As the batteries approach full charge the electrolyte in each cell will begin to gas or bubble. Excessive gassing must not be allowed.

(3) Do not fast charge longer than one hour.

If the battery does not show a significant change in specific gravity after one hour of "FAST" charge, the slow charge method should be used.

Remember to use the temperature correction when checking specific gravity.

NOTE: The manufacturers of high rate charging equipment generally outline the precautions and some models have thermostatic temperature limiting and time limiting controls.

WARNING: When batteries are being charged an explosive gas mixture forms beneath the cover of each cell. Do not smoke near batteries on charge or which have recently been charged. Do not break live circuits at the terminals of the batteries on charge. A spark will occur where the live circuit is broken. Keep all open flames away from the battery.

Slow Charging Batteries

Many discharged batteries can be brought back to good condition by slow charging, especially batteries that are sulphated.

The battery should be tested with a hydrometer and a record kept of the readings taken at regular intervals throughout the charge. A voltage test should also be made, noting the voltage uniformity between cells. Any subnormal voltage in any cell may indicate a shorted cell. When a cell has a specific gravity reading that is 25 points (.025) or more below the other cells, that cell is defective and the battery should be replaced.

Safe slow charging rates are determined by allowing one ampere per positive plate per cell. The proper slow charging rate would be 4 amperes for a 48 ampere hour battery; or 5 amperes for a 59 ampere hour battery; and 6 amperes for a 70 ampere hour battery.

The rate of charge for a normally discharged battery is one ampere per positive plate per cell.

The average length of time necessary to charge a battery by the slow charge method at normal rates is from 12 to 16 hours, however, when a battery continues to show an increase in specific gravity, the battery charge should be continued even if it takes 24 hours or more.

NOTE: Watch the temperature of batteries carefully and if the temperature of any one of them reaches 110°F., lower the charging rate.

The battery will be fully charged when it is gassing freely and when there is no further rise in specific gravity after three successive readings taken at hourly intervals. Make sure hydrometer readings are corrected for temperature.

The rate of charge for a sulphated battery should be no more than ½ the normal slow charge rate. Many sulphated batteries can be brought back to a useful condition by slow charging at half the normal charging rate from 60 to 100 hours. This long charging cycle is necessary to reconvert the crystalline lead sulphate into active materials.

Batteries that are sulphated have the following characteristics:

(1) Battery temperature tends to increase rapidly while charging.

(2) Gravity under charge increases very slowly or not at all.

(3) Battery will gas excessively under normal charging rate.

(4) Excessive voltage required to obtain normal charging rate.

NOTE: When a battery takes a full charge, but is returned several times in need of a recharge, check for a cracked cell partition with a syringe to provide air pressure; bubbles will appear in an adjacent cell if a crack is present.

PART 2

STARTING MOTOR

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
STARTER FAILS TO OPERATE	(a) Weak battery or dead cell in the battery.	(a) Test specific gravity. Recharge or replace the battery as required.
	(b) Ignition switch faulty.	(b) Test and replace the switch if necessary.
	(c) Loose or corroded battery cable terminals.	(c) Clean terminals and clamps, replace if necessary. Apply a light film of petrolatum to terminals after tightening.
	(d) Open circuit, wire between the ignition—starter switch and ignition terminal on the starter relay.	(d) Inspect and test all the wiring.
	(e) Inoperative clutch unit.	(e) Replace the clutch unit.
	(f) Faulty starting motor.	(f) Test and repair as necessary.
	(g) Armature shaft sheared.	(g) Test and repair.
	(h) Open solenoid pull-in wire.	(h) Test and replace the solenoid if necessary.
STARTER FAILS AND LIGHTS DIM	(a) Weak battery or dead cell in the battery.	(a) Test for specified gravity. Recharge or replace the battery as required.
	(b) Loose or corroded battery cable terminals.	(b) Clean the terminals and clamps, replace if necessary. Apply a light film of petrolatum to the terminals after tightening.
	(c) Internal ground in the windings.	(c) Test and repair the starter.
	(d) Grounded starter fields.	(d) Test and repair the starter.
	(e) Armature rubbing on pole shoes.	(e) Test and repair the starter.
STARTER TURNS, BUT PINION DOES NOT ENGAGE	(a) Starter clutch slipping.	(a) Replace the clutch unit.
	(b) Broken teeth on the flywheel drive gear.	(b) Replace the flywheel ring gear. Inspect the teeth on the starter clutch pinion gear.
	(c) Pinion shaft rusted, dirty or dry, due to lack of lubrication.	(c) Clean, test and lubricate.
	(d) Wrong starter pinion clearance.	(d) Adjust pinion clearance on straight-thru drive starters.
STARTER RELAY DOES NOT CLOSE	(a) Battery discharged.	(a) Recharge or replace the battery.
	(b) Faulty wiring.	(b) Test for open circuit, wire between the starter relay ground terminal post and neutral starter switch (automatic transmission only). Also test for open circuit; wire between the ignition-starter switch and ignition terminal and starter relay.
	(c) Neutral starter switch on automatic transmission faulty.	(c) Test and replace the switch if necessary.
	(d) Starter relay faulty.	(d) Test and replace if necessary.
RELAY OPERATES BUT SOLENOID DOES NOT	(a) Faulty wiring.	(a) Test for open circuit wire between the starter-relay solenoid terminal and solenoid terminal post.
	(b) Faulty solenoid switch or connections.	(b) Test for loose terminal connections between the
	(c) Solenoid switch contacts corroded.	(c) solenoid and the starter field.
	(d) Broken lead or a loose soldered connection inside the solenoid switch (brush holder plate).	(d) Test and replace the solenoid if necessary.

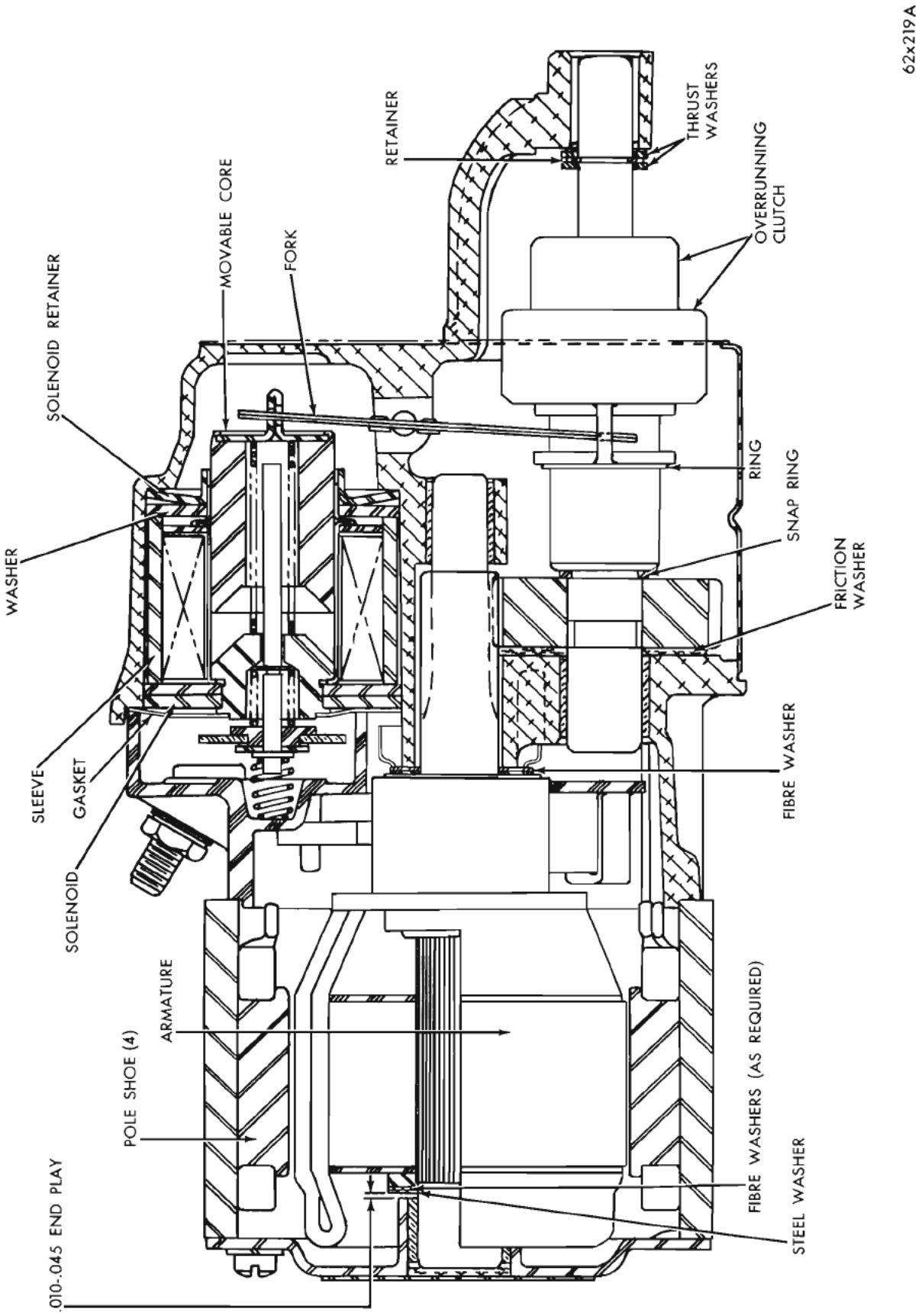

Fig. 1—Starting Motor Cross Section

Condition	Possible Cause	Correction
SOLENOID PLUNGER VIBRATES BACK AND FORTH WHEN SWITCH IS ENGAGED	(a) Battery low.	(a) Test for specific gravity of the battery. Replace or recharge the battery.
	(b) Faulty wiring.	(b) Test for loose connections at relay, ignition-starter switch and solenoid.
	(c) Lead or connections broken inside solenoid switch cover (brush holder plate) or open hold-in winding.	(c) Test and replace the solenoid if necessary.
	(d) Check for corrosion on solenoid contacts.	(d) Test and clean the contacts.
STARTER OPERATES BUT WILL NOT DISENGAGE WHEN THE IGNITION-STARTER SWITCH IS RELEASED	(a) Broken solenoid plunger spring or spring out of position.	(a) Test and repair.
	(b) Faulty ignition-starter switch.	(b) Test and replace the switch if necessary.
	(c) Solenoid contact switch plunger stuck in solenoid.	(c) Remove the contact switch plunger, wipe clean of all dirt, place a film of SAE 10 oil on the plunger, wipe off excess.
	(d) Insufficient clearance between winding leads to solenoid terminal and main contactor in solenoid.	(d) Test and repair.
	(e) Faulty relay.	(e) Test and replace the relay if necessary.

STARTING MOTOR—REDUCTION GEAR

Description

The starting motor has an armature-to-engine crankshaft ratio of 45 to 1: a 3.5 to 1 reduction gear set is built into the motor assembly, which is housed in an aluminum die casting, Fig. 1. The starting motor utilizes a solenoid shift device, the housing of the solenoid is integral with the starting motor drive end housing.

SERVICE PROCEDURES

STARTER RESISTANCE AND CURRENT DRAW TESTING

(1) Test the battery electrolyte specific gravity. Specific gravity should be 1.220 or above. If the battery specific gravity is below 1.220, recharge the battery to full charge before proceeding with the test.

(2) Disconnect the positive battery lead from the battery terminal post. Connect an 0 to 30 scale ammeter between the disconnected lead and the battery terminal post.

(3) Connect a test voltmeter with 10 volt scale division between the battery positive post and the starter switch terminal at the starter solenoid.

(4) Crank the engine and observe the reading on the voltmeter and ammeter. The voltage should not exceed .3 volt. A reading of voltage that exceeds .3 volt indicates there is high resistance caused from loose circuit connections, a faulty cable, burned starter relay or solenoid switch contacts. A current that is high and is combined with slow cranking speed, indicates that the starter should be removed and repaired.

STARTER GROUND CIRCUIT TEST

(1) Connect the voltmeter positive lead to the starter housing and the negative voltmeter lead to the battery negative post.

(2) Crank the engine with a remote control starter switch and observe the voltmeter reading. The voltmeter reading should not exceed .2 volt. A reading of .2 volt or less indicates voltage in the ground cable and connections is normal. If the voltmeter reading is more than .2 volt, it indicates excessive voltage loss in the starter ground circuit. Make the following tests to isolate the point of excessive voltage loss. Repeating the test at each connection.

(a) Starter drive housing.

(b) Cable terminal at the engine.

(c) Cable clamp at the battery.

A small change will occur each time a normal portion of the circuit is removed from the test. A definite change in the voltmeter reading indicates that the last part eliminated in the test is at fault.

Maximum allowable voltage loss is as follows:

Battery ground cable .2 volt.

Engine ground circuit .1 volt.
Each connection .0 volt.

REMOVAL OF STARTING MOTOR

(1) Disconnect the ground cable at the battery.
(2) Remove the cable at the starter.
(3) Disconnect the solenoid lead wire at the solenoid terminals.
(4) Remove the one stud nut and one bolt attaching the starting motor to the flywheel housing, slide the Automatic Transmission oil cooler tube bracket off the stud (if so equipped) and remove the starting motor and removable seal.

TESTING THE STARTING MOTOR

(Bench Test)

Free Running Test

(1) Place the starter in a vise and connect a fully charged, 12 volt battery to the starter as follows:
(2) Connect a test ammeter (100 amperes scale) and a carbon pile rheostat in series with the battery positive post and the starter terminal.
(3) Connect a voltmeter (15 volt scale) across the starter.
(4) Rotate the carbon pile to the full-resistance position.
(5) Connect the battery cable from the battery negative post to the starter frame.
(6) Adjust the rheostat until the battery voltage shown on the voltmeter reads 11 volts. The amperage draw should be as shown in specifications.

Locked-Resistance Test

(1) Install the starter in a test bench.
(2) Follow the instructions of the test equipment manufacturer and test the starter against the following specifications.
(3) With applied battery voltage adjusted to 4 volts, the amperage draw should be as shown in specifications.

SERVICING THE STARTING MOTOR

Disassembly

(1) Place the gear housing of the starter in a vise equipped with soft jaws. Use the vise as a support fixture only. **DO NOT** clamp.
(2) Remove the two through bolts and the starter end head assembly.
(3) Carefully pull the armature up and out of the gear housing and the starter frame and field assembly. Remove the steel and fiber thrust washer.

NOTE: The wire of the shunt field coil is soldered to the brush terminal. One set of brushes is connected to this terminal. The other pair of brushes is attached to the series field coils by means of a terminal screw. Carefully pull the frame and field assembly up just enough to expose the terminal screw and solder connection of the shunt field at the brush terminal. Place two wood blocks between the starter frame and starter gear housing to facilitate removal of the terminal screw, Fig. 2.

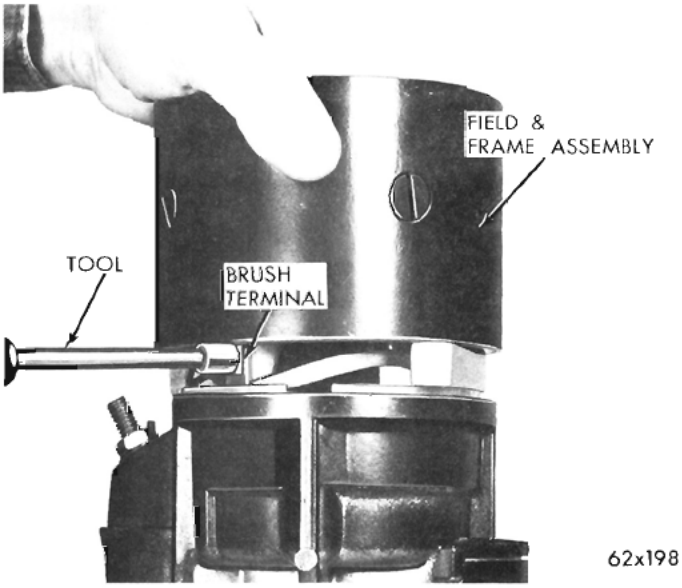

Fig. 2—Removing or Installing Brush Terminal Screw

(4) Support the brush terminal by placing a finger behind the terminal and remove the terminal screw.
(5) Unsolder the shunt field coil lead from the starter brush terminal, Fig. 3. The 4 series coil starters do not have a wire soldered at the brush terminal.

NOTE: The starter brush holder plate with the

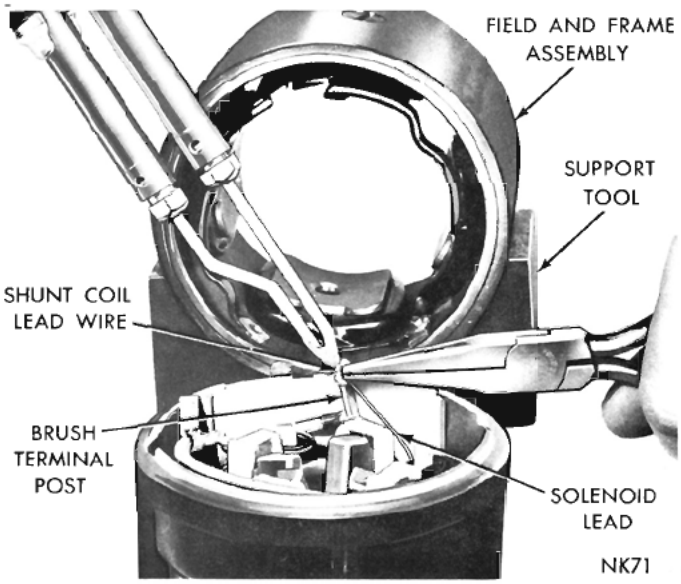

Fig. 3—Unsoldering the Shunt Coil Lead Wire

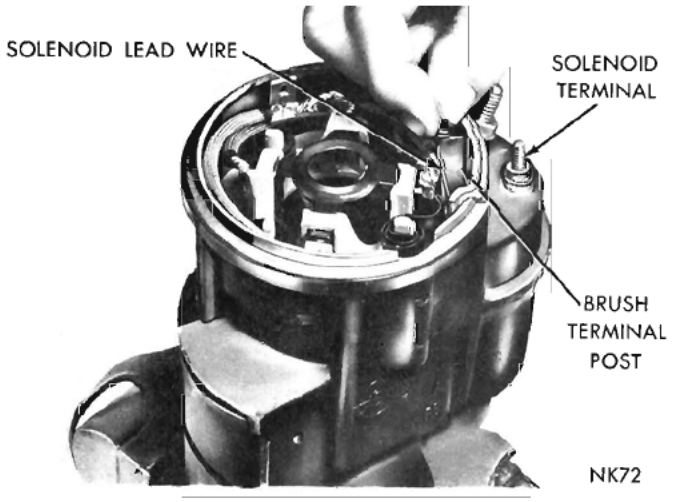

Fig. 4—Unwinding or Winding the Solenoid Lead Wire

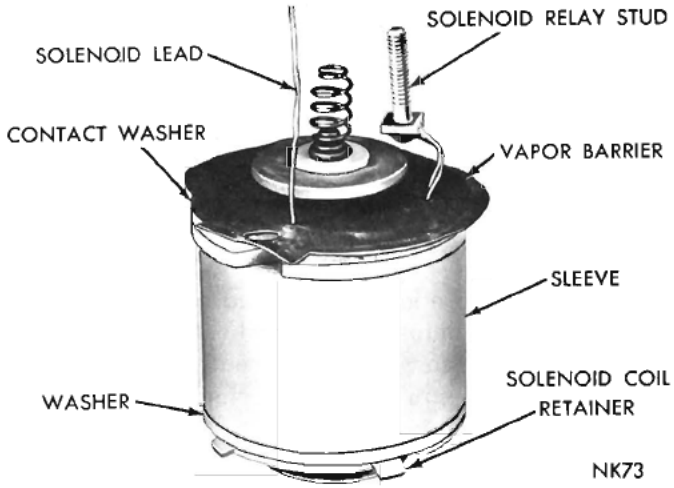

Fig. 6—Solenoid Assembly Removed

starter brush terminal, contact and brushes is serviced as an assembly.

(6) Remove all old sealer at the brush holder plate and gear housing.

(7) Unsolder the solenoid lead wire and unwind the wire from the starter brush terminal (Fig. 4).

NOTE: The 4 series coil starters do not have a wire soldered at the brush terminal.

(8) Remove the screw attaching the brush holder plate to the starter gear housing (Fig. 5).

(9) Remove the nut ($^{11}/_{32}$" wrench), steel washer and insulating washer from the solenoid terminal.

(10) Straighten the solenoid wire and remove the brush holder plate with the brushes as an assembly.

(11) Remove the solenoid assembly from the gear housing well (Fig. 6).

(12) Remove the nut, steel washer and the sealing washer from the starter battery terminal.

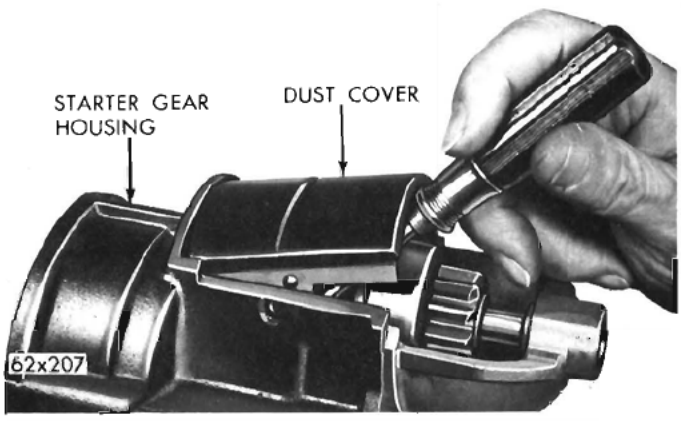

Fig. 7—Removing the Dust Cover

(13) Remove the starter battery terminal from the holder plate.

(14) Remove the solenoid contact and plunger from the solenoid.

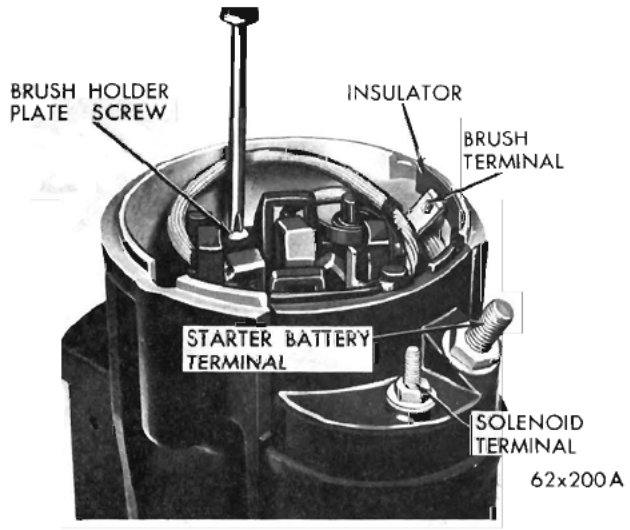

Fig. 5—Removing or Installing Brush Holder Plate Screw

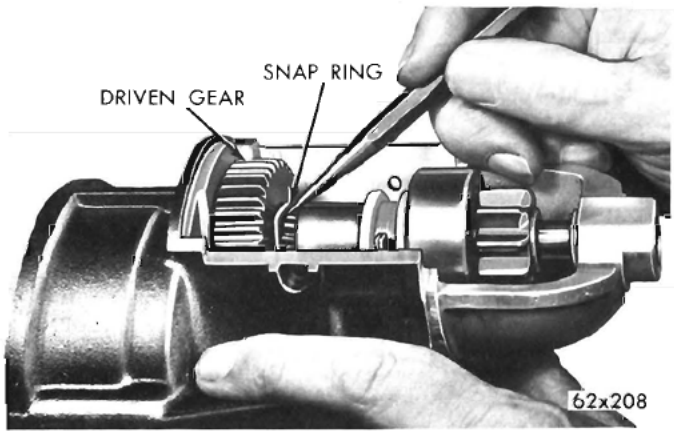

Fig. 8—Removing the Driven Gear Snap Ring

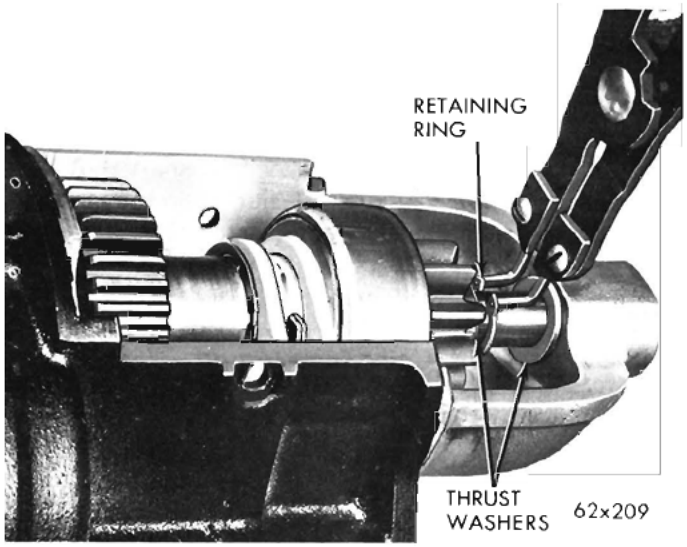

Fig. 9—Removing or Installing the Pinion Shaft Retainer Ring

(15) Remove the solenoid return spring from the well of the solenoid housing moving core.

(16) Remove the dust cover from the gear housing, as shown in Figure 7.

(17) Release the retainer that positions the driven gear on the pinion shaft (Fig. 8).

CAUTION: The retainer is under tension and a cloth should be placed over the retainer to prevent it from springing away after removal.

(18) Release the retainer ring at the front of the pinion shaft (Fig. 9).

NOTE: Do not spread the retainer ring any greater than the outside diameter of the pinion shaft otherwise the lock ring can be damaged.

(19) Push the pinion shaft towards the rear of the housing (Fig. 10) and remove the snap ring and thrust washers, clutch and pinion assembly, with the two shifter fork nylon actuators as an assembly (Fig. 11).

(20) Remove the driven gear and friction washer.

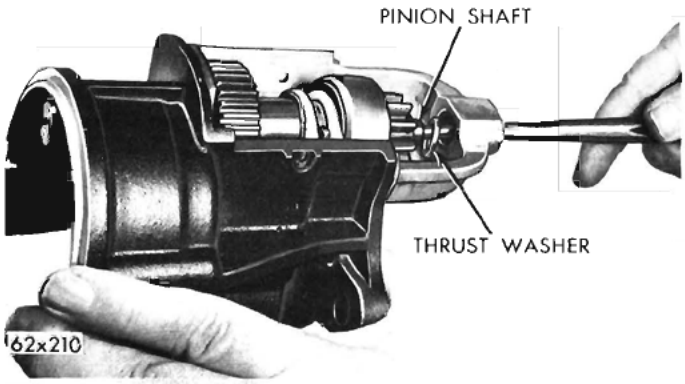

Fig. 10—Removing the Pinion Shaft

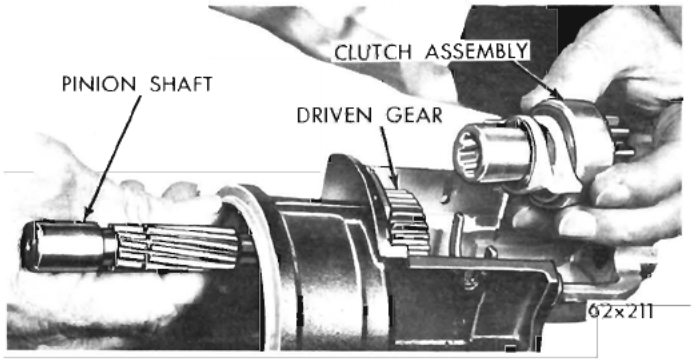

Fig. 11—Removing or Installing the Clutch Assembly

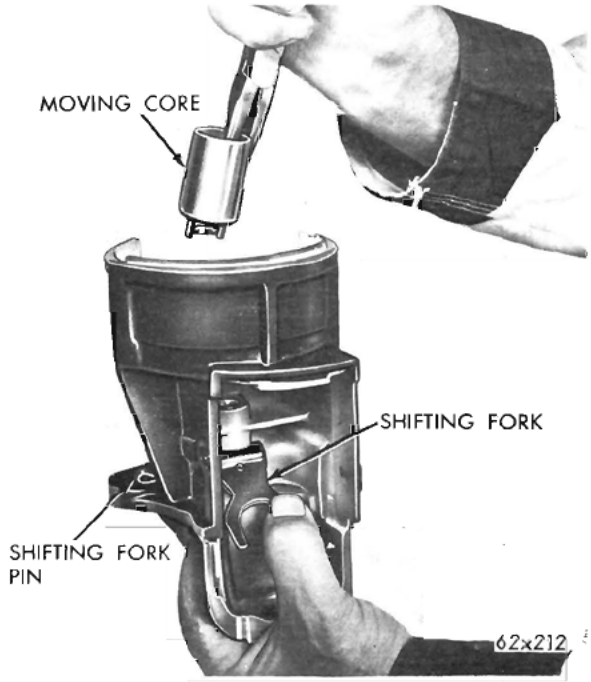

Fig. 12—Removing or Installing the Moving Core

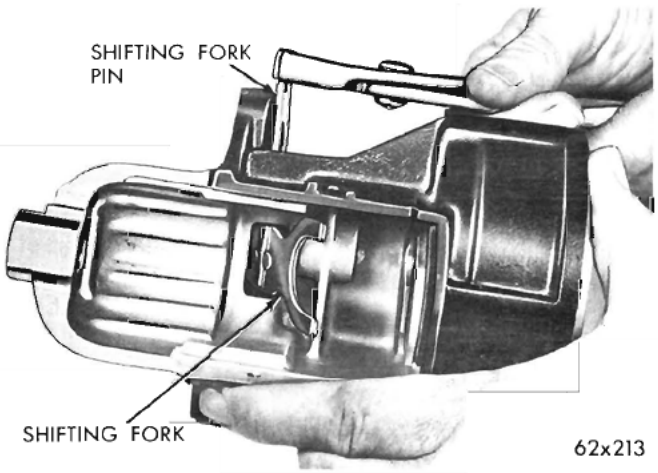

Fig. 13—Removing or Installing the Shifting Fork Pin

(21) Pull the shifting fork forward and remove the solenoid moving core (Fig. 12).

(22) Remove the shifting fork retainer pin (Fig. 13) and remove the clutch shifting fork assembly.

CLEANING THE STARTER PARTS

(1) Do not immerse the parts in a cleaning solvent. Immersing the field frame and coil assembly and/or armature will damage the insulation. Wipe these parts with a clean cloth **only.**

(2) Do not immerse the clutch unit in a cleaning solvent. The clutch is pre-lubricated at the factory and solvent will wash the lubricant from the clutch.

(3) The starter-clutch outer housing and pinion gear may be cleaned with a cloth moistened with a cleaning solvent and wiped dry with a clean dry cloth.

(4) Unsolder the solenoid lead wires from the solenoid terminal relay stud.

(5) Clean all corrosion from the solenoid assembly (washers, sleeve and retainer and inside of the solenoid housing). These metal parts are part of the solenoid hold-in ground circuit and must be clean.

(6) Clean the terminal contacts and contactor with crocus cloth.

(7) Thoroughly clean the outside area of the brush plate to remove all oil and dirt.

REPLACEMENT OF BRUSHES AND SPRINGS

(1) Brushes that are worn more than ½ the length of new brushes, or are oil-soaked, should be replaced.

(2) When resoldering the shunt field and solenoid lead, make a strong low resistance connection using a high temperature solder and resin flux. **Do not use acid** or acid core solder. **Do not** break the shunt field wire units, if so equipped, when removing and installing the brushes.

(3) Measure the brush spring tension with a spring scale hooked under the spring near the end. Pull the scale on a line parallel to the edge of the brush and take a reading just as the spring end leaves the brush. Spring tension should be 32 to 36 ounces. Replace springs that do not meet specifications.

TESTING ARMATURE

Testing the Armature for Short Circuit

Place the armature in growler and hold a thin steel blade parallel to the core and just above it, while slowly rotating the armature in the growler. A shorted armature will cause the blade to vibrate and be attracted to the core. Replace the armature if shorted.

Testing Armature for Ground

Contact the armature shaft and each of the commutator riser bars with a pair of test lamp test prods. If the lamp lights, it indicates a grounded armature. Replace a grounded armature.

Testing Commutator Runout, Refacing and Undercutting

Place the armature in pair of "V" blocks and measure the runout with a dial indicator. Measure both the shaft and commutator. A bent shaft requires replacement of the armature. When the commutator runout exceeds .003 inch, commutator should be refaced. Remove only a sufficient amount of metal to provide a smooth, even surface.

Testing The Field Coils for Ground

(1) Remove the field frame assembly from the starter.

(2) Carefully drill out the rivet that attaches the series field coil ground lead and the shunt field coil lead to the field frame.

(3) Insulate the field coil leads from the field frame.

(4) Test for ground using a 110 volt test lamp. Touch one probe of the test lamp to the series field coil lead and the other probe to the field frame. The lamp should not light. Repeat procedure for the shunt field coil.

If the lamp lights, it indicates that the field coils are grounded and require replacement.

REPLACING THE FIELD COILS

A pole shoe impact screwdriver Tool C-3475 should be used to remove and install the field coils to prevent damage to the pole shoe screws and for proper tightening. Pole shoes that are loose and not properly seated may cause the armature core to rub on the pole shoes. This will decrease starter efficiency and damage the armature core.

NOTE: Make sure the area between the leads and starter frame is clean. Peen the new rivet securely to insure a good electrical contact.

SERVICING THE STARTING MOTOR BUSHINGS

Inspect the armature shaft bearing and pinion shaft surfaces and bushings for wear. Try the bushings for wear by inserting the shafts and test for side play.

NOTE: Pre-sized starting motor bushings are available as service bushings. Use Tool C-3944 to remove the old bushings and install the new. No burnishing or reaming is required to fit the pre-sized bushings.

The C-3944 Tool and its adaptors are designed to service all of the gear reduction motor bushings with the exception of the end head bushing. The end head bushing and end head are serviced as an assembly.

Remove and install bushings, Figs. 14 through 16.

SERVICING THE STARTER CLUTCH UNIT

Do not immerse the starter clutch unit in a cleaning solvent. The starter clutch is pre-lubricated at the

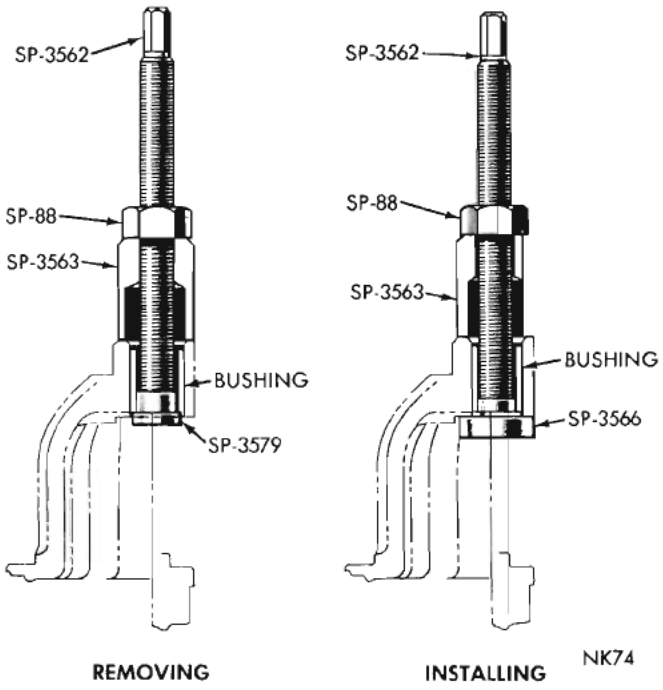

Fig. 14—Removing and Installing the Pinion Housing End Bushing

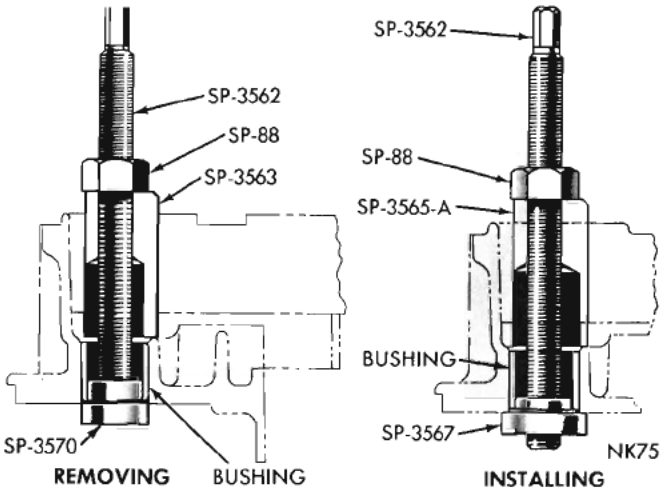

Fig. 15—Removing and Installing the Pinion Housing Drive Shaft Bushing

factory and a solvent will wash the lubricant from the clutch.

The starter clutch outer housing and pinion gear may be cleaned with a cloth moistened with cleaning solvent and wiped dry with a clean dry cloth.

Rotate the pinion. The pinion gear should rotate smoothly in one direction (not necessarily easily), but should not rotate in the opposite direction. If the starter clutch unit does not function properly, or the pinion is worn, chipped or burred, replace the starter clutch unit.

ASSEMBLING THE STARTING MOTOR (Figure 17)

NOTE: The shifter fork consists of two spring steel plates assembled with two rivets. There should be

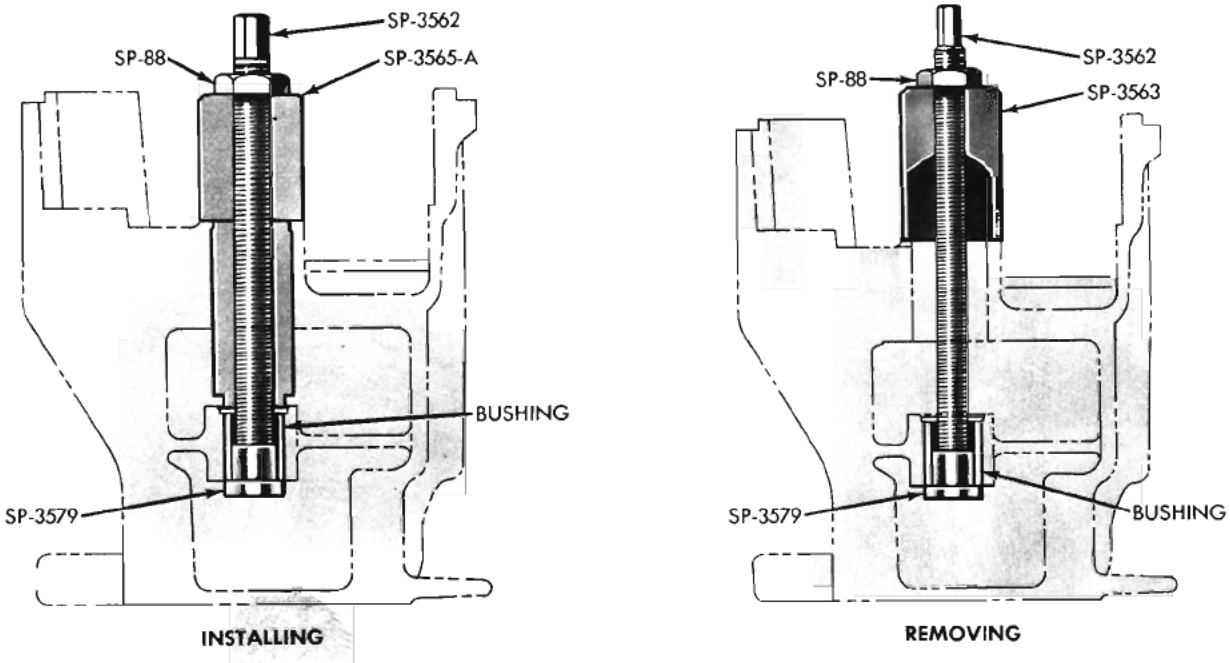

Fig. 16—Removing and Installing the Pinion Housing Armature Shaft Bushing

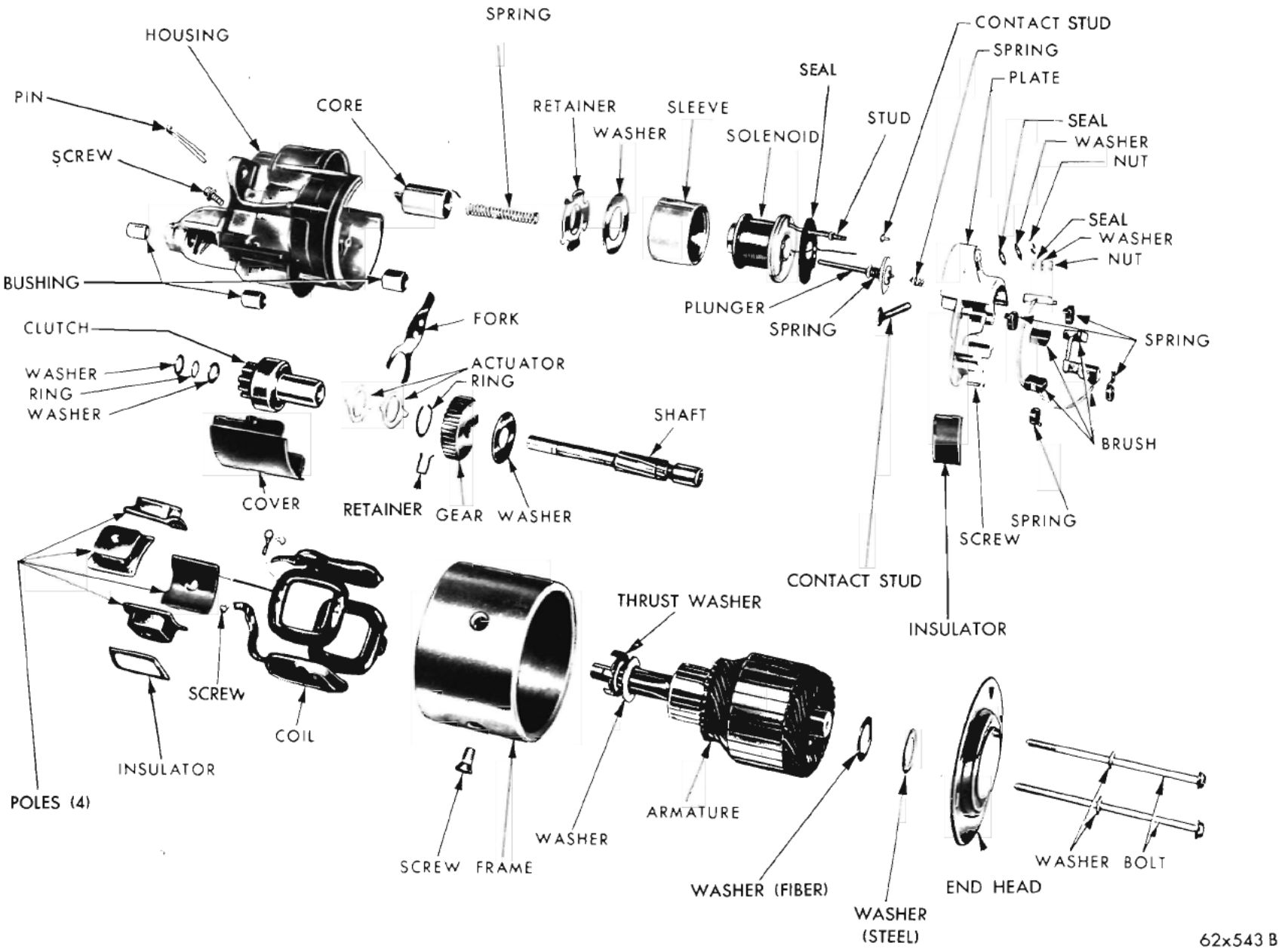

Fig. 17—Starter Motor (Disassembled View)

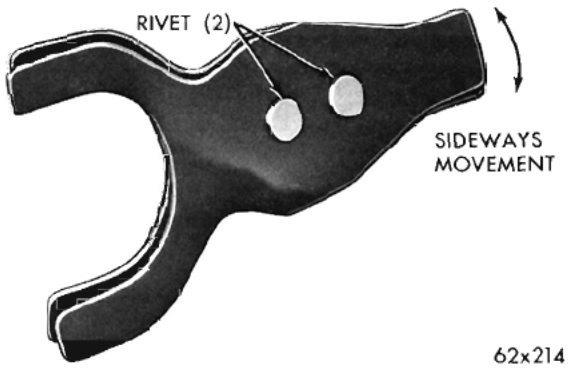

Fig. 18—Shifter Fork Assembly

approximately $^1/_{16}$ inch side movement as shown in Figure 18 to insure proper pinion gear engagement. Lubricate between the plates sparingly with SAE 10 engine oil.

(1) Position the shifter fork in the drive housing and install the shifting fork retainer pin. One tip of the pin should be straight, the other tip should be bent at a 15 degree angle away from the housing. The fork and retainer pin should operate freely after bending the tip of the pin.

(2) Install the solenoid moving core and engage the shifting fork. (Refer to Figure 12.)

(3) Enter the pinion shaft into the drive housing, and install the friction washer and drive gear.

(4) Install the clutch and pinion assembly, thrust washer, retaining ring and thrust washer. (Refer to Figure 11.)

(5) Complete the installation of the pinion shaft engaging the shifting fork with the clutch actuators. Figure 19 shows the correct relation of the parts at assembly.

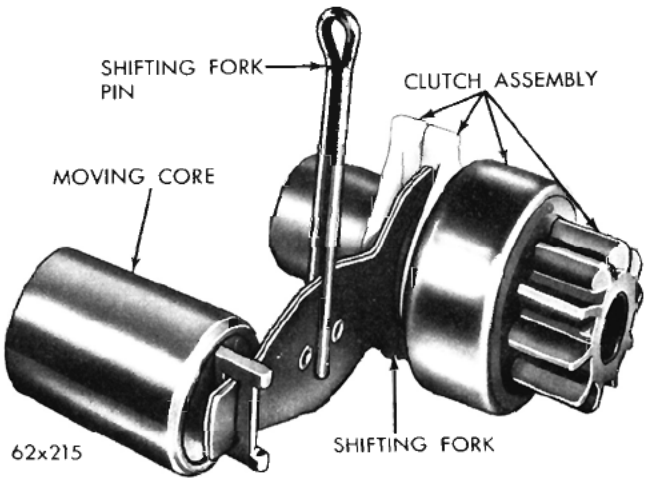

Fig. 19—Shifter Fork and Clutch Arrangement

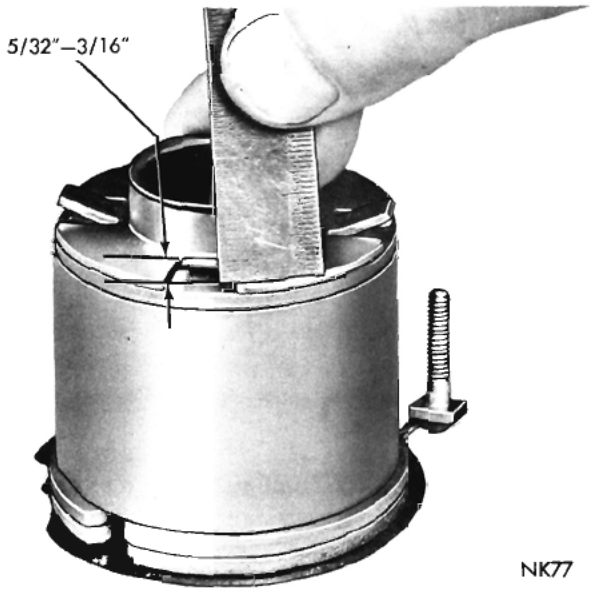

Fig. 20—Checking Height of Solenoid Coil Retainer Tangs

NOTE: The friction washer must be positioned on the shoulder of the splines of the pinion shaft before the driven gear is positioned.

(6) Install the driven gear snap ring (Fig. 8).

(7) Install the pinion shaft retaining ring (Fig. 9).

(8) Bend the four (4) Tangs of the coil retainer "up" to a measurement of $^5/_{32}$" to $^3/_{16}$" above the surface of the retainer (Fig. 20), to ensure higher compression and a more positive ground.

NOTE: Space the retainer in the housing bore so that the four tangs rest on the ridge in the housing bore and not in the recesses.

(9) Install the starter solenoid return spring into the bore of the moving core.

(10) Install the solenoid contact seal over the solenoid lead wires, inserting the double wires of the terminal stud into the large hole (Fig. 6) and the solenoid winding lead wire into the small hole.

NOTE: Inspect the condition of the starter solenoid switch contacting washer, if the top of washer is burned from arcing, disassemble the contact switch plunger assembly and reverse the washer.

(11) Install the solenoid contact plunger assembly into the solenoid and reform the double wires to allow for proper entry of the terminal stud into the brush holder with the double wires curved around the contactor.

CAUTION: The contactor must not touch the double wires when the solenoid is energized after the assembly is completed (Fig. 6).

NOTE: Make sure the contact spring is positioned on the shaft of the solenoid contact assembly.

(12) Assemble the battery terminal stud in the brush holder placing the sealing washer under the plain washer.

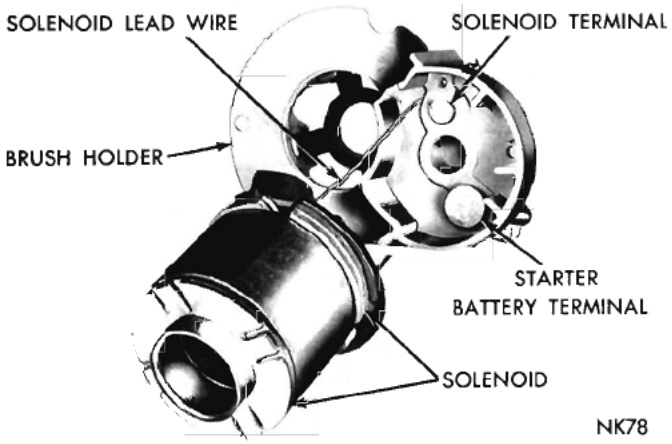

Fig. 21—Assembling Solenoid to the Brush Holder Plate

NOTE: Inspect the condition of the contacts in the brush holder plate. If the contacts are badly burned, replace the brush holder with brushes and contacts as an assembly.

(13) Enter the solenoid lead wire through the hole in the brush holder (Fig. 21) and install the solenoid stud, insulating washer, flat washer and nut.

NOTE: Use care when installing the solenoid contact seal over the tab on the brush plate to prevent tearing the seal.

(14) Wrap the solenoid lead wire tightly around the brush terminal post (Fig. 22) and solder securely with a high temperature resin core solder and resin flux.

(15) Carefully enter the solenoid coil and brush plate assembly into the bore of the gear housing and position the brush plate assembly into the starter gear housing. Align the tongue of the ground terminal with the notch in the brush holder (Fig. 23).

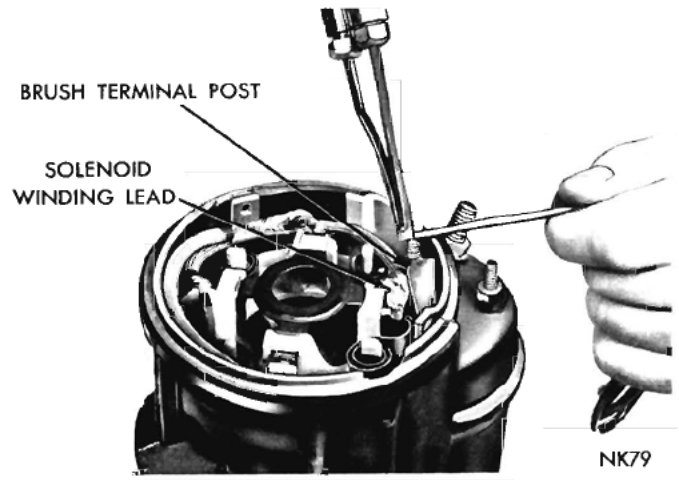

Fig. 22—Soldering the Solenoid Winding Lead to the Brush Terminal

Fig. 23—Installing the Solenoid and Brush Holder into the Gear Housing

(16) After the brush holder is bottomed in the housing, install the attaching screw (Fig. 4). Tighten the screw to 10-15 inch-pounds. Make sure the insulating tape is in position (Fig. 4).

(17) Position the brushes with the armature thrust

Fig. 24—Soldering the Shunt Coil Lead Wire

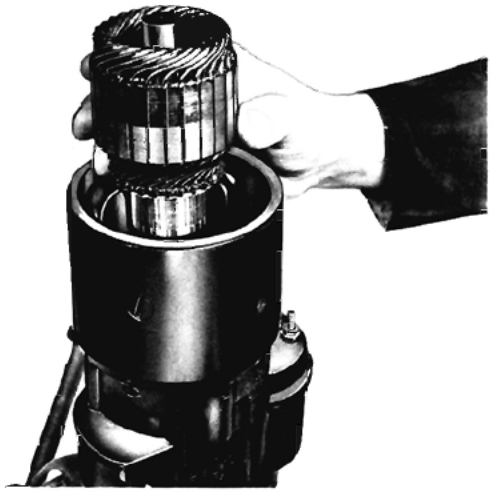
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Fig. 25—Installing Starter Armature

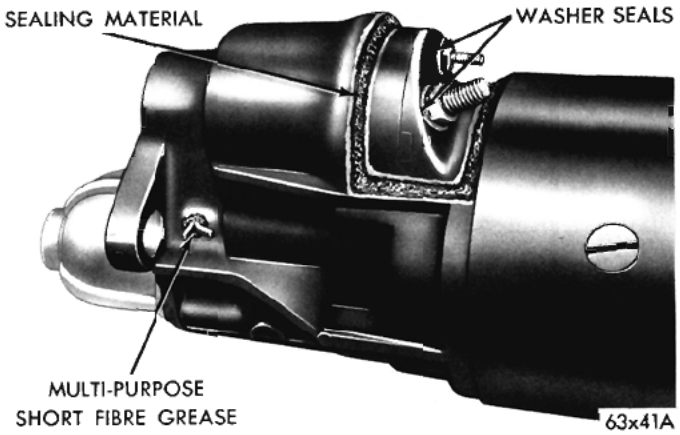

Fig. 26—Sealing the Brush Holder Plate

washer, Fig. 22. This will hold the brushes out and facilitate proper installation of the armature.

(18) On starters so equipped, solder the shunt coil lead wire to the starter brush terminal (Fig. 24).

(19) Install the brush terminal screw (Fig. 2).

(20) Position the field frame to the exact position on the gear housing and enter the armature into the field frame and starter gear housing (Fig. 25); carefully engaging the splines of the shaft with the reduction gear by rotating the armature slightly to engage the splines.

(21) Install the thrust washer (fiber) and washer (steel) on the armature shaft.

(22) Position the starter end head assembly and install the starter frame lockwashers and through bolts. Tighten the through bolts securely.

(23) Clean the area at the joint between the brush holder plate to the field frame and gear housing mating joint. Apply a bead of brush plate sealer Part NO. 2421847 around the four sides of the joint (Fig. 26).

CAUTION: Sealer must be flowed continuously to avoid gaps. After bead has been flowed on, use a brush or small paddle moistened in mineral spirits to press adhesive into joint. Be sure not to get the adhesive on the battery and/or solenoid terminals.

INSTALLATION OF THE STARTING MOTOR

(1) Before installing the starting motor, make sure the starter and flywheel housing mounting surfaces are free of dirt and oil to insure a good electrical contact.

(2) Position the starter to the flywheel housing removable seal.

(3) Install the starting motor, washer and bolt, the automatic transmission oil cooler tube bracket and the washer and nut.

NOTE: When tightening the attaching bolt and nut be sure to hold the starting motor pulled away from the engine to insure proper alignment.

(4) Attach the wire at the solenoid switch terminal and cable to the starter terminal.

(5) Connect the battery ground cable and test the operation of the starting motor for proper engine cranking.

STARTING MOTOR—DIRECT DRIVE

STARTING MOTOR CIRCUIT TESTS

Insulated Circuit Test

(1) Test the battery electrolyte specific gravity. Specific gravity should be 1.220 or above. If the battery specific gravity is below 1.220, recharge the battery to a full charge before proceeding with the test.

(2) Turn the voltmeter selector switch to the 4 volt position.

(3) Disconnect the ignition coil secondary cable.

(4) Connect the voltmeter positive lead to the battery positive post and the voltmeter negative lead to the solenoid connector which connects to the starter field coils.

NOTE: The voltmeter will read off the scale to the right until the starter is actuated.

(5) Connect the remote control switch to the battery and solenoid terminal of the starter relay.

(6) Crank the engine with a remote control starter switch and observe the voltmeter reading. Voltmeter reading should not exceed .3 volt. A voltmeter reading of .3 volt or less indicates voltage drop is normal in the cables, the starter relay switch, solenoid switch and connections between the battery and starter motor is normal. See "Starter Ground Circuit Test."

If the voltmeter reading is more than .3 volt, it indicates high resistance in the starter insulated circuit. Make the following tests to isolate the point of excessive voltage loss:

(A) Remove the voltmeter lead from the solenoid connector and connect to the following points, repeating the test at each connection. The starter terminal of the solenoid, battery terminal of the solenoid, battery cable terminal at the solenoid, starter relay and the cable clamp at the battery.

(B) A small change will occur each time a normal portion of the circuit is removed from the test. A definite change in the voltmeter reading indicates that the last part eliminated in the test is at fault. Maximum allowable voltage loss is as follows:

Battery insulated cable	.2 volt
Solenoid switch	.1 volt
Each Connection	.0 volt

Replace faulty cables. Clean and tighten all connections.

Starter Ground Circuit Test

(1) Connect the voltmeter positive lead to the starter housing and the negative voltmeter lead to the battery negative post.

(2) Crank the engine with a remote control starter switch and observe the voltmeter reading. The voltmeter reading should not exceed .2 volt. A reading of .2 volt or less indicates voltage loss in the ground cable and connections are normal. If the voltmeter reading is more than .2 volt, it indicates excessive voltage loss in the starter ground circuit. Make the following tests to isolate the point of excessive voltage loss, repeating the test at each connection.

(a) Starter drive housing.

(b) Cable terminal at the engine.

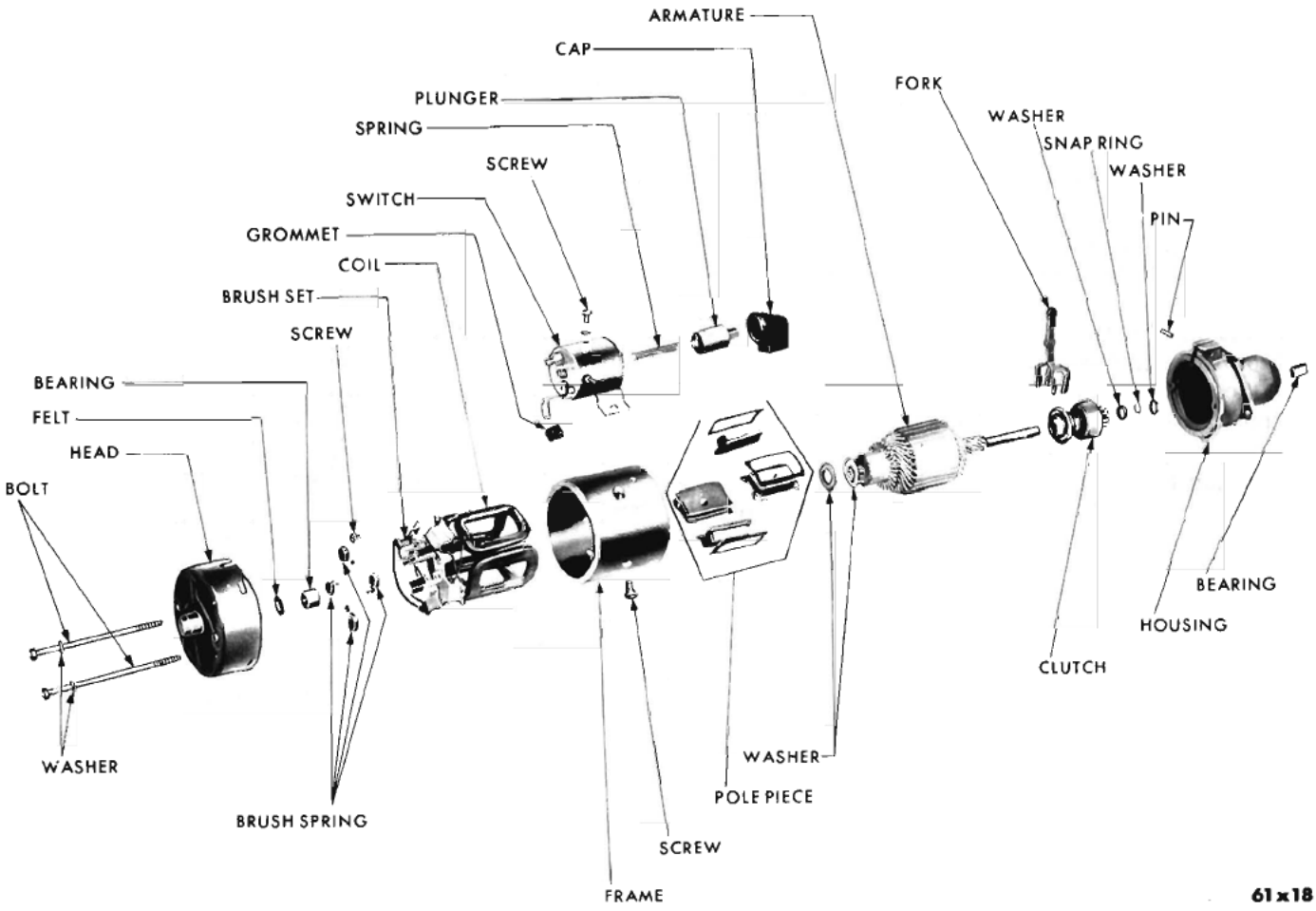

Fig. 1—Starting Motor (Disassembled View) (Typical)

(c) Cable clamp at the battery.

A small change will occur each time a normal portion of the circuit is removed from the test. A definite change in the voltmeter reading indicates that the last part eliminated in the test is at fault.

Maximum allowable voltage loss is as follows:

Battery ground cable	.0 volt
Engine ground circuit	.2 volt
Each connection	.1 volt

REMOVAL OF STARTING MOTOR

(1) Disconnect the ground cable at the battery.

(2) Remove the starter cable at the starter.

(3) Disconnect the solenoid lead wire from the solenoid.

(4) Remove the bolts attaching the starting motor to the flywheel housing and remove the starter motor and housing removable seal.

TESTING THE STARTING MOTOR
(Bench Test)

Free Running Test

(1) Place the starter in a vise equipped with soft jaws and connect a fully-charged, 12 volt battery to the starter as follows:

(2) Connect a test ammeter (100 amperes scale) and a carbon pile rheostat in series with the battery positive post and starter terminal.

(3) Connect the voltmeter (15 volt scale) across the starter.

(4) Rotate the carbon pile to the full-resistance position.

(5) Connect the battery cable from the battery negative post to the starter frame.

(6) Adjust the rheostat until battery voltage shown on voltmeter reads 11 volts.

(7) The current draw should be 78 amperes maximum at 3800 minimum rpm.

Locked Resistance Test

(1) Install the starting motor in test bench.

(2) Follow the instructions of the test equipment manufacturer and test the locked-resistance of the starter against the following specifications.

(3) With applied battery voltage adjusted to 4 volts; the current draw should be 350 amperes.

DISASSEMBLING THE STARTING MOTOR

(1) Refer to Figure 1, remove the through bolts and tap the commutator end head from the field frame.

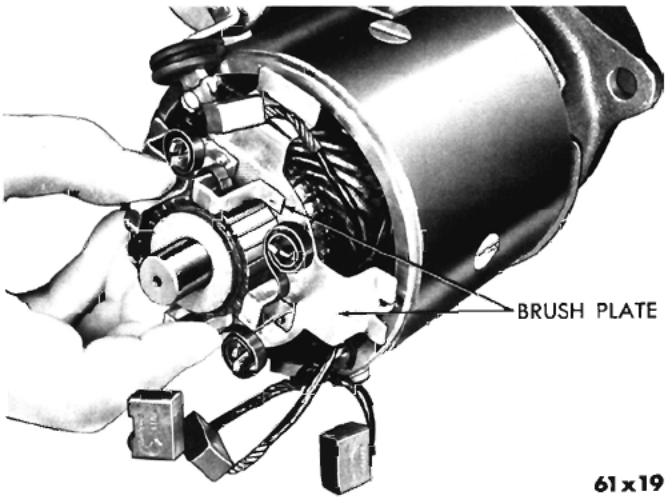

Fig. 2—Removing the Brush Ring

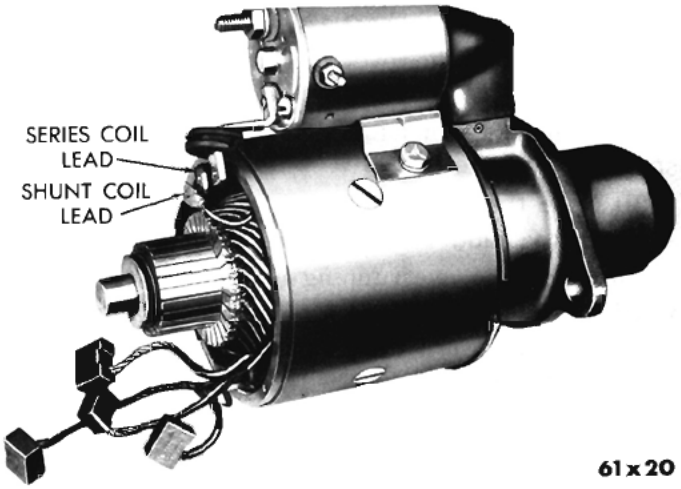

Fig. 3—Field Coil Leads Disconnected from the Solenoid Connector

(2) Remove the thrust washers from the armature shaft.

(3) Lift the brush holder springs and remove the brushes from the brush holders.

(4) Remove the brush plate (Fig. 2).

(5) Disconnect the field coil leads at the solenoid connector (Fig. 3).

(6) Remove the solenoid attaching screws and re-

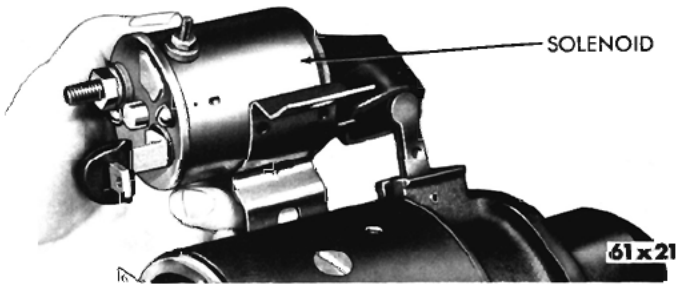

Fig. 4—Removing the Starter Solenoid

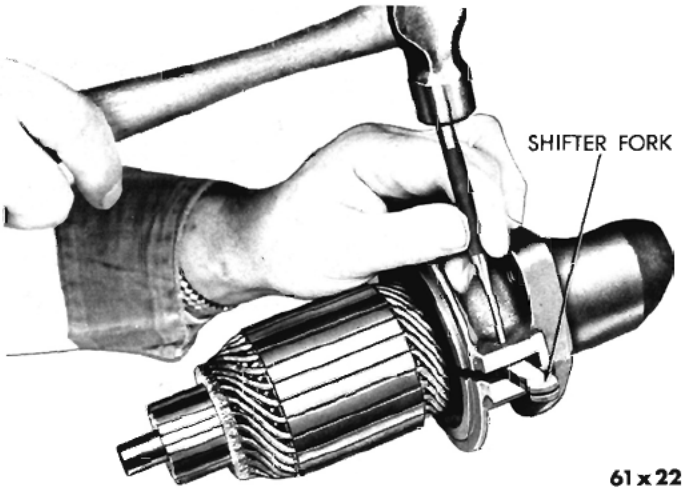

Fig. 5—Removing the Shifter Fork Pivot Pin

move the solenoid and boot assembly (Fig. 4).

(7) Drive out the overrunning clutch shift fork pivot pin (Fig. 5).

(8) Remove the drive end pinion housing and the spacer washer.

(9) Note the position of the shifter fork on the starter drive and remove the shifter fork (Fig. 6).

(10) Slide the overrunning clutch pinion gear toward the commutator end of the armature, drive the stop retainer toward the clutch pinion gear to expose the snap ring and remove the snap ring.

(11) Slide the overrunning clutch drive from the armature shaft.

(12) If it is necessary to replace the field coils, remove the ground brushes terminal attaching screw and raise the brushes with the terminal and shunt wire up and away from the field frame (Fig. 7). Remove the pole shoe screws with the special pole shoe impact screwdriver, Tool C-3475.

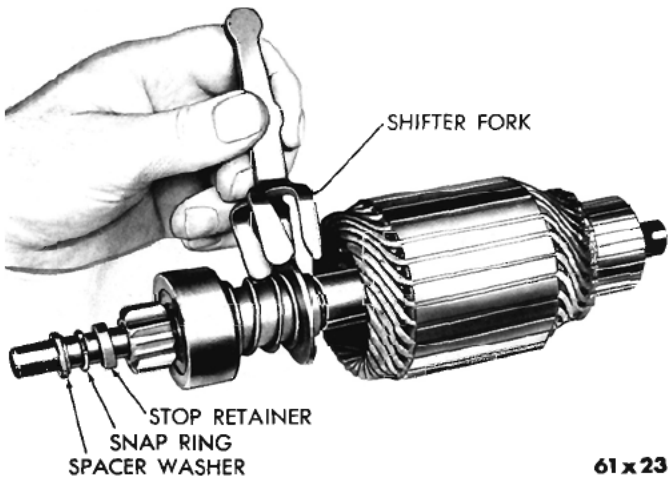

Fig. 6—Removing the Shift Fork

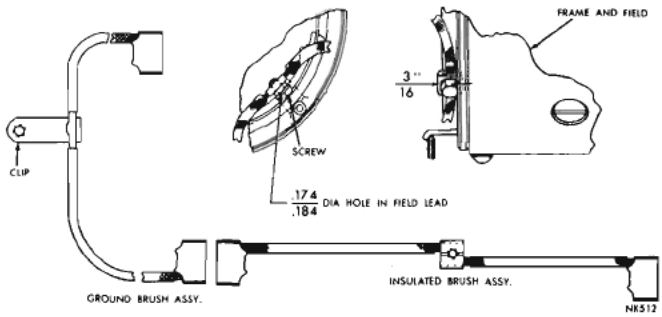

Fig. 7—Brush Replacement

CLEANING THE STARTER PARTS

(1) Do not immerse the parts in a cleaning solvent. Immersing the field frame and coil assembly and/or armature will damage the insulation. Wipe these parts with a cloth **only.**

(2) Do not immerse the drive unit in a cleaning solvent. The drive clutch is pre-lubricated at the factory and solvent will wash lubrication from the clutch.

(3) The drive unit may be cleaned with a brush moistened with cleaning solvent and wiped dry with a cloth.

BRUSHES AND SPRINGS—REPLACEMENT

(1) Brushes that are worn more than ½ the length of the new brush, or are oil-soaked, should be replaced. The brushes and springs can be replaced after removing the commutator end head and the brush plate.

(2) Disengage the brushes from the brush holders and remove the brush plate.

(3) Disconnect the series coil and the shunt field coil terminal at the solenoid connector (Fig. 3).

(4) Remove the ground brush terminal screw and carefully remove the ground brush set to prevent breaking the shunt field lead.

(5) Remove the shunt field lead from the old brush set to ensure as much length as possible.

(6) Remove the field terminal plastic covering and remove the old brushes. Use side cutters to break the weld by rolling the stranded wire off the terminal.

(7) Drill a .174 to .184 inch hole in the series coil terminal $^{3}/_{16}$ of an inch from the top of the terminal to the centerline of the hole, (Fig. 7). (Use a number 16 drill.)

CAUTION: Do not damage the field coil during the drilling operation.

(8) Attach the insulated brush set to the series field terminal with the flat washer and the number 8 self-tapping screw.

(9) Attach the shunt field lead to the new ground brush set by making a loop around the terminal and soldering the lead to the terminal with resin core solder.

(10) Attach the ground brush terminal to the field frame with the attaching screw. Fold the surplus shunt field lead back along the brush lead and secure with rubber insulating tape.

(11) Measure the brush spring tension with a spring scale hooked under the spring near the brush end. Pull the scale on a line parallel to the edge of the brush and take a reading just as the spring end leaves the brush. The spring tension should be 32 to 36 ounces. Replace the springs that do not meet specifications.

(12) Brush springs can be removed by spreading the retainers and disengaging the springs from the retainer legs.

TESTING THE ARMATURE

Testing the Armature for Short Circuit

Place the armature in a growler (Fig. 8) and hold a thin steel blade parallel to the core and just above it, while slowly rotating the armature in the growler. A shorted armature will cause the blade to vibrate and be attracted to the core. Replace a shorted armature.

Testing the Armature for Ground

Touch armature shaft and end of a commutator bar with a pair of test lamp prods (Fig. 9). If the lamp lights, it indicates a grounded armature. Replace a grounded armature.

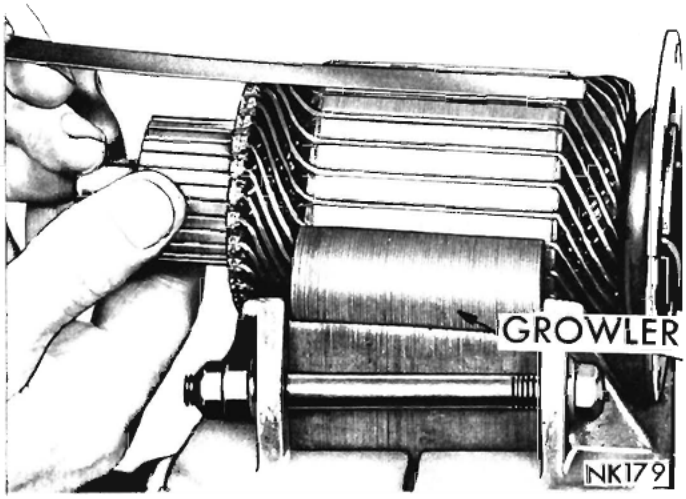

Fig. 8—Testing Armature for Short

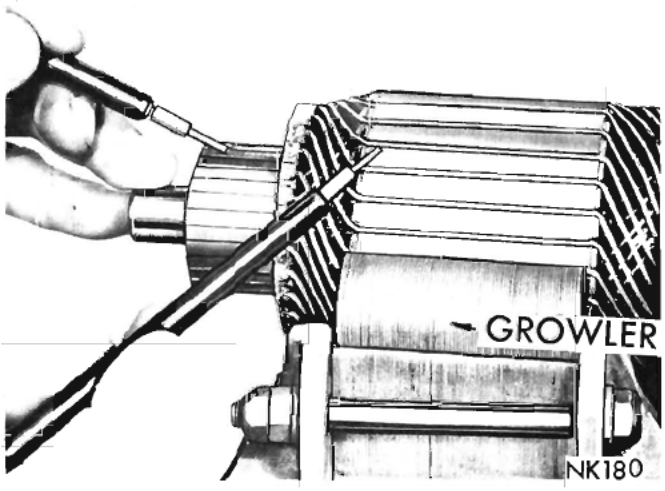

Fig. 9—Testing Armature for Ground

Testing Commutator Runout, Refacing

Place the armature in a pair of "V" blocks and check the runout with a dial indicator. Check both the shaft and commutator. A bent shaft requires replacement of the armature.

When the commutator runout exceeds .003 inch, the commutator should be refaced. Remove only a sufficient amount of metal to provide a smooth, even surface.

TESTING THE FIELD COILS FOR GROUND

(1) Remove the through bolts and remove the commutator end frame.

(2) Remove the brushes from the brush holders and remove the brush ring (Fig. 2).

(3) Disconnect the field lead wires at the solenoid connector and separate the field leads to make sure

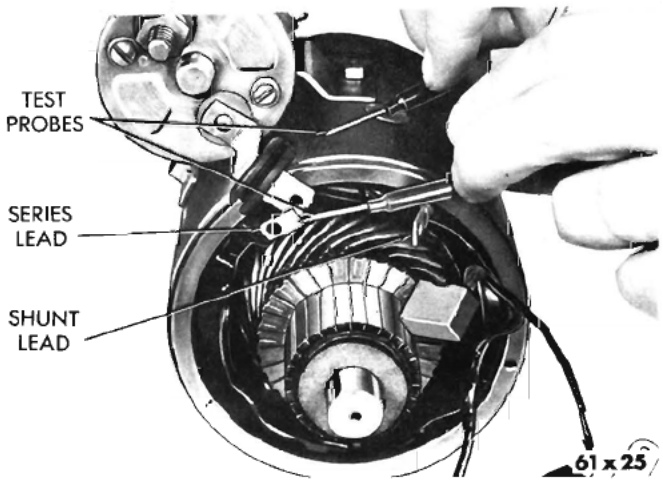

Fig. 10—Testing Series Coil for a Ground

they do not touch the solenoid connector (Fig. 3).

(4) Remove the ground brushes attaching screw, and raise the brushes with terminal and shunt wire up and away from the field frame.

(5) Touch one probe of the test lamp to the series field coil lead and the other probe to the field frame (Fig. 10). Lamp should not light.

(6) Touch one probe to the shunt field coil lead and the other probe to the field frame (Fig. 11).

If the lamp lights in either test (5) or (6), the field coils are grounded. If field coils are grounded, test each coil separately after unsoldering the connector wires. Replace grounded field coils.

(7) Touch each of the brush holders with one test probe, while holding the other test probe against the brush ring. Two brush holders that are 180 degrees apart should cause test lamp to light as they are intentionally grounded. The other two brush holders (Fig. 12) should not cause lamp to light when tested as they are insulated. If the insulated brush holders cause lamp to light when tested, it indicates that the brush holders on the brush ring are grounded. Replace the brush ring assembly if the brush holders are grounded.

REPLACING THE FIELD COILS

A pole shoe impact screwdriver Tool C-3475 should be used to remove and install the field coils to prevent damage to the pole shoe screws and for proper tightening.

Pole shoes that are loose and not properly seated may cause the armature core to rub on the pole shoes. This will decrease starter efficiency and damage the armature core.

NOTE: Scribe a mark on the pole shoe and field frame to ensure the pole shoes are assembled in their original position.

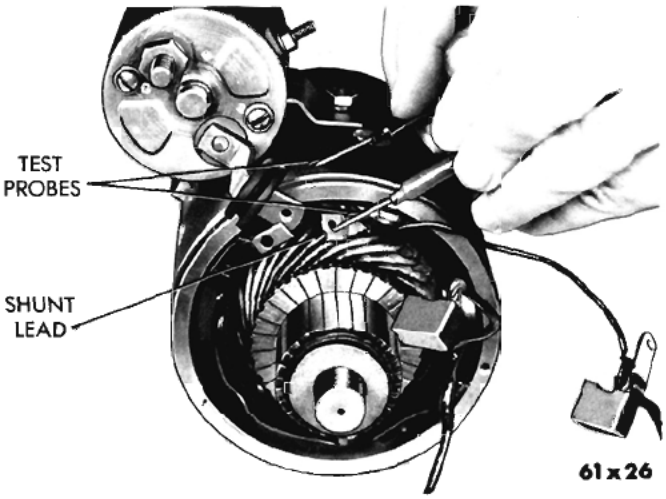

Fig. 11—Testing Shunt Coil for a Ground

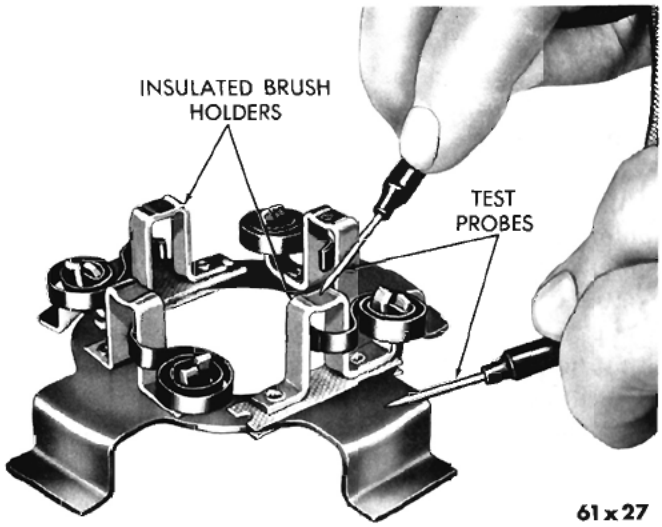

Fig. 12—Testing Insulated Brush Holder for a Ground

SERVICING THE BUSHINGS

Inspect the armature shaft bearing surfaces and bushings for wear by placing the armature core in a vise equipped with soft jaws. Do not squeeze tightly. Try the commutator end frame, the drive end frame, and armature support bushings for wear by placing them on shafts and checking for side play. Replace the commutator end frame and bushing assembly if the bushing is worn. Also, replace the drive end bushing if it is worn. The bushing should be well soaked in SAE 30-W engine oil before it is installed. The new pre-sized bushing should be pressed into the housing until the bushing is flush with the inner side of the housing to provide proper clearance. Use Tool C-3944 to remove and install the bushing.

SERVICING THE DRIVE UNIT

Place the drive unit on the armature shaft and, while holding the armature, rotate the pinion. The drive pinion should rotate smoothly in one direction (not necessarily easily), but should not rotate in the opposite direction. If the drive unit does not function properly, or if the pinion is worn or burred, replace the drive unit.

ASSEMBLING THE STARTING MOTOR

(Refer to Figure 1)

(1) Lubricate the armature shaft and splines with SAE 10-W oil or 30-W rust preventative oil.

(2) Install the starter drive, stop collar (retainer), the lock ring and spacer washer.

(3) Install the shifter fork over the starter drive spring retainer washer with the narrow leg of the

fork toward the commutator (Fig. 6). This is important, if the fork is not properly positioned, the starter gear travel will be restricted causing a lockup in the clutch mechanism.

(4) Install the drive end (pinion) housing on the armature shaft, indexing shifting fork with the slot in the drive end housing.

(5) Install the shifter fork pivot pin (Fig. 5).

(6) With the clutch drive, shifter fork, and pinion housing assembled to the armature, slide the armature into field frame until the pinion housing indexes with the slot in the field frame.

(7) Install the solenoid and boot assembly (Fig. 4). Tighten the bolts to 60-70 inch pounds.

(8) Connect the field coil leads at the solenoid connector (Fig. 3). **Be sure that the terminals do not touch the field frame.**

(9) Install the brush holder ring (Fig. 2) indexing tang of ring in hole of field frame.

(10) Position the brushes in the brush holders. Be sure the field coil lead wires are properly enclosed behind the brush holder ring and that they do not interfere with the brush operation.

(11) Install the thrust washers on the commutator end of the armature shaft to obtain .010 inch minimum end play.

(12) Install the commutator end head.

(13) Install the through bolts and tighten to 40 to 50 inch-pounds.

ADJUSTING STARTER DRIVE GEAR (PINION) CLEARANCE

(1) Place the starter assembly in a vise equipped with soft jaws and tighten the vise sufficiently to hold the starter.

NOTE: Place a wedge or screwdriver between the bottom of the solenoid and the starter frame to eliminate all deflection in the solenoid when making the pinion clearance test.

(2) Push in on the solenoid plunger cage (Fig. 13) (NOT THE FORK LEVER) until the plunger bottoms.

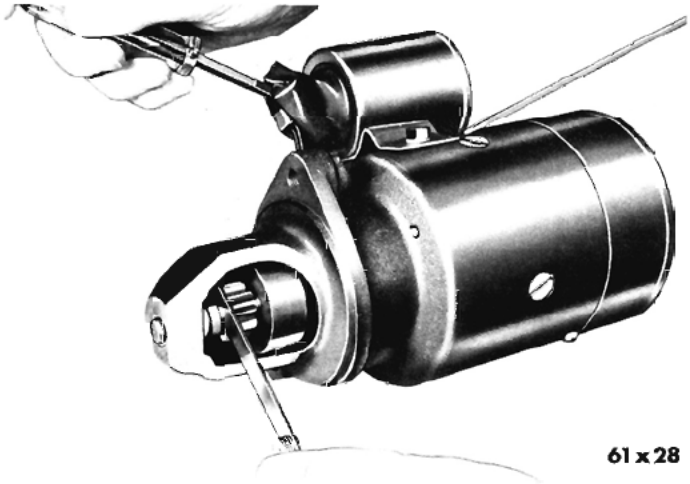

Fig. 13—Checking Starter Drive Pinion Clearance

(3) Measure the clearance between the end of pinion and pin stop with the plunger seated and the pinion pushed toward the commutator end. The clearance should be ⅛ inch. Adjust for proper clearance by loosening the solenoid attaching screws and move the solenoid fore and aft as required.

(4) Test the starter operation under a "Free Running Test."

INSTALLING THE STARTING MOTOR

(1) Before installing the starter, be sure starter and flywheel housing mounting surfaces are free of dirt and oil. These surfaces must be clean to make good electrical contact.

(2) Position the starter to the flywheel housing removable seal.

(3) Install the starter from beneath the engine.

(4) Tighten the attaching bolts securely.

(5) Attach the wires to the solenoid switch and starter terminal.

(6) Install the battery ground cable and test the operation of the starter for proper engine cranking.

PART 3

ALTERNATOR AND VOLTAGE REGULATOR

ALTERNATOR

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
ALTERNATOR FAILS TO CHARGE (No Output)	(a) Blown fusible wire in voltage regulator.	(a) Locate and correct the cause of the fuse blowing. Install a new fuse wire. Solder both ends of a new fusible wire securely.
	(b) Alternator drive belt loose.	(b) Adjust the drive belt according to specifications.
	(c) Worn brushes and/or slip rings.	(c) Install new brushes and/or slip rings.
	(d) Sticking brushes.	(d) Clean the slip rings and brush holders. Install new brushes.
	(e) Open field circuit.	(e) Test all the field circuit connections, and correct as required.
	(f) Open charging circuit.	(f) Inspect all connections in the charging circuit, and correct as required.
	(g) Open circuit in stator windings.	(g) Remove the alternator and disassemble. Test the stator windings. Install a new stator if necessary.
	(h) Open rectifiers.	(h) Remove the alternator and disassemble. Test the rectifiers. Install new rectifiers if necessary.
LOW, UNSTEADY CHARGING RATE	(a) Alternator drive belt loose.	(a) Adjust the alternator drive belt.
	(b) High resistance at battery terminals.	(b) Clean and tighten the battery terminals.
	(c) High resistance in the charging circuit.	(c) Test the charging circuit resistance. Correct as required.
	(d) High resistance in the body to engine ground lead.	(d) Tighten the ground lead connections. Install a new ground lead if necessary.
	(e) Open stator winding.	(e) Remove and disassemble the alternator. Test the stator windings. Install a new stator if necessary.
LOW OUTPUT AND A LOW BATTERY	(a) High resistance in the charging circuit.	(a) Test the charging circuit resistance and correct as required.
	(b) Low regulator setting.	(b) Reset the voltage regulator according to specifications.
	(c) Shorted rectifier. Open rectifier.	(c) Perform the current output test. Remove and disassemble the alternator. Test the rectifiers. Install new rectifiers as required.
	(d) Grounded stator windings.	(d) Remove and disassemble the alternator. Test the stator windings. Install a new stator if necessary.
EXCESSIVE CHARGING RATE TO A FULLY CHARGED BATTERY	(a) Regulator set too high.	(a) Reset the voltage regulator according to specifications.
	(b) Regulator contacts stuck.	(b) Install a new voltage regulator.
	(c) Regulator voltage winding open.	(c) Install a new voltage regulator.
	(d) Regulator base improperly grounded.	(d) Connect the regulator base to the ground connection.

Condition	Possible Cause	Correction
REGULATOR CONTACTS BURNED	(a) High regulator setting.	(a) Reset the voltage regulator according to specifications.
	(b) Shorted rotor field coil windings.	(b) Test the rotor field coil current draw. If excessive install a new rotor.
REGULATOR CONTACTS POINTS STUCK	(a) Poor ground connection between the alternator and the regulator. Open resistor element.	(a) Correct the ground connection. Install a new regulator. Test the regulator setting, and reset if necessary.
NOISY ALTERNATOR	(a) Alternator mounting loose.	(a) Properly install and tighten the alternator mounting.
	(b) Worn or frayed drive belt.	(b) Install a new drive belt and adjust.
	(c) Worn bearings.	(c) Remove and disassemble the alternator. Install new bearing as required.
	(d) Interference between the rotor fan and stator leads or rectifiers.	(d) Remove and disassemble the alternator. Correct the interference as required.
	(e) Rotor or rotor fan damaged.	(e) Remove and disassemble the alternator. Install a new rotor.
	(f) Open or shorted rectifier.	(f) Remove and disassemble the alternator. Test the rectifiers. Install new rectifiers as required.
	(g) Open or shorted winding in the stator.	(g) Remove and disassemble the alternator. Test the stator windings. Install a new stator if necessary.
EXCESSIVE AMMETER FLUCTUATION	(a) High resistance in the field circuit to the alternator or an improperly set voltage regulator.	(a) Clean all connections and tighten all connections as necessary. Adjust voltage regulator as necessary.

ALTERNATOR

Description

The alternator (Fig. 1) is fundamentally an A.C. current generator, with six (6) built-in silicon rectifiers, that convert the A.C. current into D.C. current. D.C. current is available at the "output" "BAT" terminal. A voltage regulator (Fig. 2) is used in the field circuit to limit the output voltage.

The main components of the alternator are the rotor, the stator, the rectifiers, the two end shields and the drive pulley. (See Fig. 3)

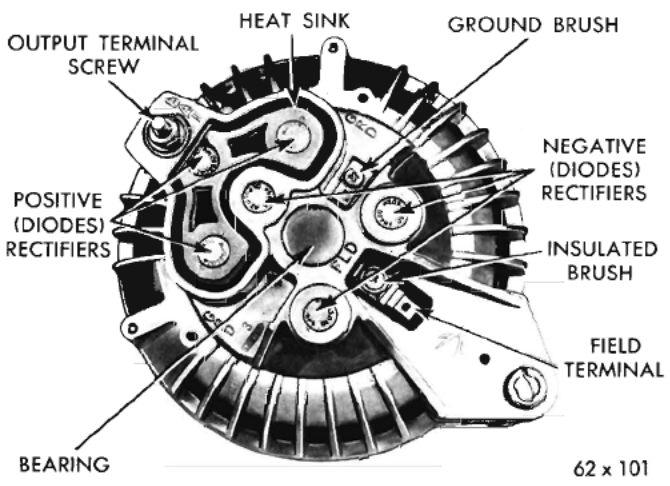

Fig. 1—Alternator Assembly

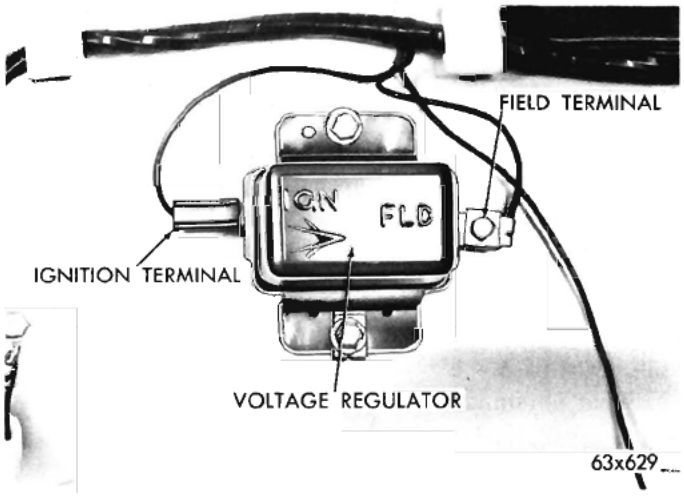

Fig. 2—Voltage Regulator Installed (Typical)

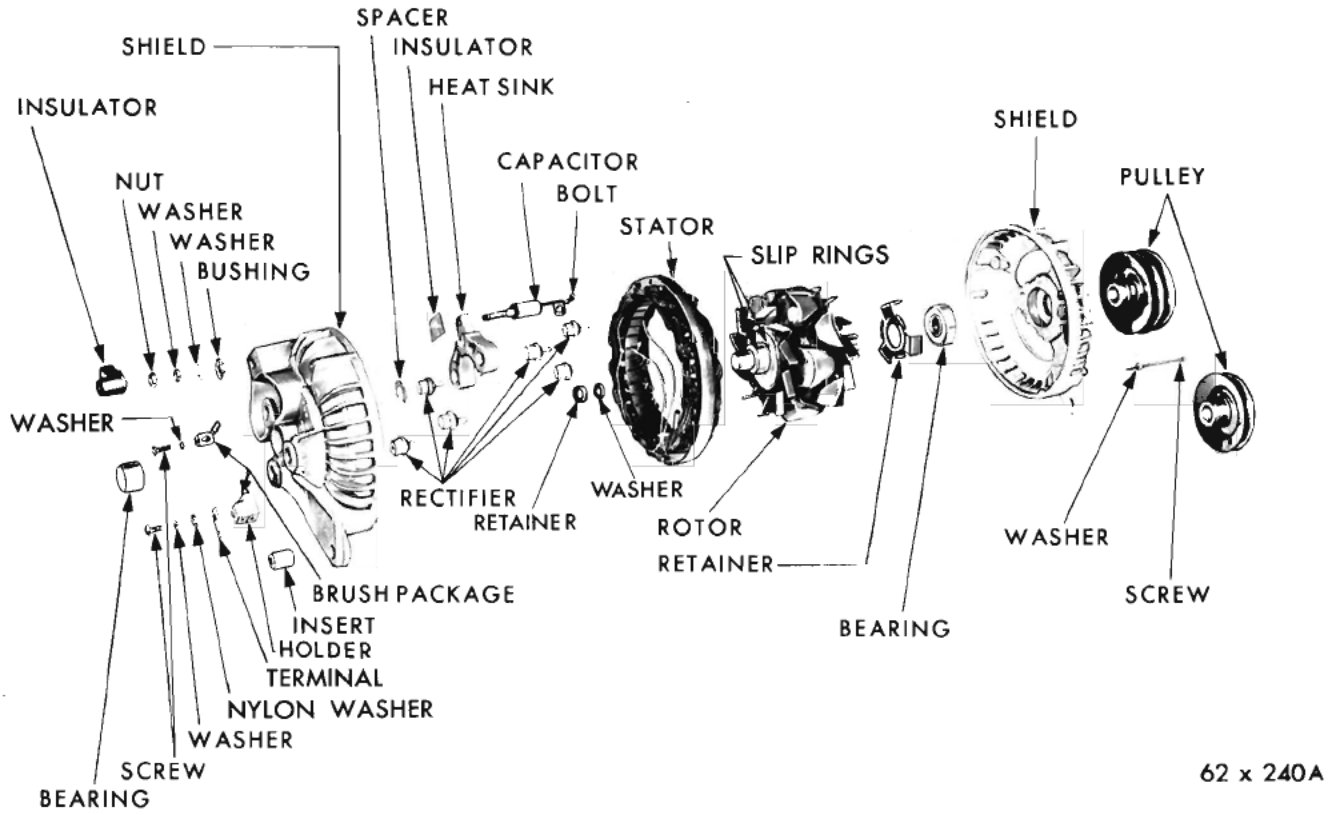

Fig. 3—Alternator (Disassembled View)

VOLTAGE REGULATOR

The only function of the regulator is to limit the output voltage. The voltage regulator accomplishes this by controlling the flow of current in the rotor field coil, and in effect controls the strength of the rotor magnetic field.

The voltage regulator is connected in the field circuit between the battery and the field terminal of the alternator. One terminal of the regulator is marked "IGN" and the other is marked "FLD." The "IGN" terminal of the regulator is connected to the coil side of the ignition switch so that the field circuit is completed **only** when the ignition switch is turned "ON."

The voltage regulator (Fig. 4) has two sets of contacts using a common single armature. The upper and lower stationary contact brackets are mounted on a molded plastic bracket which is attached to the regulator frame by a screw. (Fig. 5) The upper contact bracket is connected to the "IGN" terminal by a fusible wire. The lower contact bracket is connected to ground by another fusible wire. The armature is connected to the insulated "FLD" terminal.

Three resistance units are used (Fig. 6). Resistor number "one" and number "two" are connected between the "IGN" and "FLD" terminals, in parallel with the upper set of contacts. Resistor number "three" is connected between the "FLD" terminal and ground. Its function is to reduce arcing at the

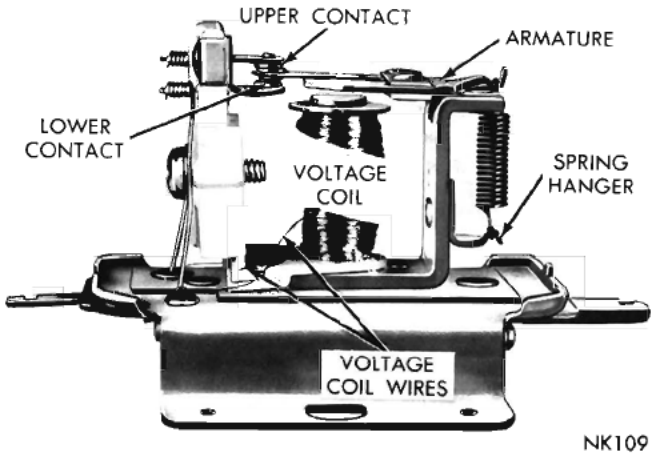

Fig. 4—Voltage Regulator (Cover Removed)

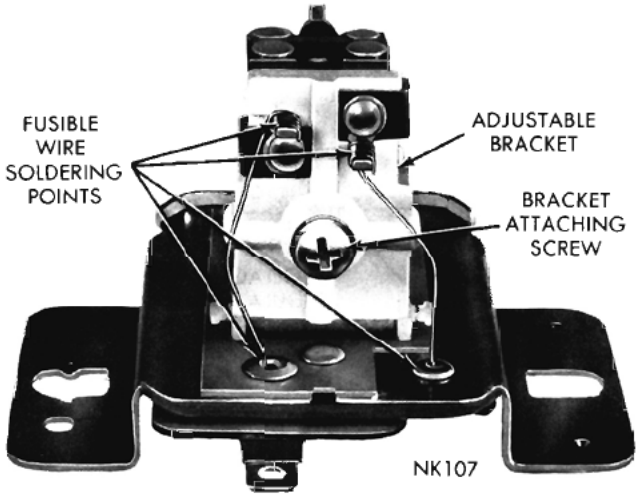

Fig. 5—Voltage Regulator Fusible Wires

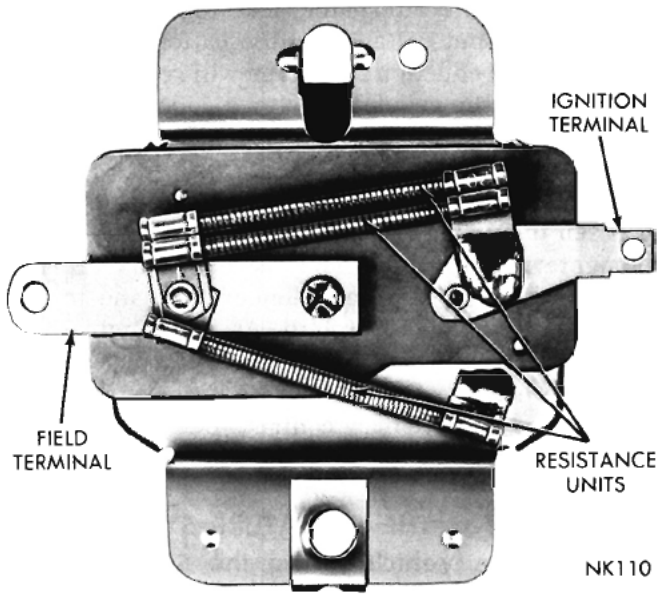

Fig. 6—Voltage Regulator Resistance Units

terminal of the regulator and "ground." Thus, when the ignition switch is turned "On," battery voltage applied to the windings energizes the coil and the magnetic force of the coil tends to attract the regulator armature.

regulator contacts.

A voltage coil, (Fig. 4) consisting of many turns of fine wire, is connected in series between the "IGN"

SERVICE PROCEDURES

REGULATOR OPERATION

(1) When the battery line voltage is relatively low, the current flow through the voltage coil will be low. The magnetic force (or pull) of the voltage coil will not be great enough to overcome the regulator armature spring tension, which is holding the armature contact against the upper stationary contact, (Fig. 4).

Battery line voltage applied to the "IGN" terminal causes current to flow through the regulator upper contacts, through the "FLD" terminal of the regulator and to the "insulated" brush and rotor slip ring. The rotor field coil circuit is completed to "ground" through the other rotor slip ring and the "ground" brush. Inasmuch as the upper contacts are "closed," the field circuit resistance is low, and maximum current will flow through the rotor field coil. The rotor field strength will be high, and the alternator output will be at its maximum for any rotor speed.

(2) As the battery line voltage increases, the magnetic pull of the voltage coil overcomes the armature spring tension, and "opens" the upper contacts. The armature contacts at this time do not touch either the upper or lower stationary contacts. Field current now flows through the regulator "IGN" terminal, through resistance number one and number two, through the "FLD" terminal, and through the rotor field to ground.

The two resistors, in series with the field circuit, reduce field current and rotor field strength, with a corresponding reduction in alternator output voltage. This momentarily reduces battery line voltage applied to the regulator voltage coil. The regulator armature spring tension overcomes the magnetic pull of the voltage coil, closing the upper contacts.

When the electrical load requirements are relatively high, the regulator armature oscillates, opening and closing the upper contacts. This alternately "puts in" and "takes out" resistance in the field circuit, and in effect limits the alternator output voltage.

(3) When the electrical load requirements are low and the engine speed is high, the alternator output voltage tends to increase. The battery line voltage (now slightly increased) causes the regulator voltage coil magnetic force to pull the armature contact against the regulator lower stationary contact.

Field current flow is now through the regulator "IGN" terminal, resistors number one and number two, to the regulator "FLD" terminal. Since the regulator armature is connected to the "FLD" terminal and the lower contacts are closed, the current path is through the regulator armature to the movable contact and then through the lower contact to ground. This is because the resistance to ground is less than the alternator rotor field coil resistance.

By-passing the alternator field coil will cause the alternator output voltage and the battery line voltage to drop. This reduction in voltage will reduce the magnetic pull of the regulator voltage coil, to the extent that it cannot hold the armature contact against the stationery lower contact.

The armature moves into a "no contact" position between the upper and lower stationary contacts. This momentarily allows the field current to flow through resistors number one and number two, and through the rotor field coil to ground. At high engine speed and low electrical load operation, the armature oscillates between the "no contact" position, and contact with the lower stationary contact, to limit the battery line voltage.

TESTING THE ARMATURE SYSTEM (On the Vehicle Using the Sun Volt Ampere Tester Model VAT-20D and Sun Battery Post Adapter)

For the sake of uniformity, one type of equipment is shown. Follow the instructions of the equipment manufacturers on comparable equipment when making the following tests:

Preliminary Checks

(1) **Test the Battery Condition.** Perform reliable battery tests to determine the condition and state of charge of the battery. If the battery is defective or not fully charged, install a fully charged battery for test purposes.

(2) **Test alternator belt condition and tension.** Replace the alternator drive belt if necessary and make sure that there is adequate tension on the belt.

(3) **Inspect the condition of wires and their connections.** Before performing the test on the system, correct any problem with the wiring, such as loose connections, corroded connections, burned wiring harness, etc.

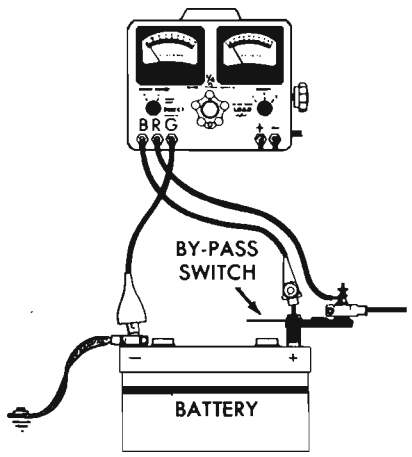

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Fig. 7—Tester Lead Connections

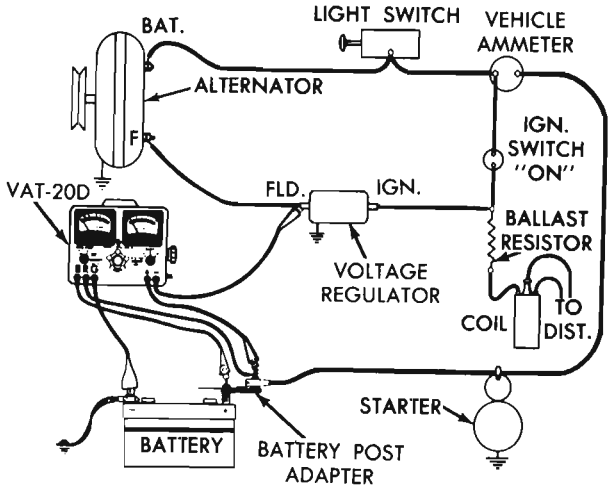

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Fig. 8—Field Circuit Resistance and Field Current Draw Test

Tester Controls and Switches

(1) Set Polarity Switch to the NEGATIVE position.
(2) Set tester control knob to the DIRECT position.
(3) Set voltage switch to the 2 VOLT position.
(4) Set field control to the OPEN position.

Tester Lead Connections (Fig. 7)

(1) Disconnect the positive battery cable from the battery post and install the BATTERY POST ADAPTER between the cable and post.

(2) Connect the "BAT" lead of the tester to the stud on the adapter.

(3) Connect the "REG" lead of the tester to the binding post on the adapter.

(4) Connect the "GRD" lead of the tester to a good ground on the vehicle.

(5) Connect the negative lead of the voltmeter to the field terminal of the regulator.

(6) Connect the positive lead of the voltmeter to the battery end of the positive battery cable.

NOTE: The Battery Post Adapter BY-PASS SWITCH must be open for all charging system tests. It is closed only for starting the engine.

Field Circuit Resistance Test (Fig. 8)

(1) Disconnect the slip-on connector from either end of the ignition ballast resistor.

(2) Turn the ignition switch on.

(3) With vehicle doors closed and all accessories turned off, observe the Voltmeter reading. The voltage should not exceed .55 volt. A reading in excess of .55 volt indicates high resistance in the field circuit between the battery and the voltage regulator field terminal.

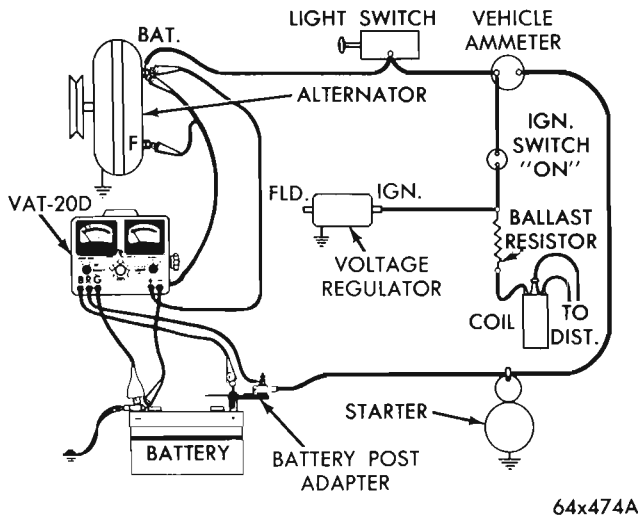

Fig. 9—Current Output Test

(4) If high resistance is indicated, move the negative voltmeter lead to each connection along the circuit towards the battery. A sudden drop in voltage indicates a loose or corroded connection between that point and the last point tested. To test the terminals for tightness, attempt to move the terminal while observing the voltmeter. Any movement of the meter pointer indicates looseness.

NOTE: Excessive resistance in the regulator wiring circuit will cause fluctuation in the ammeter, or a below normal charge rate.

Field Current Draw Test (Fig. 8)

With tester connections positioned as for the Field Circuit Resistance Test, observe the test ammeter. The test ammeter will indicate the field current draw. Refer to "Specifications."

Current Output Test (Fig. 9)

(1) With the ignition switch off, disconnect the field wire from the "FLD" terminal of the alternator and at the regulator.

(2) Connect a special jumper from the "FLD" terminal of the alternator to one of the test leads of the tester Field Control.

(3) Connect the other lead of the tester Field Control to the "BAT" terminal of the alternator.

(4) Set the Tester Voltage Switch to the 16 VOLT position.

(5) Connect the positive lead of the test Voltmeter to the "BAT" terminal of the alternator.

(6) Connect the negative lead of the Test Voltmeter to a good ground.

(7) Reconnect the slip-on connector at the ignition ballast resistor.

(8) Close the BY-PASS Switch of the Battery Post Adapter.

(9) With the tester Field Control in the OPEN position, start the engine and adjust to 1250 RPM.

(10) Open the BY-PASS Switch of the Battery Post Adapter.

(11) Rotate the tester Control Knob to the LOAD position until the Voltmeter reads 6 volts.

(12) Rotate the tester Field Control to the DIRECT position and adjust the tester Control Knob until the Voltmeter reads exactly 15 volts.

(13) Observe the test ammeter. Ammeter now indicates maximum output of alternator. The current output should be within the limits shown in "Specifications."

NOTE: The current output should be within 5 amperes of the rated output as there is a total of 5 amperes supplied by the alternator that will not appear on the test ammeter. This consists of ½ ampere approximate for the instruments, 1½ amperes for the engine ignition system, and 3 amperes for field current.

If the output is slightly less (5 to 7 amperes) than that specified above, it may be an indication of possible "open" rectifier or other alternator internal problem. If the output is considerably lower than that specified above, it may be an indication of a possible "shorted" rectifier or other alternator internal problems. In either case the alternator should be removed and tested on the bench before disassembly.

(14) Return the tester Field Control to the OPEN position.

(15) Return the tester Control Knob to the DIRECT position.

Insulated Circuit Resistance Test (Fig. 10)

(1) Connect the negative lead of the Voltmeter to the battery end of positive battery cable.

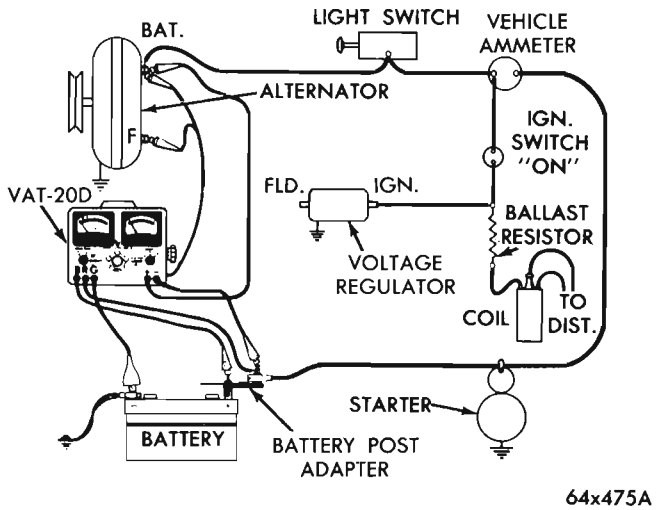

Fig. 10—Insulated Circuit Resistance Test

(2) Set the Voltage Switch to 2 VOLT position.

(3) Adjust the Field Control until the tester ammeter reads exactly 10 amperes.

(4) Observe the Voltmeter reading. Voltmeter now indicates the amount of voltage loss across the insulated circuit. The voltage loss should not exceed .3 volt. If a higher voltage loss is indicated, inspect, clean and tighten all the connections in the charging circuit. A voltage loss test may be performed at each connection to locate the connection that has excessive resistance.

Ground Circuit Resistance Test (Fig. 11)

(1) Connect the positive lead of the test Voltmeter to the negative terminal of the battery.

(2) Connect the negative lead of the test Voltmeter to a good ground on the alternator.

(3) With the alternator charging 10 amps, observe the Voltmeter reading. Voltmeter now indicates the amount of voltage loss across the ground circuit. The voltage loss should not exceed .3 volt.

(4) Rotate the tester Field Control to the OPEN position.

Voltage Regulator Test (Fig. 12)

NOTE: Regulator temperature should be normalized by operating with a 10 ampere load for 15 minutes just prior to testing.

Upper Contacts Test

(1) Remove the test lead of the tester Field Control from the "BAT" terminal of the alternator and connect to the field wire disconnected from the regulator.

(2) Set the Voltage Switch to the 16 VOLT position.

(3) Connect the positive lead of the Voltmeter to the "BAT" terminal of the alternator.

(4) Rotate the tester Field Control to the DIRECT position.

(5) With the engine operating at 1250 RPM, rotate the tester Control Knob clockwise until the Ammeter reads exactly 15 amperes.

(6) Rotate the tester Field Control from the DIRECT position to the OPEN position and then back to the DIRECT position to cycle the system.

(7) Observe the test voltmeter. The voltmeter now indicates the setting of the voltage regulator upper contacts. Refer to "Specifications."

(8) Rotate the tester Control Knob to the DIRECT position. If the regulator operates within specifications, proceed to the lower contact voltage test. If the upper contact voltage setting is not within specifications, remove the regulator cover and adjust the voltage setting as outlined in "Regulator Adjustments" test number (1).

Lower Contacts Test

(1) Increase the engine speed to 2200 RPM.

(2) Rotate the tester Control Knob to the ¼ OHM position only if the tester Ammeter reads over 5 amperes.

(3) Rotate the tester Field Control from the DIRECT position to the OPEN position and then back to the DIRECT position to cycle the system.

(4) Observe the voltmeter. Voltmeter now indicates setting of the voltage regulator lower contacts. Refer to specifications.

Voltage should increase not less than .2 volt or more than .7 volt above the previous operating voltage setting recorded in the upper contact set. A voltage reading of less than .2 volt or more than .7 volt is an indication of a possible wrong air gap setting, refer to "Regulator Mechanical Adjustments."

(5) Rotate the tester Field Control to the OPEN position and the Control Knob to the DIRECT position.

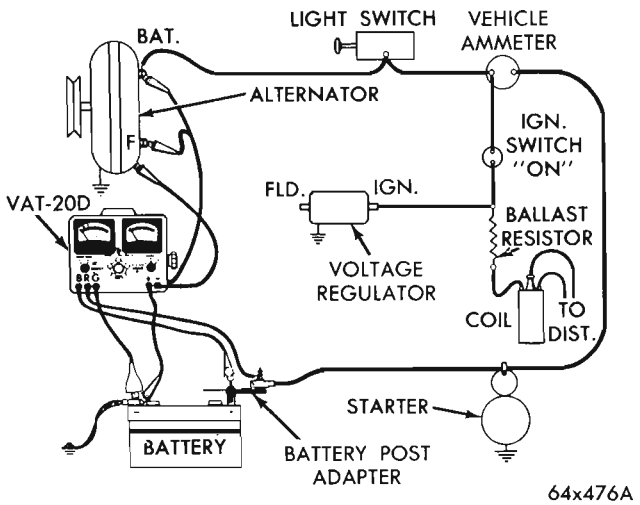

Fig. 11—Ground Circuit Resistance Test

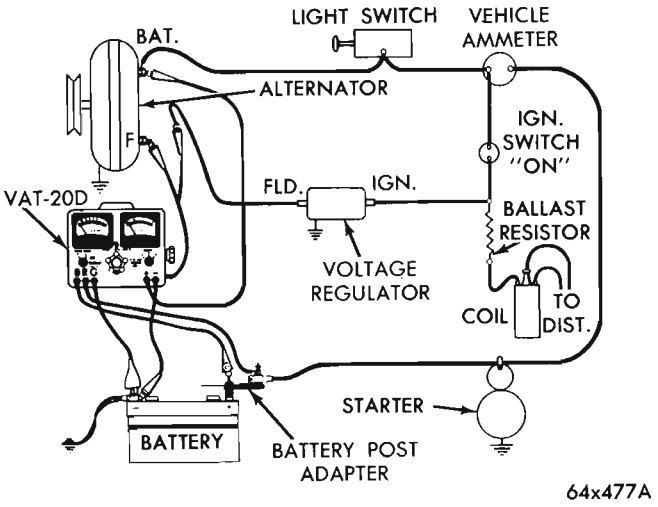

Fig. 12—Voltage Regulator Test

Upon completion of the test, reduce engine speed to idle, stop engine, and disconnect all test leads and adaptors. Be sure that all vehicle's cables and wiring connections are secure before restarting the engine.

CAUTION: Be sure the negative post of the battery is always connected to ground. Incorrect battery polarity may result in wiring harness damage and may damage the alternator rectifiers. Do not ground the alternator field circuit, as this may damage the regulator.

Adjusting the Voltage Setting to Driving Conditions

The specifications called for in the voltage regulator chart indicate a tolerance of .9 volt from the low setting to the high setting at the temperatures indicated.

To maintain the battery in a full state of charge, the voltage regulator should be adjusted to provide the proper voltage limiting setting according to the customer's driving and load requirement habits as follows:

(1) Check the entire charging system and battery as outlined in this Service Manual.

(2) If there are no defects in the charging system or in the battery and the battery was found to be in a low state of charge, increase the setting by .3 volt (do not exceed specified voltage limits) and retest for an improved battery condition after a reasonable service period (week or two). If the battery state of charge has increased to a satisfactory level, do not change the voltage setting. If the battery shows evidence of over-charge—(low electrolyte level, high water consumption, excessive dampness on top of battery), decrease the setting by .3 volt and retest for an improved battery condition after a reasonable service period (week or two).

CAUTION: Always adjust the settings in steps not to exceed .3 volt at a time. (Do not exceed specified voltage limits.)

(3) The proper setting of the voltage regulator is attained when the battery remains at least 1.225 specific gravity in the winter or 1.245 specific gravity in the summer, with a minimum water requirement (not more than an ounce of water per cell per one thousand miles).

Regulator Mechanical Adjustments

Step 1—Adjust the upper contact voltage setting as necessary by bending the regulator lower spring hanger **down** to **increase** voltage setting, **up** to **decrease** voltage setting. Use an **insulated tool** to bend the spring hanger (Fig. 13). The regulator must be installed, correctly connected, and retested after each adjustment of the lower spring hanger.

NOTE: If repeated readjustment is required, it is permissible to use a jumper wire to ground the regulator base to the fender splash shield for testing, in lieu of reinstalling the regulator each time. However, it is important that the regulator cover be reinstalled, the regulator connections correctly connected, and the regulator satisfactorily insulated by the fender cover to prevent grounding the regulator terminals or resistances. When testing, the regulator must be at the same attitude (or angle) as when installed on the vehicle. If step (1) under "Mechanical Adjustments" does not bring the voltage regulator within specifications, proceed to Step (2) following:

Step 2—Measure the lower contact point gap. The lower contact gap should be .014 inch plus or minus .002 inch. Adjust the lower contact gap as necessary by bending the lower stationary contact bracket making sure contacts are in alignment.

If the lower contact gap is correct and the voltage regulator setting is still outside the .2 to .7 volt increase, adjust the air gap as follows:

(a) Connect a small dry cell test lamp in series with the "IGN" and "FLD" terminal of the voltage regulator.

(b) Insert an .048 inch wire gauge between the regulator armature and the core of the voltage coil next to the stop pin on the armature (Fig. 14).

(c) Press down on the armature (not on the contact reed) until the armature contacts the wire gauge. The upper contacts should just **open** and the test lamp should be **dim.**

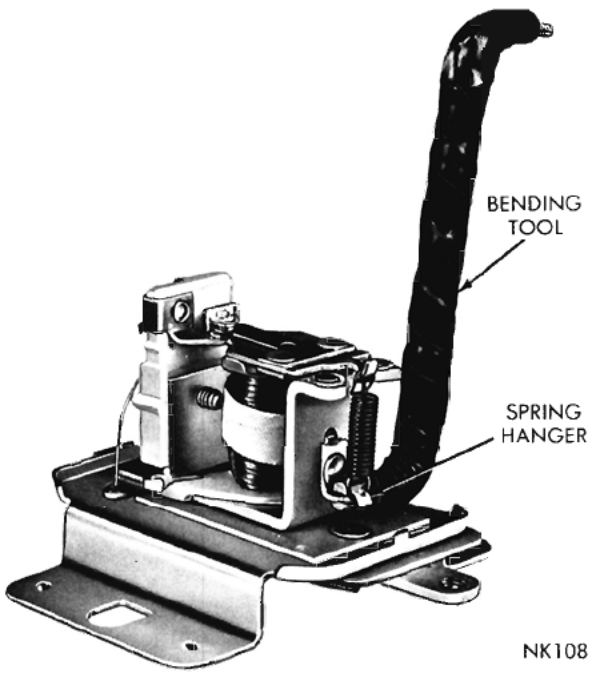

Fig. 13—Adjusting the Spring Tension

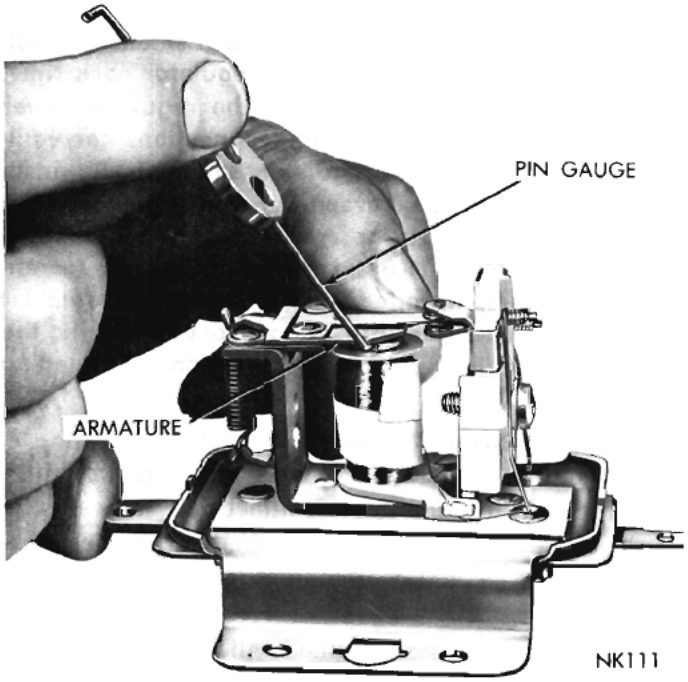

Fig. 14—Testing the Air Cap

(d) Insert an .052 inch wire gauge between the armature and the voltage coil core, next to the stop pin on the armature.

(e) Press down on the armature until it contacts the wire gauge. The upper contacts should remain **closed** and test lamp should remain **bright.**

If an adjustment is required to obtain the difference between the upper contact voltage and the lower contact voltage of .2 volt to .7 volt; adjust the air gap by loosening the stationary contact bracket screw and moving the bracket up or down as necessary to obtain the proper air gap setting as follows:

If the difference is above .7 volt, reduce the air gap to a minimum of .045 inch with the contacts open and the test lamp dim. At .048 inch the contacts should close and the test lamp should be bright.

If the difference is below .2 volt, increase the air gap to a maximum of .055 inch with the contacts closed and the test lamp bright. At .052 inch contacts should be open and test lamp should be dim.

NOTE: Make sure the air gap is checked with the stationary contact bracket attaching screw fully tightened.

Voltage Regulator Fusible Wire Replacement

(1) Cut the fuse wire above the solder connection at the base and unwind the wire at the top bracket.

CAUTION: If an attempt is made to unsolder the old fuse, the very small wire from the voltage coil may be damaged.

(2) Tin the end of the fuse wire. **Use resin core solder only.**

(3) Holding the tinned end of the new fuse wire into the recessed rivet at the base of the regulator and against the old piece of fuse wire that remains, cause a drop of solder from a soldering iron to fall on these parts. Allow solder to cool sufficiently for fuse wires to make a good solder joint.

(4) Pull the new fuse wire up enough to remove the slack and wrap it around the bracket. Solder the coiled wire to the bracket and cut off surplus fuse wire.

NOTE: The original fuse wire is machine wound on the upper bracket. The replacement fuse should be soldered to the bracket to ensure a good electrical contact.

ALTERNATOR SERVICING

If the alternator performance does not meet current output specifications limits, it will have to be removed and disassembled for further test and servicing.

(1) Disconnect the battery ground cable at the battery negative terminal.

(2) Disconnect the alternator output "BAT" and field "FLD" leads and disconnect the ground wire.

(3) Remove the alternator mounting bolts and remove the alternator.

BENCH TESTS

Field Coil Draw Test

If the alternator field coil draw has not been tested on the vehicle it may be tested on the test bench as follows:

(1) Connect the test ammeter positive lead to the battery positive terminal of a fully charged battery. Connect the test ammeter negative lead to the field terminal of the alternator. Connect a jumper wire to the negative terminal of the battery, and ground it to the alternator end shield.

(2) Slowly rotate the alternator rotor by hand. Observe the ammeter reading. The field coil draw should be 2.3 amperes to 2.7 amperes at 12 volts.

NOTE: A low rotor coil draw is an indication of high resistance in the field coil circuit, (brushes, slip rings, or rotor coil). A higher rotor coil draw indicates a possible shorted rotor coil or a grounded rotor.

Testing Alternator Internal Field Circuit for Ground

(1) To test the internal field circuit for a ground, remove the ground brush. Touch one test prod from a 110 volt test lamp to the alternator insulated brush terminal and the remaining test prod to the end

shield. If the rotor assembly or insulated brush is not grounded, the lamp will not light.

(2) If the lamp lights, remove the insulated brush assembly (noting how the parts are assembled) and separate the end shields by removing the three thru bolts.

(3) Again test by placing one of the test prods to a slip ring and the remaining test prod to the end shield. If the lamp lights, the rotor assembly is grounded and requires replacement. If the lamp does not light after removing the insulated brush and separating the end shields, the cause of the ground at the first ground test was that the insulated brush is grounded.

(4) Examine the plastic insulator and the screw. The screw is a special size and must not be substituted with another size.

(5) Install the insulated brush holder, terminal, insulated washer, shake proof washer and screw. If the parts were not assembled in this order or if the wrong screw was used this could be the cause of the ground condition.

DISASSEMBLING THE ALTERNATOR

To prevent possible damage to the brush assemblies, they should be removed before proceeding with the disassembly of the alternator. The insulated brush is mounted in a plastic holder that positions the brush vertically against one of the slip rings.

(1) Remove the retaining screw lockwasher, insulated washer, and field terminal, and carefully lift the plastic holder containing the spring and brush assembly from the end housing, (Fig. 15).

(2) The ground brush is positioned horizontally against the remaining slip ring and is retained in a holder that is integral with the end shield. Remove the retaining screw and lift the clip, spring and brush

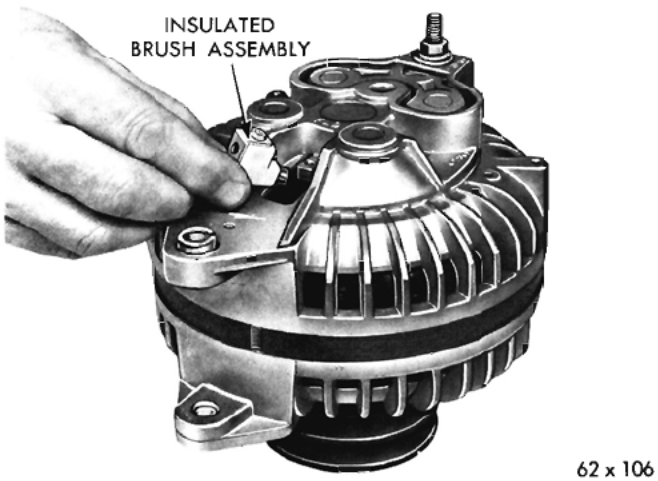

Fig. 15—Removing or Installing Insulated Brush

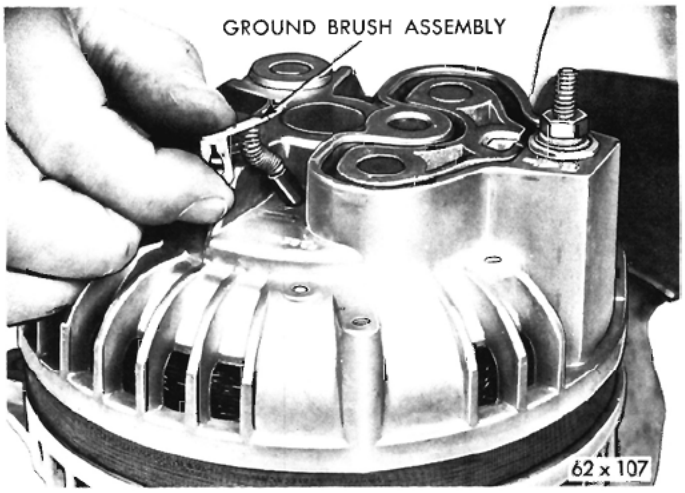

Fig. 16—Removing Or Installing Ground Brush

assembly from the end shield, (Fig. 16).

CAUTION: Stator is laminated, do not burr stator or end shield.

(3) Remove the through bolts and pry between the stator and drive end shield with the blade of a screwdriver, Fig. 17. Carefully separate the drive end shield, pulley and rotor assembly away from the stator and rectifier shield assembly.

Testing the Rectifiers with Tool C-3829

The Rectifier Tester Tool C-3829 provides a quick, simple and accurate method to test the alternator rectifiers without the necessity of disconnecting the soldered rectifier leads. With the alternator rectifier end shield separated from the drive end housing proceed with rectifier tests as follows:

Positive Case Rectifier Test (Fig. 18)

(a) Place the alternator on an insulated surface.

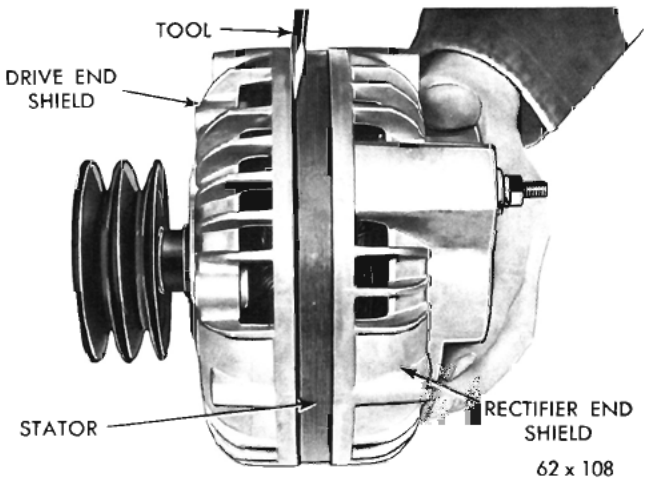

Fig. 17—Separating Drive End Shield from Stator

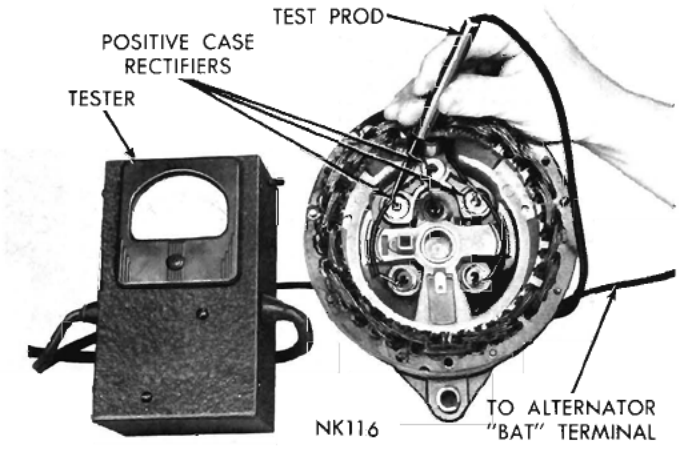

Fig. 18—Testing Positive Rectifiers

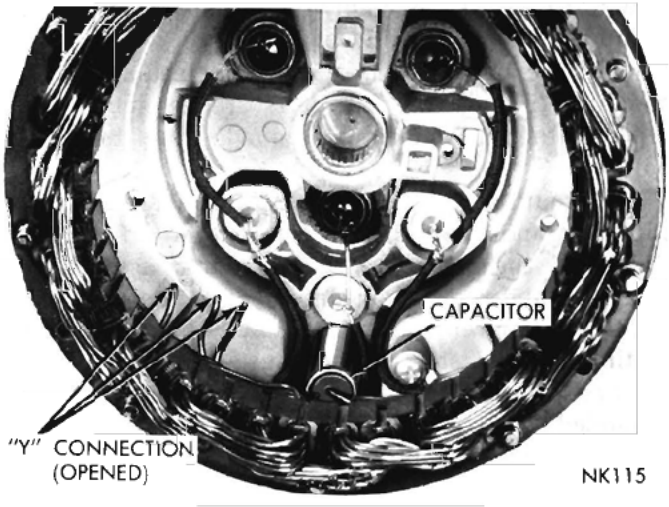

Fig. 20—Separating the Three Stator Leads

Connect the test lead clip to the alternator ("BAT") output terminal.

(b) Plug in the Tool C-3829 power source lead into a 110 volt A.C. power supply. Touch the exposed bare metal connections of each of the positive case rectifiers, with the test prod.

CAUTION: Do not break the sealing around the rectifier lead wire. The sealing material is for protection against corrosion. Always touch the test prod to the exposed metal connection nearest the rectifier.

The reading for satisfactory rectifiers will be 1¾ amperes or more. The reading should be approximately the same for the three rectifiers.

When two rectifiers are good and one is shorted, the reading taken at the good rectifiers will be low, and the reading at the shorted rectifier will be zero. Disconnect the lead to the rectifier reading zero and retest. The reading of the good rectifiers will now be within the satisfactory range.

When one rectifier is open it will read approximately one ampere, and the two good rectifiers will read within the satisfactory range.

Negative Case Rectifier Test (Fig. 19)

(a) Connect the test lead clip to the rectifier end housing.

(b) Touch the exposed connection of each of the negative case rectifiers with the test prod.

The test specifications are the same, and the test results will be approximately the same as for the positive case rectifiers, except the meter will read on the opposite side of the scale.

TESTING THE RECTIFIERS AND STATOR

(When Tool C-3829 is not available)

(a) Separate the three (3) stator leads at the "Y" connection (Fig. 20).

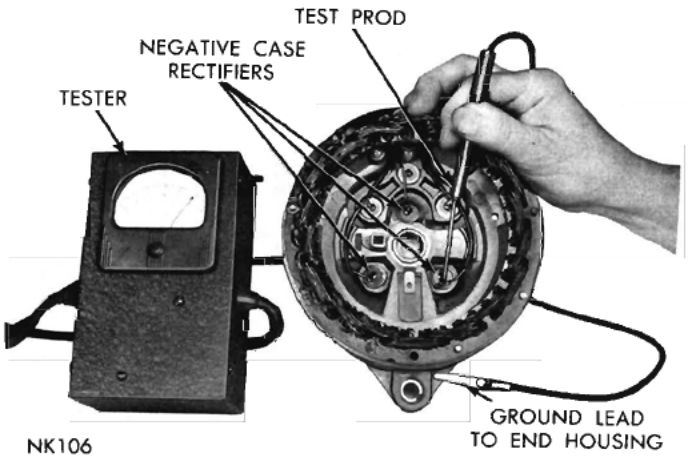

Fig. 19—Testing Negative Rectifiers

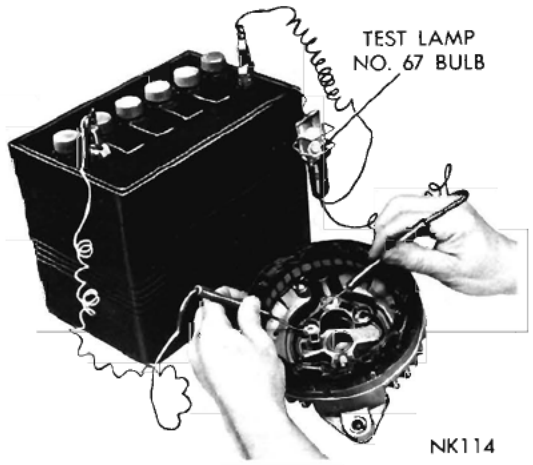

Fig. 21—Testing Rectifiers with a Test Lamp

NOTE: Cut the stator connection as close to the connector as possible because they will have to be soldered together again. If they are cut too short it may be difficult to get them together again for soldering.

(b) Test the rectifiers with a 12 volt battery and a test lamp equipped with a number 67 bulb (4 candle power) by connecting one side of test lamp to the positive battery post; the other side of the test lamp to a test probe with the other test probe connected to the negative battery post.

(c) Contact the outer case of the rectifier with one probe and the other probe to the wire in the center of the rectifier (Fig. 21).

(d) Reverse the probes, moving the probe from the rectifier outer case to the rectifier wire, and the probe from the rectifier wire to the rectifier outer case.

If the test lamp "lights" in one direction but does "not light" in the other direction, the rectifier is satisfactory. If the lamp lights in "both directions," the **rectifier** is "shorted." If the test lamp does "not light" in either direction, the rectifier is "open."

NOTE: Possible cause of an open or a blown rectifier is a faulty capacitor or a battery that has been installed in reverse polarity. If the battery is installed properly and the rectifiers are open, test the capacitor capacity—.50 microfarad (plus or minus 20%).

(e) Unsolder the rectifier leads from the stator leads.

(f) Test the stator for grounds using a 110 volt test lamp (Fig. 22). Use wood slats to insulate the stator from the rectifier shield. Contact one prod of the test lamp to the stator pole frame, and contact the other prod to each of the three stator leads. The test lamp should "not light." If the test lamp lights, the stator windings are "grounded."

(g) Test the stator windings for continuity, by contacting one prod of the test lamp to **all** three stator leads at the "Y" connection. Contact each of the three stator leads (disconnected from the rectifiers). The test lamp should "light" when the prod contacts each of the three leads. If the test lamp does not light the stator winding is "open" (Fig. 23).

Fig. 23—Testing Stator Windings for Continuity

(h) Install a new stator if the stator tested is "grounded" or "open." If the rectifiers must be replaced unsolder the rectifier wire from the stator lead wire at the soldered joint.

NOTE: Three rectifiers are pressed into the heat sink and three in the end shield. When removing the rectifiers, it is necessary to support the end shield and/or heat sink to prevent damage to these castings.

(4) Cut the lead at the malfunctioning rectifier.

(5) Place the Rectifier Removing and Installing Press in a vise and support the end shield on the clamp anvil under the rectifier to be removed (Fig. 24).

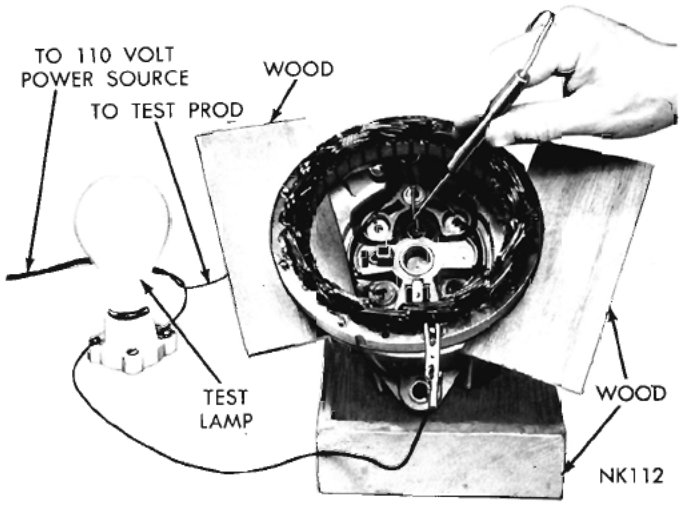

Fig. 22—Testing the Stator for Grounds

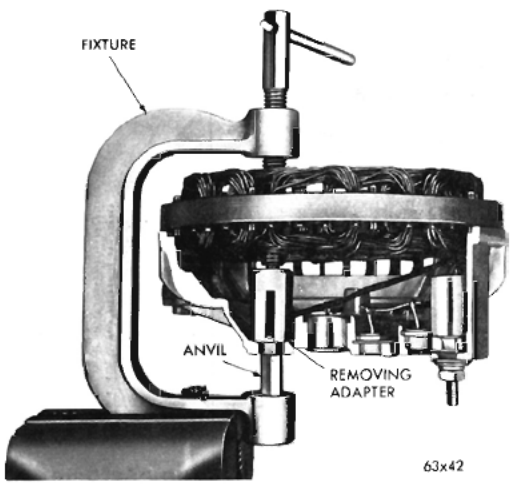

Fig. 24—Removing Rectifiers

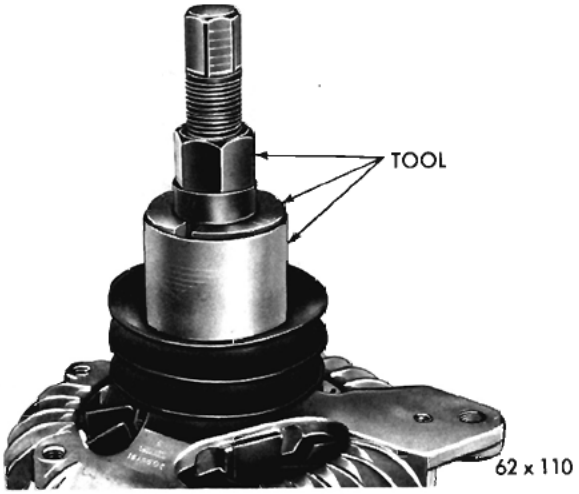

Fig. 25—Removing Pulley

NOTE: The support tool adapter SP-3821 is cut-away and slotted to fit over the wires and around the bosses in the end shield. Make sure that the bore of the tool completely surrounds the rectifier during the removal process.

(6) Carefully apply pressure with the tool pressure screw until the support tool rectifier end shield and remover pin and remover adapter are in alignment then press the rectifier out of the end shield or heat sink.

(7) The pulley is an interference fit on the rotor shaft. Remove the pulley with Puller Tool C-3615 or C-3934 and special adapters (Fig. 25).

(8) Pry the drive end bearing spring retainer from the end shield with a screwdriver (Fig. 26).

(9) Support the end shield and tap the rotor shaft with a plastic hammer to separate the rotor from the end shield.

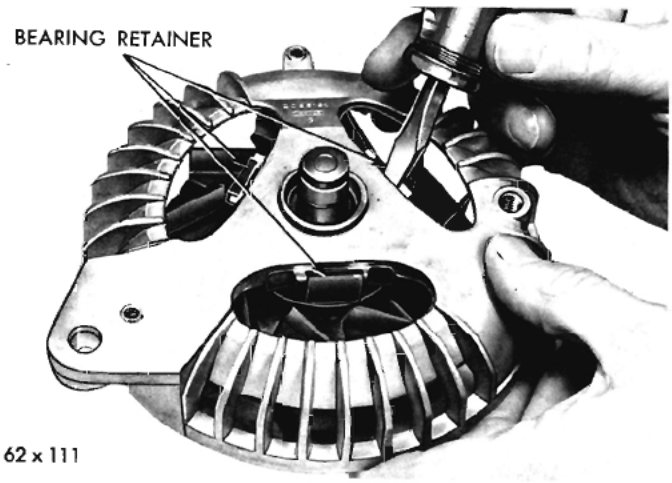

Fig. 26—Disengaging the Bearing Retainer from the End Shield

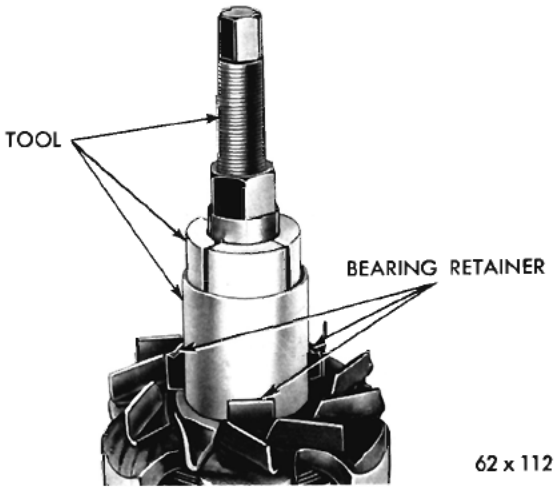

Fig. 27—Removing the Bearing from the Rotor Shaft

NOTE: The new bearing is lubricated with a predetermined amount of special lubricant and does not require additional lubrication.

(10) The drive end ball bearing is an interference fit with the rotor shaft. Remove the bearing with puller Tool C-3615 or C-3934 and adapters as follows:

(a) Position the center screw of the tool on the rotor shaft.

(b) Place the thin lower end of the adapters SP-3375 under the bearing equally spaced with the upper end of the adapters around the center screw.

(c) Hold the adapter and center screw in position with the tool sleeve.

CAUTION: The tool sleeve must bottom on bearings, otherwise adapters may be damaged.

(d) Turning the center screw while holding the outer body of tool (Fig. 27) will withdraw the bearing from the rotor shaft.

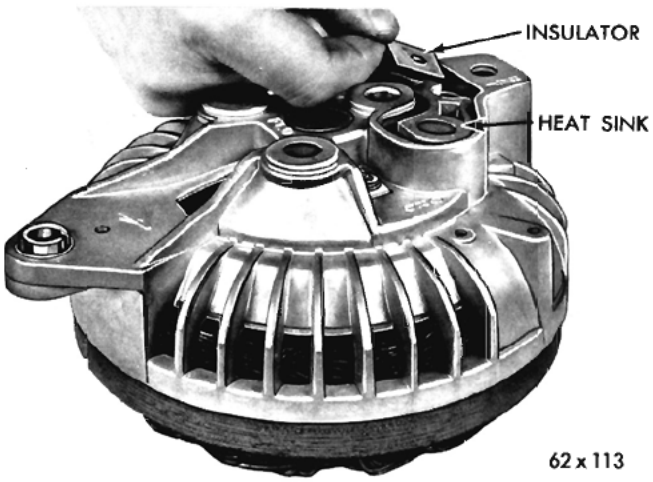

Fig. 28—Removing the Heat Sink Insulator

(11) Remove the D.C. output terminal nuts and washers and remove the terminal screw and inside capacitor.

NOTE: The heat sink is also held in place by the terminal screw.

(12) Remove the insulator (Fig. 28).

(13) The needle roller bearing in the rectifier end shield is a press fit. If it is necessary to remove the rectifier end frame needle bearing, protect the end shield by supporting the shield with Tool C-3925 when pressing the bearing out with Tool C-3770A (Fig. 29). Make sure the notches in the tool clear the raised section of the heat sink.

NOTE: The new bearing is pre-lubricated and no additional lubricant should be added, as an excessive amount of lubricant will contaminate the slip rings and cause premature brush and roller failures.

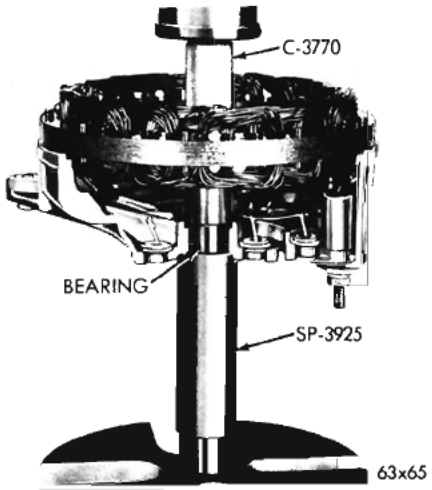

Fig. 29—Removing the Rectifier End Shield Bearing

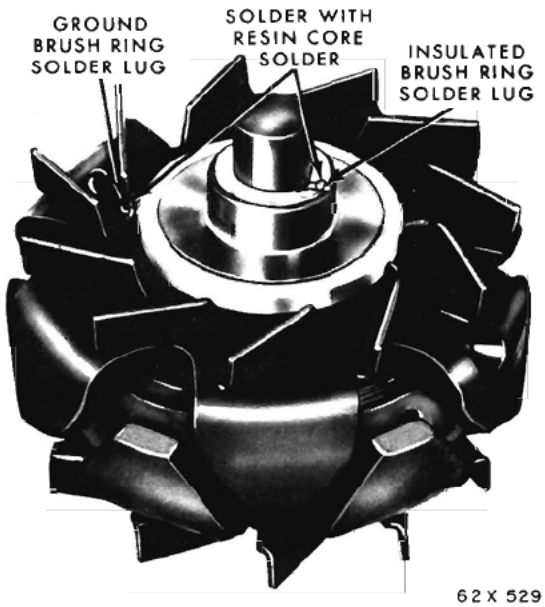

Fig. 30—Solder Points—Slip Ring Installed

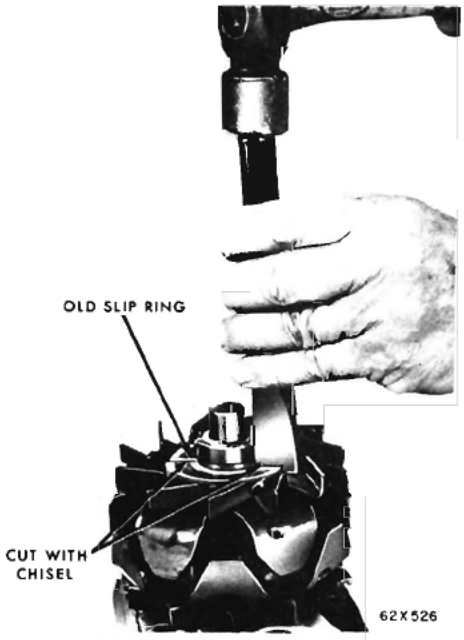

Fig. 31—Cutting the Old Slip Rings

REPLACING SLIP RINGS

Slip rings that are damaged can be replaced as follows:

(a) Cut through the rotor grease retainer with a chisel and remove the retainer and insulator.

(b) Unsolder the field coil leads at the solder lugs (Fig. 30).

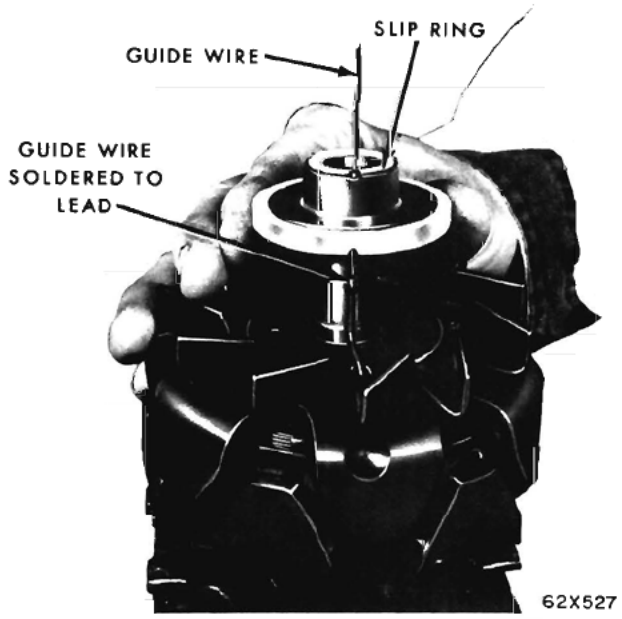

Fig. 32—Aligning Slip Ring with Field Wire and Guide Wire

(c) Cut through the copper of both slip rings at opposite points (180° apart) with a chisel (Fig. 31).

(d) Break the insulator and remove the old ring.

(e) Clean away dirt and particles of the old slip ring from the rotor.

(f) Scrape the ends of the field coil lead wires clean for good electrical contact.

(g) Scrape one end (about $^{3}/_{16}$ inch) of a piece of bare wire (approx. 18 gauge) three inches long, (to be used as a guide wire).

(h) Tin the scraped area of the guide wire with resin core solder. Lap the tinned end of the wire over the field coil lead to the insulated ring and solder the two together.

(i) Position the new slip ring carefully over the guide wire and the rotor shaft so the wire will lay in the slip ring groove (Fig. 32). The groove in the slip ring must be in line with the insulated brush field lead to provide room for the lead without damaging it.

(j) Place installing Tool C-3900 over the rotor shaft with the guide wire protruding from the slot in the tool.

(k) Position rotor, slip ring and tool assembly in an arbor press (Fig. 33). Pull up on the guide wire being careful to guide the insulated field lead into the slip ring groove. While guiding the insulated field lead through the groove, press the slip ring on the shaft. When the slip ring is bottomed on the rotor fan the end of the field lead (insulated brush ring) should be visible at the solder lug (Fig. 30).

(l) Unsolder the guide wire from insulated brush slip ring lead. Press the field lead into the solder lug and solder the lead to the lug with resin core solder.

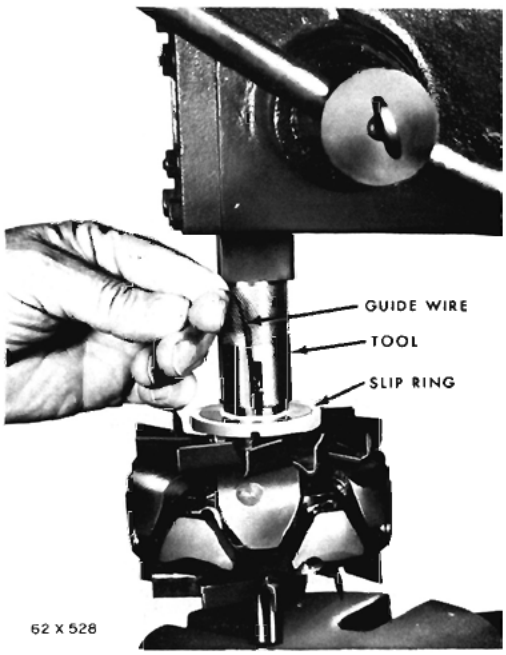

Fig. 33—Installing the Slip Ring

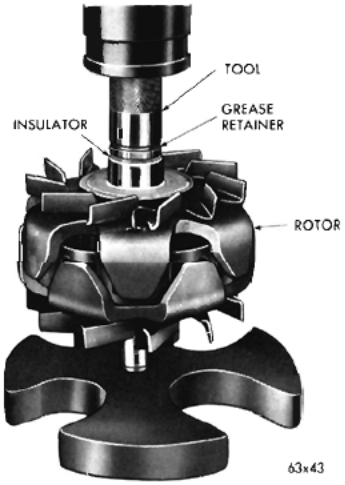

Fig. 34—Installing Bearing Grease Retainer

CAUTION: Be sure the solder bead does not protrude beyond the surface of the plastic material. Do not use acid core solder as a short circuit may result and corrosion will definitely occur.

(m) Coil the ground brush ring field lead around the solder lug and solder with resin core solder.

(n) Test the slip rings for ground with a 110 volt test lamp by touching one test lead prod to the rotor pole shoe and the remaining prod to the slip rings. Test lamp should not light. If lamp lights, slip rings are shorted to ground, possibly due to grounding insulated field lead when installing the slip ring.

If the rotor is not grounded, lightly clean the slip ring surfaces with -00- sandpaper.

(o) Position the grease retainer insulator and grease retainer on the rotor shaft and press the retainer on the shaft with installer Tool C-3921 Fig. 34. The retainer is properly positioned when the inner bore of installer tool bottoms on the rotor shaft.

ASSEMBLING THE ALTERNATOR

(1) Check the rectifier identification to make sure the correct rectifier is being installed. Refer to the Parts List for rectifier identification.

(2) Start the rectifier squarely into the mounting hole.

(3) Support the heat sink or rectifier and shield on the installer adapter of Tool C-3928. With the installing adapter positioned on the rectifier, carefully apply pressure with the tool pressure screw until the installer tool, rectifier, rectifier end shield or heat sink are in alignment and after determining that the rectifier is started squarely in the casting, slowly apply pressure with the tool pressure screw until you feel the collar of the rectifier bottom against the casting (Fig. 35).

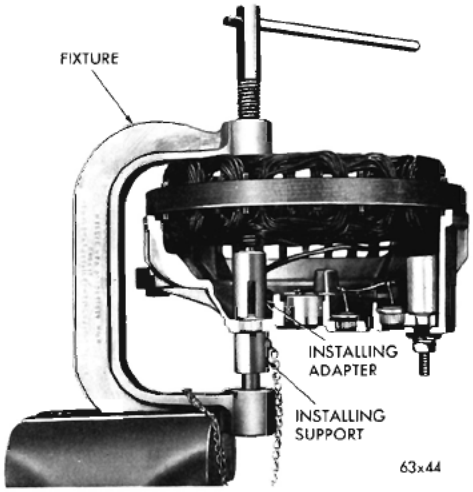

Fig. 35—Installing a Rectifier

NOTE: Make sure that the installer support adapter fits square around the rectifier inner boss and that pressure is applied on the outer rim of the rectifier.

CAUTION: DO NOT USE a hammer to start the rectifier into its bore in the end shield. DO NOT HAMMER OR SHOCK the rectifier in any manner as this will fracture the thin silicon wafer in the rectifier causing complete rectifier failure.

(4) Clean the leads and mate the stator lead with the rectifier wire and bend the loop snugly around the stator lead to provide a good electrical and mechanical connection. Solder the wires with resin core solder. Hold the rectifier lead wire with pliers just below the joint while soldering, Fig. 36. The pliers will absorb the heat from soldering and protect the rectifier.

NOTE: After soldering, quickly cool the soldered connection; touch a dampened cloth against it. This will aid in forming a solid joint.

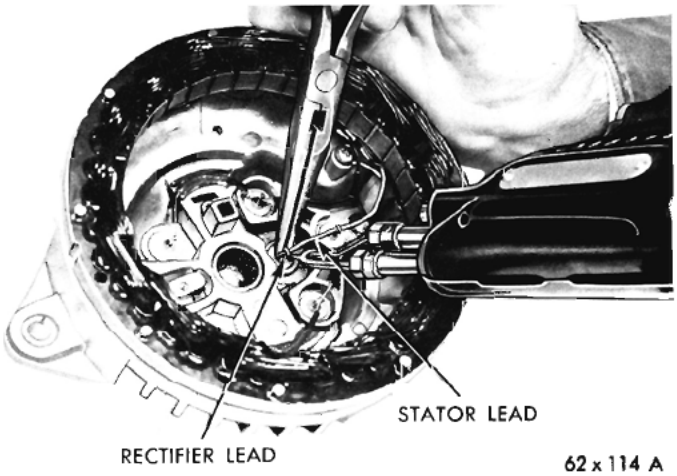

Fig. 36—Soldering Rectifier and Stator Leads

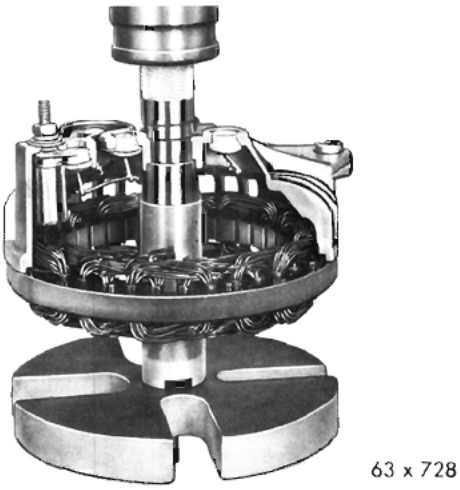

Fig. 37—Installing the Rectifier End Shield Bearings

(5) After soldering, the stator leads must be pushed down into the slots that are cast into the end shield and cemented with Cement Part Number 2299314 to protect the leads against possible interference with the rotor fans. Test each replacement rectifier to make certain the rectifier was not damaged by the soldering or pressing operations.

(6) Support the end shield on Tool C-3925 so that the notches in the support tool will clean the raised section of the heat sink and press the bearing into position with Tool SP-3381 (Fig. 37).

NOTE: New bearings are pre-lubricated, additional lubrication is not required.

(7) Insert the drive end bearing in the drive end shield and install the bearing retainer plate to hold the bearing in place.

(8) Position the bearing and drive end shield on

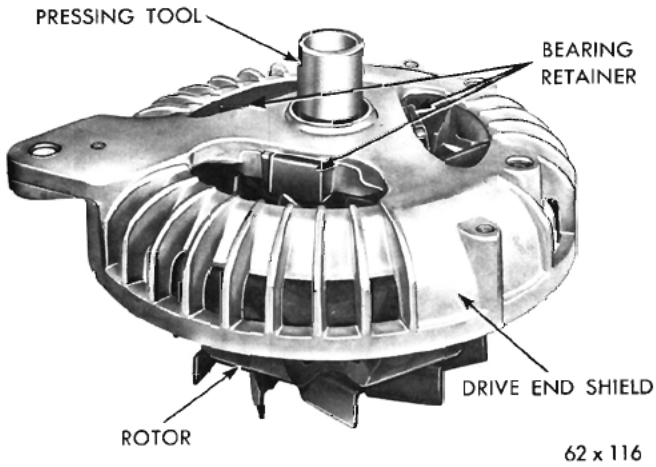

Fig. 38—Installing Drive End Shield and Bearings

the rotor shaft and, while supporting the base of the rotor shaft, press the bearing and shield into position on the rotor shaft with arbor press and Tool C-3858 (Fig. 38).

CAUTION: Make sure that the bearing is installed squarely at installation; otherwise, damage to the bearing will result. Press the bearing on the rotor shaft until the bearing contacts the shoulder on the rotor shaft.

(9) Install the pulley on the rotor shaft. The shaft of the rotor must be supported in a manner so that all pressing force is on the pulley hub and rotor shaft (Fig. 39).

NOTE: Press the pulley on the rotor shaft until the pulley contacts the inner race of the drive end bearing. Do not exceed 6800 pounds pressure.

(10) The alternators have the capacitor mounted internally. Make sure the heat sink insulator is in place (Fig. 28).

(11) Install the output terminal screw and the capacitor through the heat sink and end shield.

(12) Install the insulating washers, lockwashers and lock nuts.

(13) Make sure the heat sink and insulator are in position and tighten the lock nut.

(14) Position the stator on the rectifier end shield.

(15) Position the rotor end shield assembly on the stator and rectifier end shield. Align the through bolt holes in the stator, rectifier end shield and drive end shield.

(16) Compress the stator and both end shields by hand and install the through bolts, washers and nuts.

(17) Install the insulated brush in the rectifier end. Place the bronze terminal on the plastic holder with the tab of the terminal in the recess in the plastic holder.

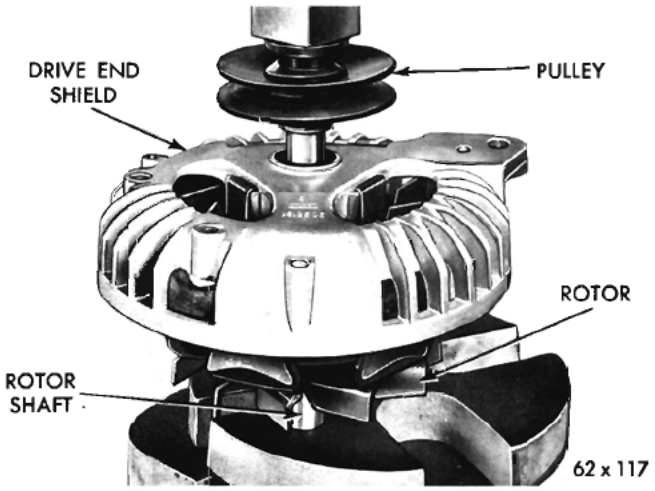

Fig. 39—Installing the Alternator Pulley

(18) Place the nylon washer on the bronze terminal and install the lockwasher and attaching screws.

(19) Install the ground brush and attaching screw.

(20) Rotate the pulley slowly by hand to be sure that the rotor fans do not hit the rectifiers, capacitor lead, and stator connections.

(21) Install the alternator and adjust the drive belt.

(22) Connect the output "BAT" and the field "FLD" leads and connect the ground wire.

(23) Connect the battery ground cable.

(24) Start and operate the engine, and observe the alternator operation.

(25) Test the current output and regulator voltage setting, if necessary.

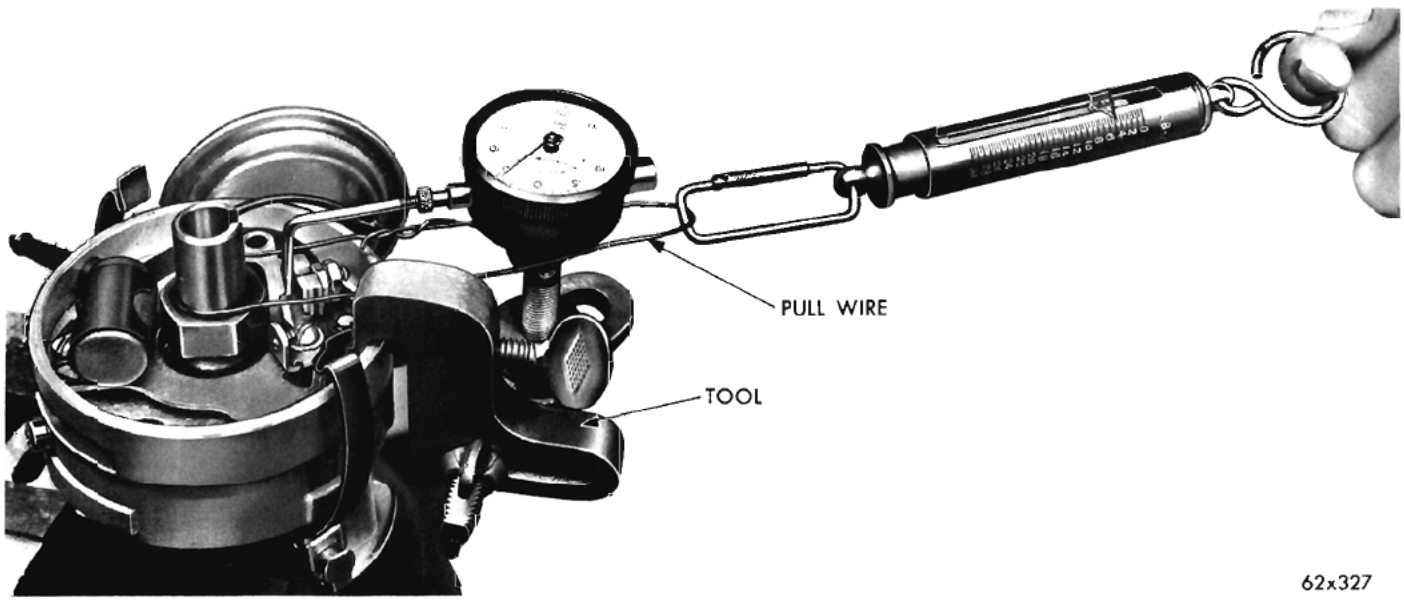

Fig. 1—Shaft and Bushing Wear Test

PART 4

IGNITION SYSTEM

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
BURNED OR PITTED DISTRIBUTOR CONTACTS	(a) Dirt or oil on contacts.	(a) If the oil is on contact face, determine the cause and correct the condition. Clean the distributor cam of dirt and grease, apply a light film of distributor cam lubricant Number 1473595 to cam lobes; wipe off the excess. Replace the contact set and adjust as necessary.
	(b) Alternator regulator setting too high.	(b) Test the alternator voltage regulator setting, adjust as necessary. Replace and adjust the distributor contacts.
	(c) Contacts misaligned or gap too small.	(c) Align and adjust contacts.
	(d) Faulty coil.	(d) Test and replace coil if necessary. Replace and adjust contacts.
	(e) Ballast resistor not in circuit.	(e) Inspect conditions, and correctly connect the coil.
	(f) Wrong condenser or faulty condenser.	(f) Test the condenser and replace if necessary. Replace and adjust contacts.
	(g) Faulty ignition switch.	(g) Replace the ignition switch.
	(h) Bushings or distributor shaft worn.	(h) Recondition the distributor.
	(j) Touching the contacts with the hands during installation.	(i) Replace and adjust the contacts.
IGNITION COIL FAILURE	(a) Alternator regulator setting too high.	(a) Test the alternator setting and adjust as necessary. Inspect the condition of the distributor contacts.
	(b) Coil damaged by excessive heat from engine.	(b) Replace coil. Inspect the condition of the distributor contacts.
	(c) Coil tower carbon-tracked.	(c) Replace the coil.
	(d) Oil leak at tower.	(d) Replace the coil.
	(e) Coil tower carbon-tracked.	(e) Wipe the tower clean. Test the coil, replace if necessary.
CONDENSER FAILURE	(a) Normal fatigue.	(a) Test and replace the condenser. Inspect distributor contacts for pitting.
	(b) Damaged by excessive engine heat or moisture.	(b) Test and replace the condenser. Inspect distributor contacts for pitting.

IGNITION SYSTEM

6-CYLINDER DISTRIBUTOR

Description

The ignition system consists of two separate circuits. The battery, ammeter, ignition switch, ballast resistor, primary winding of the ignition coil, distributor contacts and condenser, vehicle frame, and the primary wiring make up the low voltage primary circuit. The secondary high voltage circuit includes the coil secondary winding, the distributor cap and rotor, the spark plug cables, the spark plugs and the vehicle frame.

SERVICE PROCEDURES

SECONDARY CIRCUIT INSPECTION

The coil to distributor cap wire and the spark plug wires should make good, clean contact in the ignition coil, the distributor cap towers and the spark plugs. Wires that are loose or are not inserted all the way into the towers or on the plugs will corrode and increase the resistance as well as cause carbon tracking of the coil or cap towers.

Make sure the spark plug covers are in good condition and that they are tight on the cap towers and around the spark plug insulators. Snap the plug covers into the cylinder head wells so that the lip of the cover is tight against the cylinder head. Always use neoprene insulating nipples.

The ignition coil tower, if oily or dirty, should be wiped clean and inspected for cracks, carbon tracking or oil leaks. Replace the coil if faulty.

Inspect the distributor cap for oil film, dirt or metal particles on the inside surface. Any contamination, however slight can become conducting and cause hard starting in wet weather. Thoroughly wash the cap in a **weak** solution of liquid soap or non flammable detergent in warm water. Do not use a concentrated solution or soak the cap in the solution. Scrub the inner surfaces with a stiff bristle nylon brush to clean between the ribs and the crevices. Rinse well in hot water, shake out excess water and dry thoroughly. Do not use compressed air to dry or blow out the water. Carefully inspect for cracks or carbon tracking on the inner or outer surfaces. Replace the cap if faulty.

Old, cracked or damaged wires should be replaced. The secondary cables, cap and rotor should be tested, using Tool C-3296. This tester provides high voltage which is sufficient for testing secondary insulation.

Test the resistance type wire for an open circuit, loose terminals or high resistance. Replace the cable if resistance is more than 30,000 ohms, or if the terminal has pulled off the cable.

NOTE: Jerking the wires to disconnect them from the plugs can stretch them and increase secondary resistance. To remove the wire, grasp the boot at the end of the wire and rotate the boot slightly to break the adhesion between it and the spark plug insulator, then use a straight pull to remove from the spark plug.

Resistor type wire is identified by the word "Radio" stamped on the insulating jacket. No additional resistors are necessary.

The rotor and distributor cap electrodes should be inspected for burning. Replace the rotor if the electrode is burned on the top or if electrode is worn too short.

DISTRIBUTOR RESISTANCE TEST

This test indicates the resistance of the ignition primary circuit from the distributor side of the coil, through the contacts and the distributor ground. Excessive resistance in this portion of the ignition system will prevent the coil from producing sufficient output for good overall ignition. To perform test, proceed as follows:

(1) Turn the Selector Switch of a tach-dwell unit to the CALIBRATE position and adjust the Dwell Calibrator until the Dwell Meter reads on the set line (test leads separated).

(2) Leave the Selector Switch in the CALIBRATE position, connect the tach-dwell red lead to the distributor terminal of the coil and the black lead to a good ground.

(3) Turn the ignition switch "ON." Observe dwell meter reading. The meter pointer should be well within the black bar marked "DISTRIBUTOR RESISTANCE.' 'If the reading is zero or outside of black bar, crank the engine with the starter until the meter pointer moves as far to the right as possible. (This will indicate that contacts are closed.) A reading now within the black bar indicates a normal distributor primary circuit.

If the reading is outside the black bar, high resistance is present in the distributor primary circuit.

(4) Remove the test lead from the distributor terminal of the coil and connect to the following points:

(a) Distributor primary terminal (outside)
(b) Distributor primary terminal (inside)
(c) Contact terminal bracket (insulated bracket)
(d) Ground side of the contacts.
(e) Distributor housing.

(5) Repeat the test at each connection until a noticeable change occurs in the meter reading. If a poor connection or faulty lead is indicated, clean, tighten or replace as necessary and repeat test (3).

If faulty contacts are indicated, remove the distributor for complete inspection, service, testing and calibration.

IDLE RPM TEST

The engine idle rpm setting should be tested and recorded as it is when the vehicle is first brought into the shop for testing. This will assist in diagnosing complaints of engine stalling or complaints of creeping and hard shifting on vehicles equipped with automatic transmissions.

Test procedures are as follows:

(1) Turn the Selector Switch to the CALIBRATE

position and adjust Dwell Calibrator until the Dwell Meter reads on the SET line (test leads separated).

(2) Connect the red lead of the test unit to the distributor primary terminal at the coil and the black lead to a good ground.

(3) Turn the Selector Switch to the 6 LOBE position.

(4) Turn the tachometer rpm switch to the 1000 rpm position.

(5) With engine at normal operating temperature (off fast idle), momentarily open the throttle and release to make sure there is no bind in the linkage and that the idle speed screw is against its stop.

(6) Note engine rpm on 1000 rpm scale and adjust the carburetor idle speed to specifications shown in Fuel System "Specifications."

DISTRIBUTOR CONTACT DWELL

The degrees of distributor dwell are the degrees of rotation through which the breaker contacts remain closed. This is also commonly referred to as "dwell angle" or "cam angle."

Correct distributor contact dwell is essential for good ignition performance and contact life.

Test procedures are as follows:

(1) Connect the Tach-Dwell red lead to the distributor terminal of coil and black lead to a good ground.

(2) Turn the Selector Switch to the 6 LOBE position.

(3) Start the engine and operate at idle speed.

(4) Observe the dwell meter reading. If the dwell reading is within "Specifications," the contact gap, cam rubbing block and contact arm are all in satisfactory condition.

If the dwell reading is not within specifications, incorrect contact gap, worn cam, worn rubbing block or distorted movable contact arm may be indicated.

DWELL VARIATION

This test indicates the mechanical condition of the distributor. Excessive wear in distributor mechanical parts cause dwell variations which will affect ignition timing.

Test procedures are as follows:

(1) With the engine at idle speed, vacuum hose disconnected, and with the test leads connected as in the contact Dwell Test, turn the Tachometer rpm Switch to the 5000 rpm position.

(2) Slowly increase the engine speed to 1500 rpm, then slowly reduce to idle speed while observing the dwell meter reading.

If the dwell reading varies more than 2 degrees from initial reading between idle speed and 1500 rpm, probable wear in the distributor shaft, bushings or breaker plate is indicated. Remove distributor for complete inspection and testing on a distributor tester.

Dwell variation at speed above 1500 rpm does not necessarily indicate distributor wear.

IMPORTANT: Dwell and gap of the contacts must both be within their specified limits at the same time. If this cannot be accomplished, it is probable that wrong contacts are installed, the rubbing block or cam lobes are badly worn or the movable contact arm is distorted.

IGNITION TIMING

To obtain maximum engine performance, the distributor must be correctly positioned on the engine to give proper ignition timing.

The ignition timing test will indicate the timing of the spark at NO. 1 cylinder at idle (only).

Test procedures are as follows:

(1) Disconnect the vacuum hose at the distributor.

(2) Connect the secondary lead of the Power Timing Light to NO. 1 spark plug, the red primary lead to the positive terminal of the battery and the black primary lead to the negative battery terminal.

Do not puncture the wires, boots or nipples with test probes. Always use adapters. Puncturing spark plug wires with a probe will damage the wires. The probe can separate the conductor and cause high resistance. In addition breaking the rubber insulation may permit secondary current to arc to ground.

(3) Start the engine and set idle to "Specifications" (transmission in neutral).

(4) Use a timing light to observe the position of the timing mark on the crankshaft damper and check against specifications.

(5) Loosen the distributor hold-down arm screw and rotate the distributor housing so that crankshaft damper mark aligns with the specified BTC mark on timing plate. Refer to "Specifications." (Moving the distributor housing counter-clockwise advances the ignition timing and clockwise retards the timing.)

(6) Tighten the distributor hold-down arm screw after timing has been set and recheck timing adjustment with a Power Timing Light.

(7) When the ignition timing is correct, reconnect the vacuum hose to the distributor.

DISTRIBUTOR REMOVAL

(1) Disconnect the vacuum hose at the distributor.

(2) Disconnect the primary lead wire at the coil.

(3) Unfasten the distributor cap retaining clips and lift off the distributor cap.

(4) Rotate the engine crankshaft until the distributor rotor is pointing toward the cylinder block, scribe a mark on block at this point to indicate the

position of the rotor as reference when reinstalling the distributor.

(5) Remove the distributor hold-down arm screw.

(6) Carefully lift the distributor from the engine, the shaft will rotate slightly as the distributor gear is disengaged from the camshaft gear.

Shaft and Bushing Wear Test

(1) Remove the distributor rotor.

(2) Disconnect the primary lead wire at the distributor terminal. **Do not loosen** the removable contact arm spring retaining nut.

(3) Clamp the distributor hold-down arm in a vise equipped with soft jaws and apply only enough pressure to restrict any movement of the distributor during this test.

(4) Attach a dial indicator to the distributor housing so that the indicator plunger arm rests against the movable arm at the rubbing block and with the rubbing block of the movable contact arm on the highest point of a cam lobe (Fig. 1).

(5) Place one end of a wire loop around the top of the distributor shaft. Hook a spring scale in the other end of the wire loop and pull on a line with the plunger of the indicator gauge. The wire loop must be down on the distributor shaft to insure a straight pull also be sure that the wire loop does not interfere with the indicator or indicator holding bracket. Apply a five pound pull and read the movement of the plunger on the indicator dial. (Be sure the rubbing block of the movable contact arm is on the highest point of the cam lobe during this test.) If the plunger movement exceeds .006 inch, replace the bushings and/or distributor shaft, see "Distributor Disassembly."

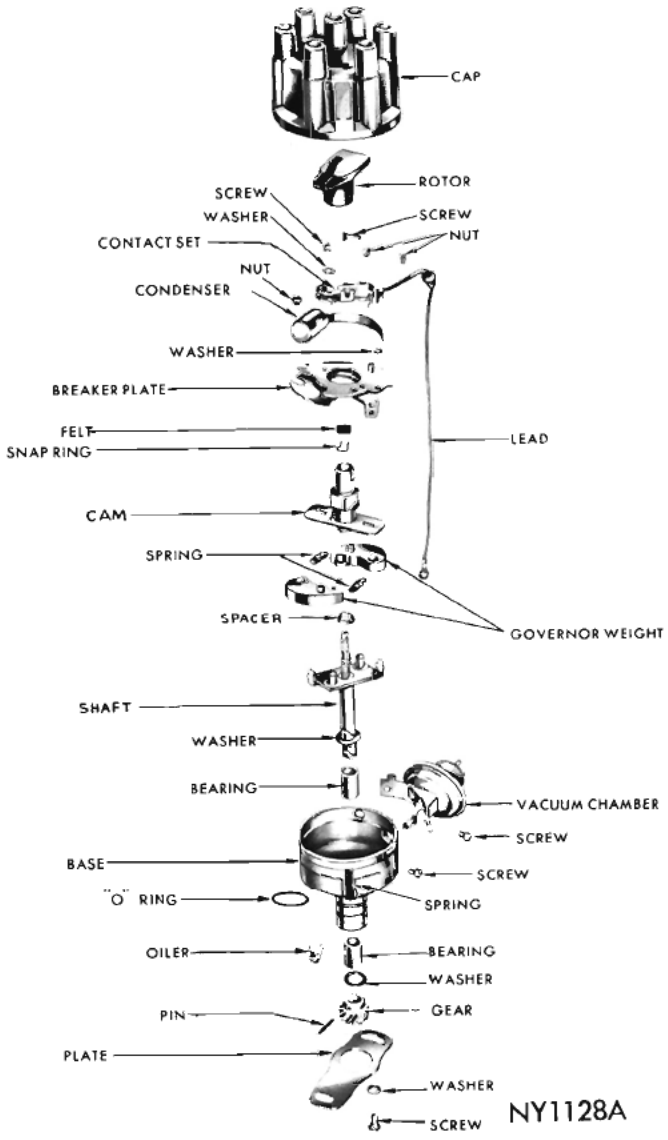

Fig. 2—Distributor Disassembled View (Typical)

DISASSEMBLY OF THE DISTRIBUTOR (Fig. 2)

(1) Remove the distributor rotor.

(2) Remove the two screws and lockwashers attaching the vacuum control unit to the distributor housing and remove the vacuum control unit.

(3) Remove the primary lead terminal at the terminal screw and slide the primary lead off the breaker plate terminal. Remove wire and grommet as an assembly. (Push the grommet towards the inside of distributor to remove—Do not pull the wire.)

(4) Remove the two screws and lockwashers attaching the contact plate to the housing and lift out the contact plate, contacts and condenser as an assembly.

The distributor cap clamp springs are held in place by peened metal around the openings and should not be removed.

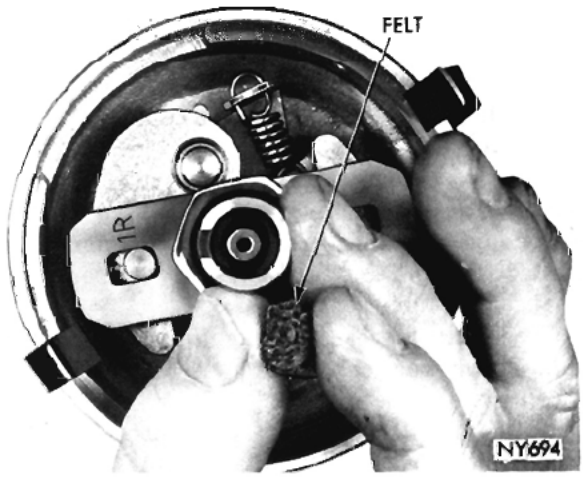

Fig. 3—Removing or Installing Distributor Cam Felt (Typical)

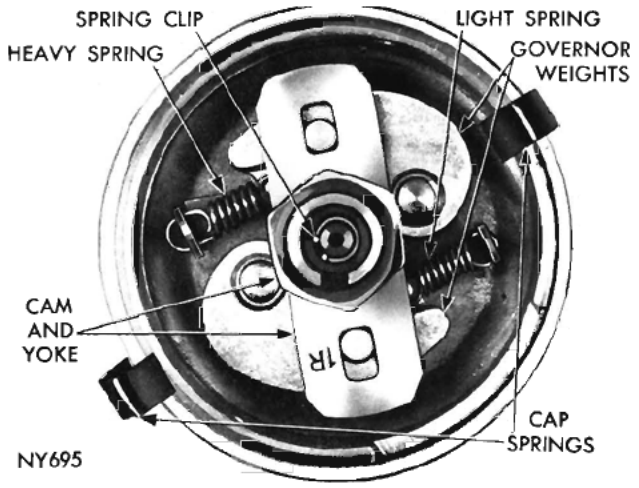

Fig. 4—Distributor Cam Installed (Typical)

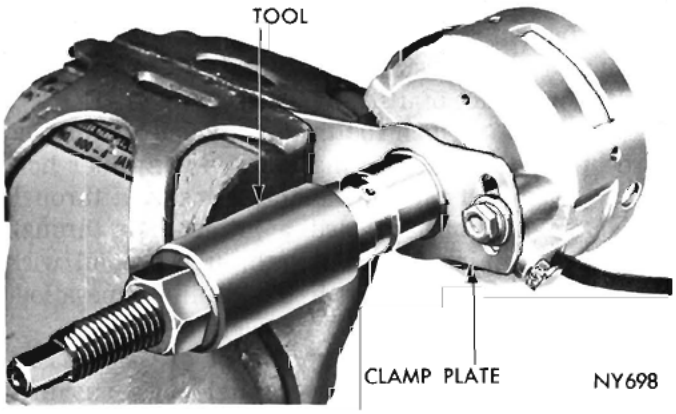

Fig. 6—Removing Distributor Housing Lower Bushing (Typical)

(5) Remove the oil felt wick from the distributor cam (Fig. 3). Remove the wire clip from the oil well in the cam (Fig. 4), then remove the cam and yoke assembly, and the spacer.

If the side play exceeds .006 inch in the "Shaft and Bushing Wear Test," replace bushings and/or shaft as follows:

(a) Remove the distributor drive gear retaining pin and slide the gear off the end of the shaft. If the gear is worn or damaged see "Assembling the Distributor" Step (8).

CAUTION: Support the hub of the gear in a manner that the pin can be driven out of the gear and shaft without damaging the gear teeth.

(b) Use a fine file to clean the burrs from around the pin hole in the shaft and remove the lower thrust washer.

(c) Push the shaft up and remove through the top of distributor body. Remove the upper thrust washer.

(d) Remove the shaft oiler and lift out the oiler wick.

CAUTION: Do not drive the bushings out of the housings.

(e) Remove the upper bushing with Tool C-3744 (Fig. 5) by threading the tap securely into the bushing. Place the spacer over the tap. Install the tool nut and while holding the tool tap, tighten the tool nut to remove the bushing. Invert the housing and remove the lower bushing in the same manner (Fig. 6).

(f) Soak the new bushing in light engine oil for approximately 15 minutes before installation.

(g) Position the new upper bushing with the hole in the bushing up and in line with the oil hole in the housing, then press the bushing into the housing with Tool C-3041 and adapter (flat face of adapter contacting bushing) (Fig. 7) so that the upper end of

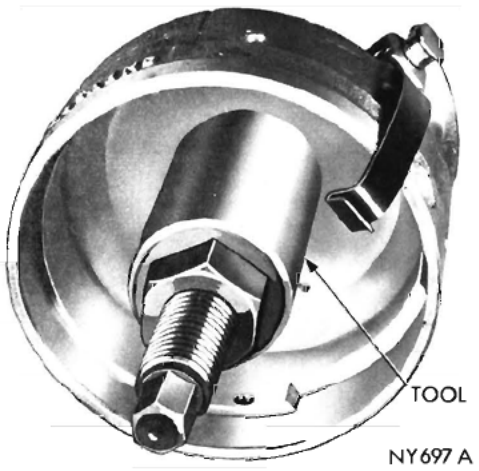

Fig. 5—Removing Distributor Housing Upper Bushing

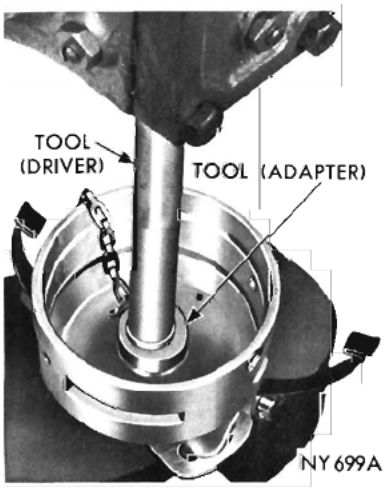

Fig. 7—Installing Distributor Housing Upper Bushing (Typical)

the bushing is **above** the top of the housing bore. The upper end of the bushing should be 1.613 inch from the top of the distributor housing measured from the bottom face of the straight edge to the top of bushing. Invert the housing and install the lower bushing flush with face of distributor base (Fig. 9).

(h) Insert a $^{3}/_{32}$ inch rod through housing oiler hole to see if the hole in bushing indexes with oiler hole in the housing. If the rod cannot be inserted through the housing and bushing, drill a ⅛ inch hole through the upper bushing by drilling through the oil wick hole. Remove burrs caused by the drilling operation, and blow the chips out of the oil hole.

(i) Install the burnishing tool, part of C-3041 Tool Set and press the burnisher through both bushings (Fig. 10). The corrected bushing inside diameter is .4995 to .5000 inch.

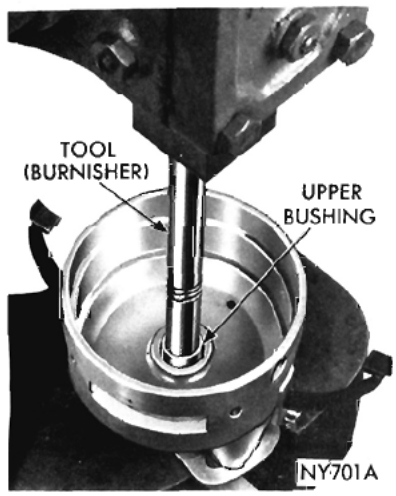

Fig. 9—Burnishing Distributor Housing Bushings (Typical)

ASSEMBLING THE DISTRIBUTOR

(Refer to Fig. 2)

(1) Test the operation of centrifugal weight and inspect the weight springs for distortion.

(2) Lubricate the governor weights.

(3) Inspect all bearing surfaces and pivot pins for roughness, binding or excessive looseness.

(4) Install the cam spacer, (chamfered end down) on distributor shaft.

(5) Slide the cam and yoke assembly on the distributor shaft and engage the weight lugs with the slots in the yoke (Fig. 10).

(6) Install the cam retaining spring clip (Fig. 4).

(7) Lubricate and install the upper thrust washer (or washers) on the shaft and slide the shaft into the distributor body (Fig. 10).

(8) If the gear is worn or damaged, replace as follows:

(a) Install the lower thrust washer and old gear on the lower end of the shaft and temporarily install the roll pin.

(b) Scribe a line on the end of the shaft from the center to edge, so that the line is centered between two gear teeth as shown in Figure 11. **Do not Scribe completely across the shaft.**

(c) Remove the roll pin and gear. Use a fine file to clean the burrs from around the pin hole.

(d) Install the new gear with thrust washer in place and with the hole in the gear rotated approximately

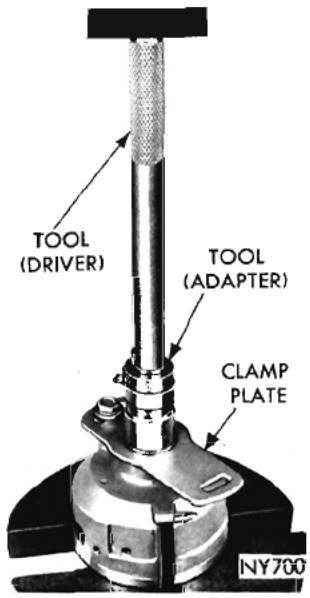

Fig. 8—Installing Distributor Housing Lower Bushing (Typical)

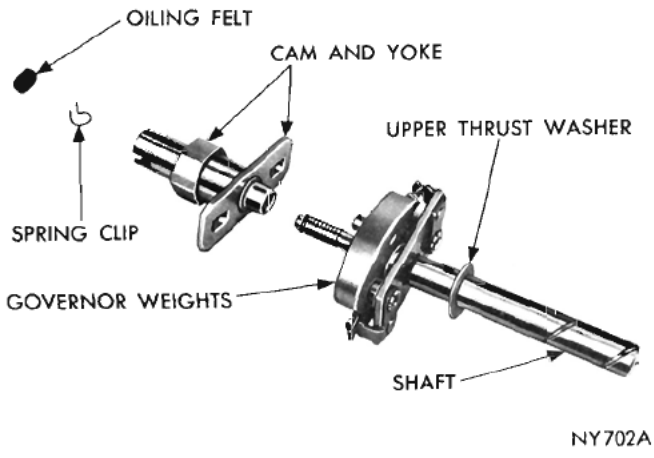

Fig. 10—Distributor Shaft—Disassembled

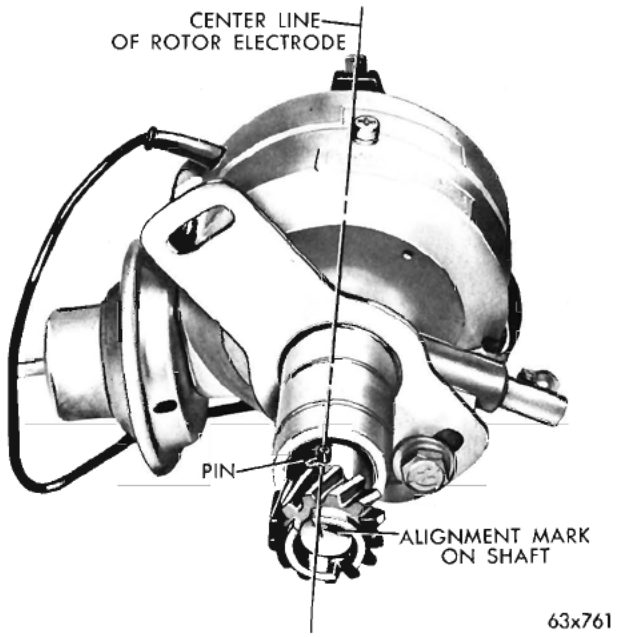

Fig. 11—Scribe Line on Distributor Shaft

90 degrees from the old hole in the shaft and with the scribed line centered between the two gear teeth as shown.

NOTE: If it appears that the new pin hole may interfere with the shaft oil groove, rotate the gear to the centerline of the next pair of gear teeth, aligning again with the scribe mark on the end of the shaft.

(e) Before drilling through the shaft and gear, place a .007 inch feeler gauge between the gear and thrust washer and after again observing that the centerline between two of the gear teeth is in line with the centerline of the rotor electrode (Fig. 12) drill a .124-.129 inch hole and install the roll pin.

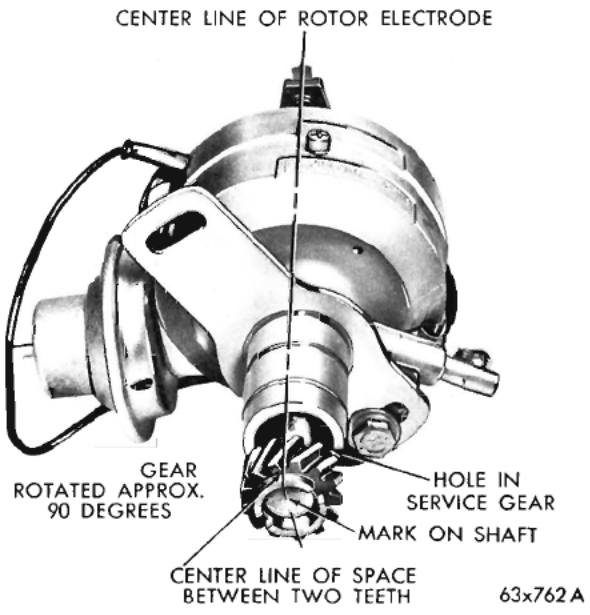

Fig. 12—Aligning Gear Teeth with Centerline of Rotor Electrode

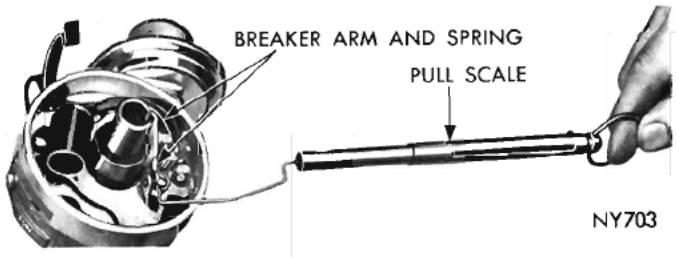

Fig. 13—Testing Breaker Arm Spring Tension (Typical)

CAUTION: Support the hub of gear when installing the roll pin so that the gear teeth will not be damaged.

(9) Install the oiler wick and oiler.

(10) Install the contact plate assembly, align the condenser lead, movable contact spring, primary lead, and install attaching screws.

(11) Install the felt wick in top of distributor cam (Fig. 3).

(12) Attach the vacuum advance unit arm to the contact plate and install the retainer clip.

(13) Install the vacuum unit attaching screws and washers.

(14) Check the contact arm spring tension.

(15) Adjust the contact gap.

(16) Lubricate the felt pad in top of distributor cam with 3 to 5 drops of light engine oil and install the rotor.

TESTING CONTACT ARM SPRING TENSION

(1) Hook a spring scale MTU-36 on the breaker arm

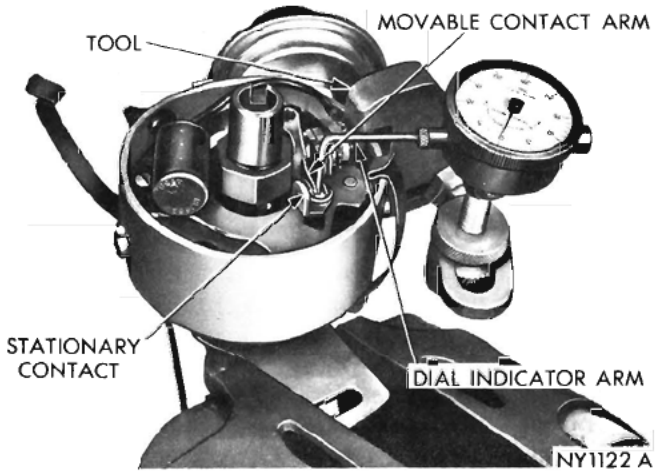

Fig. 14—Adjusting Point Clearance with Indicator (Typical)

and pull in a straight line at a right angle to the contact surfaces (Fig. 13). Take a reading as the contacts start to separate under the slow and steady pull of the scale. Spring tension should be 17 to 20 ounces. If the reading is outside these limits, loosen the screw which holds the end of the breaker arm spring, and slide the end of the spring in or out, as necessary.

(2) Tighten the screw and measure the spring tension.

NOTE: Spring tension that is too great, will cause excessive wear on the distributor cam and on the nylon block of the movable contact arm. Spring tension that is too weak, is unable to keep the contacts in contact with each other when they close. this is particularly true as engine speed is increased, causing high-speed misfiring.

INSTALLING AND ALIGNING CONTACTS

(1) Loosen the terminal screw nut, and remove the primary lead, condenser lead and terminal screw.

(2) Remove the stationary contact lock screw and remove the old contact set.

(3) Install a new contact set; the sleeve at one end of the adjustable bracket fits over and pivots on the upper breaker plate mounting pin, the contact insulator also retains the terminal screw head.

(4) Connect the condenser and primary leads.

(5) Align the contacts, if necessary, to obtain contact in the center of the contacts, by bending the stationary contact bracket only. **Never bend** the movable contact arm to obtain alignment.

(6) After aligning the contacts, adjust contact clearance to "Specifications," using dial indicator (Fig. 14). Recheck the contact arm spring tension.

(7) Test the dwell angle to show proper degree of closure. See Paragraph, "Distributor Contact Dwell." The lock screw should be loosened just enough so that the stationary bracket can be removed with a slight drag; otherwise it will be difficult to set the contacts accurately. After setting the contacts to the correct gap, tighten the lock screw.

DISTRIBUTOR LUBRICATION

(1) Add 3 drops of SAE 10W oil to the oiler on the outside of distributor base.

(2) Lubricate the felt wick under the rotor in top of distributor cam with 3 to 5 drops of SAE 10W oil.

(3) Wipe all old grease from surface of the distributor cam. Apply a light film of new distributor cam lubricant number 1473595.

CAUTION: Do not over-lubricate. Excess grease will be thrown from the distributor cam when the engine is running. If this grease strikes the contacts, arcing and burning of the contacts will result.

TESTING DISTRIBUTOR ADVANCE

Centrifugal Advance Curve

Carefully mount the distributor assembly (less cap and rotor) in a reliable stroboscope-type distributor tester so that gear is not damaged and proceed with tests as follows:

(1) Turn the Tach-Dwell switch to the 6 LOBE position and the Motor Switch to the correct direction of rotation. Refer to "Distributor Advance Specifications" in this manual.

(2) Turn the battery switch "ON."

(3) Regulate the tester speed control to operate distributor at 100 distributor rpm.

(4) Hold the distributor contact plate in the full retard position and align the "O" of the distributor tester degree ring with any of the arrow flashes.

(5) Adjust the tester speed control to operate the distributor at speeds called for under "Specifications" and observe arrow flashes opposite tester degree ring to determine degrees of advance.

(6) If the advance is not according to specifications, corrections can be made by bending either the light or heavy governor weight spring tabs on the cam yoke to increase or decrease spring tension. Adjust the light spring tension to obtain the first two positions shown in the specifications; adjust the heavy spring tension to obtain the last two positions. The governor spring tabs can be reached through the access hole at the contact plate. Rotate the shaft until the proper spring and tab line up with the access hole. Insert a screwdriver blade through the access hole and bend the spring tab toward the distributor cam to decrease the spring tension and advance the spark, or away from the distributor cam to increase spring tension and retard the spark.

NOTE: The light tension spring controls the lower end of the advance curve, and the heavier spring controls the upper end of the advance curve.

Vacuum Diaphragm Leak Test

With the distributor mounted in Distributor Tester and with vacuum unit attached to the distributor, proceed as follows:

(1) Place thumb over end of vacuum pump hose and adjust the regulator control knob to give a reading of 20 inches of vacuum with the hose closed off to be sure the tester hose does not leak.

(2) Attach the tester vacuum pump hose to the tube on the vacuum unit. Vacuum gauge should hold on maximum vacuum obtainable if no leaks exist.

(3) Observe the breaker plate while performing the leak test, to test the response of the breaker plate. There should be instant response to the pull of the diaphragm, moving the plate without a drag, bind or jerk in either direction.

(4) If leakage is indicated, replace the vacuum unit assembly.

Vacuum Advance Curve

If only the vacuum advance curve is to be checked, connect the tester vacuum pump hose to the distributor vacuum advance unit and perform operations 1 through 4 under "centrifugal Advance Curve." Then proceed as follows:

(1) Turn tester vacuum pump "ON." Adjust vacuum pump regulator to vacuum test specifications. See "Specifications" and observe arrow flashes on tester degree ring to determine degrees of advance.

(2) If the vacuum advance is below or above specifications, replace the vacuum advance unit. Retest the vacuum advance curve.

INSTALLATION OF DISTRIBUTOR

(1) Position the distributor on the engine. Make certain the rubber "O" ring seal is in the groove of the distributor shank.

(2) Carefully engage the distributor drive gear with the camshaft drive gear so that when the distributor is installed properly, the rotor will be in line with the previously scribed line on the cylinder block.

NOTE: If the engine has been cranked while distributor is removed, it will be necessary to establish the proper relationship between the distributor shaft and the Number 1 piston position as follows:

(3) Rotate the crankshaft until the number one piston is at the top of the compression stroke. The mark on the inner edge of the crankshaft pulley should be in line with the "O" (TDC) mark on the timing chain case cover.

(4) Rotate the rotor to a position just ahead of the number one distributor cap terminal.

(5) Lower the distributor into the opening, engaging the distributor gear with the drive gear on the camshaft. With the distributor fully seated on the engine, the rotor should be under the cap number 1 tower with the ignition contacts just separating.

(6) Install the distributor cap (make sure all high tension wires "snap" firmly in the cap towers).

(7) Install the hold-down arm screw and tighten it finger tight.

(8) Attach the primary lead wire to the coil.

NOTE: Do not connect the distributor vacuum hose at this time.

(9) Connect the secondary lead of the Power Timing Light to the Number 1 spark (using the proper adaptor) and the red primary lead to the positive terminal of the battery and the black primary lead to the negative battery terminal.

NOTE: Do not puncture the cable cap nipples or spark plug covers to make a contact. Use the proper adapters.

(10) Start the engine and run at idle speed.

(11) Rotate the distributor housing so that the timing mark on the crankshaft damper is aligned with the "BTC" mark on the chain case cover. Refer to "Specifications" (Moving the distributor housing counter-clockwise advances the timing and clockwise retards the timing.)

(12) Tighten the distributor hold down arm screw after timing has been set and recheck the timing adjustment with a Power Timing Light.

(13) When the timing is correct, connect the vacuum hose to the distributor.

(14) Remove the timing light from the engine.

Ignition Timing (with C-744 Test Lamp)

(1) Connect the C-744 test lamp between the distributor primary terminal and the battery positive post.

(2) Turn the engine until the number 6 exhaust valve is just closing; continue turning the engine slowly until the specified degree mark on the crankshaft pulley is at the pointer.

(3) Loosen the distributor clamp bolt so that the distributor housing can be rotated with a slight drag, then turn the distributor in the normal rotation until the test lamp lights.

(4) Turn the distributor against normal distributor rotation until the test lamp goes out.

NOTE: If the test lamp lights immediately when connected, turn the distributor against normal distributor rotation until the light goes out.

(5) Tighten the distributor clamp bolt securely and remove test lamp. If the operation is performed properly the engine is timed to specifications.

NOTE: If the engine is turned beyond the timing mark, continue turning the engine for two full revolutions of the crankshaft; this will place the distributor rotor in approximately the initial position.

CAUTION: DO NOT reverse the rotation of the crankshaft if you have passed the timing mark as this would affect valve timing and distributor timing.

IGNITION COIL

The ignition coil is designed to operate with an external ballast resistor. When testing the coil for output, include the resistor in tests. Inspect the coil for external leaks and arcing.

Test the coil according to the coil tester Manufacturer's instructions. Test the coil primary resistance. Test the ballast resistor resistance. Test the coil secondary resistance. Replace any coil or ballast resistor that does not meet specifications.

Every time an ignition coil is replaced because of a burned tower, carbon tracking, or any evidence of arcing at the tower, the nipple or boot on the coil end of the secondary lead should be replaced. Any arcing at the tower will carbonize the nipple so that placing it on a new coil will invariably cause another coil failure.

If the secondary lead shows any signs of damage, the lead should be replaced with a new lead with the neoprene nipple since the old lead can cause arcing, and therefore, ruin a new coil.

Ballast Resistor

The ballast resistor is a compensating resistance in the ignition primary circuit. During low speed operation, when the primary circuit current flow is as high, the ballast resistor temperature rises, increasing the resistance. This reduces the current flow, thereby prolonging ignition contact life. At high speed operation, when the primary current flow is low, the ballast resistance cools off allowing more current flow, which is required for high speed operation. During starter operation, the ballast resistor is bypassed, allowing full battery voltage to ignition primary circuit.

IGNITION SYSTEM

8 CYLINDER DISTRIBUTOR

Description

The ignition system consists of two separate circuits. The battery, ammeter, ignition switch, ballast resistor, primary winding of the ignition coil, distributor contacts and condenser, vehicle frame, and the primary wiring make up the low voltage primary circuit. The secondary high voltage circuit includes the coil secondary winding, the distributor cap and rotor, the spark plug cables, the spark plugs and the vehicle frame.

SERVICE PROCEDURES

SECONDARY CIRCUIT INSPECTION

The coil to distributor cap wire and the spark plug wires should make good, clean contact in the ignition coil, the distributor cap towers and on the spark plugs. Wires that are loose or that are not inserted all the way into the towers or on the plugs will corrode and increase the resistance as well as cause carbon tracking of the coil or cap towers. Make sure the cap nipples on spark plug covers are in good condition and that they are tight on the cap towers and around the plug insulators.

The ignition coil tower, if oily or dirty, should be wiped clean and inspected for cracks, carbon tracking or oil leaks. Replace the coil if faulty.

Inspect the distributor cap for oil film, dirt or metal particles on the inside surface. Any contamination, however slight, can become conductive and cause hard starting in wet weather. Thoroughly wash the cap in a **weak** solution of liquid soap or non-flamable detergent in warm water. Do not use a concentrated solution or soak the cap in the solution. Scrub the inner surfaces with a stiff bristle nylon brush to clean between the ribs and the crevices. Rinse well in hot water, shake out excess of water and dry thoroughly. Do not use compressed air to dry or blow out the water. Carefully inspect for cracks or carbon tracking on the inner and outer surfaces. Replace the cap if faulty.

The secondary cables, cap and rotor should be tested, using Tool C-3296. This tester provides high voltage which is sufficient for testing secondary insulation.

Test the resistance of the spark plug cables. Replace the cable if resistance is more than 30,000 ohms, or if the terminal has pulled off the cable.

Jerking the wires to disconnect them from the plugs can stretch them and increase secondary resistance. To remove the wire, grasp the boot at the end of the wire and rotate the boot slightly to break the adhesion between it and the spark plug insulator. Then use a straight pull to remove the spark plug.

The rotor and distributor cap electrodes should be inspected for burning. Replace the rotor if the electrode is burned on the top or if the electrode is worn too short.

DISTRIBUTOR RESISTANCE TEST

This test indicates the resistance of the ignition primary circuit from the distributor side of the coil, through the points and the distributor ground. Excessive resistance in this portion of the ignition system will prevent the coil from producing sufficient output for good over-all ignition. To perform test, proceed as follows:

(1) Turn the Selector Switch of a tach-dwell unit to the CALIBRATE position and adjust the Dwell Calibrator until the Dwell Meter reads on the set line (test leads separated).

(2) Leave the selector Switch in the CALIBRATE position, connect the tach-dwell red lead to the distributor terminal of the coil and the black lead to a good ground.

(3) Turn the ignition switch "ON." Observe the dwell meter reading. Meter points should be well within the black bar marked "DISTRIBUTOR RESISTANCE." If reading is zero or outside of black bar, crank the engine with the starter until the meter pointer moves as far to right as possible. (This will indicate that the contacts are closed.) A reading now within

the black indicates a normal distributor primary circuit.

If the reading is outside the black bar, high resistance is present in the distributor primary circuit.

(4) Remove the test lead from the distributor terminal of the coil and connect to the following points:

(a) Distributor primary terminal (outside)

(b) Distributor primary terminal (inside)

(c) Contact terminal bracket (insulated bracket).

(d) Ground side of the contacts.

(e) Distributor housing.

(5) Repeat the test at each connection until a noticeable change occurs in the meter reading. If a poor connection or faulty lead is indicated, clean, tighten or replace as necessary and repeat test (3).

If faulty contacts are indicated, remove the distributor for complete inspection, service, testing and calibration.

IDLE RPM TEST

The engine idle rpm setting should be tested and recorded as it is when the vehicle is first brought into the shop for testing. This will assist in diagnosing complaints of engine stalling, creeping and hard shifting on vehicles equipped with automatic transmissions.

Test procedures are as follows:

(1) Turn the Selector Switch to the CALIBRATE position and adjust the Dwell Calibrator until the Dwell Meter reads on the SET line (test leads separated).

(2) Connect the red lead of the test unit to the distributor primary terminal at the coil and the black lead to a good ground.

(3) Turn the Selector Switch to the 8 LOBE position.

(4) Turn the tachometer rpm switch to the 1000 rpm position.

(5) With the engine at normal operating temperature (off fast idle), momentarily open the throttle and release to make sure there is no bind in the linkage and that the idle speed screw is against its stop.

(6) Note engine rpm on 1000 rpm scale and adjust carburetor idle speed to specifications. See "Fuel System" specifications.

DISTRIBUTOR CONTACT DWELL

The degrees of distributor dwell are the degrees of rotation through which the contacts remain closed. This is also commonly referred to as "dwell angle" or "cam angle."

The correct distributor point dwell is essential for good ignition performance and contact point life.

Test procedures are as follows:

(1) Connect the Tach-Dwell red lead to the distributor terminal of coil and black lead to a good ground.

(2) Turn the Selector Switch to the 8 LOBE position.

(3) Start the engine and operate at idle speed.

(4) Observe the dwell meter reading. If the dwell reading is within "Specifications" the contact gap, cam rubbing block and contact arm are all in satisfactory condition.

If the dwell reading is not within specifications, incorrect contact gap, worn cam, worn rubbing block or distorted contact arm may be indicated.

DUAL CONTACTS

Block one set of contacts with a clean insulator and adjust the opposite set of contacts to specifications using the dwell meter.

NOTE: Loosen the stationary contact lock screw just enough, so that the stationary contact can be moved with a slight drag; otherwise it will be difficult to set the contacts accurately.

When the one set of contacts has been adjusted for the correct clearance, tighten the stationary contact lock screw.

Block the adjusted set of contacts with an insulator and adjust the remaining set of contacts in the same manner as the first set. Remove the insulator and recheck tightness of the stationary contact lock screw.

If the contacts have been properly adjusted, the dwell should be as specified for two contact sets.

DWELL VARIATION

This test indicates the mechanical condition of the distributor. Excessive wear in distributor mechanical parts cause dwell variations which will affect ignition timing.

Test procedures are as follows:

(1) With the engine at idle speed, the vacuum hose disconnected, and with the test leads connected as in "Contact Dwell Test," turn the Tachometer rpm Switch to the 5,000 rpm position.

(2) Slowly increase the engine speed to 1500 rpm, then slowly reduce to idle speed while observing the dwell meter reading.

If the dwell reading varies more than 2 degrees from initial reading between idle speed and 1500 rpm, probable wear in the distributor shaft, bushings or contact plate bearing and pivot pin is indicated. Remove the distributor for complete inspection and testing on a distributor tester.

NOTE: Dwell variation at speeds above 1500 rpm does not necessarily indicate distributor wear. Dwell and gap of the contacts must both be within their specified limits at the same time. If this cannot be accomplished, it is probable that the wrong contacts are installed or the rubbing block or cam lobes are badly worn or movable contact is distorted.

IGNITION TIMING

To obtain maximum engine performance, the distributor must be correctly positioned on the engine to give the proper ignition timing.

The ignition timing test will indicate the timing of the spark at NO. 1 cylinder at idle (only).

Test procedures are as follows:

(1) Disconnect the vacuum hose at the distributor.

(2) Connect the secondary lead of the Power Timing Light to the NO. 1 spark plug, red primary lead to the positive terminal of the battery and the black primary lead to the negative battery terminal.

NOTE: Do not puncture the wires, boots or nipples with test probes. Always use adapters. Puncturing spark plug wires with a probe will damage the wires. The probe can separate the conductor and cause high resistance. In addition, breaking the rubber insulation may permit secondary current to arc to ground.

(3) Start the engine and set the idle to specifications, engine at normal operating temperature (transmission in neutral).

(4) Using a timing light, observe the positions of the timing mark on the crankshaft damper and check against the specifications.

(5) Loosen the distributor hold down clamp screw and rotate the distributor housing so that the specified timing mark on damper aligns with the specified "BTC" mark on the timing plate. Moving the distributor "clockwise" advances the timing and "counterclockwise" retards the timing.

(6) Tighten the distributor hold down clamp screw after the timing has been set and recheck the timing adjustment with a Power Timing Light.

(7) When the ignition timing is correct, connect the vacuum hose to the distributor.

NOTE: As the engine speed is increased, the timing mark should move down on the vibration dampener below the pointer if advance units are functioning.

DISTRIBUTOR

Removal

(1) Disconnect the vacuum hose at the distributor.

(2) Disconnect the primary lead wire at the coil.

(3) Unfasten the distributor cap retaining clips and lift off the distributor cap.

(4) Scribe a mark on the edge of the distributor housing to indicate the position of the rotor as reference when reinstalling the distributor.

(5) Remove the distributor hold-down clamp screw and the clamp.

(6) Carefully lift the distributor from the engine.

Shaft and Bushing Wear Test

(1) Remove the distributor rotor.

(2) Disconnect the primary lead wire at the distributor terminal. DO NOT LOOSEN the inner nut that holds the movable contact arm tension spring to the terminal post.

(3) Clamp the ribbed section of the distributor housing lightly in a vise equipped with soft jaws and attach the dial indicator to the body of the distributor with the indicator plunger arm resting against the movable contact arm at the rubbing block and with the rubbing block of the contact arm on the highest point of the cam lobe (Fig. 1).

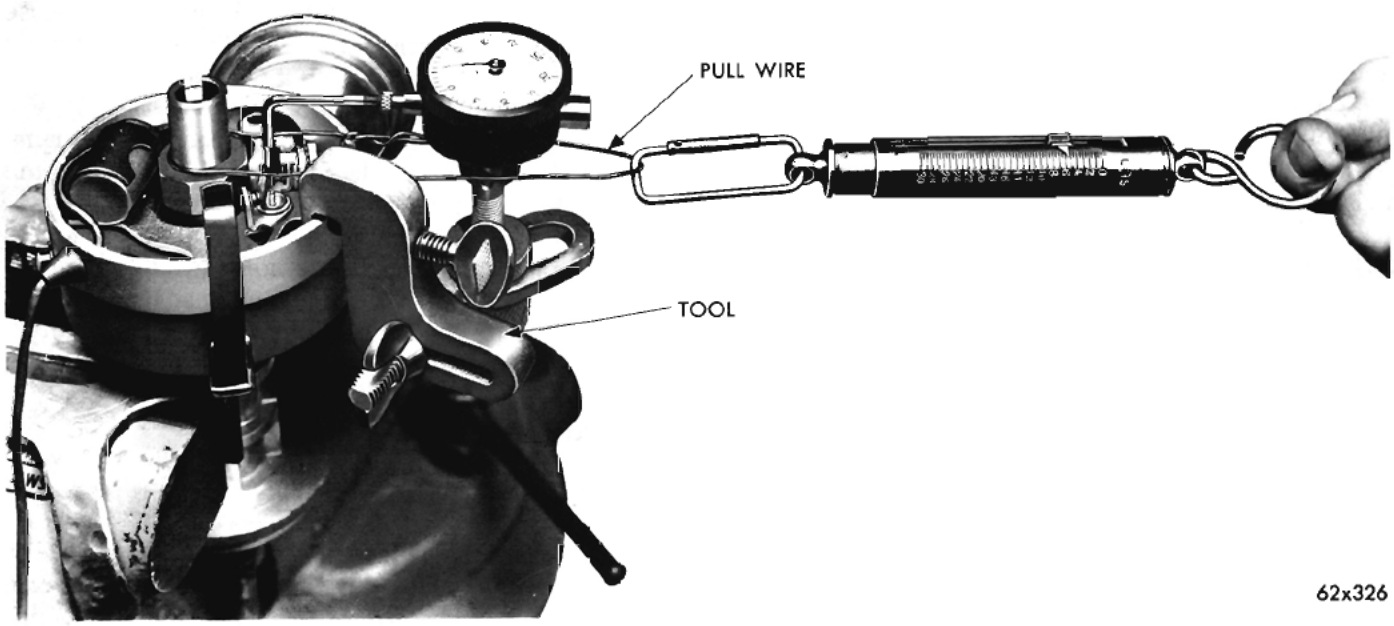

Fig. 1—Shaft and Bushing Wear Test

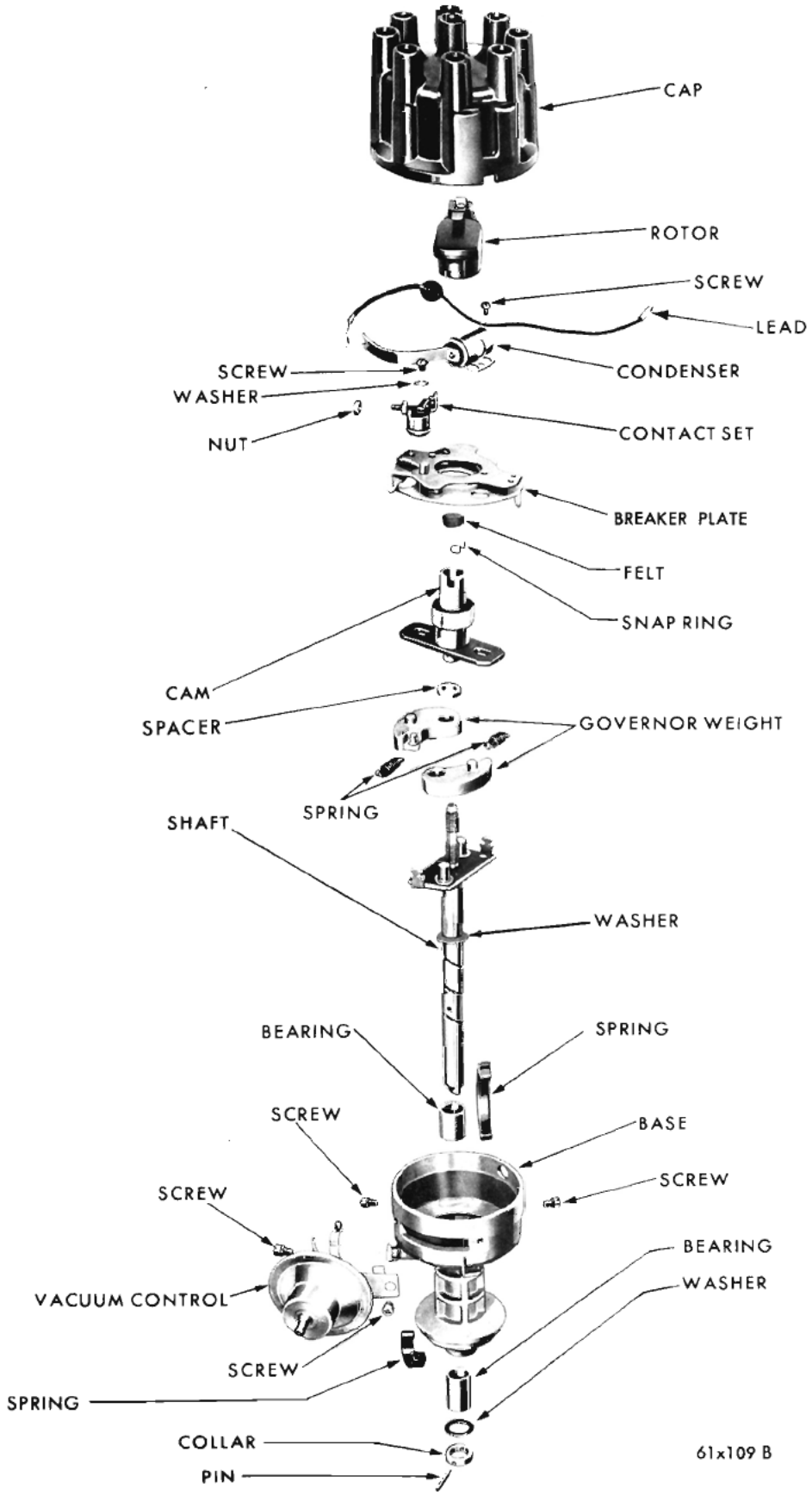

Fig. 2—Distributor—Disassembled View

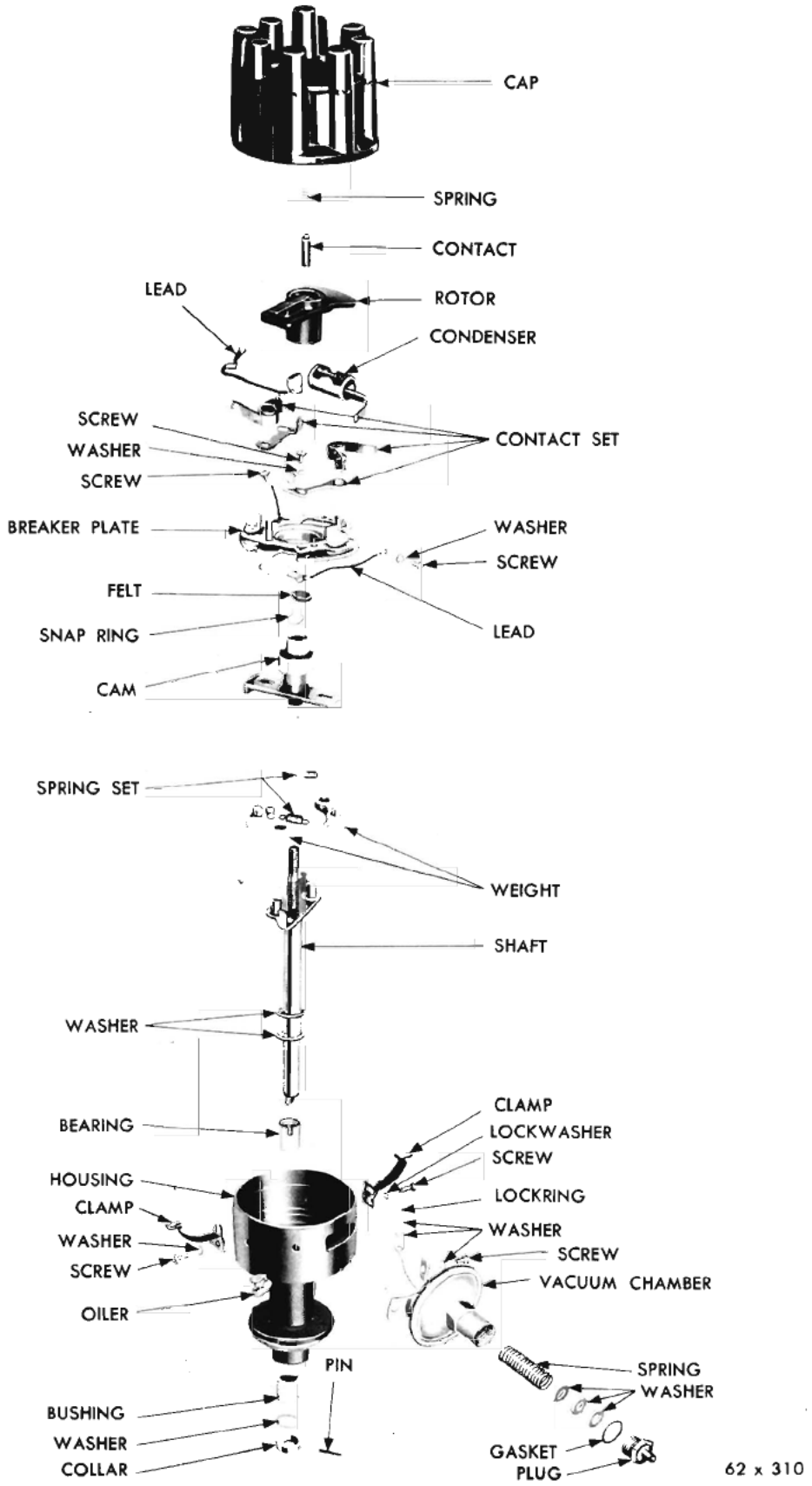

Fig. 3—Distributor—Disassembled View (Prestolite)

(4) Place one end of a wire loop around the top of the distributor shaft. Hook a spring scale in the other end of the wire loop and pull on a line with the plunger of the indicator gauge. Be sure the wire loop on shaft end is down on the shaft to insure a straight pull and also that the wire loop does not interfere with the indicator or holding bracket. Apply a five pound pull and read the movement of the plunger on the indicator dial. (Be sure the rubbing block of contact arm is on the highest point of the cam lobe during this test). If the plunger movement exceeds .006 inch, replace the bushings and/or distributor shaft, see "Distributor Disassembly."

DISASSEMBLY OF THE DISTRIBUTORS
(Figs. 2 and 3)

(1) Remove the distributor rotor.

NOTE: The distributor cap clamp springs on Chrysler built distributors are held in place by peened metal around the openings and should not be removed.

(2) Remove the retainer attaching the vacuum advance unit to the contact plate advance arm.

(3) Remove the two screws and lockwashers attaching the vacuum advance unit to the distributor housing and remove the unit.

(4) Remove the primary lead wire and rubber grommet as an assembly. Push the grommet towards the inside of the distributor to remove. Do not pull on the wire.

(5) Remove the two screws, and lockwashers attaching the contact plate to the housing and lift out the contact plate, contacts and condenser as an assembly.

(6) Remove the oil wick from the distributor cam (Fig. 4). Remove the spring clip from the oil well in the cam and remove the cam and yoke assembly and spacer.

(7) If the side play exceeded .006 inch in the "Shaft and Bushing Wear Test," replace bushing and/or distributor shaft as follows:

(a) Remove the distributor drive collar retaining pin and slide the collar off the end of the shaft.

(b) Use a fine file to clean the burrs from around the pin hole in the shaft and remove the lower thrust washer.

(c) Push the shaft up and remove it through the top of the distributor body. Remove the upper thrust washer.

(d) Remove the shaft oiler and lift out the oiler wick.

CAUTION: Do not drive the bushings out of the housing.

(e) Remove the upper bushing with Tool C-3744 (Fig. 5) by threading the tap securely into the bushing. Place the spacer over the tap. Install the tool nut and, while holding the tap, tighten tool nut to remove the bushing. Invert the housing and remove the lower bushing in the same manner.

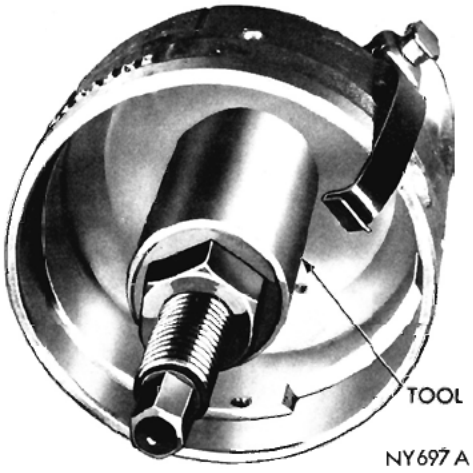

Fig. 5—Removing Distributor Housing Upper Bushing

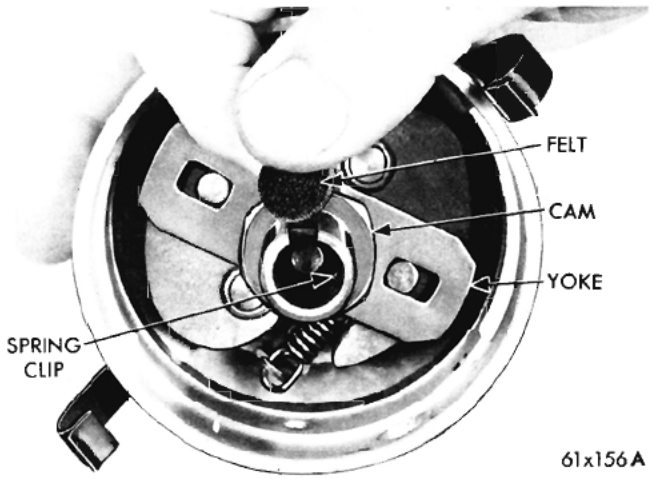

Fig. 4—Removing or Installing Cam Felt Wick

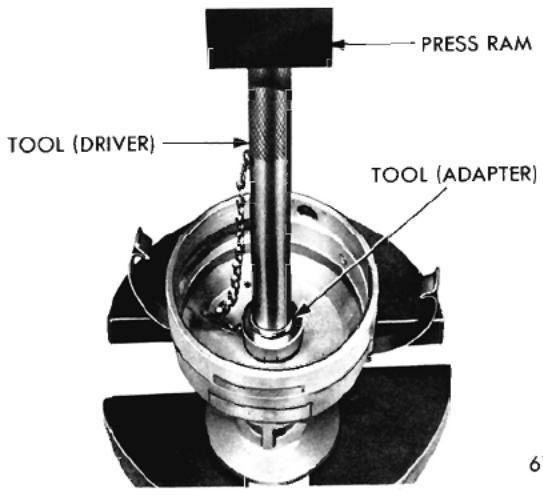

Fig. 6—Installing Distributor Housing Upper Bushing

On Prestolite built distributors, place the housing in an arbor press and press out the upper and lower bushings from the bottom of the housing using Driver Tool C-3041.

(f) Soak the new bushings in light engine oil for approximately 15 minutes.

(g) Position the new upper bushing with the hole in the bushing **up** and in line with the oil hole in the housing, then press the bushing into the distributor housing with Tool C-3041 and the tool adapter with the flat face of the adapter contacting the bushing (Fig. 6), press the bushing into the distributor until top of bushing is 1.613 inches from top machined face of distributor housing. Place a straight-edge on the machined surface of housing and measure from bottom face of straight-edge to the top of the bushing. Invert the housing and install the other bushing (Fig. 7) flush with the face of the distributor base.

(h) Insert a $^{3}/_{32}$ inch rod through the housing oiler hole to see if the hole in the bushing indexes with the oiler hole in the housing. If the rod cannot be inserted through the housing and the bushing, drill a ⅛" hole through the upper bushing by drilling through the oil wick hole. Remove burrs caused by the drilling operation.

(i) Install the burnishing tool part of C-3041 tool set and force the burnisher through both the bushings (Fig. 8). The correct bushing inside diameter is .4995 to .5000 inch.

ASSEMBLING THE DISTRIBUTOR

(1) Test operation of centrifugal weight and inspect the weight springs for distortion. Lubricate the governor weights.

(2) Inspect all bearing surfaces and pivot pins for roughness, binding or excessive looseness.

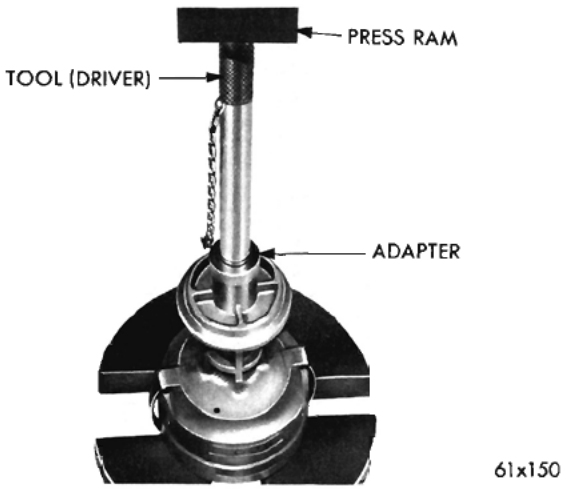

Fig. 7—Installing Distributor Housing Lower Bushing

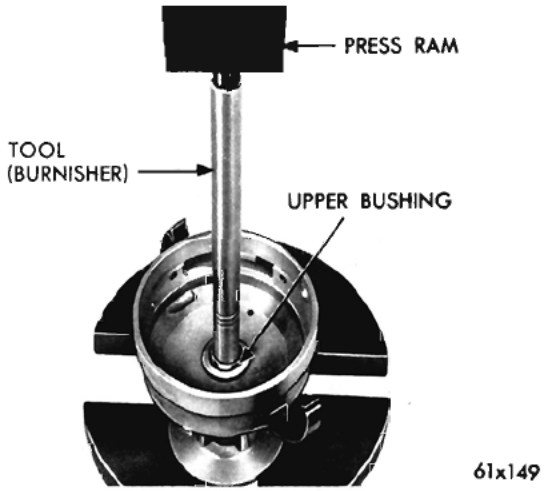

Fig. 8—Burnishing Distributor Housing Bushings

(3) Install the cam spacer, chamfered end down on the distributor shaft.

(4) Slide the cam and yoke on the distributor shaft, engage the weight lugs with the slots in the yoke. Install the cam retaining spring clip. Be sure it is properly seated in the groove of the distributor shaft.

(5) Lubricate and install the flat thrust washer. Position the washer on the distributor shaft and slide the shaft into the distributor body. Position the lower thrust washer and drive the collar on the lower end of the shaft. Install the retainer pin.

(6) Install the oiler wick and oiler.

(7) Install the contact plate assembly. Align the condenser lead, contact point spring, primary lead and install the attaching screw

(8) Install the felt wick in the top of the distributor cam.

(9) Attach the vacuum advance unit arm to the contact plate and install the retainer. Install the vacuum unit attaching screws and washers.

(10) Test the contact arm spring tension, and adjust the contact gap.

(11) Lubricate the felt pad in the top of the distributor cam with 3 to 5 drops of light engine oil and install the rotor.

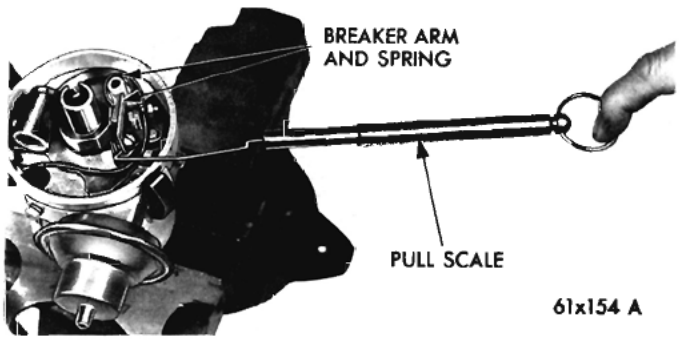

Fig. 9—Testing Breaker Arm Spring Tension

TESTING CONTACT ARM SPRING TENSION

(1) Hook a spring scale Tool MTU-36 on the breaker arm and pull in a straight line at right angles to the point surfaces (Fig. 9). Take a reading as the points start to separate under the slow and steady pull of the scale. The spring tension should be 17 to 20 ounces. If the reading is outside these limits, loosen the screw which holds the end of the movable arm contact spring and slide the end of the spring in or out, as necessary to adjust tension.

(2) Retighten the screw and measure the spring tension.

NOTE: Spring tension that is too great, will cause excessive wear on the distributor cam and on the nylon block of the movable contact arm. Spring tension that is too weak, is unable to keep the contacts in contact with each other when they close. This is particularly true as engine speed is increased, causing high-speed misfiring.

INSTALLING AND ALIGNING CONTACTS

(1) Remove the old contacts and install a new set.

Touching the contact faces with fingers during installation will cause burning of contacts during operation.

(2) Align the contacts to obtain center contact, by bending the stationary contact bracket only. **Never bend** the movable arm to obtain alignment.

(3) After aligning the contacts, readjust the contact clearance to specifications using a dial indicator (Fig. 10).

(4) Test the dwell angle to show proper degrees of closure. See "Distributor Point Dwell." The lock screw should be loosened just enough so that the stationary bracket can be moved with a slight drag; otherwise, it will be difficult to set the contacts accurately. After setting the contacts to the correct gap, tighten the lock screw.

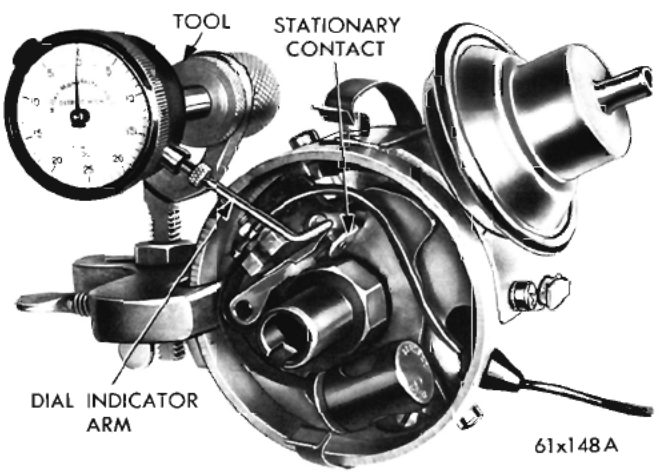

Fig. 10—Adjusting Point Clearance with Indicator

DISTRIBUTOR LUBRICATION

(1) Add 3 to 5 drops of SAE 10W oil to the oiler on the outside of the distributor base.

(2) Lubricate the felt pad under the rotor in the top of the distributor cam with 3 to 5 drops of SAE 10W oil.

(3) Wipe all old grease from surface of the distributor cam. Apply a light film of new distributor cam lubricant number 1473595.

NOTE: Do not over-lubricate. Excess grease will be thrown from the distributor cam when the engine is running. Should this grease strike the contact faces, arcing and burning of the contacts will result and ignition trouble will be experienced.

TESTING DISTRIBUTOR ADVANCE

Centrifugal Advance Curve

Note the model number of the distributor and refer to the specifications before making this test.

Mount the distributor assembly (less cap and rotor) in a reliable stroboscope-type distributor tester and proceed with tests as follows:

NOTE: Clamp around the rib section of the distributor housing. The bottom section of the distributor housing is not a machined surface and concentricity would be affected, causing a wobble.

(1) Turn the Tach-Dwell switch to the 8 "LOBE" position and the Motor Switch to correct direction of rotation. Refer to "Distributor Advance Specifications" in this Manual.

(2) Turn the battery switch "ON."

(3) Regulate the tester speed control to operate the distributor at 200 distributor rpm.

(4) Hold the distributor contact plate in the full retard position and align the "O" of the distributor tester degree ring with any one of the arrow flashes.

(5) Adjust the tester speed control to operate the distributor at speeds called for under "Specifications" and observe arrow flashes opposite tester degree ring to determine degrees of advance.

(6) If the advance is not according to specifications, corrections can be made by bending the primary and secondary spring tabs to increase or decrease the spring tension. The governor spring tabs can be reached through the access hole at the breaker plate. Rotate the shaft until the proper spring and tab line up with the access holes. Insert a screwdriver blade through the access hole and bend the spring tab toward the distributor cam to decrease spring tension and advance to spark, or away from the distributor cam to increase the spring tension and retard the spark.

NOTE: The light tension spring controls the lower end of the advance curve, and the heavier spring controls the upper end of the advance curve.

Vacuum Diaphragm Leak Test

With distributor mounted in distributor tester and with the vacuum unit attached to the distributor, proceed as follows:

(1) Place the thumb over the end of the vacuum pump and hose and adjust the regulator control knob to give a reading 20 inches with hose closed off to be sure tester hose does not leak.

(2) Attach the tester vacuum pump hose to the tube on the distributor vacuum unit. The vacuum gauge should hold on maximum vacuum obtainable if no leak exists.

(3) Observe the contact plate while performing the leak test to test response of the contact plate. There should be instant response to the pull of the diaphragm, moving the plate without a drag or bind.

(4) If leakage is indicated, replace the vacuum unit assembly.

Vacuum Advance Curve

Connect the tester vacuum pump hose to the distributor vacuum advance unit and perform operations 1 through 5 under "Centrifugal Advance Curve." Then proceed as follows:

(1) Turn the tester vacuum pump "ON." Adjust the vacuum pump regulator to vacuum test specifications. See "Specifications" and observe the arrow flashes on the tester degree ring to determine the degrees of advance.

(2) If the vacuum advance is above or below specifications, replace the vacuum advance unit. Retest the vacuum advance curve.

INSTALLATION OF DISTRIBUTOR

(1) Position the distributor on the engine. Align the rotor with marks previously scribed on the distributor housing.

(2) Engage the tongue of the distributor shaft with the slot in the distributor and the oil pump drive gear.

NOTE: If the engine has been cranked while the distributor is removed, it will be necessary to establish the proper relationship between the distributor shaft and the NO. 1 piston position as follows:

(a) Rotate the crankshaft until the number one piston is at top of the compression stroke.

(b) Rotate the rotor to the position of the number one distributor cap terminal.

(c) Lower the distributor into the opening, connect the primary lead and install the distributor cap. Make sure all high tension wires "snap" firm in the cap towers. Install the distributor hold-down clamp screw. Tighten the screw finger tight.

(d) Connect the secondary lead of a Power Timing Light to the NO. 1 spark plug (using proper adapter). Connect the red primary lead to the positive terminal of the battery and the black primary lead to the negative battery terminal.

(e) Start and operate the engine at idle speed. Rotate the distributor housing so that the specified timing mark and the pointer are in alignment (Moving the distributor housing against the shaft rotation advances the timing and with the shaft rotation retards the timing).

(f) At low altitudes, with any good grade of the recommended gasoline, either "regular" or "premium," the engine will give its best performance if timed according to specifications.

When using low grade fuels, or after carbon has accumulated, objectionable spark ping may occur with the specified timing. In cases of this nature, ignition timing should be retarded, but not to exceed 5 degrees of crankshaft rotation later than specified.

At high altitudes or when using higher quality gasoline, for example, "premium" where "regular" is specified or "super premium" where "premium" is specified, there is less tendency for spark ping. In such cases, improved performance may be obtained by advancing the spark not to exceed 5 degrees of crankshaft rotation ahead of specified timing.

Within the foregoing limits, namely, from 5 degrees ahead to 5 degrees later than specified timing, a good rule to follow is to advance the spark until a slight ping is heard when accelerating to 15 mph in direct drive at wide open throttle, with hot engine.

(g) Tighten the distributor clamp screw after the timing has been set and recheck the timing adjustment with a Power Timing Light.

(h) If the timing is correct, connect the vacuum hose to the distributor and remove the timing light from the engine.

Ignition Timing (with C-744 Test Lamp)

(1) Connect the C-744 test lamp between the distributor primary terminal and the battery positive post.

(2) Turn engine until the number 6 exhaust valve is just closing; continue turning the engine slowly until the specified degree mark on the crankshaft pulley is at the pointer.

(3) Loosen the distributor clamp bolt so that the distributor housing can be rotated with a slight drag, then turn the distributor in the normal rotation until the test lamp lights.

(4) Turn the distributor against normal distributor rotation until the test lamp goes out.

NOTE: If the test lamp lights immediately when connected, turn the distributor against normal distributor rotation until light goes out.

(5) Tighten the distributor clamp bolt securely and

remove test lamp. If the operation is performed properly the engine is timed to specifications.

NOTE: If the engine is turned beyond the timing mark, continue turning the engine for two full revolutions of the crankshaft; this will place the distributor rotor in approximately the initial position.

CAUTION: DO NOT reverse the rotation of the crankshaft if you have passed the timing mark as this would affect valve timing and distributor timing.

IGNITION COIL

The ignition coil is designed to operate with an external ballast resistor. When testing the coil for output, include the resistor in tests.

Inspect the coil for external leaks and arcing. Always make two tests when testing the coil. One when the coil is cold, the other after the coil has been warmed up.

Test the coil according to the coil tester Manufacturer's instructions. Test the coil primary resistance. Test the ballast resistor resistance. Test the coil secondary resistance. Replace any coil and ballast resistor that does not meet specifications.

Every time an ignition coil is replaced because of a burned tower, carbon tracking or any evidence of arcing at the tower, the nipple or boot on the coil end of the secondary lead should be replaced. Any arcing at the tower will carbonize the nipple so that placing it on a new coil will invariably cause another coil failure.

If the secondary lead shows any signs of damage, the lead should be replaced with a new lead with the neoprene nipple since the old lead can cause arcing, and therefore, ruin a new coil.

BALLAST RESISTOR

The ballast resistor is a compensating resistance in the ignition primary circuit. During low speed operation, when the primary circuit current flow is as high, the ballast resistor temperature rises, increasing the resistance. This reduces the current flow, thereby prolonging ignition contact life. At high speed operation, when the primary current flow is low, the ballast resistance cools off allowing more current flow, which is required for high speed operation. During starter operation, the ballast resistor is bypassed, allowing full battery voltage to the ignition primary circuit.

SPARK PLUGS

To insure peak performance, spark plugs should be removed, cleaned, tested and regapped periodically, depending on driving conditions. Worn and dirty plugs may give satisfactory operation at idling speed but may fail under operation conditions. Spark plug appearance or conditions can reflect a wide variety of engine conditions as follows:

Fig. 1—Normal Conditions

Normal Conditions

Normal conditions are shown in Figure 1. This plug has been running at the correct temperature in a "healthy" engine. The few deposits present will probably be light tan or gray in color with most regular grades of commercial gasoline. Electrode burning will not be in evidence; gap growth will average not more than about .001"/1000 miles. Chances are the plug, as pictured, could be cleaned, the gap electrodes filed, regapped and reinstalled with good results.

Cold Fouling

Cold fouling or carbon deposits, (Fig. 2). This dry black appearance is fuel carbon and can be due to over rich fuel-air mixture, possibly resulting from a faulty choke, clogged air cleaner, improper carburetor idle adjustment, or dirty carburetor. However, if only one or two plugs in a set are fouled like this it's a good idea to check for sticking valves or defective ignition leads. This condition also results from prolonged operation at idle. If the car is operated extensively at idle and low speeds, improved plug service will be obtained by using the next step hotter spark plugs.

Wet Fouling

Wet fouling, (Fig. 3) tells you that the plug has

Fig. 2—Cold Fouling

Fig. 3—Wet Fouling

drowned in excess oil. In an old engine, suspect worn rings or excessive cylinder wear. In OHV engines, too much oil may be coming in past the valve guides. Use of a hotter plug may relieve such fouling, but plugs can't take the place of needed engine overhaul.

NOTE: Remember that "break-in" fouling of new engines may occur before normal oil control is achieved. In new or recently overhauled jobs, such fouling plugs can be cleaned and reinstalled.

Splashed Fouling

Splashed fouling, (Fig. 4) may sometimes occur after a long-delayed tune-up. Here, deposits accumulated after a long period of misfiring may be suddenly loosened when normal combustion temperatures are restored upon installation of new plugs. During a high speed run, these materials shedding off the combustion chamber are thrown against the hot insulator surface. If they happen to short out the plug, they can be removed with regular cleaning techniques. The plugs can then be reinstalled with good results as the engine has scavenged itself.

Core Bridging

Core bridging, (Fig. 5) will be encountered only rarely in automotive engines. It's usually due to the same conditions described under splashed deposits. In this case, a chunk of deposit was thrown off the piston and formed a bridge between the insulator and shell. Result: A "dead short." Such evidence of excessive combustion chamber deposits will be most common where oil control is poor . . . or where vehicles are usually driven in slow speed, start-stop service. In such instances, it usually pays to physically remove accumulated deposits from the engine.

Gap Bridging

Gap bridging, (Fig. 6) is also relatively rare in automotive engines. It also may be traced to flying deposits in the combustion chamber. In a few cases, fluffy deposits may accumulate on the plugs during in-town driving; when the engine is suddenly put under high load, this material can melt and bridge the gap.

High Speed Glazing

High speed glazing may cause misfiring at speeds

Fig. 4—Splashed Fouling

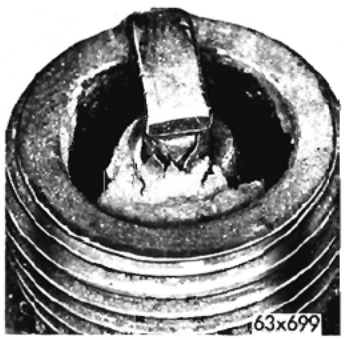

Fig. 5—Core Bridging

Fig. 6—Gap Bridging

Fig. 7—High Speed Glazing

above 50-60 mph. The shiny deposit (Fig. 7) may be yellow or tan in color. It usually suggests that temperatures have suddenly risen during a hard acceleration. As a result normal deposits do not get a chance to fluff off the plug . . . instead they melt and form a conductive coating. If this continues to reoccur, suggest a colder heat range and regular spark plug cleanings.

Scavenger Deposits

Fuel scavenger deposits, (Fig. 8) may be white or yellow in color. They may **appear** to be bad, but this is a **normal** appearance with certain branded fuels. Such materials are designed to change the chemical nature of deposits to lessen misfire tendencies. Notice that accumulation on the ground electrode and shell areas may be unusually heavy, but the material is easily flaked off. Such plugs can be considered normal in condition, and can be cleaned with standard procedures.

Overheating

Overheating, (Fig. 9) is indicated by a white or light gray insulator which appears "blistered." Electrode gap wear rate will be considerable in excess of .001" /1000 miles. This suggests that a cooler heat range should be used . . . however, over-advanced ignition timing, detonation and cooling system stoppages can also overheat the **correct** spark plug heat ranges.

Turbulence Burning

Turbulence burning, (Fig. 10) causes electrodes to wear away on one side. This is the result of normal turbulence patterns in the combustion chambers of certain engines. It can be ignored if normal plug life is being obtained. If gap growth appears excessive, review the corrective measures suggested under **overheating.**

Initial Pre-Ignition Damage

Initial pre-ignition damage may be caused by excessive temperatures, (Fig. 11) this produces melting of the center electrode and, somewhat later, the ground electrode. Remember that the spark plug is like an

Fig. 8—Scavenger Deposits

Fig. 9—Overheating

Fig. 10—Turbulence Burning

Fig. 11—Initial Pre-Ignition Damage

Fig. 12—Sustained Pre-Ignition Damage

electric fuse . . . when it melts, it warns you to look for the causes, and for damage to the engine such as scuffed pistons, burned pistons or burned valves. Inspect for correct spark plug heat range, overadvanced ignition timing, loose spark plugs, burned head gasket, excessive detonation due to low octane fuel and for similar causes of overheating.

Sustained Pre-ignition Damage

Sustained pre-ignition damage, (Fig. 12) usually involves melting of the ceramic firing tip. Since this requires temperatures above 1700F, it's a good possibility that other components of the engine may have been damaged by preignition. This is another sure sign that careful inspection of the engine and its adjustments are required.

Chipped Insulator

Chipped insulator, (Fig. 13) usually results from bending the center electrode during regapping of the plug. Under certain conditions, severe detonation can also split insulator firing ends. In a four-cycle engine, a piece of ceramic like this is easily blown out through the exhaust.

Mechanical Damage

Mechanical damage to the firing end, (Fig. 14) is caused by some foreign object in the combustion chamber. Since small objects can travel from one cylinder to another, always check the other cylinders to prevent reoccurrence of damage.

Inspect the distributor cap for oil film or dirt.

Pressure Type Gap Tool

Pressure type gap tools, if improperly used, impose a tremendously high unit pressure on the center electrode, (Fig. 15). This is because of compression being exerted between the end of the center electrode and the top of the shell. If too much force is applied thru leverage multiplication, the center electrode seal on any type or brand of spark plug is likely to be damaged. There are several of these pliers type gap tools on the market.

Reversed Coil Polarity

Reversed coil polarity can often be detected by "dishing" of the ground electrode. Note in (Fig. 16) that the center electrode is usually not worn badly. This source of misfiring and rough idle can be corrected by reversing the primary coil leads. An oscilloscope is the surest way to detect reversed polarity.

While these examples may not be conclusive in all instances, they may indicate possible corrective procedures and further diagnosis may be necessary.

Fig. 13—Chipped Insulator

Fig. 14—Mechanical Damage

Fig. 15—Pressure Type Gap Tool Damage

Fig. 16—Reversed Coil Polarity

Cleaning and Regapping

Carefully clean the spark plugs in an abrasive type cleaner. Use a pin type feeler gauge to check spark plug gap. Reset gaps to .035 inch.

NOTE: Before setting spark plug gap, file center electrode flat, make adjustment by bending ground (side) electrode, never bend the center electrode.

Inspect the spark plug cables, coil secondary (high tension) cable, nipples and covers for cracks, wear and fraying. Always use the neoprene insulating nipples whenever it becomes necessary to replace high tension cables or nipples. Inspect for loose terminals.

When installing spark plugs, tighten to 30 foot-pounds.

ENGINE

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SERVICE DIAGNOSIS 3
6 CYLINDER ENGINES 6
8 CYLINDER ENGINES 7
SPECIFICATIONS AND TIGHTENING REFERENCE . . . . . (In Back of Manual)

PLYMOUTH ENGINE APPLICATION

Model Application	Engine Names	No. Cyl.	Engine Type & Displacement	Compression Ratio	
AV1 (Std.)	Standard 170	6	"G" 170 Cubic Inch	8.5 to 1	1 BBl. Carb.
(Opt.)	Super 225	6	"RG" 225 Cubic Inch	8.4 to 1	1 BBl. Carb.
AV2 (Std.)	Fury 273	8	"LA" 273 Cubic Inch	8.8 to 1	2 BBl. Carb.
(Opt.)	Fury 273-H	8	"LA" 273 Cubic Inch	10.5 to 1	4 BBl. Carb. Spec. Cam
AR1 (Std.)		6	"RG" 225 Cubic Inch	8.4 to 1	1 BBl. Carb.
AR2 (Std.)	Fury 273	8	"LA" 273 Cubic Inch	8.8 to 1	2 BBl. Carb.
AR2 (Opt.)	V800	8	"A" 318 Cubic Inch	9.0 to 1	2 BBl. Carb.
	Commando 361	8	"B" 361 Cubic Inch	9.0 to 1	2 BBl. Carb.
	Commando 383H	8	"B" 383 Cubic Inch	10.0 to 1	4 BBl. Carb. Spec. Cam
	Commando 426H	8	"RB" 426 Cubic Inch	10.3 to 1	4 BBl. Carb. Spec. Cam
AP1 (Std.)		6	"RG" 225 Cubic Inch	8.4 to 1	1 BBl. Carb.
AP2 (Std.)	V800	8	"A" 318 Cubic Inch	8.8 to 1	2 BBl. Carb.
AP2 (Opt.)	Commando 383	8	"B" 383 Cubic Inch	9.2 to 1	2 BBl. Carb.
	Commando 383H	8	"B" 383 Cubic Inch	10.0 to 1	4 BBl. Carb. Spec. Cam
	Commando 426H	8	"RB" 426 Cubic Inch	10.3 to 1	4 BBl. Carb. Spec. Cam

V8 ENGINES

Description

The V8 engines (Fig. 2) are all the valve-in-head type. Engines vary in compression ratio, piston displacement, camshaft, valve springs and power output.

The Fury 273 has mechanical tappets, 8.8 to 1 compression ratio, two bore carburetor; uses regular fuel.

The Fury 273H also has mechanical tappets with a high-performance camshaft and valve springs, 10.5 to 1 compression ratio, 4 bore carburetor; uses premium fuel.

The V800 318 cubic inch with a 9.0 to 1 compression ratio, mechanical tappets, two bore carburetor; uses regular fuel.

The Commando 361 has hydraulic tappets, two bore carburetor, 9.0 to 1 compression ratio; uses regular fuel.

The Commando 383 has hydraulic tappets, two bore carburetor, 9.2 to 1 compression ratio; uses regular fuel.

The Commando 383H has hydraulic tappets with a high-performance camshaft and valve springs, 10.0 to 1 compression ratio, 4 bore carburetor; uses premium fuel.

The Commando 426H has hydraulic tappets with a high-performance camshaft and valve springs, 10.3 to 1 compression ratio, 4 bore carburetor; uses premium fuel.

The engine oiling system consists of a rotor type oil pump and a full flow oil filter. 318 cubic inch engine pump is mounted internally and 361, 383-426 cubic inch engines are mounted externally. Oil is forced by the oil pump to a series of oil passages in the engine, (Figs. 119 and 120).

PART 1

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
ENGINE WILL NOT START	(a) Weak battery.	(a) Test battery specific gravity and recharge or replace as necessary.
	(b) Corroded or loose battery connections.	(b) Clean and tighten battery connections. Apply a coat of petrolatum to terminals.
	(c) Faulty starting motor.	(c) Refer to "Starting Motor."*
	(d) Moisture on ignition wires and distributor cap.	(d) Wipe wires and cap clean and dry.
	(e) Faulty ignition cables.	(e) Replace any cracked or shorted cables.
	(f) Faulty coil or condenser.	(f) Test and replace if necessary.*

Condition	Possible Cause	Correction
	(g) Dirty or corroded distributor contact points.	(g) Clean or replace as necessary.
	(h) Incorrect spark plug gap.	(h) Set gap at .035".
	(i) Incorrect ignition timing.	(i) Refer to "Ignition Timing."*
	(j) Dirt or water in fuel line or carburetor.	(j) Clean lines and carburetor.**
	(k) Carburetor flooded.	(k) Adjust float level—check seats.**
	(l) Incorrect carburetor float setting.	(l) Adjust float level—check seats.**
	(m) Faulty fuel pump.	(m) Install new fuel pump.**
	(n) Carburetor percolating. No fuel in the carburetor.	(n) Measure float level.** Adjust bowl vent. Inspect operation of manifold control valve.
ENGINE STALLS	(a) Idle speed set too low.	(a) Adjust carburetor.**
	(b) Incorrect choke adjustment.	(b) Adjust choke.**
	(c) Idle mixture too clean or too rich.	(c) Adjust carburetor.**
	(d) Incorrect carburetor float setting.	(d) Adjust float setting.**
	(e) Leak in intake manifold.	(e) Inspect intake manifold gasket and replace if necessary.***
	(f) Dirty, burned or incorrectly gapped distributor contact points.	(f) Replace points and adjust.*
	(g) Worn or burned distributor rotor.	(g) Install new rotor.
	(h) Incorrect ignition wiring.	(h) Install correct wiring.
	(i) Faulty coil or condenser.	(i) Test and replace if necessary.*
ENGINE LOSS OF POWER	(a) Incorrect ignition timing.	(a) Refer to "Ignition Timing."*
	(b) Worn or burned distributor rotor.	(b) Install new rotor.
	(c) Wrong mechanical or vacuum advance (distributor).	(c) Install correct vacuum advance unit. Adjust mechanical advance.
	(d) Excessive play in distributor shaft.	(d) Remove and repair distributor.*
	(e) Worn distributor shaft cam.	(e) Remove and repair distributor.*
	(f) Dirty or incorrectly gapped spark plugs.	(f) Clean plugs and set gap at .035".
	(g) Dirt or water in fuel line, carburetor or filter.	(g) Clean lines, carburetor and replace filter.**
	(h) Incorrect carburetor float setting.	(h) Adjust float level.**
	(i) Faulty fuel pump.	(i) Install new pump.
	(j) Incorrect valve timing.	(j) Refer to "Checking Valve Timing."***
	(k) Blown cylinder head gasket.	(k) Install new head gasket.***
	(l) Low compression.	(l) Test compression of each cylinder.***
	(m) Burned, warped, or pitted valves.	(m) Install new valves.***
	(n) Plugged or restricted exhaust system.	(n) Install new parts as necessary.
	(o) Faulty ignition cables.	(o) Replace any cracked or shorted cables.
	(p) Faulty coil or condenser.	(p) Test and replace as necessary.*
ENGINE MISSES ON ACCELERATION	(a) Dirty, burned, or incorrectly gapped distributor contact points.	(a) Replace points and adjust.*
	(b) Dirty, or gap too wide in spark plugs.	(b) Clean spark plugs and set gap at .035".
	(c) Incorrect ignition timing.	(c) Refer to "Ignition Timing."*
	(d) Dirt in carburetor.	(d) Clean carburetor.**
	(e) Acceleration pump in carburetor.	(e) Install new pump.**
	(f) Burned, warped or pitted valves.	(f) Install new valves.***
	(g) Faulty coil or condenser.	(g) Test and replace if necessary.*
ENGINE MISSES AT HIGH SPEED	(a) Dirty or incorrectly gapped distributor contact points.	(a) Clean or replace as necessary.*
	(b) Dirty or gap set too wide in spark plug.	(b) Clean spark plugs and set gap at .035".
	(c) Worn distributor shaft cam.	(c) Remove and repair distributor.*
	(d) Worn or burned distributor rotor.	(d) Install new rotor.

Condition	Possible Cause	Correction
	(e) Excessive play in distributor shaft.	(e) Remove and repair distributor.*
	(f) Faulty coil or condenser.	(f) Test and replace if necessary.*
	(g) Incorrect ignition timing.	(g) Refer to "Ignition Timing."*
	(h) Dirty jets in carburetor.	(h) Clean jets.**
	(i) Dirt or water in fuel line, carburetor or filter.	(i) Clean lines, carburetor and replace filter.**
NOISY VALVES	(a) High or low oil level in crankcase.	(a) Check for correct oil level.***
	(b) Thin or diluted oil.	(b) Change oil.***
	(c) Low oil pressure.	(c) Check engine oil level.***
	(d) Dirt in tappets.	(d) Clean tappets.***
	(e) Bent push rods.	(e) Install new push rods.***
	(f) Worn rocker arms.	(f) Inspect oil supply to rockers.***
	(g) Worn tappets.	(g) Install new tappets.***
	(h) Worn valve guides.	(h) Ream and install new valves with O/S stems.***
	(i) Excessive run-out of valve seats or valve faces.	(i) Grind valve seats and valves.***
CONNECTING ROD NOISE	(a) Insufficient oil supply.	(a) Check engine oil level. Inspect oil pump relief valve, damper and spring.***
	(b) Low oil pressure.	(b) Check engine oil level.***
	(c) Thin or diluted oil.	(c) Change oil to correct viscosity.
	(d) Excessive bearing clearance.	(d) Measure bearings for correct clearances or failures.***
	(e) Connecting rod journals out-of-round.	(e) Remove crankshaft and regrind journals.***
	(f) Misaligned connecting rods.	(f) Replace bent connecting rods.***
MAIN BEARING NOISE	(a) Insufficient oil supply.	(a) Check engine oil level. Inspect oil pump relief valve, damper and spring.***
	(b) Low oil pressure.	(b) Check engine oil level.***
	(c) Thin or diluted oil.	(c) Change oil to correct viscosity.
	(d) Excessive bearing clearance.	(d) Measure bearings for correct clearances or failures.***
	(e) Excessive end play.	(e) Check No. 3 main bearing for wear on flanges.***
	(f) Crankshaft journal out-of-round or worn.	(f) Remove crankshaft and regrind journals.
	(g) Loose flywheel or torque converter.	(g) Tighten to correct torque.
OIL PUMPING AT RINGS	(a) Worn, scuffed, or broken rings.	(a) Hone cylinder bores and install new rings.***
	(b) Carbon in oil ring slots.	(b) Install new rings.***
	(c) Rings fitted too tight in grooves.	(c) Remove the rings. Check grooves. If groove is not proper width, replace piston.***
OIL PRESSURE DROP	(a) Low oil level.	(a) Check engine oil level.
	(b) Faulty oil pressure sending unit.	(b) Install new sending unit.
	(c) Clogged oil filter.	(c) Install new oil filter.
	(d) Worn parts in oil pump.	(d) Replace worn parts or pump.
	(e) Thin or diluted oil.	(e) Change oil to correct viscosity.
	(f) Excessive bearing clearance.	(f) Measure bearings for correct clearance.***
	(g) Oil pump relief valve stuck.	(g) Remove valve and inspect, clean, and reinstall.
	(h) Oil pump suction tube loose, bent or cracked.	(h) Remove oil pan and install new tube if necessary.

*Refer to the "Electrical and Instruments" Group 8 for service procedures.
**Refer to the "Fuel System" Group 14 for service procedures.
***Refer to the "Engine" Group 9 for service procedures.

PART 3

EIGHT CYLINDER ENGINES

SERVICE PROCEDURES

TUNE-UP

(1) Test the battery specific gravity, add water if necessary, clean and tighten the battery connections.

(2) Test the cranking voltage if below 9.6 volts and more than 130 amperes draw see Starting Motor Cranking Voltage Electrical Section of this manual.

(3) Tighten the intake manifold bolts to 270 inch pounds torque for 273 cubic inch engine and 40 foot pounds torque for 318 cubic inch engine and 50 foot pounds torque for 361, 383 and 426 cubic inch engines.

(4) Perform the cylinder compression test. The compression should not vary more than 20 pounds between cylinders for 273, 318, 361 and (383-9:2 to 1 compression ratio and 25 pounds for (383 with 10:0 to 1) 413 or 426 cubic inch engines.

(5) Clean or replace the spark plug as necessary and adjust the gap to .035 inch. Tighten to 30 foot-pounds torque using new gaskets.

(6) Test the resistance of the spark plug cables and if the resistance is more than 30,000 ohms, replace the cable.

(7) Remove the distributor. Clean the cap and rotor using a non-flammable detergent. Inspect for carbon tracking, cracks and corrosion. Inspect the breaker plate, contacts, lead wire and vacuum advance, replace if necessary. Adjust to specifications. Test coil and condenser.

(8) Install the distributor, distributor cap, and spark plug cables. Reset the ignition timing with the vacuum advance line disconnected. The ignition timing should be set to compensate for altitudes and/or gasoline grades as follows:

A. At low altitudes, with any good grade of the recommended gasoline, either "regular" or "premium," the engine will give its best performance if timed according to specifications.

B. When using lower grade fuels, or after carbon has accumulated, objectionable spark ping may occur with the specified timing. In cases of this nature, ignition timing should be retarded, but not to exceed 5 degrees of crankshaft rotation later than specified.

C. At high altitudes or when using higher quality gasoline, for example "premium" where "regular" is specified, or "super premium" where premium is specified, there is less tendency for spark ping. In such cases, improved performance may be obtained by advancing the spark not to exceed 5 degrees of crankshaft rotation ahead of specified timing.

NOTE: It is recommended, however, that the vehicle operating at high speeds or hauling trailers have the ignition timing set at not over the specified setting.

D. Within the foregoing limits, namely, from 5 degrees ahead to 5 degrees later than specified timing, a good rule to follow is to advance the spark until a slight ping is heard when accelerating from 15 mph in direct drive at wide open throttle.

(9) Set carburetor idle mixture adjustment. Adjust

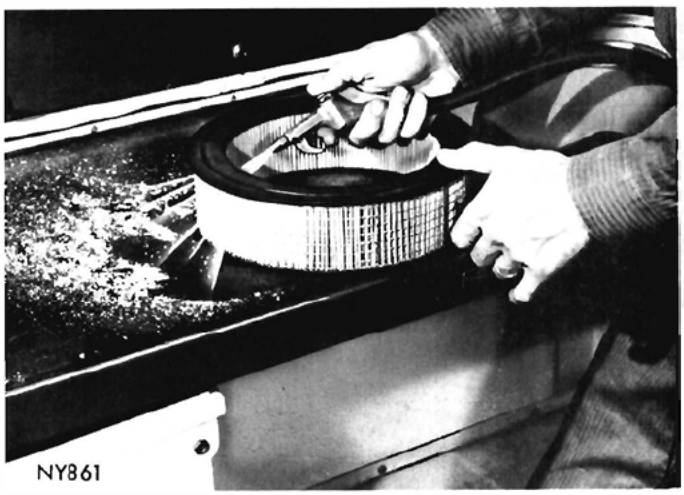

Fig. 58—Cleaning Filter Element

the throttle stop screw to specifications. Perform a combustion analysis.

(10) Test the fuel pump for pressure and vacuum. Refer to "Fuel System" Group 14, Specifications.

(11) Inspect the manifold heat control valve in the right exhaust manifold for proper operation and apply Manifold Heat Control Valve Solvent Part Number 1879318 to the bushing and shaft.

(12) Every 6 months, remove the air cleaner filter element and blow out dirt gently with air hose. Direct air from inside out, and keep nozzle 2 inches away from element to avoid damaging. Clean the metal housing and replace the element (Fig. 58). Every two years, install a new factory recommended MoPar filter element. Service the unit more frequently when driving under severe conditions, such as in dusty areas.

(13) Inspect and adjust the accessory belt drives referring to "Cooling System," Group 7, for proper adjustments.

(14) Road test the vehicle as a final test.

FRONT ENGINE MOUNTS (Figs. 59 and 60)

Removal

(1) Disconnect throttle linkage at transmission and at carburetor.

(2) Raise hood and position fan to clear radiator hose and radiator top tank.

(3) Remove torque nuts from insulator studs.

(4) Raise the engine just enough to remove front engine mount assembly.

Installation

(1) Install insulator to engine bracket and tighten to 75 foot-pounds torque.

(2) Lower the engine and install washers and prevailing torque nuts to insulator studs; tighten nuts to 75 foot-pounds torque.

(3) Connect throttle at the transmission and carburetor.

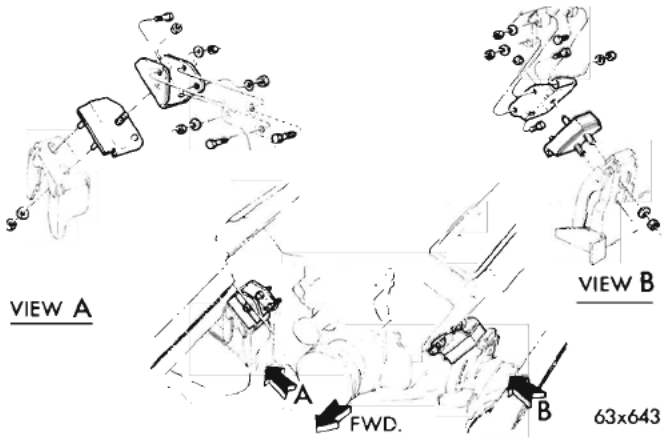

Fig. 59—Front Engine Mounts 273 Cubic Inch AR-2

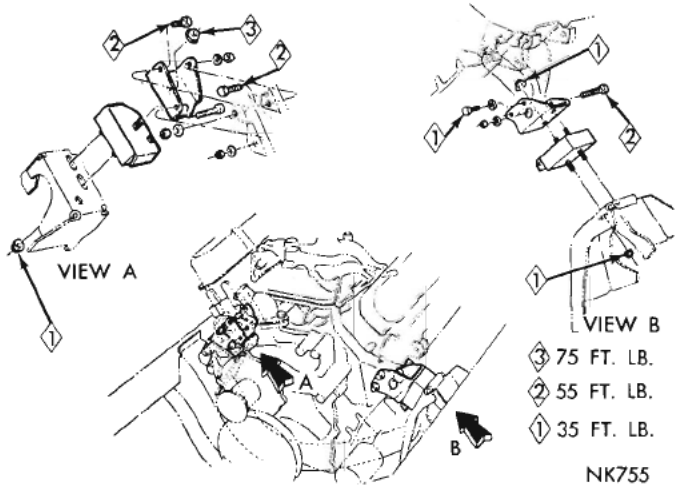

Fig. 60—Front Engine Mounts 361-383-426 AP-2

REAR ENGINE MOUNT (Fig.61)

Removal

(1) Raise the vehicle on hoist.

(2) Install the transmission jack.

(3) Remove the rear engine crossmember from frame and remove rear mount.

Installation

(1) Install the rear engine mount to crossmember and tighten nut to 150 inch-pounds torque.

(2) Install the rear crossmember to frame and tighten bolts to 75 foot-pounds torque.

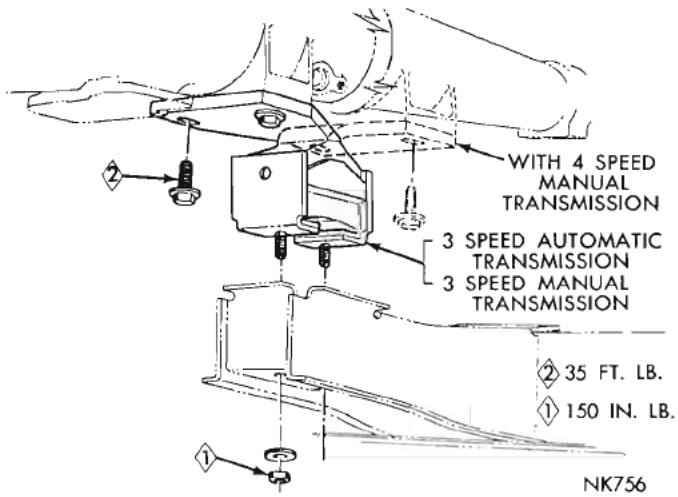

Fig. 61—Engine Rear Mount AP-1, AP-2

(3) Remove transmission jack.

(4) Install the rear engine mount to transmission bolts and tighten to 35 foot-pounds torque.

(5) Lower the vehicle.

ENGINE ASSEMBLY

Removal

(1) Scribe the outline of the hinge brackets on the hood to assure proper adjustment when installing. Remove the hood.

(2) Drain the cooling system and remove the battery.

(3) Remove all hoses, fan shroud (or air conditioned vehicles), oil cooler lines and radiator.

(4) Disconnect the fuel lines, linkage and wires attached to engine units and remove the air cleaner and carburetor.

(5) Attach the engine lifting fixture Tool C-3466 to the carburetor flange studs on the intake manifold.

(6) Raise the vehicle on a hoist and install the engine support fixture Tool C-3487 on the chassis to support the rear of the engine.

(7) Drain the transmission.

(8) Disconnect the exhaust pipes at the manifolds, propeller shaft, wires linkage, speedometer cable, and the oil cooler lines at the transmission.

(9) Remove the engine rear support crossmember and remove the transmission from the vehicle.

(10) Lower the vehicle and attach a crane or other suitable lifting tool to the fixture eyebolt.

(11) Remove the engine front mounts. Raise the engine with lifting tool and work engine out of the chassis.

(12) Place the engine in repair stand C-3167 and adapter C-3662 for disassembly using transmission mounting bolts.

Installation

(1) Attaching the engine lifting fixture Tool C-3466 to the carburetor flange studs on intake manifold.

(2) Attach a crane or other suitable lifting tool to the fixture eyebolt.

(3) Remove the engine from the repair stand and lower the engine carefully until the engine is positioned in the chassis with front engine mounts in place.

(4) Install the engine support fixture Tool C-3487 on the chassis to support the rear of the engine. Remove the crane.

(5) Raise the vehicle on a hoist, install the transmission, engine rear support crossmember, tighten front engine mounts, remove the engine support fixture, Tool C-3487.

(6) Connect the propeller shaft, wires, linkage, speedometer cable, oil cooler lines at the transmission, connect exhaust pipes to manifolds. Install the transmission filler tube.

(7) Lower the vehicle and remove the engine lifting fixture Tool C-3466 from the engine. Install the carburetor and fuel lines.

(8) Install the radiator, fan shroud, hoses, oil cooler lines and connect all wires and linkage.

(9) Install the hood using scribe marks for the proper alignment.

(10) Close all the drain cocks and fill cooling system, install battery.

(11) Fill the engine crankcase and transmission. Refer to "Lubrication" Group O, for quantities and lubricants to use. Inspect the entire system for leaks and correct as necessary.

NOTE: Whenever an engine has been rebuilt and/or a new camshaft and/or new tappets have been installed, add one quart of MoPar Engine Supplement Part Number 1879406 to engine oil to aid break-in. The oil mixture should be left in engine for a minimum of 500 miles, and drained at the next normal oil change.

(12) Start the engine and run until normal operating temperature is reached.

(13) On **273 and 318 Cubic inch engines** only adjust the tappets.

(14) Test the timing (with vacuum advance line removed) and adjust carburetor and transmission linkage as necessary. Connect vacuum lines, install air cleaner and road test the vehicle.

ROCKER ARMS AND SHAFT

Removal (318 Cubic Inch Engine)

For cleaning, inspection or installation of new parts, remove the cylinder heads from the engine on 318 Cubic Inch Engines. Refer to Cylinder Head As-

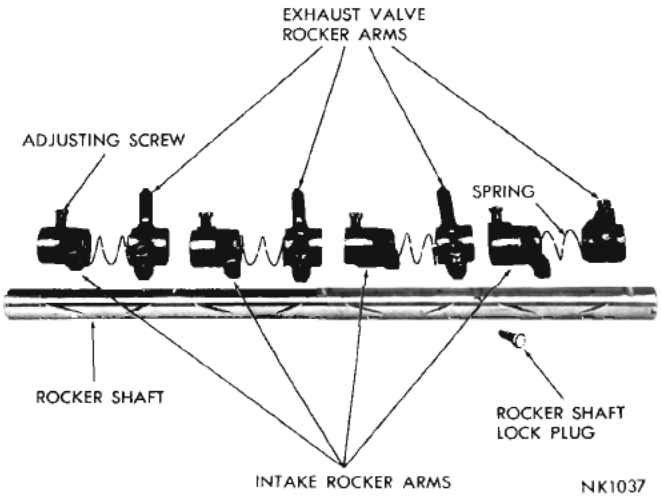

Fig. 62—Rocker Shaft Assembly (318 Cubic Inch)

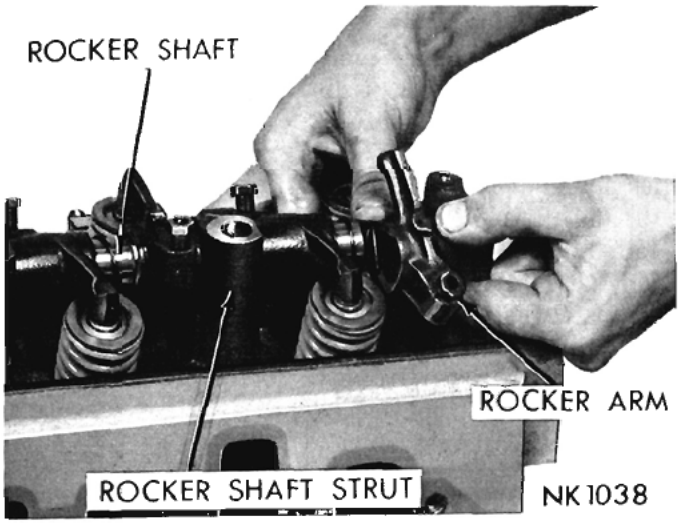

Fig. 63—Installing Rocker Arms (318 Cubic Inch)

sembly.

Remove the lock plug, slide the rocker shaft out of the rocker shaft struts disengaging the rocker arms and springs (Fig. 62).

Installation

Slide the rocker shaft into bore of strut and at the same time engage intake rocker arm (Fig. 63). Install spring and engage exhaust rocker arm. Install remainder of the rocker arms in same sequence. Make sure that head bolt holes in rocker shaft line up with head bolt holes in rocker shaft strut. In addition, the plug hole in strut must also line up with hole in rocker shaft. Tap in rocker arm shaft plug (Fig. 64). Install plugs in both ends of rocker arm shaft.

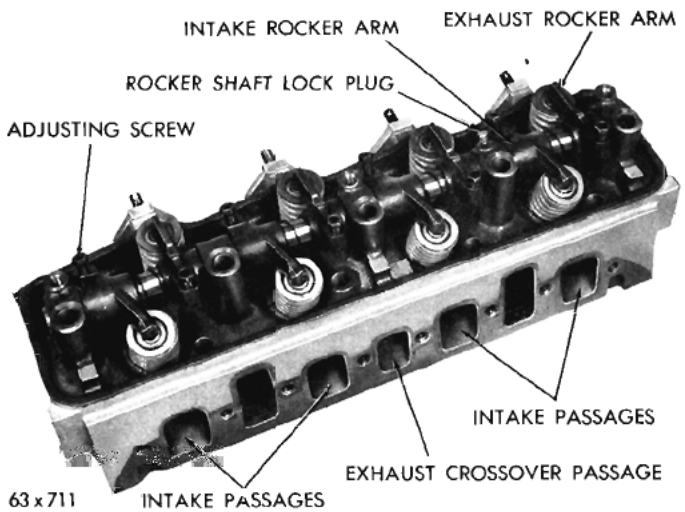

Fig. 64—Cylinder Head Assembly (318 Cubic Inch)

Fig. 65—Rocker Arm Assemblies Installed

Removal (273, 361, 383 & 426 Cubic Inch Engines)

(1) Remove the cylinder head cover and gasket.

(2) Remove the bolts that attach the rocker arm shaft to the cylinder head and remove the rocker arms and shaft as an assembly.

(3) If the rocker arm assemblies have been disassembled for cleaning, inspection, or replacement, refer to Figure 65 for proper reassembly.

Installation

(1) On 273 Cubic Inch Engine only, install the rocker arm and shaft assemblies with the "NOTCH" on the end of the rocker shaft pointing to the centerline of

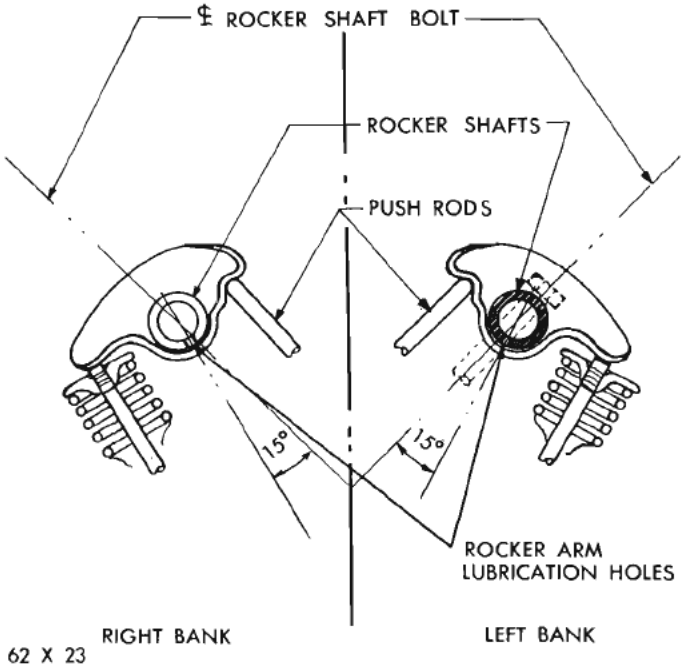

Fig. 66—Rocker Arm Lubrication Holes (361, 383 & 426 Cubic Inch)

the engine and toward the front of the engine on the left bank and to the rear of the right bank, making sure to install the long stamped steel retainers in the number two and four positions, tighten to 15 foot-pounds.

(2) On 361, 383 and 426 Cubic Inch Engines only, install the rocker shafts so that the $^{3}/_{16}$ inch diameter rocker arm lubrication holes point downward into the rocker arm, and so that the 15° angle of these holes point outward towards the valve end of the rocker arms (See Fig. 66).

NOTE: The 15° angle of the rocker arm lubrication holes is determined from the center line of the bolt holes through the shaft which are used to attach the shaft assembly to the cylinder head.

(3) Install the rocker arms and shaft assembly making sure to install the long stamped steel retainers in the number two and four positions.

NOTE: Use extreme care in tightening the bolts so that tappets have time to bleed down to their operating length. Bulged tappet bodies, bent push rods and permanent noisy operation may result if the tappets are forced down too rapidly.

(4) Tighten the bolts to 25 foot-pounds torque.

(5) On 273 and 318 Cubic Inch Engines only, start the engine and run until normal operating temperature is reached.

(6) Adjust the tappets to .013 inch for intake and .021 for exhaust.

(7) Install the valve covers with new gaskets, tighten to 40 inch pounds torque.

CYLINDER HEAD ASSEMBLY

Removal

(1) Drain the cooling system. Remove the carburetor air cleaner, fuel line, alternator and distributor vacuum line.

(2) Disconnect the throttle linkage, coil wires, heat indicator sending unit wire and heater hoses at the engine.

(3) Remove the distributor cap and the spark plug cables and the engine closed vent system.

(4) Remove the intake manifold attaching bolts and remove the manifold, carburetor and coil as an assembly.

(5) On **361, 383, and 426 Cubic inch engines** only, remove the tappet chamber cover and spark plugs located under the exhaust manifolds.

(6) Remove the cylinder head covers, closed vent system and exhaust manifolds. (All engines.)

(7) On **273, 361, 383 and 426 Cubic inch engines** only, remove the rocker arms and shaft assemblies, push rods and place them in their respective slots in holder, Tool C-3068.

(8) Remove head bolts from each cylinder head and remove cylinder heads. Place cylinder heads in holding fixture, Tool C-3626.

NOTE: The 318 Cubic Inch Engine push rods are removed with cylinder head and rocker arm assemblies.

Installation

(1) Inspect all surfaces with a straightedge if there is any reason to suspect leakage.

(2) Coat the new gaskets with Mopar Sealer Part Number 1057794.

(3) Remove the cylinder heads from the holding fixtures Tool C-3626 and install on the engine.

(4) On **273 and 318 Cubic Inch Engines,** install and tighten all head bolts starting at top center, to 85 foot-pounds using the torque sequence, as shown in Figure 67. Repeat the procedure, retightening all head bolts to 85 foot-pounds torque.

(5) On **361, 383 and 426 Cubic Inch Engines;** torque all head bolts to 70 foot-pounds torque in sequence, as shown in Figure 68. Repeat the procedure retighten

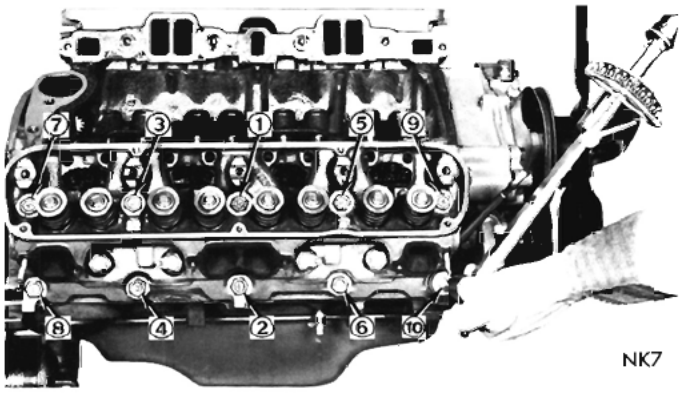

Fig. 67—Cylinder Head Tightening Sequence (273 & 318 Cubic Inch)

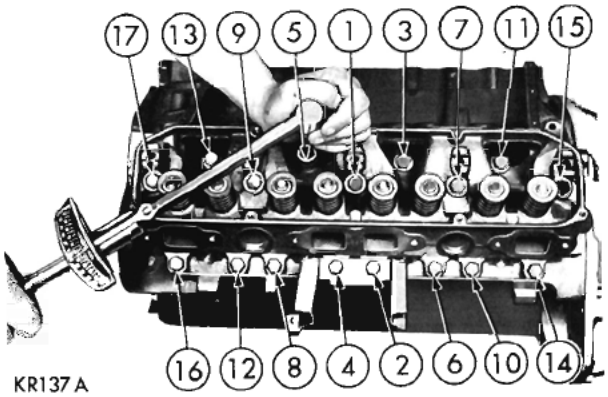

Fig. 68—Cylinder Head Tightening Sequence (361, 383 & 426 Cu. In.)

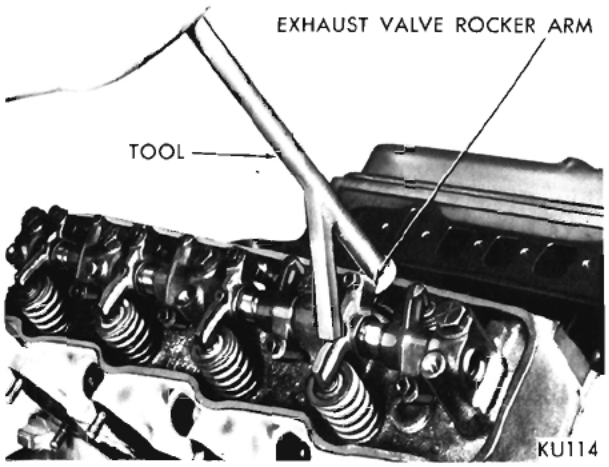

Fig. 69—Compressing Exhaust Valve Spring (Tool C-3695 318 Cu. In.)

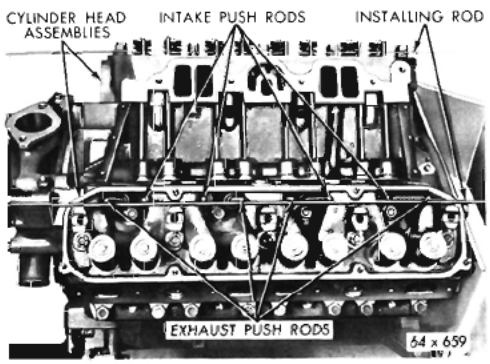

Fig. 70—Push Rods Installed (361, 383 & 426 Cubic Inch)

all head bolts to 70 foot-pounds torque.

(6) On **318 Cubic Inch Engine** only; install the push rods with the ball ends in the tappets. When using Tool C-3695 (Fig. 69), rocker arm valve spring compressor, to position large end of push rod under rocker arm, **make certain the low point of the camshaft is under the tappet.** Install new intake manifold gaskets and seals.

(7) On **273, 361, 383 and 426 Cubic Inch Engines** install the small end of the push rods in the tappets. Use alignment rod on Models 361, 383 and 426 as shown in Figure 70 to assist in aligning the push rods.

(8) Install the rocker arm and shaft assembly starting each push rod into its respective rocker arm socket making sure to install the long stamped steel retainers in the number two and four positions.

(9) On **361, 383 and 426 Cubic Inch Engines Use extreme care in tightening bolts to 25 foot-pounds torque so the tappets have time to bleed down to their operating length. Bulged tappet bodies, bent push rods, and permanently noisy operation may result if tappets are forced down too rapidly.**

a. Install tappet chamber cover and tighten end bolts to 9 foot-pounds torque.

b. Install the valve covers with new gaskets and tighten to 40 inch-pounds torque.

(10) On **273 and 318 Cubic Inch Engines** coat the intake manifold gaskets and side seals with number 1316241 sealer.

(a) On **273 Cubic Inch Engine** install the intake manifold gaskets with the bead down and the end seals locked in the tangs of the head gasket.

(b) On **318 Cubic Inch Engine** install the intake manifold gaskets with the bead down and the end seals locked in the tangs of the head gasket.

(c) Add a drop of sealer in the "V" notches of the side seals after installation.

(11) (a) On **273 Cubic Inch Engine** position the intake manifold on the engine and install the twelve attaching cap screws "Finger Tight" in the tightening sequence shown in Figure 71. Tighten the cap screws one through four to 60 inch-pounds and tighten the remaining cap screws to 60 inch-pounds, then retighten cap screws one through four to 270 inch-pounds and follow by retightening the remaining cap screws to 270 inch-pounds in the sequence shown.

(b) On **318, 361, 383 and 426 Cubic Inch Engines** install the intake manifold, tighten manifold bolts to 40 foot-pounds torque for 318 cubic inch engine and 50 foot-pounds torque for 361, 383, 413 and 426 cubic inch engines.

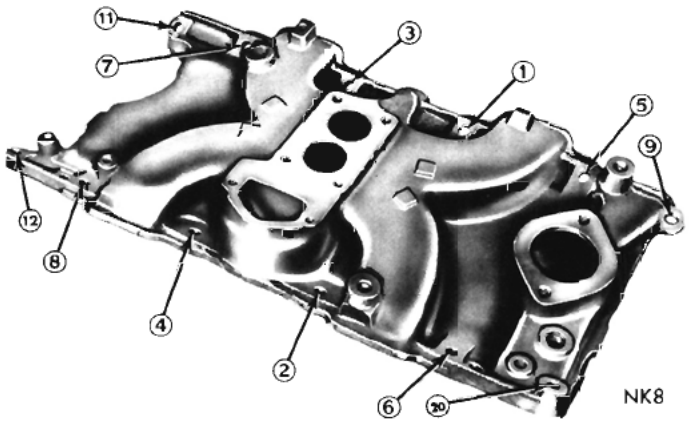

Fig. 71—Intake Manifold Tightening Sequence (273 Cubic Inch)

(11) Install the exhaust manifolds, use new gaskets on the 318 cubic inch engine, no gaskets are required for the 361, 383, 413 and 426 cubic inch engines, tighten to 30 foot-pounds torque.

(12) Install the spark plugs with new gaskets. Tighten to 30-foot-pounds torque.

(13) Install the distributor cap and spark plug cables and the engine closed vent system.

(14) Install the carburetor and the coil (if removed), throttle linkage, coil wires, heat indicator sending unit wire, and the heater hoses.

(15) Install the alternator, distributor vacuum line, fuel line, and carburetor air cleaner.

(16) Fill the cooling system. Start the engine and run until normal operating temperature is reached.

(17) On **273 and 318 Cubic Inch Engines** Adjust the tappets to .013 inch for intake and .021 inch for exhaust. Install the valve covers with new gaskets, tighten to 40 inch-pounds torque.

VALVES AND VALVE SPRINGS

NOTE: Intake and exhaust valves operate in guides that are integral with the heads.

Removal

(1) With the cylinder head removed, compress the valve springs, using Tool C-3422A, as shown in Figure 72.

(2) Remove the valve retaining locks, valve spring retainers, valve stem cup seals and valve springs.

NOTE: Remove any burrs from the valve stem lock grooves to prevent damage to the valve guides when the valves are removed.

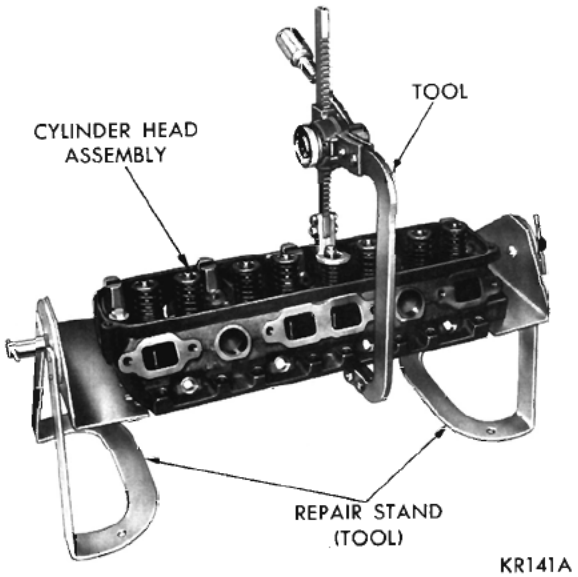

Fig. 72—Compressing Valve Spring Using Tool C-3422A (Typical)

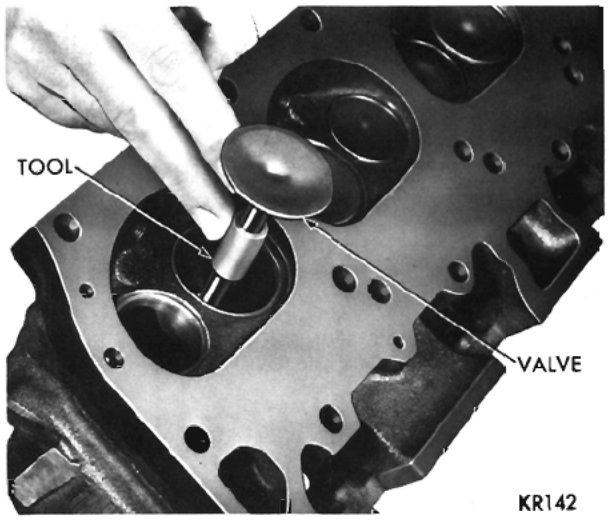

Fig. 73—Installing Tool C-3973 (Typical)

Valve Inspection

(1) Clean the valves thoroughly, and discard burned, warped and cracked valves.

(2) Measure the valve stems for wear. The new intake valve stem diameter should measure .372 to .373 inch and exhaust valve stem diameter should measure .371 to .372 inch. If the wear exceeds .002 inch, replace the valve.

(3) Remove the carbon and varnish deposits from the inside of the valve guides with cleaner, Tool C-756.

(4) Measure the valve stem guide clearance as follows: Install sleeve, Tool C-3973 over valve stem to hold valve at working height in head, as shown in Fig. 73.

(5) The special sleeve places the valve at the correct height for measuring with a dial indicator. Attach the dial indicator Tool C-3339 to cylinder head and set it at a right angle to the valve stem being measured (Fig. 74). Move valve to and from the indicator. Total movement should not exceed .016 inch on in-

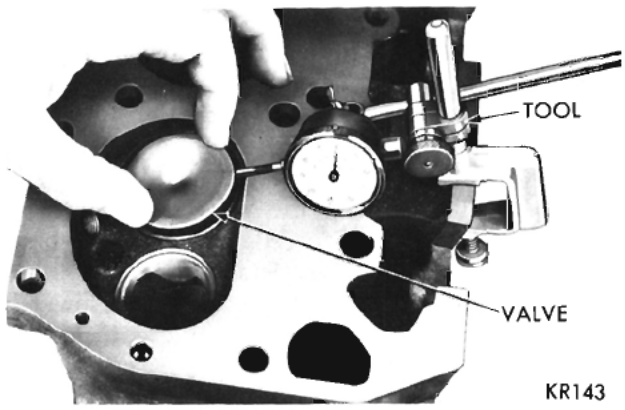

Fig. 74—Measuring Guide Wear Using Tool C-3339 (Typical)

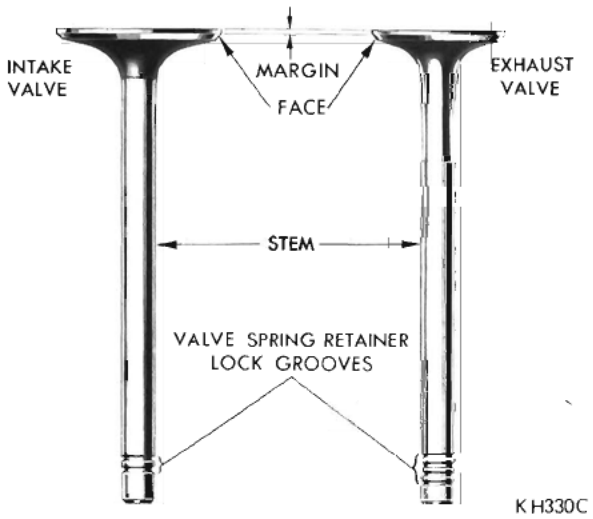

Fig. 75—Intake and Exhaust Valve Faces

take valves and .018 inch on exhaust valves for 273, 318, 361, 383, and 426 Cubic Inch Engines.

(6) If the tolerance is excessive, ream guides and install valve with oversize stems. Reamer Tool C-3433 will ream guides for .005 inch oversize valve stems. Tool C-3430 for .015 inch oversize, Tool C-3427 for .030 inch oversize. Turn reamer by hand, and clean guides thoroughly when finished. Use .005 inch reamer first and, if necessary, the .015 inch, then the .030 inch so the guides remain true in relation to the seat.

Refacing Valves and Valve Seats

The intake and exhaust valve faces have a 45° angle. Always inspect the remaining margin after the valves are refaced (Fig. 75). Valves with less than $^{3}/_{64}$ inch margin should be replaced.

(1) The angle of both valve and seat should be identical. When refacing the valve seats it is important that the correct size valve guide pilot be used for the reseating stones. A true and complete surface must be obtained.

(2) Measure the concentricity of the valve seat using dial indicator No. 13725. The total runout should not exceed .003 inch (total indicator reading).

(3) Inspect the valve seat with Prussian Blue to determine where the valve contacts the seat. To do this, coat the valve seat **lightly** with Prussian Blue then set the valve in place. Rotate the valve with light pressure. If the blue is transferred to the center of the valve face, the contact is satisfactory. If the blue is transferred to the top edge of the valve face, lower the valve seat with a 30° stone. If the blue is transferred to the bottom edge of the valve face raise the valve seat with a 60° stone.

(4) When the seat is properly positioned the width of the intake seats should be $^{1}/_{16}$ to $^{3}/_{32}$ inch. The width of the exhaust seats should be $^{3}/_{64}$ to $^{1}/_{16}$ inch.

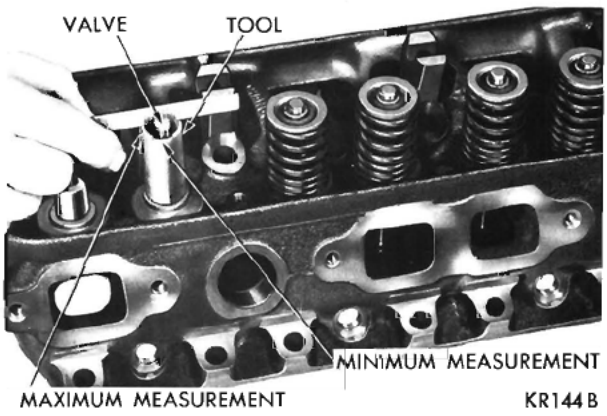

Fig. 76—Measuring Valve Stem Length (Typical)

(5) When the valves and seats are reground, the position of the valve in the cylinder head is changed, the valve stems will extend farther out of the cylinder heads. This increased dimension will decrease valve spring compression, and for 361, 383, and 426 cubic inch engines only it will shorten the operating length of the hydraulic tappet. This means that the plunger is operating closer to its bottomed position, with less clearance available for thermal expansion of the valve mechanism during high speed driving.

(6) The design of the valve mechanism includes a safety factor to allow for a limited amount of wear, and the refacing of valves and seats.

(7) To insure that the limits have not been exceeded, the dimension from valve spring seat in head to valve tip should be measured with gauge Tool C-3968 for 273 Cubic Inch Engine and gauge Tool C-3927 for 318 Cubic Inch Engine and gauge Tool C-3648 for 361, 383 and 426 Cubic Inch Engines, as shown in Figure 76.

If the valve stem extends above the gauge, grind the end of the stem to fall between the maximum and the minimum.

Testing Valve Springs

(1) Whenever the valves have been removed for inspection, reconditioning or replacement, the valve springs should be tested. To test a spring, determine the length at which the spring is to be tested. As an example, the compressed length of the spring to be tested is $1^{15}/_{32}$ inches. Turn the table of Tool C-647 until surface is in line with the $1^{15}/_{32}$ inch mark on the threaded stud and the zero mark to the front. Place spring over the stud on the table and lift the compressing lever to set the tone device. Pull on torque wrench until a ping is heard. Take the reading on torque wrench at this instant. Multiply this reading by two. This will give the spring load at the test length. Fractional measurements are indicated on the table for finer adjustments. The valve springs should test

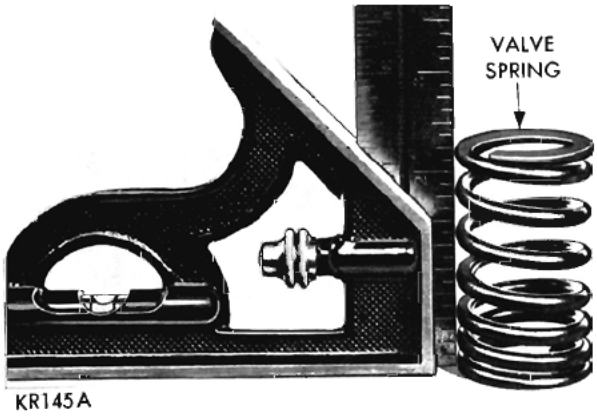

Fig. 77—Inspecting Valve Spring Squareness

49 to 57 pounds when compressed to $1^{11}/_{16}$ inches and 137 to 150 when compressed to $1^{5}/_{16}$ inches for 273 and 318 cubic inch engines. For 361, 383, and 426 cubic inch engines see specifications. Replace springs that do not meet specifications.

(2) Inspect each valve spring for squareness at both ends with a steel square and surface plate, as shown in Figure 77.

(3) If the spring is more than $^{1}/_{16}$ inch out of square, install a new spring.

Installation

(1) Coat the valve stems with lubricating oil and insert them in position in the cylinder head.

(2) Install new cup seals on the intake and exhaust valve stems and other valve guides, as shown in Figure 78 and 79 and install valve springs and retainers.

(3) Compress the valve springs with Tool C-3422A. Install locks and release tool.

NOTE: If the valves and/or seats are reground, measure the installed height of springs. Make sure measurement is taken from the bottom of the spring seat in cylinder head to the bottom surface of spring retainer. (If spacers are installed, measure from the top of spacer.) If height is greater than $1^{11}/_{16}$ inches for 273 and 318 Cubic Inch Engines or $1^{57}/_{64}$ inches for 361, 383, and 426 Cubic Inch Engines, install a $^{1}/_{16}$ inch spacer in head counterbore to bring spring height back to normal.

HYDRAULIC TAPPETS

(361, 383 and 426 Cubic Inch Engines Only)

(1) Before disassembling any part of the engine to correct tappet noise, check the oil pressure and the oil level in the oil pan. The pressure should be 45 to 65 pounds at 1000 RPM.

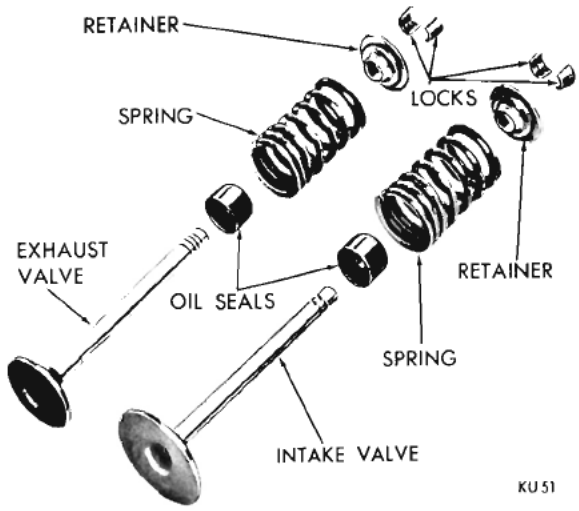

Fig. 78—Valve Assembly (Disassembled View)

(2) The oil level in the pan should never be above the "full" mark on the dipstick, or below the "add oil" mark. Either of these two conditions could be responsible for noisy tappets.

(3) **Oil Level Too High**—If the oil level is above the "full" mark on the dipstick, it is possible for the connecting rods to dip into the oil while the engine is running and create foam. Foam in the oil pan would be fed to the hydraulic tappets by the oil pump causing them to go flat and allowing the valves to seat noisily.

(4) **Oil Level too Low**—Low oil level may allow the oil pump to take in air which, when fed to tappets, causes them to lose length and allows the valves to seat noisily. Any leaks on the intake side of the pump through which air can be drawn will create the same tappet action. When the tappet noise is due to aeration, it may be intermittent or constant, and usually more

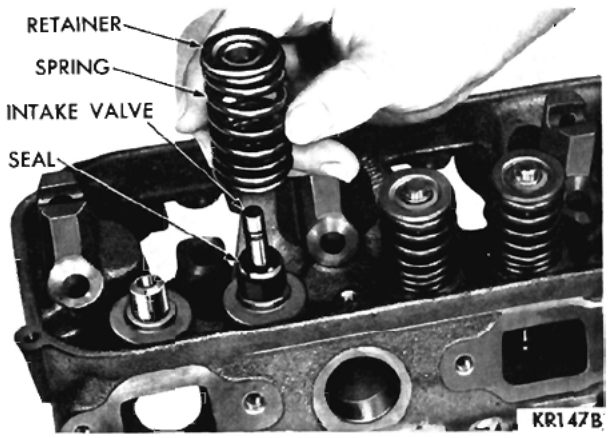

Fig. 79—Installing Valve and Cup Seals

than one tappet will be noisy. When oil level and leaks have been corrected, the engine should be operated at fast idle for sufficient time to allow all of the air inside the tappets to be bled out.

Tappet Noises

(1) To determine the source of tappet noise, operate the engine at idle with the cylinder head covers removed.

(2) Feel each valve spring or rocker arm to detect the noisy tappet. The noisy tappet will cause the affected spring and/or rocker arm to vibrate or feel rough in operation.

NOTE: Worn valve guides or cocked springs are sometimes mistaken for noisy tappets. If such is the case, noise may be dampened by applying side thrust on valve spring. Inspect rocker arm push rod sockets and push rod ends for wear. If noise is not appreciably reduced, it can be assumed the noise is in the tappet.

(3) Valve tappet noise ranges from a light noise to a heavy click. A light noise is usually caused by excessive leakdown around the unit plunger, (which will necessitate replacing tappet) or by the plunger partially sticking in the tappet body cylinder. A heavy click is caused either by a tappet check valve not seating, or by foreign particles becoming wedged between the plunger and tappet body, causing plunger to stick in the down position. This heavy click will be accompanied by excessive clearance between the valve stem and the rocker arm as the valve closes. In either case, the tappet assembly should be removed for inspection and cleaning.

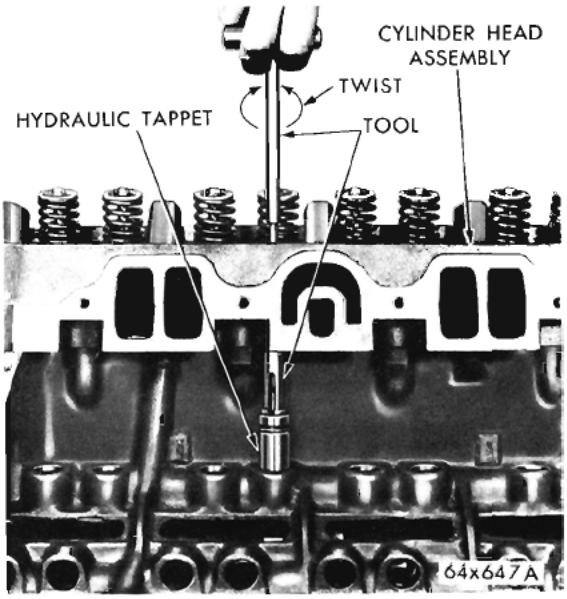

Fig. 80—Removing Tappet Using Tool C-3661

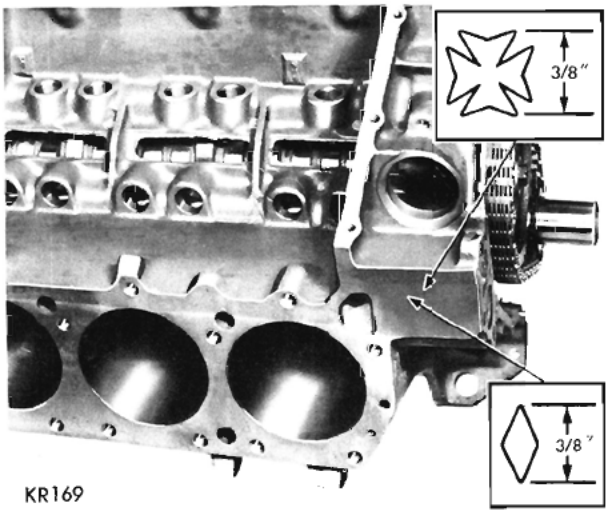

Fig. 81—Showing Location of External Numbering Pad (361, 383 & 426 Cubic Inch)

Removal of Tappets

(1) Tappets can be removed without removing the intake manifold or cylinder heads by following this recommended procedure: Remove the cylinder head covers.

(2) Remove the rocker arms and shaft assembly.

(3) Remove the push rods and place them in their respective holes in Tool C-3068.

(4) Slide the puller Tool C-3661 through the push rod opening in the cylinder head and seat the tool firmly in the head of the tappet.

(5) Pull the tappet out of the bore with a twisting motion, as shown in Figure 80.

If all tappets are to be removed, remove the hydraulic tappets and place them in their respective holes in tappet and push rod holder, Tool C-3068. This will insure installation of the tappets in their original location. If there is a diamond shaped mark-

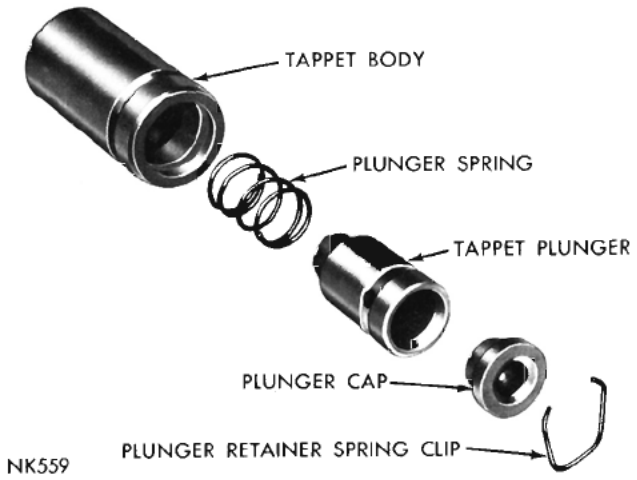

Fig. 82—Hydraulic Tappet Assembly (Disassembled View)

ing stamped on the engine numbering pad it indicates that some tappet bodies are .008 inch oversize. (See Fig. 81.)

CAUTION: Do not disassemble a tappet on a dirty work bench. The plunger and tappet bodies are not interchangeable. The plunger and valve must always be fitted to the original body. It is advisable to work on one tappet at a time to avoid mixing of parts.

Disassembly (Fig. 82)

(1) Pry out the plunger retainer spring clip.

(2) Clean the varnish deposits from the inside of tappet body above the plunger gap.

(3) Invert the tappet body and remove the plunger cap, plunger, flat check valve, check valve spring, check valve retainer and plunger spring.

(4) Separate the plunger, check valve retainer, check valve spring. Place all parts in their respective place in the tappet holder, Tool C-3068.

Cleaning and Assembly

(1) Clean all tappet parts in a solvent that will remove all varnish and carbon.

(2) Replace the tappets that are unfit for further service.

(3) Assemble the tappets, as shown in Figure 82.

Inspection

(1) If the tappet or bore in cylinder block is scored, scuffed, or shows signs of sticking, ream the bore to the next oversize, using Tool C-3028.

(2) If plunger shows signs of scoring or wear and valve is pitted, or if the valve seat on the end of the plunger indicates any condition that would prevent the valve from seating, install a new tappet assembly.

Testing

(1) Fill a pan with clean kerosene.

(2) Remove the cap from the plunger and completely submerge the tappet in an upright position.

(3) Allow the tappet to fill with kerosene, remove the tappet, and replace the cap.

(4) Hold the tappet in an upright position and insert the lower jaw of pliers, Tool C-3160, in the groove of the tappet body (Fig. 83).

(5) Engage the jaw of the pliers with the top of the tappet plunger. Test the leakdown by compressing the pliers. If plunger collapses almost instantly as pressure is applied, disassemble the tappet, clean and test again.

(6) If the tappet still does not operate satisfactorily after cleaning, install a new tappet assembly.

Installation

(1) Lubricate the tappets.

(2) Install the tappets and push rods in their original positions.

(3) Install the rocker arm and shaft assembly.

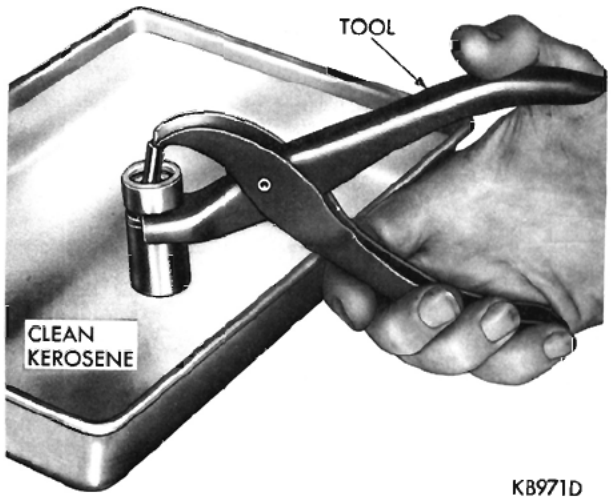

Fig. 83—Testing Tappet Using Tool C-3160

(4) Start and operate the engine. To prevent damage to valve mechanism, the engine must not be run above fast idle until all of hydraulic tappets have filled with oil and have become quiet. Warm up to normal operating temperature.

TESTING THE VALVE TIMING (All Engines)

(1) Turn the crankshaft until the No. 6 exhaust valve is closing and the No. 6 intake valve is opening.

(2) For 273 and 318 cubic inch engines, turn the NO. 1 intake valve adjusting screw in one complete turn. (Second valve on the left bank.)

(3) For 361, 383 and 426 cubic inch engines, insert a ¼ inch spacer between the rocker arm pad and the stem tip of the NO. 1 intake valve (second valve on the left bank). Allow the spring load to bleed the tappet down giving in effect a solid tappet.

(4) Install a dial indicator so that the plunger contacts the valve spring retainer as nearly perpendicular as possible. Zero the indicator.

(5) Turn the crankshaft clockwise (normal running direction) until intake valve has lifted .028 inches for 273 cubic inch engine or .041 inches for 318 cubic inch engine or .013 inches for 361 and 383 cubic inch engines with 2 barrel Carburetor or .034 inch for 361, 383, and 426 cubic inch engines with 4 barrel carburetor.

CAUTION: Do not turn crankshaft any further clockwise as the valve spring might bottom and result in serious damage.

The timing on the timing indicator, located on the chain cover, should read from 10 degrees BTDC to 2 degrees ATDC. If the reading is not within the specified limits: Inspect the timing sprocket index marks,

inspect the timing chain for wear, and check the accuracy of the "0" mark on the timing indicator. Turn the crankshaft counter-clockwise until the valve is closed and remove the indicator and readjust lash for 273 and 318 cubic inch engines or remove the spacer on the 361, 383, and 426 cubic inch engines.

TIMING SPROCKETS AND CHAIN

Removal

(1) Drain the cooling system and remove the radiator and water pump assembly.

(2) Remove the bolt holding the vibration damper on the crankshaft.

(3) Remove two of the pulley bolts, install Tool C-3688 and pull the damper assembly off the end of crankshaft, as shown in Figure 84.

(4) On the 273 and 318 cubic inch engines remove the fuel line and fuel pump.

(5) Remove the chain case cover and gasket, using extreme caution to avoid damaging the oil pan gasket. It is normal to find particles of neoprene collected between the crankshaft seal retainer and the crankshaft oil slinger.

(6) Slide the crankshaft oil slinger off the end of the crankshaft.

(7) Remove the camshaft sprocket attaching bolt.

(8) Remove the timing chain with the crankshaft and camshaft sprockets.

Installing Timing Chain

On 273 and 318 cubic inch engines when installing the timing chain, use Tool C-3509 to prevent the camshaft from contacting the welch plug in the rear of the engine block. Remove the distributor and the oil pump-distributor drive gear. Locate tool against rear side of cam gear and attach the tool with distributor retainer plate bolt (Fig. 85). The tool should remain installed until the camshaft and crankshaft sprockets and timing chain have been installed.

On 361, 383 and 426 Cubic Inch Engines modify

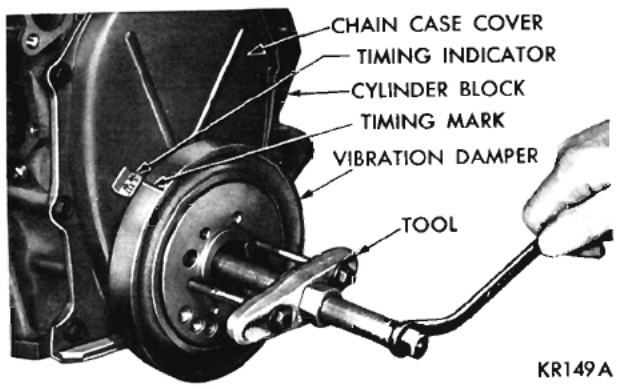

Fig. 84—Removing Vibration Damper Assembly Using Tool C-3688

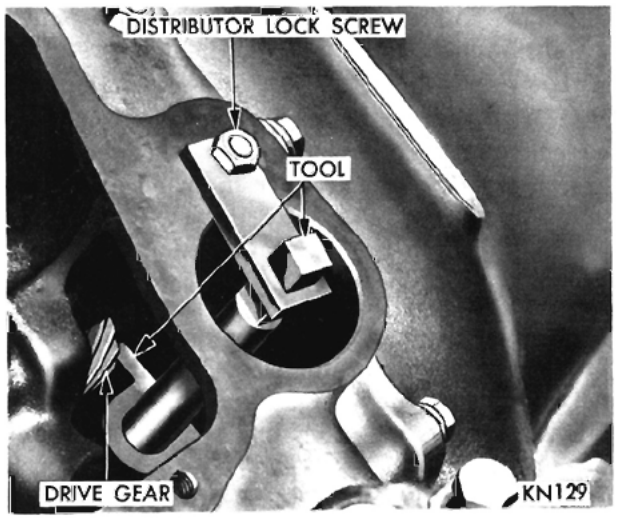

Fig. 85—Camshaft Holding Tool C-3509 (273 & 318 Cubic Inch)

Tool C-3509 by grinding off the index lug holding the upper arm on the tool and rotate the arm 180°. Install Tool C-3509 in place of distributor drive gear and shaft, shown in Figure 86, and attach the tool with the distributor retainer plate bolt.

(1) Place both the camshaft sprocket and crankshaft sprocket on the bench with the timing marks on the exact imaginary center line through both camshaft and crankshaft bores.

(2) Place the timing chain around both sprockets.

(3) Turn the crankshaft and camshaft to line up with the keyway location in crankshaft sprocket and the dowel holes in the camshaft sprocket.

(4) Lift the sprockets and chain (keep sprockets tight against the chain in position as described).

(5) Slide both sprockets evenly over their respective shafts.

(6) Use a straightedge to check the alignment of the timing marks (Fig. 87).

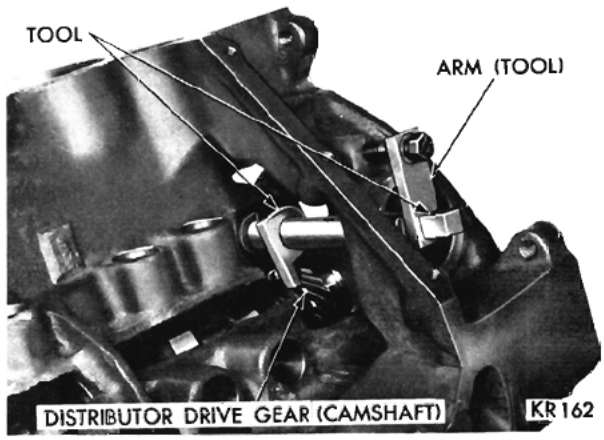

Fig. 86—Camshaft Holding Tool C-3509 (361, 383 & 426 Cubic Inch)

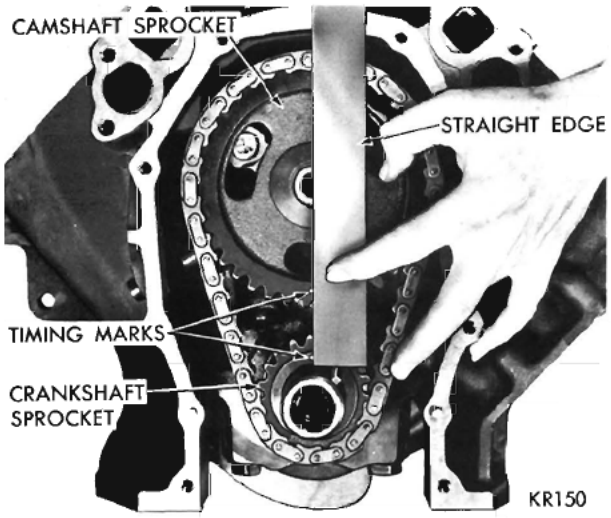

Fig. 87—Inspecting Alignment of Timing Marks Using a Straight Edge (Typical)

(7) Install the washer and camshaft sprocket bolt and tighten to 35 foot-pounds torque.

Testing Timing Chain for Stretch

(1) Place a scale next to the timing chain so that any movement of the chain may be measured.

(2) Place a torque wrench and socket over the camshaft sprocket attaching bolt and apply torque in the direction of crankshaft rotation to take up the slack; 30 foot-pounds torque (with cylinder head installed) or 15 foot-pounds torque (cylinder heads removed).

(3) Holding a scale with dimensional reading even with the edge of a chain link, apply torque in the reverse direction 30 foot-pounds (with cylinder heads installed) or 15 foot-pounds (cylinder heads removed), and note the amount of chain movement, as shown in Figure 88.

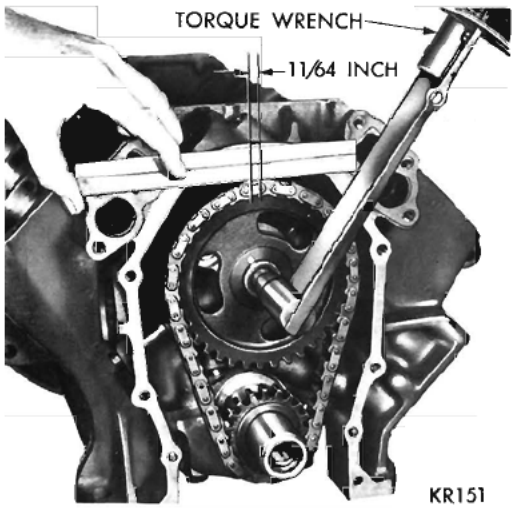

Fig. 88—Measuring Chain Stretch (Typical)

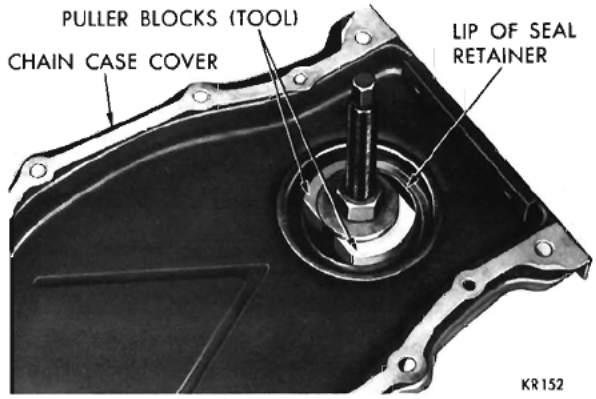

Fig. 89—Puller Blocks Expanded to Puller Position Using Tool C-3506

(4) Install a new timing chain, if its movement exceeds $^{3}/_{16}$ inch for the 273 and 318 cubic inch engines and $^{11}/_{64}$ inch for the 361, 383 and 426 cubic inch engines.

NOTE: With a torque applied to the camshaft sprocket bolt, the crankshaft should not be permitted to move. It may be necessary to block the crankshaft to prevent rotation.

(5) If the chain is satisfactory, slide the crankshaft oil slinger over the shaft and up against the sprocket (flange away from sprocket).

TIMING CHAIN CASE COVER OIL SEAL REPLACEMENT

Removal

(1) Position the puller screw of Tool C-3506 through case cover, the inside of case cover up. Position the puller blocks directly opposite each other, and force the angular lip between the neoprene and flange of the seal retainer.

(2) Place the tool washer and nut on puller screw. Tighten the nut as tight as possible by hand, forcing

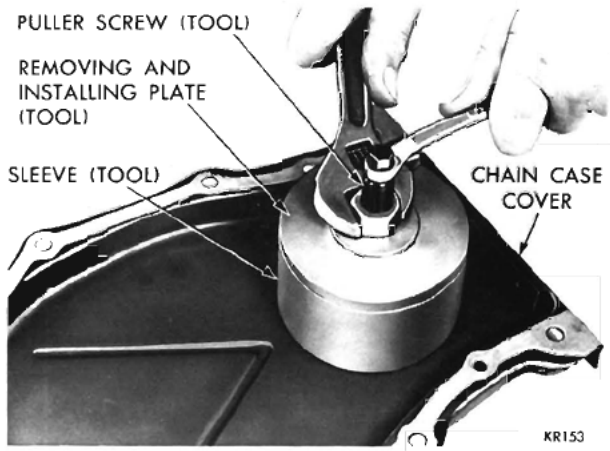

Fig. 90—Removing Oil Seal Tool C-3506

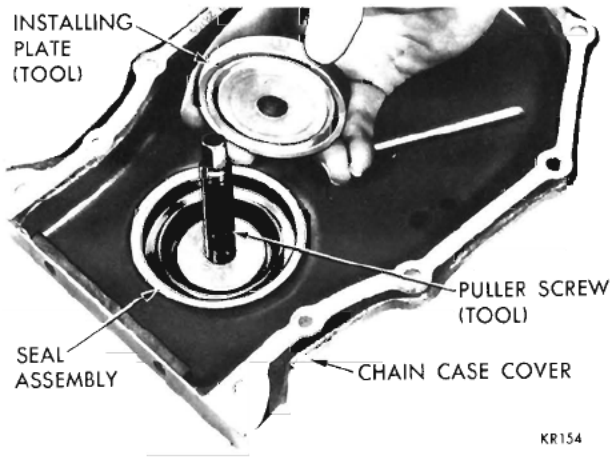

Fig. 91—Positioning Installer Plate on New Seal Tool C-3506

the blocks into the gap to a point of distorting the seal retainer lip (Fig. 89). This is important (puller is only positioned at this point).

(3) Place the sleeve over the retainer and place removing and installing plate into sleeve.

(4) Place the flat washer and nut on puller screw. Hold the center screw and tighten the lock nut to remove the seal (Fig. 90).

Installation of Oil Seal

(1) Insert the puller screw through the removing and installing plate so that the thin shoulder will be facing up.

(2) Insert the puller screw with plate through the seal opening (inside of chain case cover facing up).

(3) Place the seal in the cover opening, with neoprene down. Place the seal installing plate into the new seal, with protective recess toward lip of seal retainer (Fig. 91).

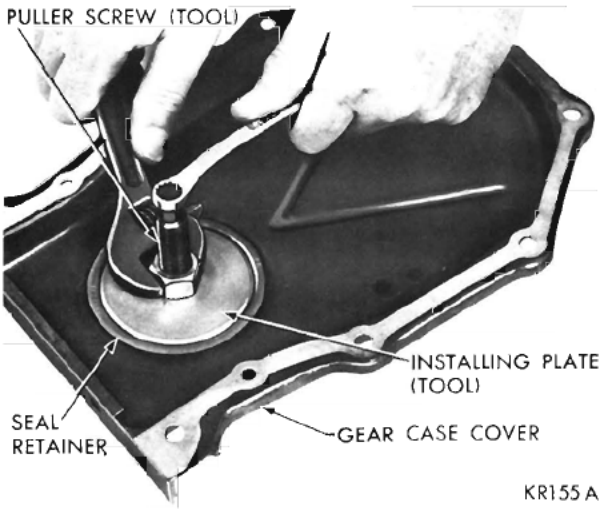

Fig. 92—Installing New Seal Tool C-3506

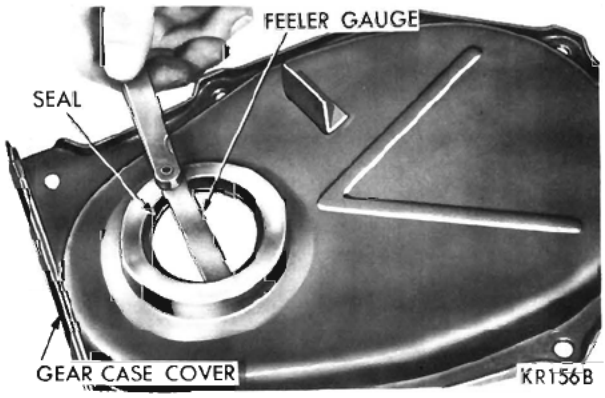

Fig. 93—Measuring Seal for Proper Seating

NOTE: Lip of the neoprene seal must be toward the source of oil.

(4) Install the flat washer and nut on puller screw, hold screw and tighten the nut (Fig. 92).

(5) The seal is properly installed when neoprene is tight against the face of the cover. Try to insert a .0015 feeler gauge between the neoprene and the cover (Fig. 93). If this seal is installed properly, the feeler gauge cannot be inserted. It is normal to find particles of neoprene collected between the seal retainer and crankshaft oil slinger after the seal has been in operation.

Installing Chain Case Cover

(1) Be sure the mating surfaces of the chain case cover and cylinder block are clean and free from burrs.

(2) Using a new gasket slide the chain case cover over the locating dowels and tighten bolts to 15 foot-pounds torque. Use extreme caution to avoid damaging the oil pan gasket.

(3) On 273 and 318 Cubic Inch Engines, install the fuel pump lines and fuel pump.

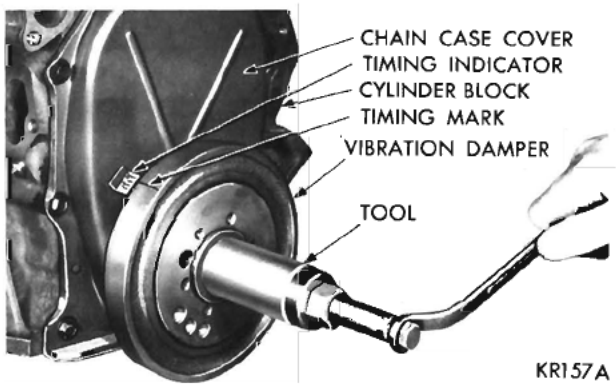

Fig. 94—Installing Vibration Damper Assembly Tool C-3688

(4) Install the water pump and housing assembly using new gaskets. Tighten bolts to 30 foot-pounds torque.

Installing Vibration Damper

(1) Install the hub on the crankshaft.

(2) Place the installing tool, part of puller set Tool C-3688 in position and press the damper hub on the crankshaft (Fig. 94).

(3) Slide the pulley over the shaft and attach with bolts and lockwashers.

(4) Tighten the bolts to 15 foot-pounds torque.

(5) Install damper hub retainer washer and bolt. Tighten to 135 foot-pounds torque.

(6) Install radiator, fan and belt, hoses and close the drains.

(7) Fill the cooling system.

CAMSHAFT

Removal

The camshaft thrust is forward with the 273 and 318 Cubic Inch Engines, and a thrust plate is used to control the .002 to .006 inch end play. The 361, 383 and 426 Cubic Inch Engines camshaft thrust is rearward only. Thrust is taken by the rear face of the cast iron camshaft sprocket hub, bearing directly on the front face of the cylinder block, eliminating the need for a thrust plate.

(1) With the tappets and timing sprockets removed, remove the distributor and lift out the oil pump and the distributor drive shaft.

(2) On 361, 383 and 426 Cubic Inch Engines, remove the fuel pump to allow the push rod to drop away from the cam eccentric.

(3) Install a long bolt into the front of the camshaft to facilitate the removal of the camshaft; remove the camshaft being careful not to damage the cam bearings with the cam lobes.

Installation

(1) Lubricate the camshaft lobes and camshaft bearing journals and insert the camshaft to within ½ inch of its final position in the cylinder block.

(2) Install Tool C-3509 as described in paragraph "Timing Chain and Sprocket."

(3) Push the camshaft into the final position.

(4) Keep the tool in place until the sprockets and the chain have been installed. Complete installation as described in Paragraph "Timing Chain and Sprockets."

NOTE: Whenever an engine has been rebuilt and a new camshaft and/or new tappets have been installed, one quart of factory recommended oil additive should be added to the engine oil to aid in break-in. The oil mixture should be left in the engine for a minimum of 500 miles. Drain the oil mixture at the next normal oil change.

NOTE: Whenever the camshaft is replaced, all of the tappet faces must be inspected for crown with a straightedge. If any negative (crown dish) is observed, the tappet must be replaced.

CAMSHAFT BEARINGS
(Engine Removed from Vehicle)

Removal

(1) With the engine completely disassembled, drive out the rear cam bearing welch plug.

(2) Install the proper size adapters and horse shoe washers (part of Tool C-3132A) at the back of each bearing shell to be removed and drive out the bearing shells.

Installation

(1) Install the new camshaft bearings with Tool C-3132A by sliding the new camshaft bearing shell over the proper adapter.

(2) Position the bearing in the tool. Install the horse shoe lock and by reversing the removal procedure, carefully drive bearing shell into place, as shown in Figure 95.

(3) Install the remaining shells in like manner.

NOTE: Install the NO. 1 camshaft bearing $^1/_{32}$" inward from the front face of the cylinder block.

The oil holes in the camshaft bearings and cylinder block must be in exact alignment to insure proper lubrication (Fig. 95).

Camshaft bearing index can be inspected after installation by inserting a pencil flashlight in the bearing shell. The camshaft bearing oil hole should be perfectly aligned with the drilled oil passage from the main bearing. Also the Number 4 bearing must index with the two oil passages to the cylinder heads. If the camshaft bearing shell oil holes are not in exact alignment, remove and reinstall them correctly. Apply Mo-Par Sealer to the plug and use Tool C-897 to install a new core hole plug at the rear of camshaft. Be sure this plug does not leak.

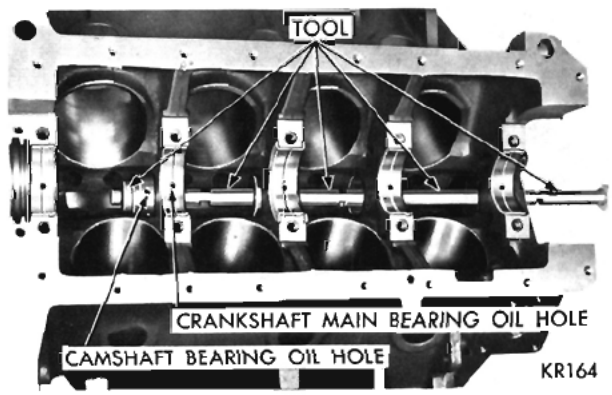

Fig. 95—Removing Camshaft Bearing Using Tool C-3132A

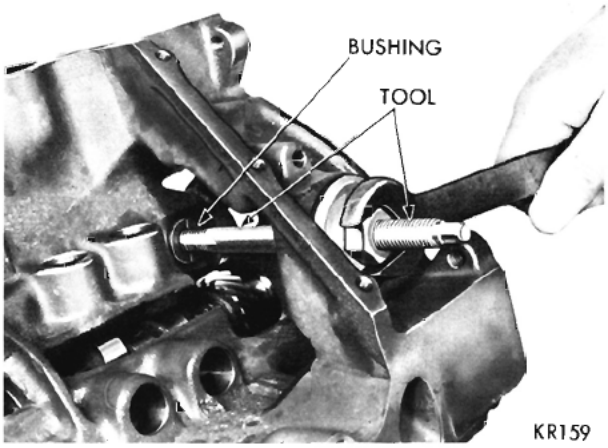

Fig. 96—Removing Distributor Drive Shaft Bushing Using Tool C-3052

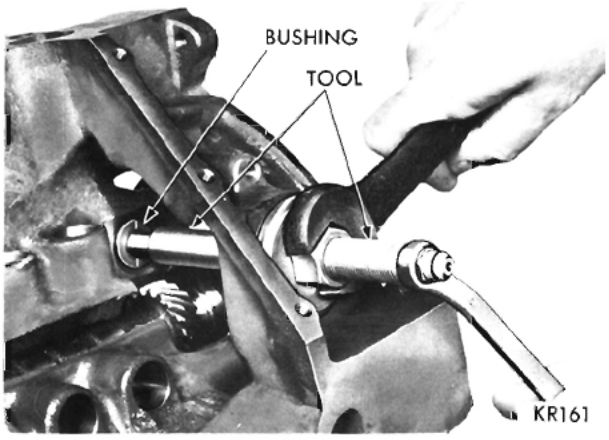

Fig. 98—Burnishing Distributor Drive Shaft Bushing Using Tool C-3053

DISTRIBUTOR DRIVE SHAFT BUSHING

Removal

(1) Insert Tool C-3052 into the old bushing and thread down until a tight fit is obtained (Fig. 96).

(2) Hold the puller screw and tighten puller nut until the bushing is removed.

Installation

(1) Slide a new bushing over the burnishing end of Tool C-3053 and insert the tool bushing into the bore, as shown in Figure 97.

(2) Drive the bushing and tool into position, using a soft hammer.

(3) As the burnisher is pulled through the bushing by tightening the puller nut, the bushing is expanded tight in the block and burnished to correct size, as shown in Figure 98. **DO NOT REAM THIS BUSHING.**

Distributor Timing

Before installing the distributor and oil pump drive shaft, time the engine as follows:

(1) Rotate the crankshaft until the NO. 1 cylinder is at top dead center on the firing stroke.

(2) When in this position, the straight line on the vibration damper should be under ("0") on the timing indicator.

(3) Coat the shaft and drive gear with engine oil. Install the distributor drive gear so when the gear spirals into place on the camshaft, the slot in the top of the distributor drive gear should be pointing to the first intake manifold bolt on the left side of engine (Fig. 99) for the 273 and 318 cubic inch engines and parallel with the centerline of the crankshaft, as shown in (Fig. 100) for the 361, 383, and 426 cubic inch engines.

Installation of Distributor

(1) On 273 and 318 Cubic Inch Engines, hold the distributor over the mounting pad on the cylinder block with the vacuum chamber pointing to number 8 spark plug.

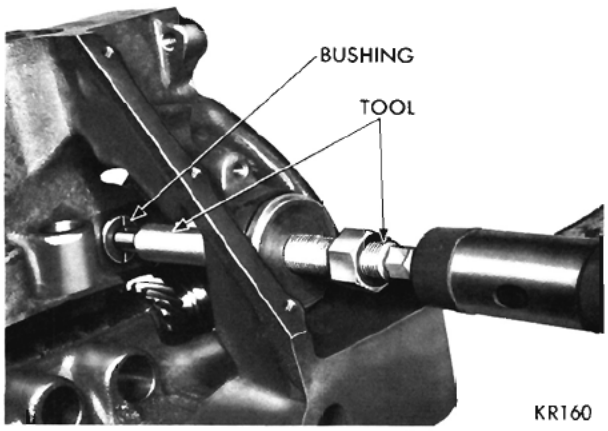

Fig. 97—Installing Distributor Drive Shaft Bushing Using Tool C-3053

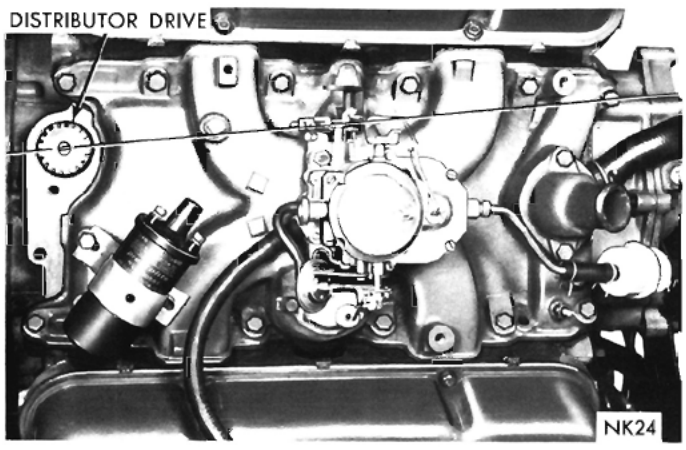

Fig. 99—Position of Distributor Drive Shaft (273 & 318 Cu. In.)

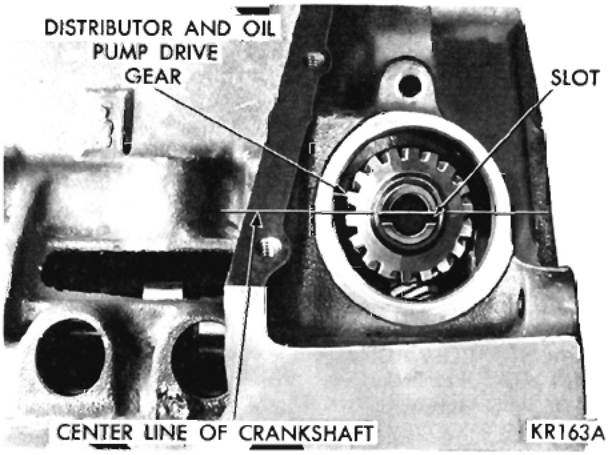

Fig. 100—Distributor Drive Gear Installed (361, 383 & 426 Cu. In.)

(2) On the 361, 383 and 426 Cubic Inch Engines, hold the distributor over the mounting pad on the cylinder block with the vacuum chamber pointing toward the center of the engine.

(3) Turn the rotor until it points to the approximate location of the NO. 1 tower terminal in the distributor cap.

(4) Place the distributor gasket in position.

(5) Lower the distributor and engage the shaft in the slot of the distributor drive shaft gear.

(6) Turn the distributor counter-clockwise for 273 and 318 cubic inch engine and clockwise for 361, 383 and 426 cubic inch engine until the breaker contacts are just separating, and install hold down clamp.

CYLINDER BLOCK

Cleaning and Inspection

(1) With the engine in repair stand C-3167 and the cylinder heads, oil pan and timing chain removed clean the cylinder block thoroughly. Inspect all core plugs for evidence of leaking.

(2) If new core plugs are installed coat the edges of the plug and core hole with MoPar Sealer and drive the plugs in place with a suitable driver.

(3) Examine the block for cracks or fractures.

(4) Remove the top ridge of the cylinder bores with a reliable ridge reamer before removing the pistons from the cylinder block. Be sure to keep the tops of the pistons covered during this operation.

NOTE: Pistons and connecting rods must be removed from the top of the cylinder block. When removing the piston and connecting rod assemblies from the engine, rotate crankshaft so each connecting rod is centered in the cylinder bore.

(5) Remove the oil strainer and tube. On 273 and 318 cubic inch engines, remove with the oil pump.

(6) Mark all bearing caps as necessary for proper location.

(7) Remove the connecting rod cap.

(8) Install Tool C-3221 on one connecting rod bolt and protector over the other bolt and push each piston and rod assembly out of the cylinder bore.

(9) After removal, install the bearing cap on the mating rod.

Cylinder Bore Inspection

The cylinder walls should be measured for out-of-round and taper with Tool C-119. If the cylinder bores show more than .005" out-of-round, or a taper of more than .010" or if the cylinder walls are badly scuffed or scored, the cylinder block should be rebored and honed, and new pistons and rings fitted. Whatever type of boring equipment is used, boring and honing operation should be closely coordinated with the fitting of pistons and rings in order that specified clearances may be maintained.

Honing Cylinder Bores

Before honing, stuff plenty of clean rags under the bores, over the crankshaft to keep the abrasive materials from entering the crankcase area.

(1) Use carefully, the cylinder bore resizing hone Tool C-823, equipped with 220 grit stones, is the best tool for this job. In addition to deglazing, it will reduce taper and out-of-round as well as removing light scuffing, scoring or scratches. Uusually a few strokes will clean up a bore and maintain the required limits.

Fig. 101—Cross-Hatch Pattern

(2) Deglazing of the cylinder walls may be done using a cylinder surfacing hone, Tool C-3501, equipped with 280 grit stones (Tool C-3501-3810). If the cylinder bore is straight and round, 20-60 strokes depending on the bore condition will be sufficient to provide a satisfactory surface. Inspect cylinder walls after each 20 strokes. Use honing oil C-3501-3880 or a light honing oil available from major oil distributors. Do not use engine or transmission oil, mineral spirits or kerosene.

(3) Honing should be done by moving the hone up and down fast enough to get a cross-hatch pattern. When hone marks intersect at 60°, the cross hatch angle is most satisfactory for proper seating of rings (See Figure 101).

(4) After honing, it is necessary that the block be cleaned again to remove all traces of abrasives.

CAUTION: Be sure all abrasives are removed from engine parts after honing. It is recommended that a solution of soap and water be used with a brush and the parts then thoroughly dried. The bore can be considered clean when it can be wiped clean with a white cloth and cloth remains clean. Oil bores after cleaning to prevent rusting.

PISTON AND RINGS

The pistons are cam ground so that the diameter at the pin boss is less than its diameter across the thrust face. This allows for expansion under normal operating conditions. Under operating temperatures, expansion forces the pin bosses away from each other, thus, causing the piston to assume a more nearly round shape. It is important that pistons be checked for taper and elliptical shape before they are fitted into the cylinder bore (See Figs. 102 and 103).

Finished Pistons

All pistons are machined to the same weight in grams, regardless of oversize to maintain piston balance. For cylinder bores which have been honed or rebored, pistons are available in standard and the following oversizes: .005, .020, .040 inch.

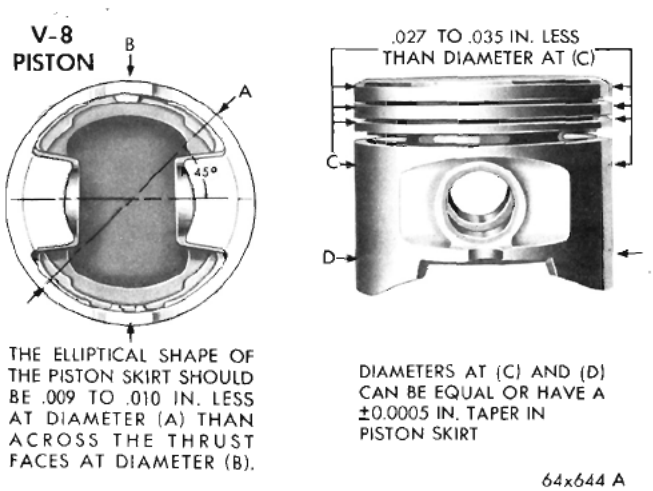

Fig. 102—Piston Measurements (273 & 318 Cubic Inch)

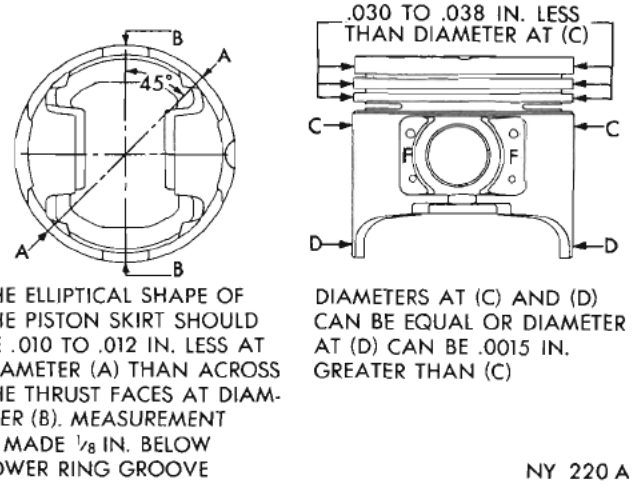

Fig. 103—Piston Measurements (361,383 & 426 Cubic Inch)

273 and 318 Cubic Inch Engine

Fitting Pistons

Piston fitting should be done at normal room temperature, 70°. Use a spring scale and a strip of ½ inch wide feeler stock .0015 inch thickness. The feeler stock should be long enough to extend into the cylinder bore to the full length of the piston travel. **The cylinder bore and piston must be clean.**

(1) Coat the cylinder bore lightly with SAE 10W engine oil. Insert the piston in the bore upside down with the feeler stock between the thrust face of the piston and the cylinder wall.

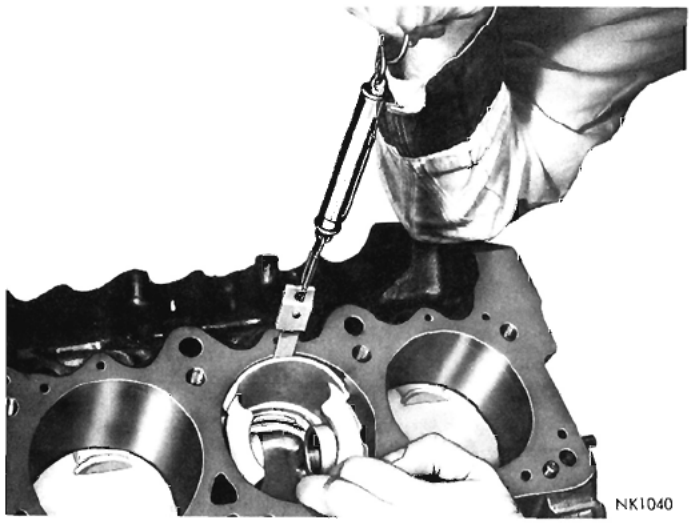

Fig. 104—Fitting Piston in Cylinder Bore (273-318 Cubic Inch)

(2) Hold the piston and draw the feeler stock straight out, with the spring scale Tool C-690 as shown in Figure 104. The amount of pull required should be from 5 to 10 pounds.

361, 383 & 426 Cubic Inch Engines

Fitting Pistons

The piston and cylinder wall must be clean and dry. The specified clearance between the piston at the top of the skirt and the cylinder wall is .0005 to .0015 inch.

The piston diameter should be measured at the top of the skirt 90° to the piston pin axis. The cylinder bores on used engines should be measured halfway down the cylinder bore and 90° to the engine crankshaft center line. **Pistons and cylinder bores should be measured at normal room temperature 70°F.**

All service pistons include the pin, and are available in standard and the following oversizes: .005, .020, and .040 inch.

Piston Rings

(1) Measure the piston ring gap about 2 inches from the bottom of the cylinder bore in which it is to be used. (An inverted piston can be used to push the rings down into position. This will insure the rings being exactly square with the cylinder wall before measuring.)

(2) Insert the feeler stock in the gap. For 273 and 318 Cubic Inch Engine, the ring gap should be from .010 inch to .047 inch for the compression rings and .015 inch to .062 inch for the oil ring steel rails in standard size bores (for new service rings). For 361, 383 and 426 Cubic Inch Engines, the ring gap should be between .013 to .052 inch for the compression rings and .015 to .062 inch for the oil ring steel rails in standard size bores (for new service rings). All engines, maximum gap in .005 inch O/S bores should be .060 inch for compression rings and .070 inch for oil ring steel rails.

(3) Measure the side clearance between piston ring and ring land. The clearance should be .0015 to .003 inch for the top compression ring and the intermediate ring, and .001 to .009 for the oil control ring. (For new service rings.) (Fig. 105.)

(4) Install the oil ring in the lower ring groove using the instructions in the service ring package.

(5) Install the compression rings in the middle and top grooves with side marked "TOP" up; use ring installer Tool C-263 for the 273 Cubic Inch Engine, Tool C-3586 for the 318 Cubic Inch Engine, Tool C-3673 for the 383 and 426 Cubic Inch Engines, Tool C-3628 for the 361 Cubic Inch Engine.

PISTON PIN
(273 and 318 Cubic Inch Engine)

Removal

(1) Mark all pistons and connecting rods as necessary for proper location.

(2) Remove piston pin lock rings and press out piston pins.

Fitting Piston Pins

(1) The piston pin fit in the connecting rod and piston should be a tight thumb push fit at normal room temperature, 70 degrees F.

(2) If there is excessive clearance between the piston pin and piston, ream piston and connecting rod to next oversize. Piston pins are available in standard, .003, .008 inch oversize.

(3) If there is excessive clearance between the piston pin and connecting rod, replace the connecting rod bushing and fit the bushing to the piston pin.

(4) New pistons are supplied with fitted pins.

Installation

(1) Assemble pistons and rods for the left hand cylinder bank (1-3-5-7) with piston boss marked "Front" and indent on piston head on the same side

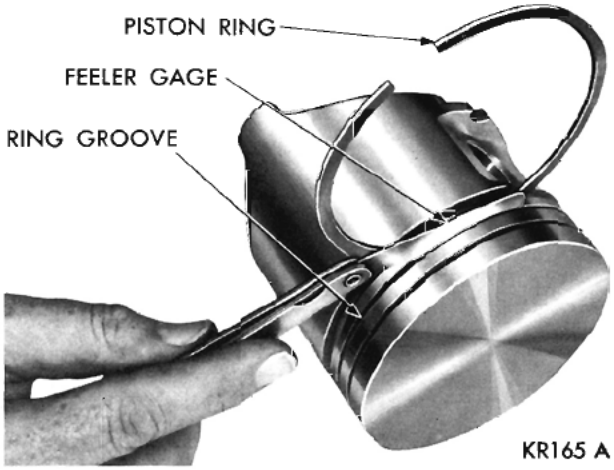

Fig. 105—Measuring Piston Ring Clearance

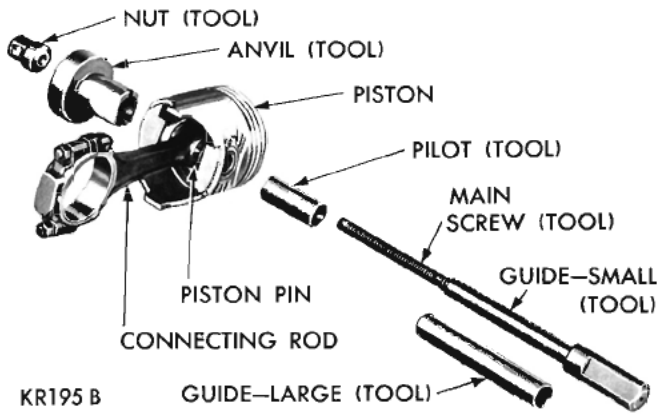

Fig. 106—Tool Arrangement for Removing Piston Pin Tool C-3684

as the large chamfer on large end of connecting rod. Assemble pistons and rods to be used in the right cylinder bank (2-4-6-8) with "Front" and indent opposite the large chamfer in the connecting rod.

361, 383 & 426 Cubic Inch Engines

Removal

(1) Arrange Tool C-3684 parts for the removal of piston pin, as shown in Figure 106.

(2) Install the pilot on the main screw.

(3) Install the screw through the piston pin.

(4) Install the anvil over the threaded end of the main screw with the small end of the anvil against the piston boss.

NOTE: Be sure spring is removed from anvil.

(5) Install nut loosely on the main screw and place the assembly on a press, as shown in Figure 107.

(6) Press the piston pin out of the connecting rod.

NOTE: When the pin falls free from the connecting rod, stop the press to prevent damage to the bottom of the anvil.

(7) Remove the tool from the piston.

Installation

(1) Test the piston pin fit in the piston. It should be a sliding fit in the piston at 70°F. Piston pins are supplied in standard sizes only.

(2) Lubricate the piston pin holes in the piston and connecting rod.

(3) Arrange the tool parts for installation of the piston pin, as shown in Figure 108.

(4) Install the spring inside the pilot and install the spring and pilot in the anvil. Install the piston pin over the main screw.

(5) Place the piston, with "front" up, over the pilot

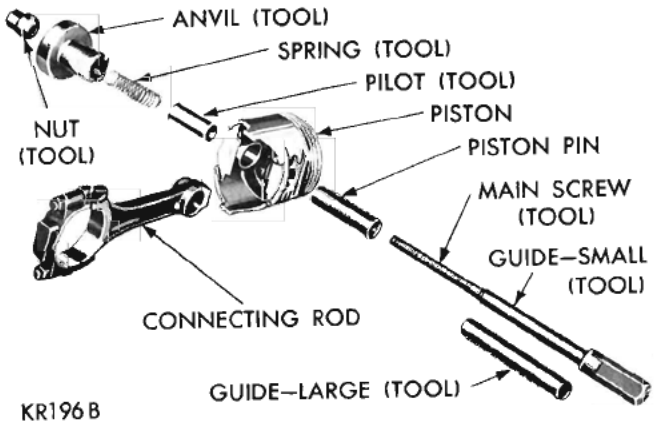

Fig. 108—Tool Arrangement for Installing Piston Pin Tool C-3684

so that the pilot extends through the piston pin hole.

(6) Position the connection rod over the pilot which extends through the piston hole.

NOTE: Assemble rods to pistons of the right cylinder bank (2, 4, 6 and 8) with the indent on the piston head opposite to the large chamfer on the large bore end of connecting rod. Assemble the rods to pistons of the left cylinder bank (1, 3, 5 and 7) with the indent on the piston head on the same side as the large chamfer on the large bore end of connecting rod.

(7) Install the main screw and piston pin in the piston, as shown in Figure 109.

(8) Install the nut on puller screw to hold assembly together. Place assembly on a press, as shown in Figure 109.

(9) Press in the piston pin until the piston pin bottoms on the pilot properly positioning the pin in the

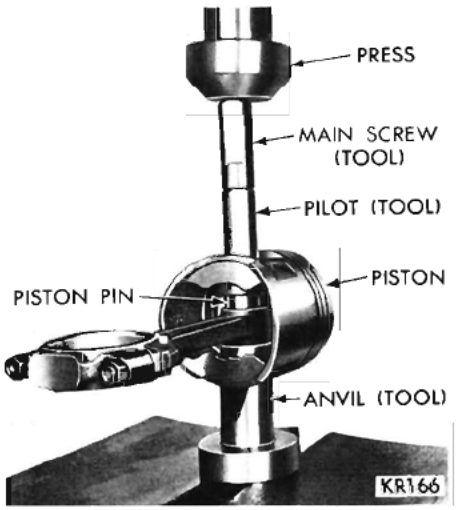

Fig. 107—Removing Piston Pin Tool C-3684

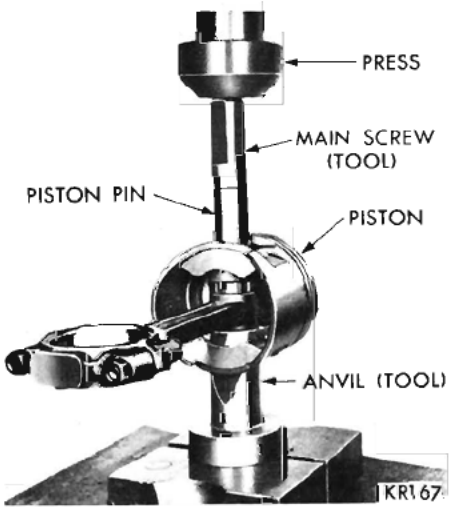

Fig. 109—Installing Piston Pin

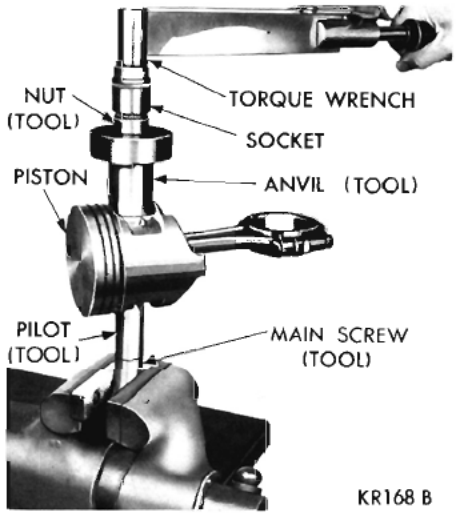

Fig.110—Testing Fit of Piston Pin in Connecting Rod Tool C-3684

connecting rod.

(10) Remove the tool and arrange tool parts and piston assembly in the same manner, as shown in Figure 106.

(11) Place the assembly in a vise, as shown in Figure 110.

(12) Attach the torque wrench to nut and test torque up to 15 foot-pounds torque. If the connecting rod moves downward on piston pin, reject this connecting rod and piston combination. Obtain a connecting rod with proper small end bore diameter and repeat the installation and checking procedure.

(13) If the connecting rod does not move under 15 foot-pounds torque, the piston pin and connecting rod interference is satisfactory and the tool may be removed.

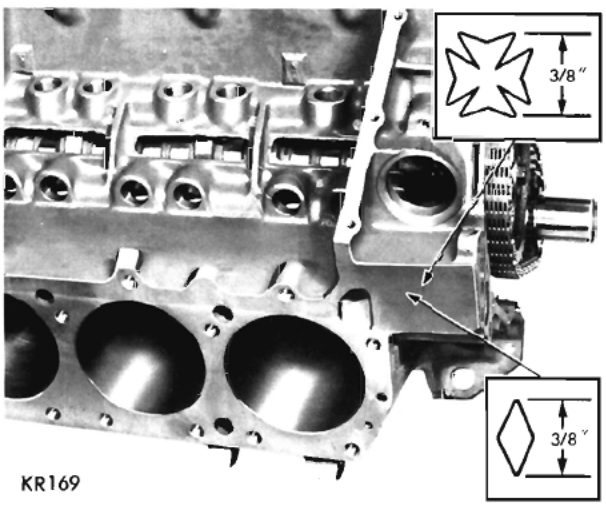

Fig. 111—Showing Location of External Engine Numbering Pad

CONNECTING ROD—IDENTIFICATION

A Maltese Cross stamped on the engine numbering pad (Fig. 111) indicates that the engine is equipped with a crankshaft which has one or more connecting rods and main bearing journals finished .001 inch undersize. However on 273 and 318 cubic inch engines with a B following engine serial number and/or on 361, 383 and 426 cubic inch engines with a "X" following a maltese cross indicates that all main journals and/or all rod journals are .010 inch undersize. The position of the undersize journal or journals will be stamped on the machined surface of the NO. 3 counterweight (Fig. 112).

Connecting rod journals will be identified by the letter "R" and main bearing journals by the letter "M." For example "M-1" indicates that NO. 1 main bearing is .001 inch undersize.

CONNECTING ROD BEARINGS

Installation

NOTE: Fit all rods on one bank until completed. Do not alternate from one bank to another, because when the rods are assembled to pistons correctly, they are not interchangeable from one bank to another.

Connecting rod bearings caps have a small "V" groove across the parting face. When installing a lower bearing, the "V" groove of the bearing must be placed on the "V" groove side of the cap. This provides lubrication of the cylinder wall in the opposite bank. Also, the tangs in the steel back must be placed in the grooves in the rods and caps. The connecting rod side play for the 273 and 318 cubic inch engine should be .006 to .014 inch (two rods) and .009 to .017 inch for the 361, 383 and 426 cubic inch engines.

The limits of taper or out-of-round on any crankshaft journals should be held to .001 inch. Bearings are available in .001, .002, .003, .010 and .012 inch

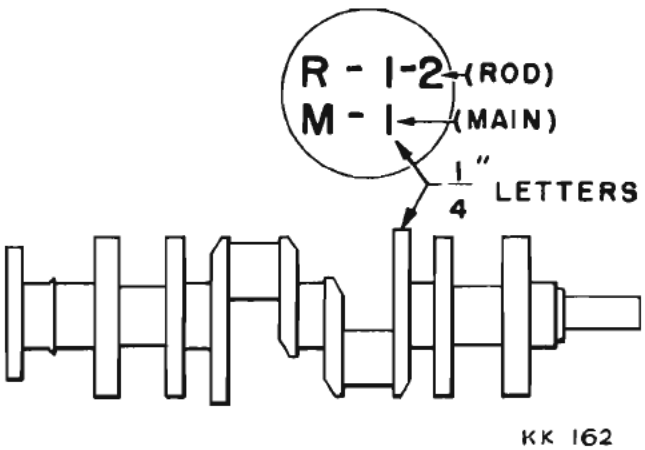

Fig. 112—Showing Location of Marking of No. 3 Counterweight

undersize. Install the bearings in pairs. Do not use a new bearing half with an old bearing half. Do not file the rods or bearing caps.

MEASURING CONNECTING ROD BEARING CLEARANCE

Shim Stock Method

(1) Place an oiled .001 inch feeler stock (½ inch wide and ¾ inch long) between bearing and connecting rod journal.

(2) Install bearing cap and tighten to 45 foot-pounds torque.

(3) Turn the connecting rod ¼ turn in each direction. A slight drag should be felt which indicates clearance is satisfactory. The correct clearance is from .0005 to .0015 inch.

(4) The side play for the 273 and 318 Cubic Inch Engine should be .006 to .014 inch (two rods) and .009 to .017 inch for 361, 383 and 426 Cubic Inch Engines.

PISTON AND CONNECTING ROD ASSEMBLY

Installation

(1) Before installing the pistons, rods, and rod assemblies in the bore, be sure that compression ring gaps are staggered so that neither are in line with the oil ring rail gaps.

(2) The oil ring expander ends should be positioned toward the outside of the "V" of the engine. The oil ring rail gaps should be positioned opposite each other and above the piston pin holes.

(3) Immerse the piston head and rings in clean engine oil, slide the ring compressor, Tool C-385, over the piston and tighten with the special wrench (part of Tool C-385).

(4) Be sure the position of the rings does not change during this operation. Screw the connecting rod bolt protector (part of Tool C-3221) on one rod bolt, and insert the rod and piston into cylinder bore.

NOTE: Rotate the crankshaft so that the connecting rod journal is on center of the cylinder bore.

(5) Attach the puller part of Tool C-3321 on the other bolt, and guide the rod over the crankshaft journal, as shown in Figure 113.

(6) Tap the piston down in the cylinder bore, using the handle of a hammer. At the same time, guide the connecting rod into position on the crankshaft journal.

(7) The notch or groove on the top of the piston must be pointing toward the front of the engine and the larger chamfer of the connecting rod bore must be installed toward the crankshaft journal fillet.

(8) Install the rod caps, and tighten nuts to 45 foot-pounds torque.

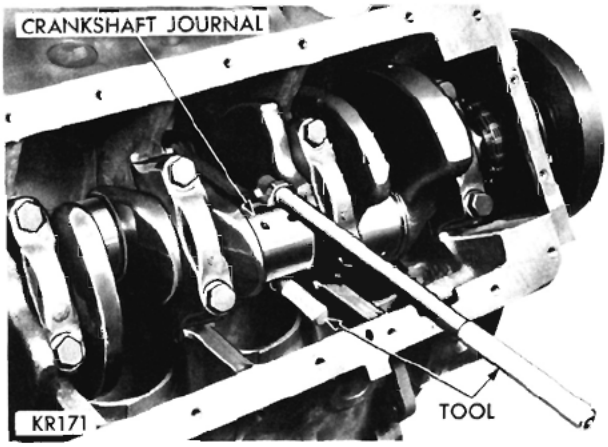

Fig. 113—Removing or Installing Connecting Rod Using Tool C-3221

CRANKSHAFT MAIN JOURNALS

The crankshaft journals should be inspected for excessive wear, taper and scoring. Journal grinding should not exceed .012 inch under the standard journal diameter. DO NOT grind the thrust faces of NO. 3 main bearing. DO NOT nick the crankpin or main bearing fillets. After regrinding, remove the rough edges from the crankshaft oil holes and clean out all the oil passages.

CRANKSHAFT MAIN BEARINGS

The upper main bearings are not interchangeable with the lower main bearings. On 273 and 318 cubic inch engines (Fig. 114), bearing numbers 1, 2 and 4 are interchangeable as complete bearings. On 361, 383 and 426 cubic inch engines (Fig. 115), bearings 2, 4 and 5 are interchangeable as complete bearings. The NO. 1 upper main bearing is not interchangeable and is chamfered on the tab side for timing chain oiling and can be identified by a red marking on the

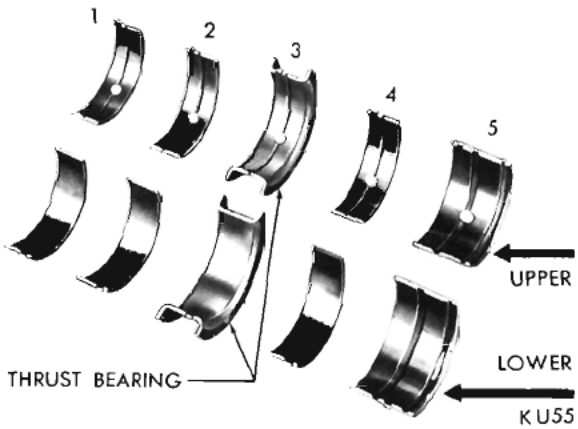

Fig. 114—Main Bearing Identification 273 and 318 Cubic Inch

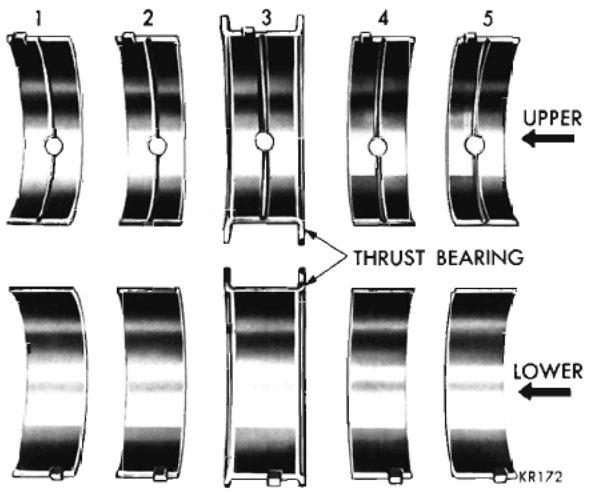

Fig. 115—Main Bearing Identification (361, 383 & 426 Cubic Inch)

edge of the bearing.

On all engines, number 3 bearing halves are flanged to carry the thrust load and are not interchangeable with the other four bearings. Bearings that are not badly worn or pitted must be reinstalled in the same position.

The bearing caps are not interchangeable and should be marked at removal to insure the correct assembly. Bearing shells are available in standard and the following undersizes: .001, .002, .003, .010 and .012 inch. Never install an undersize bearing shell that will reduce the clearance below specifications.

Removal

(1) Remove the oil pan and mark the bearing caps before removal.

(2) Remove the bearing caps one at a time. Remove the upper half of the bearing by inserting Tool C-3059 (Fig. 116) into the oil hole of the crankshaft.

(3) Slowly rotate the crankshaft clockwise, forcing out the upper half of bearing shell.

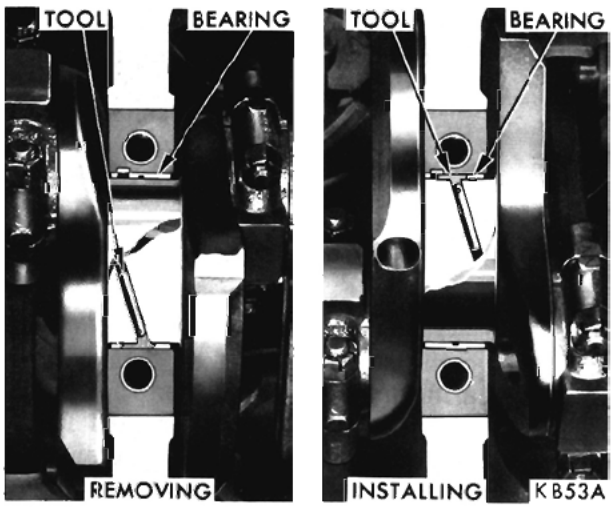

Fig.116—Removing or Installing Main Bearing (Tool C-3059)

Measuring Main Bearing Clearance (Shim Stock Method)

(1) Smooth the edges of a ½ × ¾ inch piece of soft copper or brass shim stock, .001 inch thickness.

(2) Lubricate the main bearing journals and position the shim stock across the center main journal.

(3) Install the bearing in the center main bearing cap, bearing tang in groove in cap, lubricate bearing and seat cap or block. Tighten bolts to 85 foot-pounds torque.

(4) If a slight drag is felt as the crankshaft is turned (move no more than ¼ turn in either direction), the clearance is .001 inch or less and is considered satisfactory.

If, however, no drag is felt, the bearing is too large or the crankshaft cannot be rotated, the bearing is too small and should be replaced with the correct size.

(5) Measure crankshaft end play to .002-.007 inch. If end play is less than .002" or more than .007", install a new Number 3 main bearing.

(6) Fit the remaining bearings in same manner.

Only one main bearing should be selectively fitted while all other main bearing caps are properly torqued.

It is permissible to use one .001 inch undersize bearing shell with one standard bearing shell or one .002 inch bearing shell with one .001 inch undersize shell. **Always use the smaller diameter bearing half as the upper.** Never use a new bearing with a used bearing and never use an upper bearing half more than .001 inch smaller than the lower bearing half.

Installation of the Upper Main Bearing

NOTE: When installing a new upper bearing shell, slightly chamfer the sharp edges from the plain side.

(1) Start bearing in place, and insert Tool C-3059 into the oil hole of the crankshaft (Fig. 116).

(2) Slowly rotate the crankshaft counter-clockwise sliding the bearing into position.

(3) After all bearings have been fitted, tighten all caps to 85 foot-pounds torque. The crankshaft end play should be .002 to .007 inch.

REPLACEMENT OF THE REAR MAIN BEARING OIL SEALS (Crankshaft Removed)

Upper Seal

(1) Install a new rear bearing oil seal in the cylinder block so that both ends protrude.

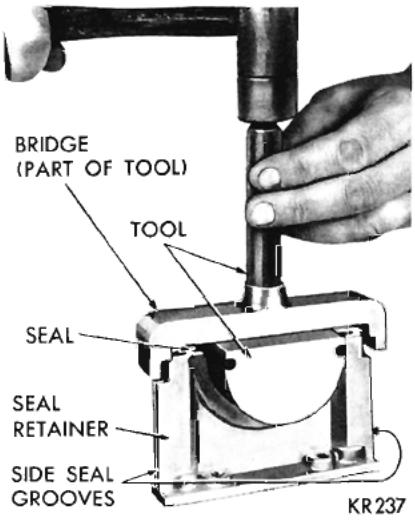

Fig. 117—Installing Rear Main Bearing Lower Oil Seal

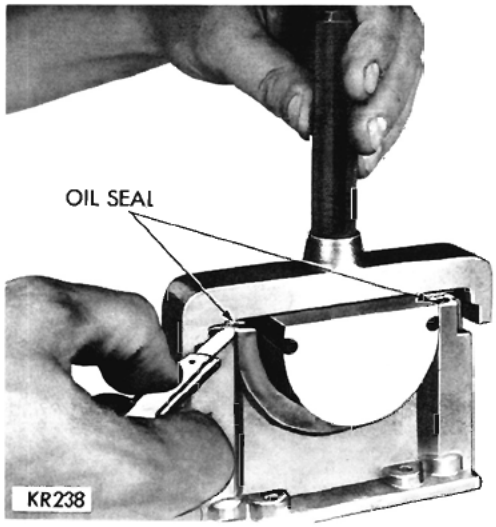

Fig. 118—Trimming Rear Main Bearing Lower Oil Seal

(2) Use Tool C-3511 for 273 and 318 cubic inch engine or Tool C-3625 for 361 and 383 cubic inch engine or Tool C-3743 for 426 cubic inch engine, (with bridge removed), tap the seal down into position until the tool is seated in the bearing bore.

(3) Hold the tool in this position and cut off the portion of the seal that extends above the block on both sides.

Lower Seal 273 and 318 Cubic Inch Engine

(1) Install a new rear main bearing oil seal in the cap with Tool C-3511.

(2) Hold the tool in this position and cut off the ends of seal flush with cap.

(3) Install the bearing shell and cap seals with the bearing cap and tighten to 85 foot-pounds torque.

361,383 & 426 Cubic Inch Engines

(1) Install a new seal in the seal retainer so that the ends protrude. Figure 117.

(2) Install the bridge on Tool C-3625 for 361 and 383 cubic inch engine or Tool C-3743 for 426 cubic inch engine, tap the seal down into position until the tool is seated.

(3) Trim off the portion of the seal that protrudes from the cap. Figure 118.

Side Seals

Seals are cut to proper length. Under no circumstances should these seals be cut off. Perform the following operation as rapidly as possible. These side seals are made from a material that expands quickly when oiled. A slight oil leak may be encountered when starting the engine if sufficient time has not elapsed to adequately expand the seals.

(1) Apply mineral spirits or diesel fuel to side seals.

(2) Install seal immediately in seal retainer grooves.

(3) Install seal retainer and tighten screws to 30 foot-pounds torque.

NOTE: Failure to pre-oil seals will result in oil leak.

ENGINE OILING SYSTEM

OIL PAN

Removal

(1) Disconnect the negative (ground) cable from the battery, and remove the dipstick.

(2) Raise the vehicle on a hoist, drain the oil. On 273 and 318 cubic inch engines; remove the engine to torque converter left housing brace.

(3) Remove the steering and idle arm ball joints from the steering linkage center link.

(4) Remove the exhaust cross-over pipe from the exhaust manifolds and leave it hang without disconnecting it from the muffler. On AV-2 it will be necessary to remove the cross-over pipe.

(5) Remove the oil pan bolts and the oil pan.

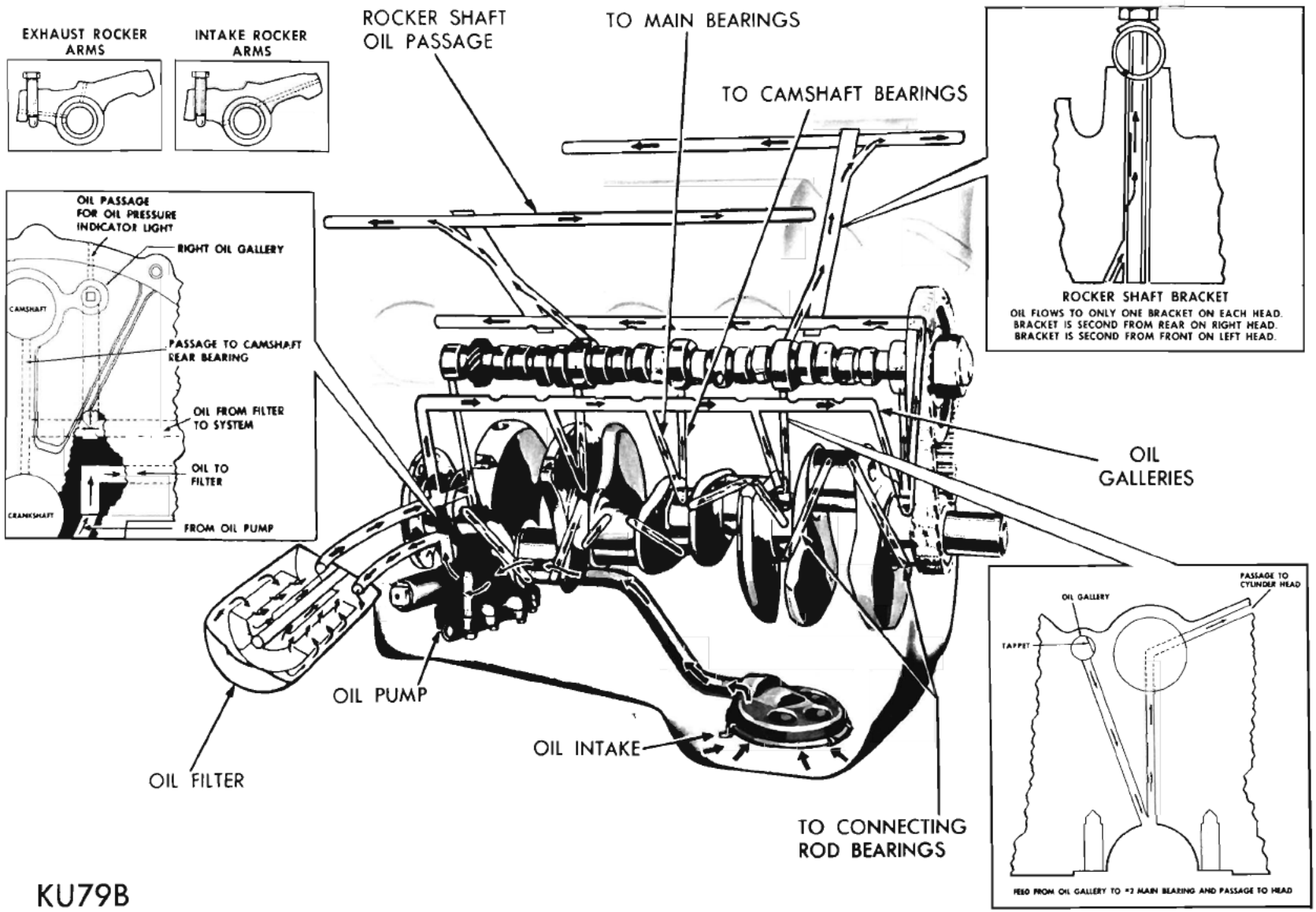

Fig. 119—Engine Oiling System (273 & 318 Cubic Inch)

Installation

(1) Inspect the alignment of the oil strainer. The bottom of the strainer must be parallel with the machined surface of the cylinder block. The bottom of the strainer must touch the bottom of the oil pan.

(2) Install the oil pan using a new gasket and seals on 273 and 318 cubic inch engine, and install the engine to converter housing brace.

(3) Connect the exhaust cross-over pipe to manifolds. (If so equipped.)

(4) Connect the steering and idler arm ball joints to the steering center link.

(5) Lower the vehicle, install the dipstick, fill with the proper grade and quantity of motor oil, connect battery ground.

OIL PUMP (Figs. 121 & 122)

Removal

On the 273 and 318 cubic inch engine, remove the oil pump from the rear main bearing cap.

361, 383 and 426 cubic inch engines, remove the oil pump attaching bolts and remove the pump and filter assembly from the left front lower corner of the engine.

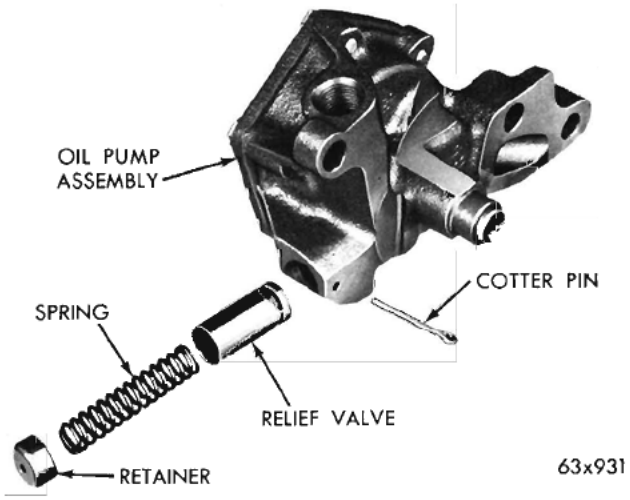

Fig. 121—Oil Pump Assembly (273 & 318 Cubic Inch)

Disassembly

(1) Remove the cover screws and remove the cover from the (361, 383 and 426 cubic inch engines) filter base (Fig. 122).

(2) Remove the pump rotor and shaft and lift out the outer pump rotor.

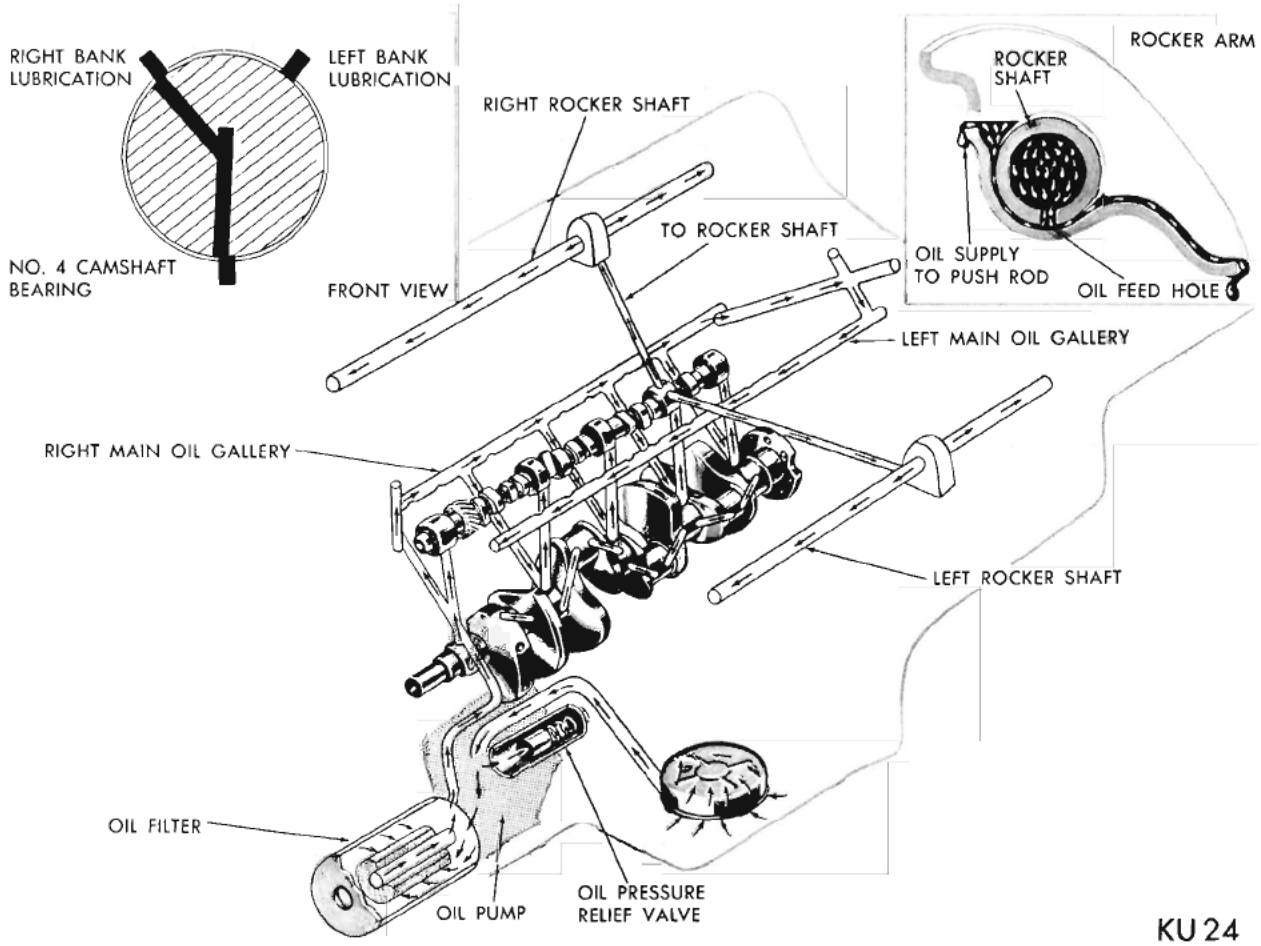

Fig. 120—Engine Oiling System (361, 383 & 426 Cubic Inch)

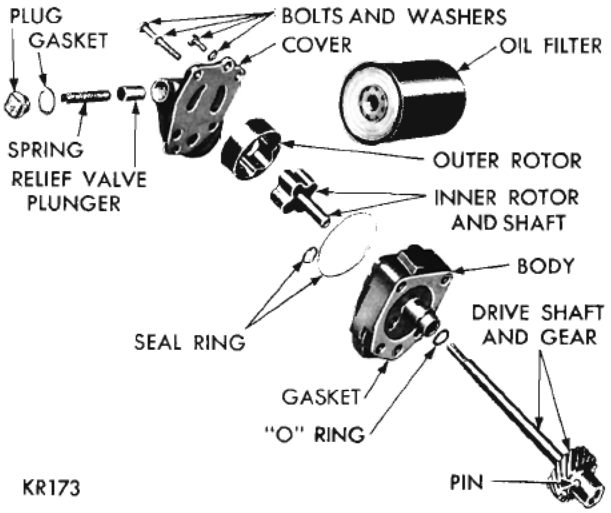

Fig. 122—Oil Pump and Filter (Disassembled View 361, 383 & 426 Cubic Inch)

(3) Remove the oil pressure relief valve plug carefully as it is under spring pressure. Remove the spring and the valve.

(4) Clean all parts thoroughly.

Inspection and Repair

(1) Lay a straightedge across the oil pump cover surface (Fig. 123). If a .0015 inch feeler gauge can be inserted between the cover and the straightedge, the cover should be replaced.

(2) For the 273 and 318 cubic inch engine, the outer rotor length should not be less than .825 inch (Fig. 124) and the outer diameter less than 2.469 inch. On the 361, 383 and 426 cubic inch engines these dimensions should not be less than .943 and 2.469 inch respectively.

(3) If the inner rotor thickness measures less than .825 inch for the 273 and 318 cubic inch engine (Fig. 125) or .942 inch for 361, 383 and 426 cubic inch engines, a new rotor should be installed.

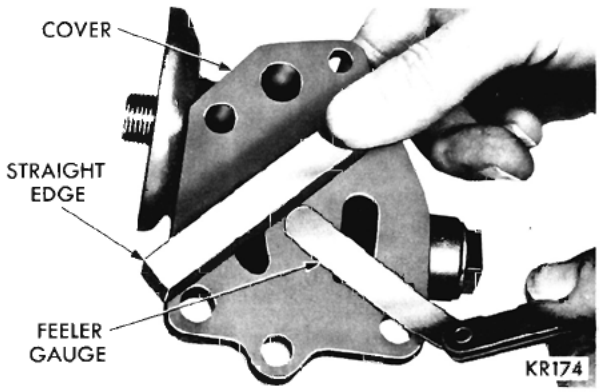

Fig. 123—Measuring Oil Pump Cover Flatness

Fig. 124—Measuring Outer Rotor Thickness

(4) Place the outer rotor in pump body. Press the rotor to one side with the fingers and measure the clearance between the rotor and pump body. If the measurement is more than .012 inch, install a new oil pump body (Fig. 126). (This test is not necessary if a new pump body is being used.)

(5) Place the inner rotor in the outer rotor. Measure the clearance between the inner rotor and outer rotor. If measurement is more than .010 inch for 273 and 318 cubic inch engines or .010 inch (Fig. 127), for 361, 383 and 426 cubic inch engine, install new pump rotors.

(6) Place a straightedge across the pump body (between bolt holes). If feeler gauge of more than .004 inch (Fig. 128) can be inserted between the rotors and a straightedge, install a new pump body and/or rotors.

(7) Inspect the oil pump relief valve plunger for scoring and for free operation in its bore. Small

Fig. 125—Measuring Inner Rotor Thickness

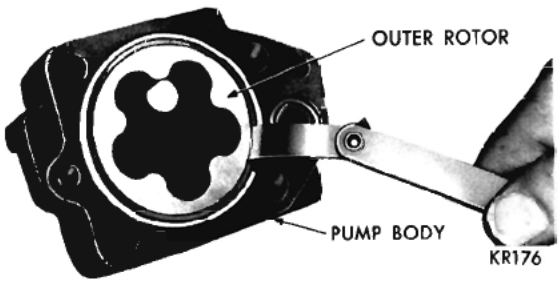

Fig. 126—Measuring Outer Rotor Clearance

scores may be removed with 400 grit wet or dry paper providing extreme care is used not to round off the sharp edge portion of the valve.

(8) For 273 and 318 cubic inch engine the relief valve has a free length of $2^{1}/_{32}$ to $2^{3}/_{64}$ inch. For 361, 383, and 426 cubic inch engines the relief valve has a free length of a $2^{9}/_{32}$ to $2^{19}/_{64}$ inch and is red in color.

(9) If the oil pressure is low, inspect for worn bearings, or look for other causes of possible loss of oil pressure.

Assembly and Installation

(1) Assemble the oil pump, using new parts as required.

(2) Install new oil and seal rings between the cover and body. Tighten cover bolts to 10 foot-pounds torque for 273 and 318 cubic inch engine and 35 foot-pounds torque for 361, 383 and 426 cubic inch engines.

(3) Install the oil pump and tighten attaching bolts to 35 foot-pounds torque.

Oil Filter Replacement

The oil filter should be replaced every six months to coincide with an engine oil change.

(1) Using Tool C-3845 (Fig. 129), unscrew the filter from the base on the bottom side of the engine and

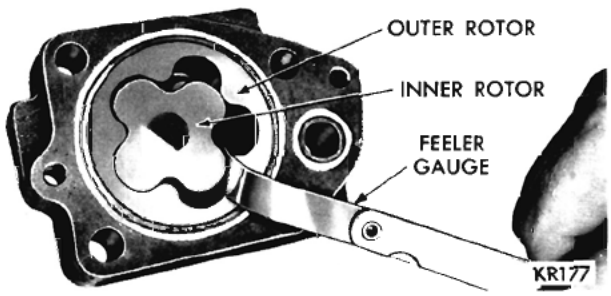

Fig. 127—Measuring Clearance Between Rotors

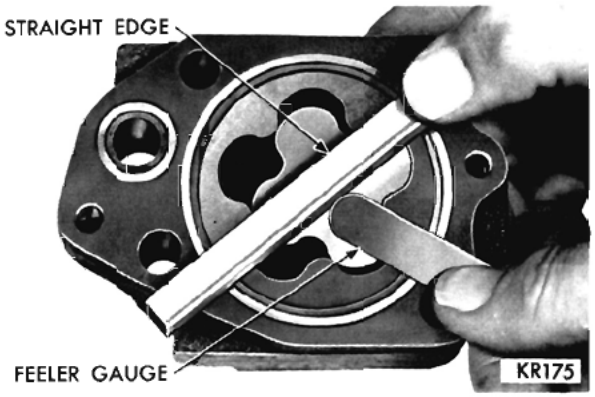

Fig. 128—Measuring Clearance Over Rotors

discard.

(2) Wipe the base clean.

(3) Screw a new filter on the base until the gasket on the filter contacts the base. To obtain an effective seal, tighten filter **by hand** the additional number of turns **indicated on the replacement filter.** Start engine and inspect for leaks.

CRANKCASE VENTILATION SYSTEM

Description

All models are equipped with a positive crankcase ventilation system consisting of a crankcase ventilator valve and cap mounted on the cylinder head cover, a special carburetor with a hose fitting in its base, and a hose connecting the ventilator valve to the carburetor base fitting. The oil filler cap provides the air inlet for the system. The air drawn into the oil filler cap is circulated through the engine, and drawn out of the cylinder head cover by manifold vacuum into

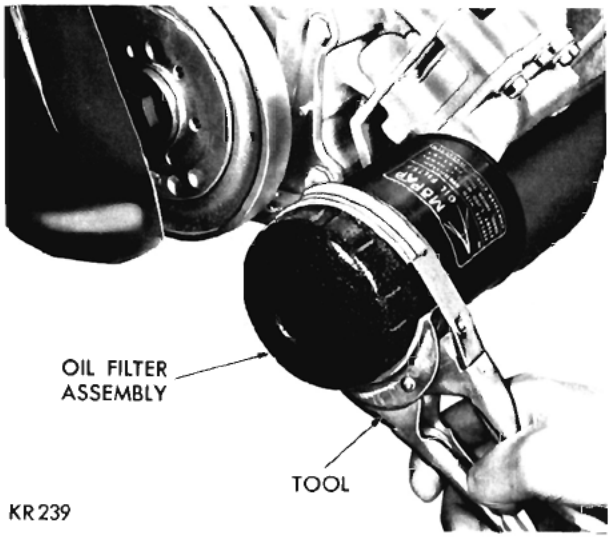

Fig. 129—Removing Oil Filter Tool C-3845

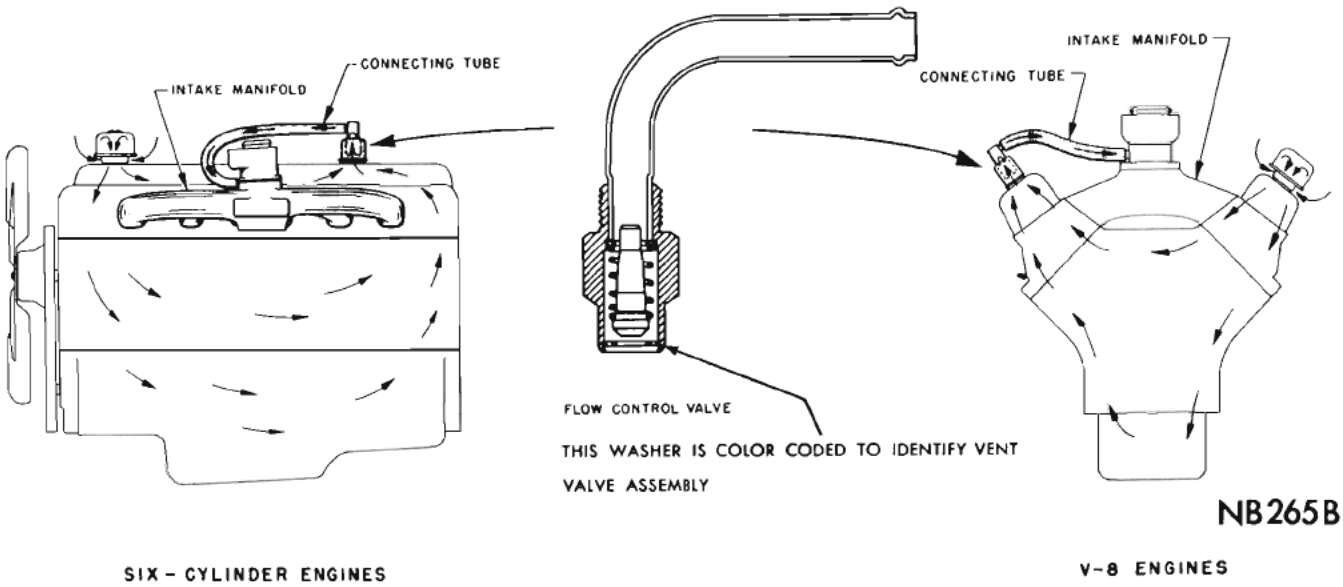

Fig. 130—Crankcase Ventilating System

the combustion chambers and dispelled with the exhaust gases (Fig. 130).

SERVICE PROCEDURES

The system must be kept clean to maintain good engine performance durability as deposits will accumulate in the valve, hoses, and the carburetor parts, therefore, the ventilation system should be inspected at least every six months and the valve replaced once a year preferable to coincide with the annual engine performance evaluation. This service will be required more frequently if the vehicle is used extensively for short trips—driving less than 10 miles—with frequent idling, such as city traffic.

With the engine running at idle, remove the ventilator valve and cap assembly from the rocker cover. If the valve is not plugged, a hissing noise will usually be heard as air passes through the valve and a strong vacuum should be felt when a finger is placed over the valve inlet. Replace the ventilator valve and cap assembly and remove the inlet breather cap. With the

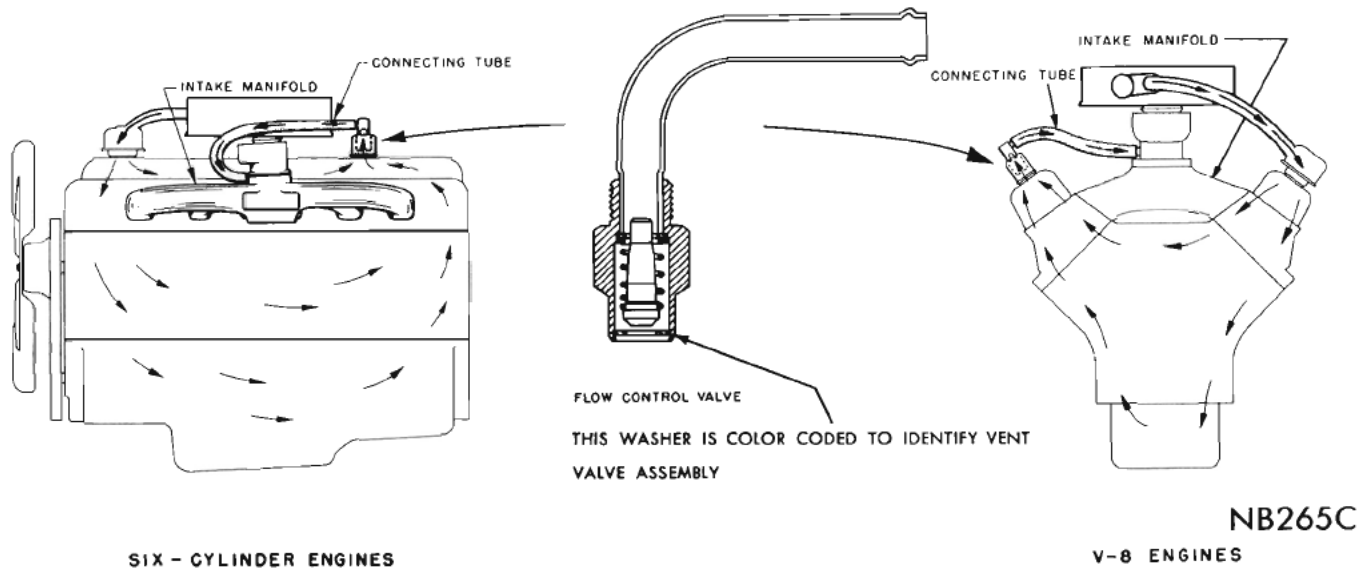

Fig. 131—California Closed Crankcase Ventilation System

engine still running at idle, loosely hold a piece of stiff paper or a parts tag over the oil fill pipe. Within a few seconds, it should be sucked against the oil fill pipe with a holding force. If this occurs, a final test should be made to be certain the valve shuttle is free. A clicking noise should be heard when the valve is shaken (engine not running). If the noise is heard, the unit is functioning satisfactory and no further service is necessary.

If the valve does not click when shaken or if the paper is not sucked against the fill pipe, the valve should be replaced and the system retested. (Do not attempt to clean the valve.) The 170 cubic inch engine Mopar Ventilator Valve is identified by a stamped number 6 on the end, a step on the end face, or a white end washer. On all other engines (except 170 cubic inch engine) the Mopar Ventilator Valve is identified by a letter "H" stamped on the end, a flat end or a black end washer. With a new valve installed, if the vacuum can be felt with the engine idling, the system is satisfactory. If the vacuum cannot be felt, it will be necessary to clean the ventilator hose and the passages in the lower part of the carburetor. The carburetor must be removed, hand turn a ¼ inch drill through the passages to dislodge the solid particles. Blow clean.

NOTE: Use a smaller drill if necessary as no metal is to be removed. It is not necessary to disassemble the carburetor for this service.

CLOSED CRANKCASE VENTILATING SYSTEM FOR STATE OF CALIFORNIA

Description

A fully closed crankcase ventilation system (Fig. 131) is installed on vehicles built for sale in the State of California and as extra equipment in other states. This fully-closed crankcase system has a closed oil filler cap with a hose connecting the filler cap to the carburetor air cleaner housing.

The air drawn from the carburetor air cleaner through the connecting hose to the filler cap, is circulated through the engine and drawn out of the cylinder head cover by manifold vacuum; through another connecting hose to the carburetor base, into the combustion chamber, and dispelled with the exhaust gases (Fig. 131).

On all California vehicles a new outer wrapper is used on the outside of the air cleaner element except **High Performance Engines with non-silenced air cleaners.** Vehicles **not** equipped with air cleaner element wrapper must be serviced more frequently than the ones with the wrapper.

SERVICE PROCEDURES

The system must be kept clean to maintain good engine performance and durability as deposits will accumulate in the valve, hose and the carburetor parts, therefore, the ventilation system should be inspected, crankcase oil changed and the valve replaced once a year preferable to coincide with the annual engine performance evaluation. This service will be required more frequently if the vehicle is used extensively for short trips—driving less than 10 miles —with frequent idling, such as city traffic.

With the engine running at idle, remove the ventilator valve and cap assembly from the rocker cover. If the valve is not plugged, a hissing noise will usually be heard as air passes through the valve and a strong vacuum should be felt when a finger is placed over the valve inlet. Replace the ventilator valve and cap assembly and remove the oil filler cap. With the engine still running at idle, loosely hold a piece of stiff paper or a parts tag over the fill pipe. Within a few seconds, it should be sucked against the oil fill pipe with a holding force. If this occurs, a final test should be made to be certain the valve shuttle is free. A clicking noise should be heard when the valve is shaken (engine not running). If the noise is heard, the unit is functioning satisfactory and no further service is necessary.

If the valve does not click when shaken or if the paper is not sucked against the fill pipe, the valve should be replaced and the system retested. (Do not attempt to clean the valve.) The 170 cubic inch engine Mopar Ventilator Valve is identified by a stamped number 6 on the end, a step on the end face, or a white end washer. On all other engines, the Mopar Ventilator Valve is identified by a letter "H" stamped on the end, a flat end or a black end washer. With a new valve installed, if the vacuum can be felt with the engine idling, the system is satisfactory. If the vacuum cannot be felt, it will be necessary to clean the ventilator hose and the passages in the lower part of the carburetor. The carburetor must be removed, hand turn a ¼ inch drill through the passages to dislodge the solid particles. Blow clean.

NOTE: Use a smaller drill if necessary as no metal is to be removed. It is not necessary to disassemble the carburetor for this service.

CARBURETOR AIR CLEANER

(With Wrapper Air Cleaner)

The paper element carburetor air cleaner should be inspected and cleaned every six months, and replaced every two years with wrapper.

To clean the filter element, it should be removed from its container. Remove wrapper from element. Wash wrapper in kerosene or similar solvent to remove oil and dirt. Shake or blot dry. Gently blow out the dirt from the element with compressed air. The air nozzle should be held about two inches from the inside screen. Clean the metal housing, install wrapper on element and reinstall the element. Use a new

Mopar Filter Element for replacements. These services will be required more frequently if the vehicle is used extensively for short trips with frequent idling.

(Without Wrapper Air Cleaner)

The paper air cleaner element should be inspected every crankcase oil change and replaced every year.

Remove the carburetor air cleaner element from its container. If the paper element is dry and with only one or two oil wetted spots, clean by blowing gently with compressed air, holding the air nozzle about two inches from the inside screen. If the element is saturated with oil, install a new element.

NOTE: Whenever oil wetting of the paper element is observed. THE CRANKCASE ventilator valve and associated parts should be checked for excessive deposit build-up or plugging.

Clean the metal housing and reinstall the element. These services will be required more frequently if the vehicle is used extensively for short trips with frequent idling.

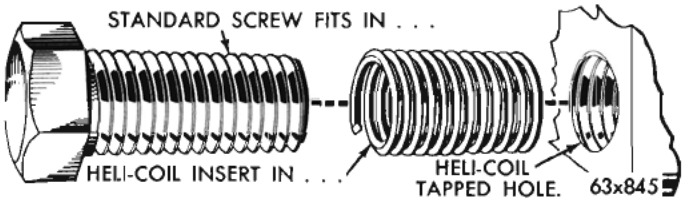

Fig. 132—Heli-Coil Installation

REPAIR OF DAMAGED OR WORN THREADS

Damaged or worn threads can be repaired by the use of Heli-Coils. Essentially, this repair consists of drilling out the worn or damaged threads, tapping the hole with a special Heli-Coil Tap, and instaling a Heli-Coil Insert into the tapped holes. This brings the hole back to its original thread size (See Fig. 132).

The following chart lists the threaded hole sizes which are used in the engine block and the necessary tools and inserts for the repair of damaged or worn thread. Heli-Coil tools and inserts are readily available from automotive parts jobbers.

HELI-COIL INSERT			DRILL	TAP	INSERTING TOOL	EXTRACTING TOOL
Thread Size	Part No.	Insert Length	Size	Part No.	Part No.	Part No.
½-20	1185-4	⅜"	17/64 (.266)	4 CPB	528-4N	1227-6
5/16-18	1185-5	15/32"	Q (.332)	5 CPB	528-5N	1227-6
⅜-16	1185-6	9/16"	X (.397)	6 CPB	528-6N	1227-6
7/16-14	1185-7	21/32"	29/64 (.453)	7 CPB	528-7N	1227-16
½-13	1185-8	¾"	33/64 (.516)	8 CPB	528-8N	1227-16

EXHAUST SYSTEM

CONTENTS

	Page		Page
DESCRIPTION	1	SERVICE PROCEDURES	2
SERVICE DIAGNOSIS	1	TIGHTENING REFERENCE	(At Rear of Manual)

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
EXHAUST SYSTEM		
EXCESSIVE EXHAUST NOISE	(a) Leaks at the pipe joints.	(a) Tighten clamps at leaking joints.
	(b) Burned or blown out muffler.	(b) Replace muffler assembly.
	(c) Burned or rusted out exhaust pipe.	(c) Replace exhaust pipe.
	(d) Exhaust pipe leaking at manifold flange.	(d) On 273 cu. in. engines, tighten ball joint connection attaching bolt nuts to 35 foot-pounds. On all other engines, install a new gasket and tighten flange bolt nuts to 35 foot-pounds.
	(e) Exhaust manifold cracked or broken.	(e) Replace manifold.
	(f) Leak between manifold and cylinder head.	(f) Tighten manifold to cylinder head stud nuts to 10 foot-pounds on 6-cylinder engines; 15 foot-pounds on 273 cu. in. engines and 30 foot-pounds on all other V-8 engines.
LEAKING EXHAUST GASES	(a) Leaks at pipe joints.	(a) Tighten clamps at leaking joints to 100 inch-pounds.
	(b) Damaged or improperly installed gaskets.	(b) Replace gaskets as necessary.
	(c) Restriction in muffler or tail pipe.	(c) Remove restriction, if possible, or replace as necessary.
ENGINE HARD TO WARM UP OR WILL NOT RETURN TO NORMAL IDLE	(a) Heat control valve frozen in the open position.	(a) Free up manifold heat control valve using Solvent, Part No. 1879318.
NOISE IN MANIFOLD	(a) Thermostat broken.	(a) Replace thermostat.
	(b) Weak, broken or missing anti-rattle spring.	(b) Replace spring.
MANIFOLD HEAT CONTROL VALVE RATTLE	(a) Thermostat broken.	(a) Replace thermostat.
	(b) Broken, weak or missing anti-rattle spring.	(b) Replace spring.

Description

Aluminized mufflers and tail pipes are used on all models provided with a single line exhaust system. Stainless steel mufflers are used in dual exhaust systems. The exhaust systems on AV-1, AV-2, AR-1 and AR-2 models are suspended by "C" type hangers and supports (Figs. 1, 2, 3 and 4). Double strap hangers are used to support the mufflers on AP-1 and AP-2 models (Figs. 5, 6 and 7).

Ball joint seating connections at the exhaust manifolds which facilitate alignment of the exhaust system, are used on 273 cubic inch V-8 engines.

The exhaust manifolds on all engines incorporate a thermostatic heat control valve to direct the exhaust gases to a heat chamber beneath the carburetor mounting flange to help vaporize the fuel.

On six-cylinder engines, the heat control valve is located in the manifold on the left side of the engine. On eight cylinder engines, the heat control valve is located in the manifold on the right side of the engine.

SERVICE PROCEDURES

EXHAUST PIPES, MUFFLERS AND TAIL PIPES

Removal

(1) Raise the vehicle on the hoist and apply penetrating oil to all the clamp bolts and nuts to loosen rust and corrosion.

NOTE: If only the muffler is to be replaced, cut the extension pipe just forward of the muffler with a hack saw or cutter. It is not necessary to remove the exhaust pipe. The replacement muffler can be installed, attaching it to the exhaust pipe with a clamp.

(2) Remove the clamps, hangers and supports from the exhaust pipe, muffler and tail pipe (Figs. 1, 2, 3, 4, 5, 6 and 7).

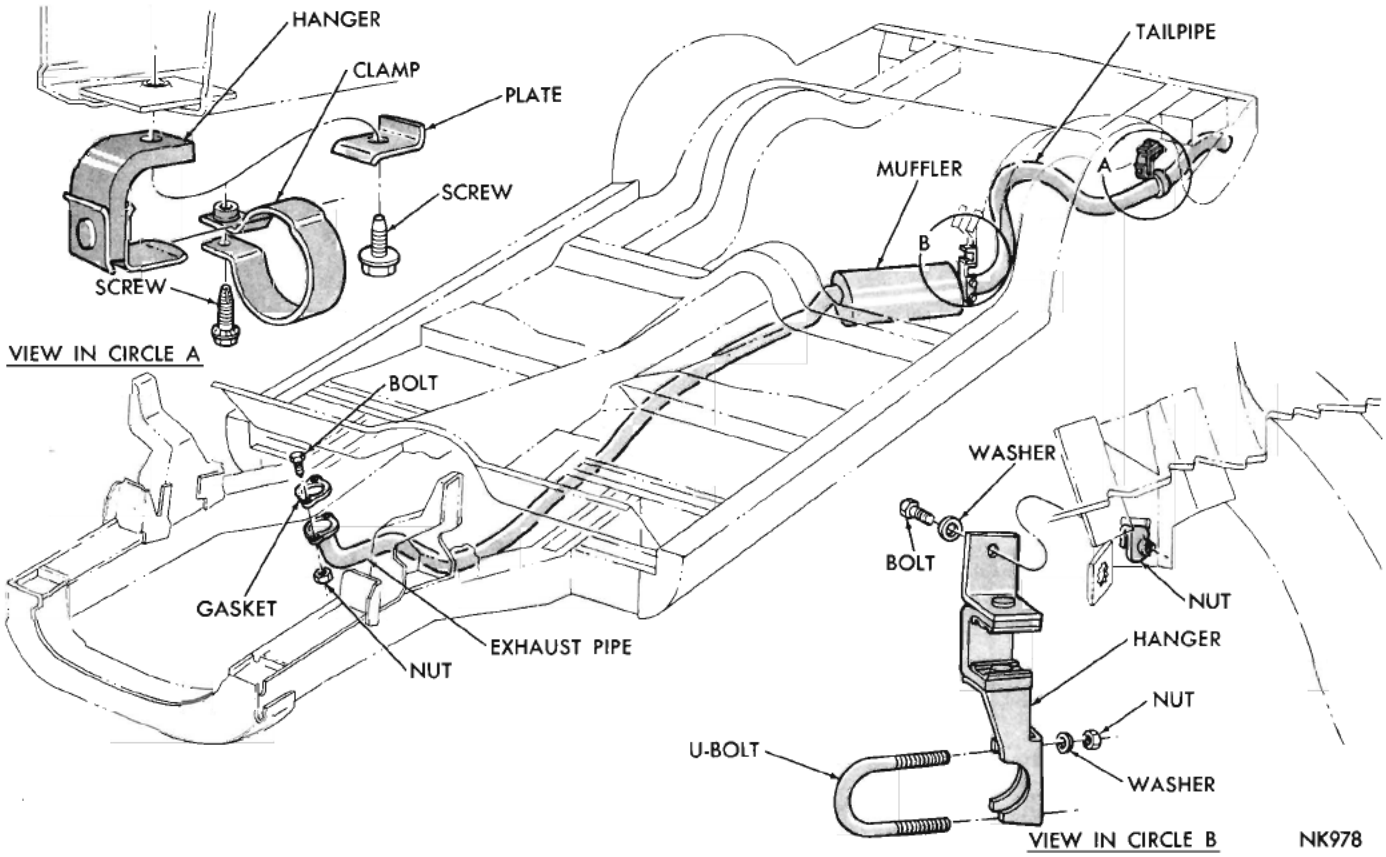

Fig. 1—Exhaust System—AV-1 Models

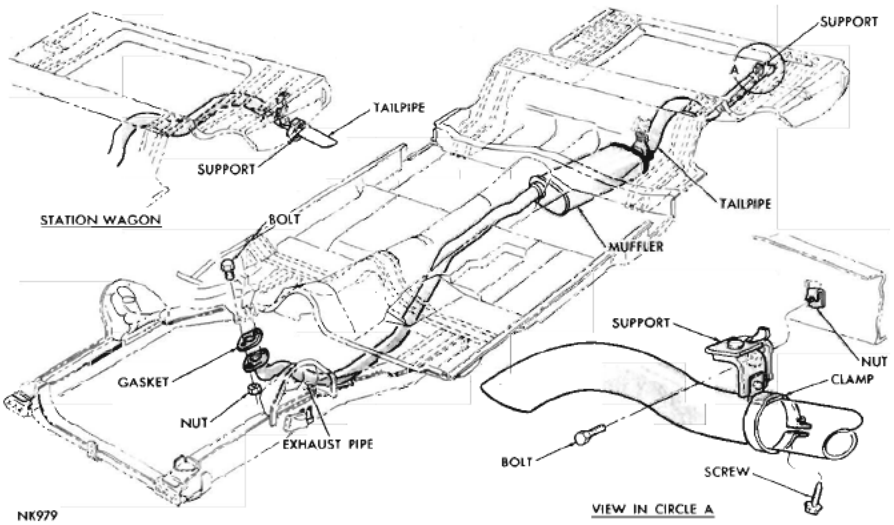

Fig. 2—Exhaust System—AR-1 Models

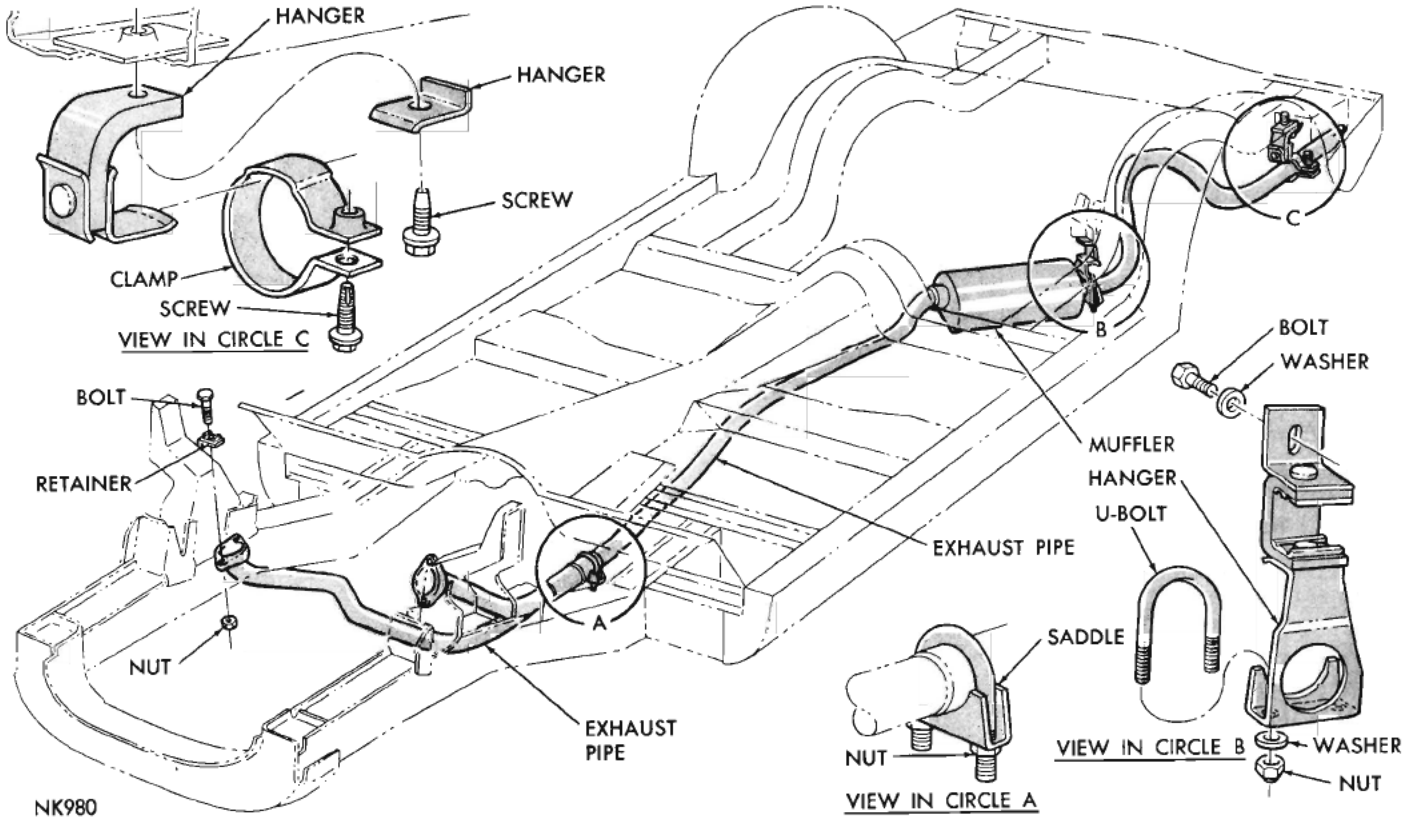

Fig. 3—Exhaust System—AV-2 Models

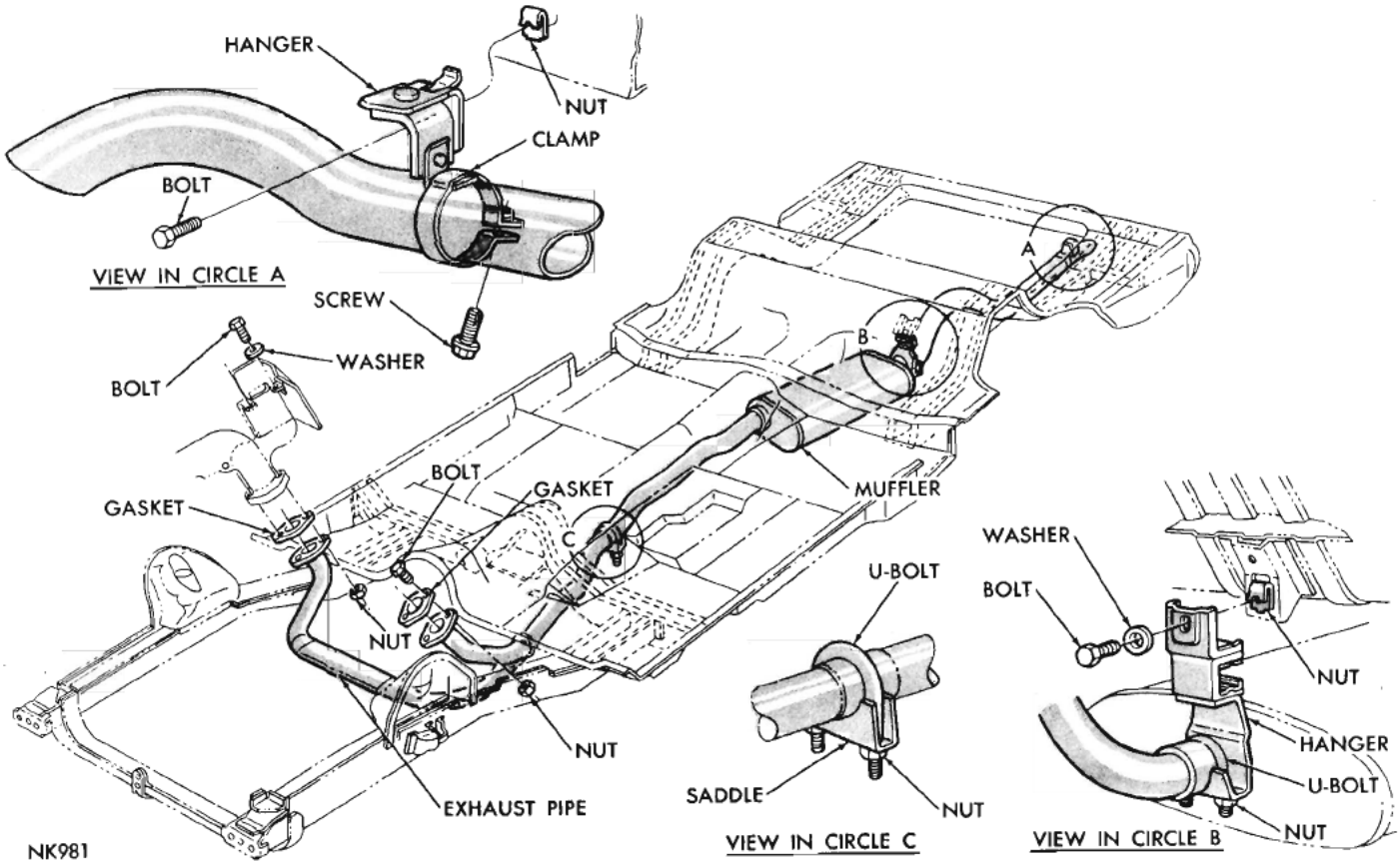

Fig. 4—Exhaust System—AR-2 Models

(3) Disconnect the exhaust pipe at the exhaust manifold and remove the exhaust pipe. On models using gaskets at the exhaust pipe flanges, discard the gaskets and carefully clean the manifold flanges of any gasket particles.

(4) Remove the muffler and the extension pipe assembly.

(5) Raise the rear end of vehicle to relieve the body weight from the rear springs and remove the tail pipe.

Installation

(1) Assemble the exhaust system loosely to permit the proper alignment (Figs. 1, 2, 3, 4, 5, 6 and 7).

(2) Connect the exhaust pipe to exhaust manifolds, using new gaskets, where required. Tighten the exhaust pipe attaching bolt nuts to 35 foot-pounds. On systems using the ball joint seating connection at the exhaust manifold, do not tighten the attaching bolt nuts at this time.

(3) Adjust the supports and hangers to provide proper underbody clearance and clearance with adjacent parts. Do not fully tighten attaching bolts and screws at this time.

(4) Tighten all slip joint clamp bolt nuts to 100 inch-pounds, working from rear to front.

(5) Tighten all support and hanger attaching bolts and nuts to 95 inch-pounds, at same time maintaining proper clearance with adjacent parts.

(6) Tighten the ball joint connection bolt nuts to 35 foot-pounds. When tightening bolts, alternate tightening between the bolts to insure parallelism of flanges.

INTAKE AND EXHAUST MANIFOLD ASSEMBLY (6-Cyl. Engines)

Removal

(1) Remove the carburetor air cleaner. **If the engine is equipped with the closed type oil breather cap, disconnect the hose at the air cleaner intake tube.**

(2) Disconnect the vacuum control tube at the carburetor and distributor. Disconnect the fuel line, the crankcase ventilating valve hose, the automatic choke rod and throttle at the carburetor and remove the carburetor.

(3) Disconnect the exhaust pipe at the exhaust manifold.

(4) Remove the nuts and washers attaching the manifold assembly to the cylinder head and remove the manifold (Fig. 8). Remove the three screws securing the intake manifold to the exhaust manifold and separate the manifolds.

(5) Discard the gasket and clean all gasket surfaces on the manifolds. Wash the manifolds in solvent and dry with compressed air.

(6) Test the mating surfaces of manifolds for parallelism with a straightedge. Surfaces should be flat within .008 inch.

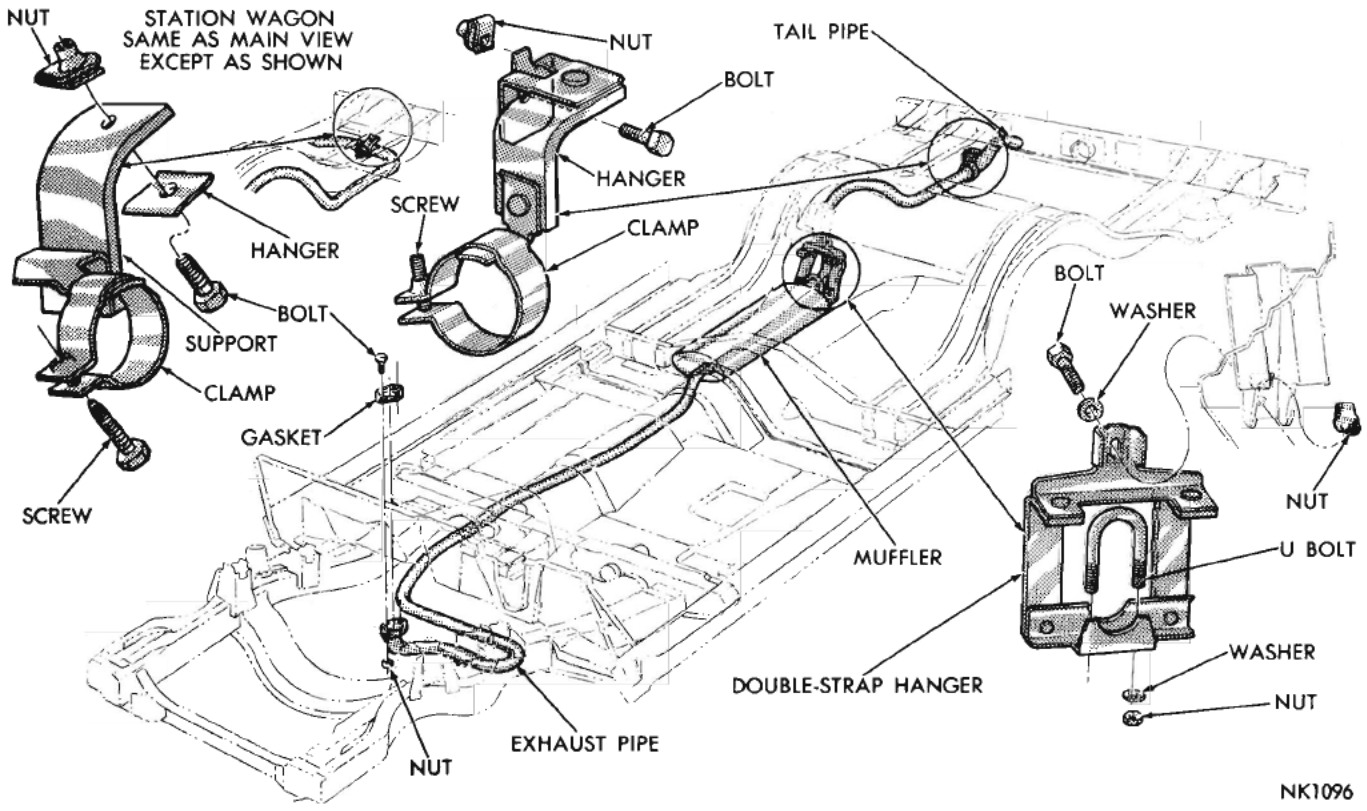

Fig. 5—Exhaust System—AP-1 Models

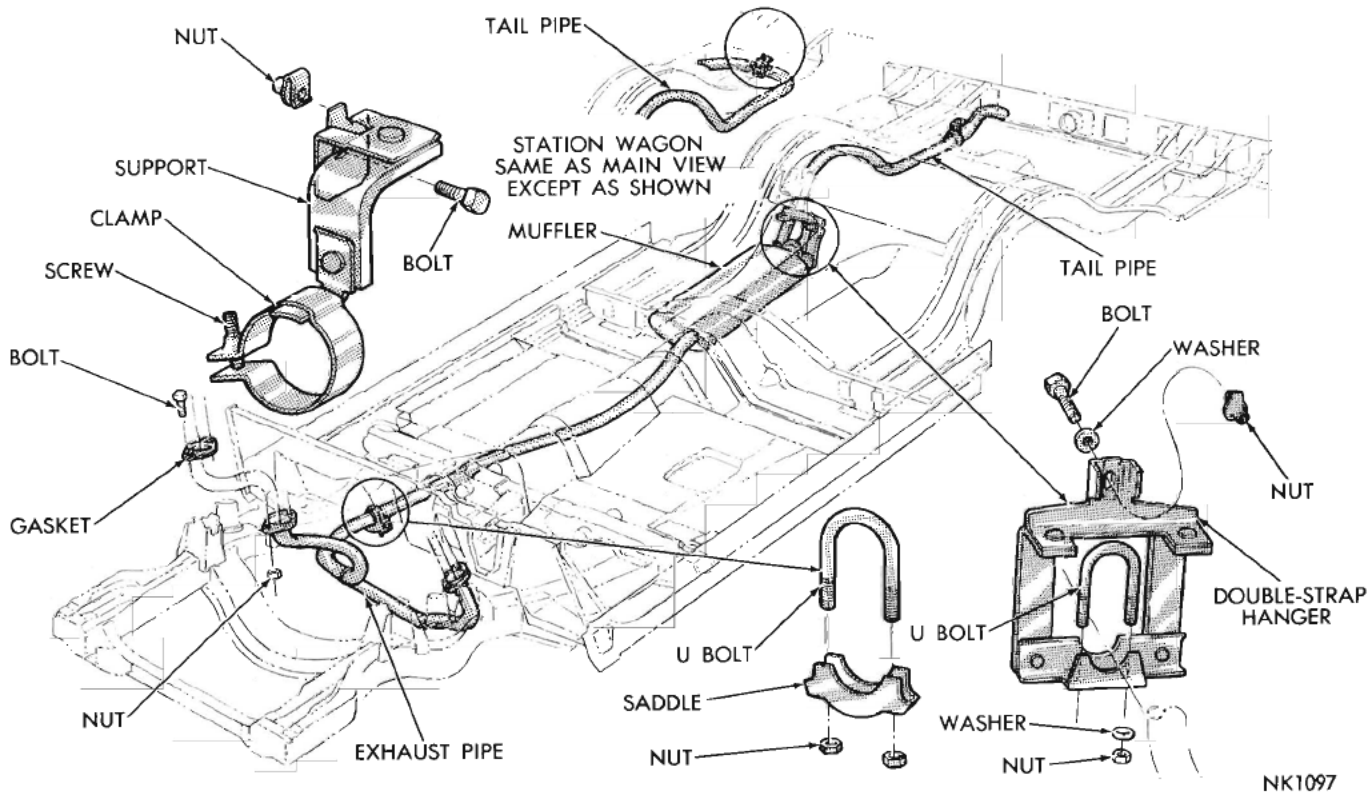

Fig. 6—Exhaust System—AP-2 Models

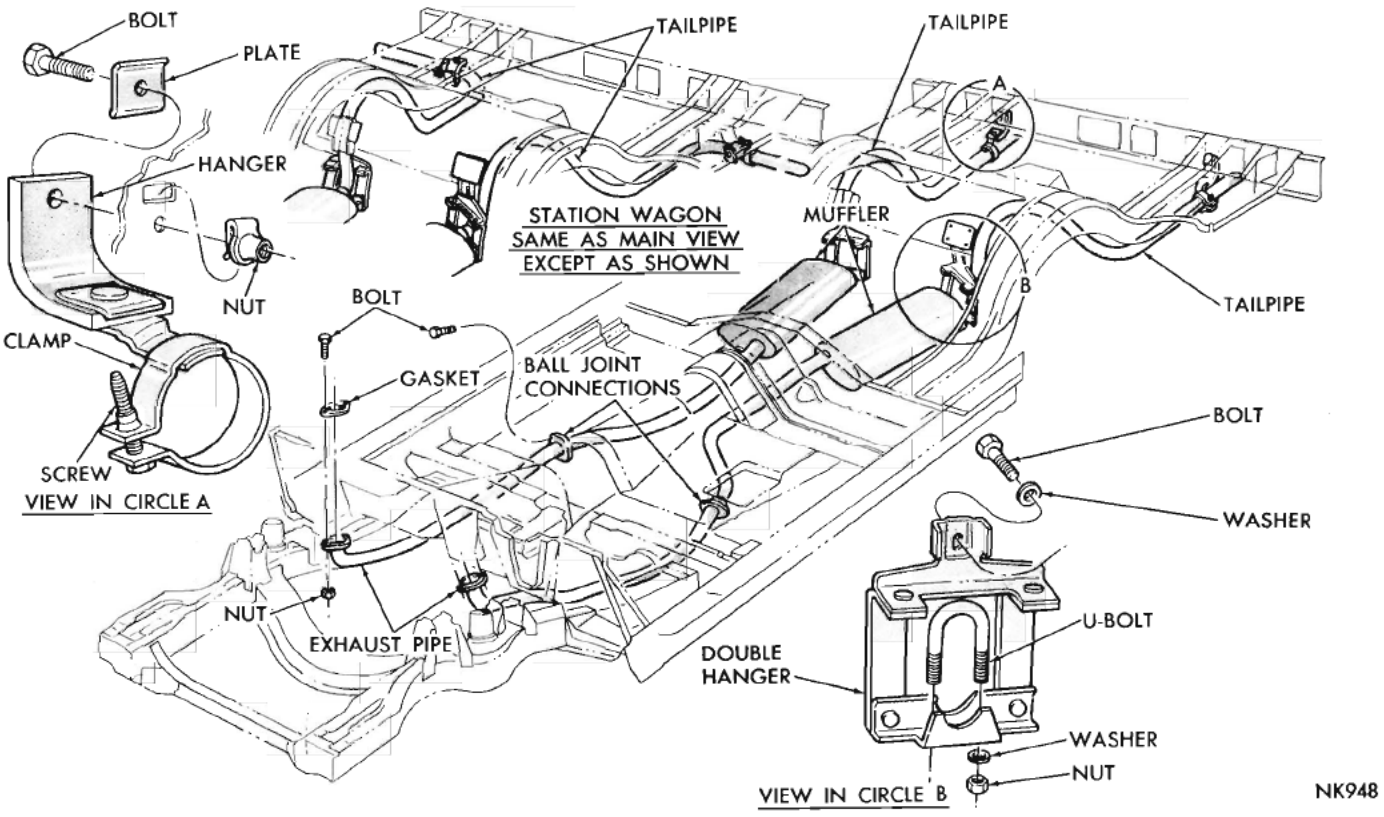

Fig. 7—Exhaust System—Dual—AP-2 Models

(7) Inspect the manifolds for cracks or distortion. Test the operation of manifold heat control valve. If the shaft is binding, apply Manifold Heat Control Solvent, Part Number 1879318, as outlined in Paragraph, "Manifold Heat Control Valve."

Installation

(1) Install a new gasket between the two manifolds and install the three long screws securing the manifolds (Fig. 8). **Do not tighten the screws at this time. Leave them loose temporarily.**

(2) Position the manifold assembly on the cylinder head, using a new gasket. Install the triangular washers and nuts on the upper studs opposite numbers 2 and 5 cylinders and on the six lower studs. The eight triangular washers should be positioned squarely on the machined surfaces of both the intake and exhaust manifold retaining pads. These washers must be installed with the cup sides against the manifold. Install the nuts and washers only when the engine is cold.

(3) Install the other conical washers with cup side against manifold. Tighten nuts to 10 foot-pounds.

CAUTION: Do not over tighten these nuts.

(4) Tighten the three screws securing the intake manifold to the exhaust manifold to 15 foot-pounds, starting with the **inner** screw, then the **two outer** screws.

(5) Attach the exhaust pipe to the manifold flange, using a new gasket and tighten bolt nuts to 35 foot-pounds.

(6) Install the carburetor and connect the automatic choke rod and throttle linkage. Assemble crankcase ventilating valve hose, vacuum control tube and fuel line to carburetor. Install the carburetor air cleaner, and connect the closed breather cap hose to air cleaner inlet tube, if used.

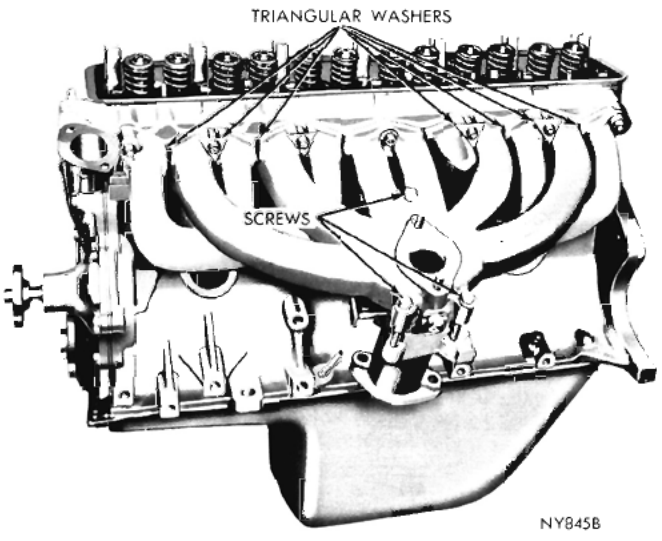

Fig. 8—Manifold Assembly (6-Cylinder)

INTAKE MANIFOLD (273 Cubic Inch Engine)

NOTE: Remove the intake manifold as outlined in Group 9, "Engine."

Servicing

(1) Clean the manifold in solvent and blow dry with compressed air. Inspect the manifold for cracks.

(2) Inspect the mating surfaces of the manifold for parallelism with a straightedge.

(3) Inspect the exhaust crossover passages through the manifold (Fig. 9). If passages are coated with hard, black carbon, they should be scraped clean and sandblasted to remove the carbon deposits.

(4) Install the intake manifold, using new gaskets. Tighten the manifold screws to 270 inch-pounds.

EXHAUST MANIFOLD (273 Cubic Inch Engine)

Removal

(1) Remove the bolts and the nuts attaching the exhaust pipe to the manifold. **On the left hand manifold,** remove the bolt, nut and washer attaching the two manifold braces.

(2) Remove the bolts, nuts and washers attaching the manifolds to the cylinder heads. Remove the manifolds from the cylinder heads.

(3) Clean the gasket surfaces on the cylinder heads and the manifolds, wash with solvent and blow dry with compressed air. Inspect the manifolds for cracks.

(4) Inspect the mating surfaces of the manifold for parallelism with a straightedge. Gasket surfaces must be flat within .008 inch.

(5) On the right hand manifold, test the manifold heat control valve for free operation. If necessary to free up, apply Manifold Heat Control Solvent, Part Number 1879318, as outlined in Paragraph "Manifold Heat Control Valve."

Installation

(1) Position the two outboard arms of the mani-

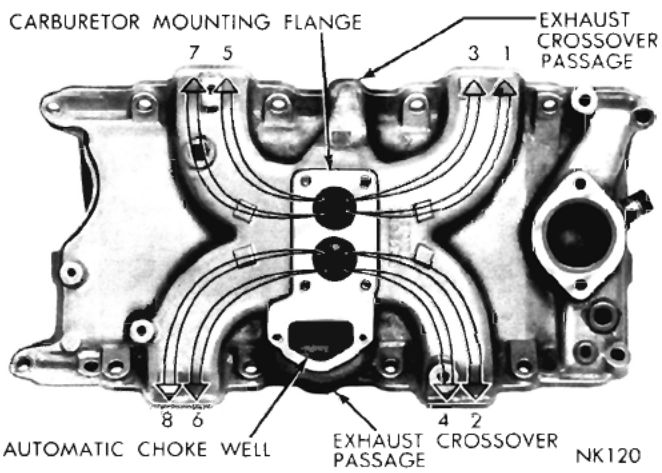

Fig. 9—Intake Manifold (273 Cu. In. Engine)

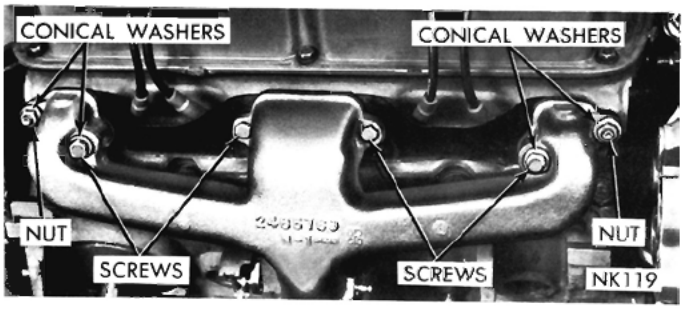

Fig. 10—Installing Exhaust Manifold (273 Cu. In. Engine)

folds on the two studs on cylinder heads, using new gaskets. Install the conical washers and nuts on the studs (Fig. 10).

(2) Install the two screws and the conical washers at the inner ends of the outboard arms of the manifold. Install the two screws **without** washers on the center arm of the manifold (Fig. 10). Tighten the screws and nuts, starting at the center arm and working outward, to 15 foot-pounds.

(3) Assemble the exhaust pipe to the manifold, and secure with bolts, nuts and washers. Tighten the nuts to 25-45 foot-pounds. **On the left hand manifold,** attach the two braces to the manifold with bolt, nut and washer. Tighten the nut to 30 foot-pounds.

INTAKE MANIFOLD (318, 361, 383 and 426 Cu. In. Engines)

Remove the Intake Manifold as outlined in Group 9 "Engine."

Servicing

(1) Clean the manifold (Figs. 11 and 12) in solvent and blow dry with compressed air.

(2) Inspect the exhaust crossover passages (Figs. 11 and 12) and pressure test for any leakage into the intake passages.

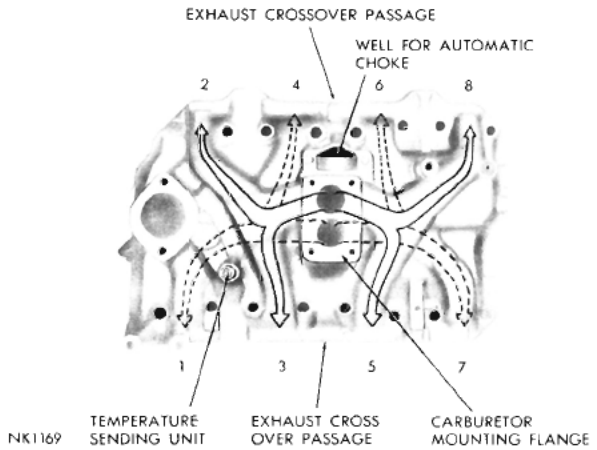

Fig. 11—Intake Manifold (318 Cu. In. Engine)

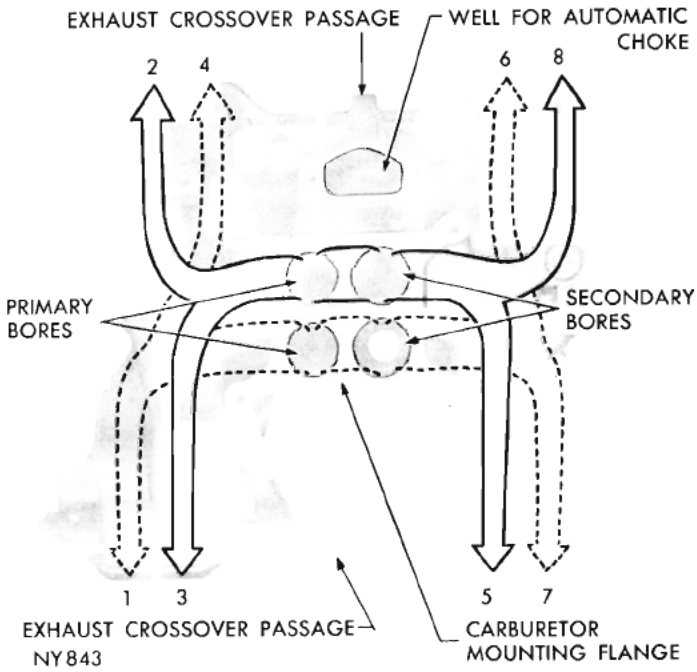

Fig. 12—Intake Manifold (361 and 383 Cu. In. Engines)

(3) Inspect the mating surfaces for parallelism.

(4) Use new gaskets when installing the manifold. Reinstall the manifold as outlined in Group 9, "Engine."

EXHAUST MANIFOLD (318, 361, 383, 426 Cubic Inch Engines)

Removal

(1) Disconnect the spark plug cables.

(2) Remove the alternator.

(3) Disconnect the exhaust pipe at the exhaust manifold.

(4) Remove the stud nuts attaching the exhaust manifolds to the cylinder heads. Slide the manifolds off the studs and away from the cylinder heads.

(5) Clean the manifolds in solvent and blow dry with compressed air.

(6) Inspect the manifolds for cracks and distortion.

(7) On the right hand manifold, test the heat control valve for free operation. If necessary to free up, apply Manifold Heat Control Solvent, Part Number 1879318, as outlined in Paragraph "Manifold Heat Control Valve."

Installation

(1) **318 Cu. In. Engine**—Install the manifolds using new gaskets. Tighten stud nuts to 30 foot-pounds.

(2) **361, 383 and 426 Cu. In. Engines**—Install manifolds on cylinder heads. No gaskets are required. Tighten the stud nuts to 30 foot-pounds.

(3) Install the alternator and adjust the belt tension.

(4) Attach the spark plug cables to the spark plugs.

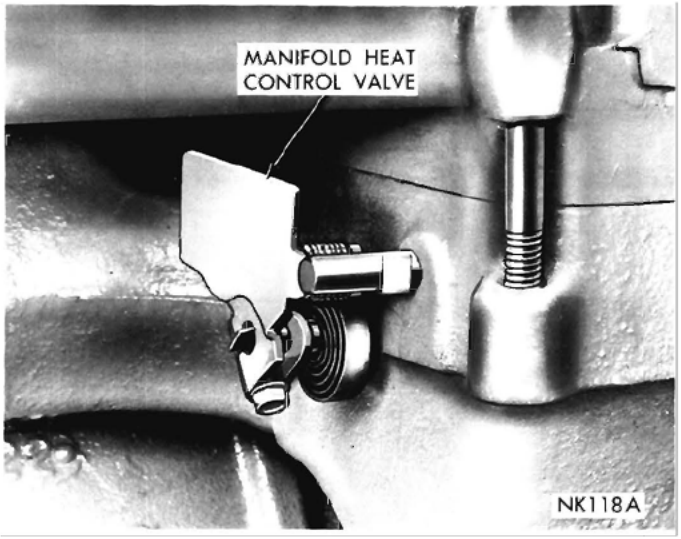

Fig. 13—Manifold Heat Control Valve (170 and 225 Cu. In. Engines)

MANIFOLD HEAT CONTROL VALVE (170 and 225 Cu. In. Engines)

The application of a few drops of Manifold Heat Control Valve Solvent, Part Number 1879318, every six months, to both ends of the manifold heat control valve shaft will keep the valve working freely. The solvent should be applied when the engine is **COOL** and the solvent allowed to soak a few minutes. Work the valve back and forth until it turns freely.

Operation of the manifold heat control valve (Fig. 13), should be inspected periodically. With the engine idling, accelerate momentarily to wide open **throttle.** The counterweight should respond by moving counterclockwise approximately ½-inch and return to its original position. If no movement is observed, the shaft is binding due to accumulation of deposits or the thermostat is weak or broken.

Removal

(1) Remove the counterweight and lock from the end of the shaft by loosening the clamp bolt (Fig. 14).

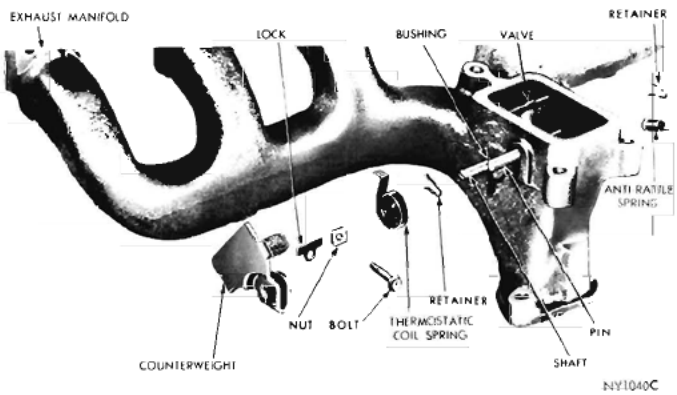

Fig. 14—Manifold Heat Control Valve (170 and 225 Cu. In. Engines)

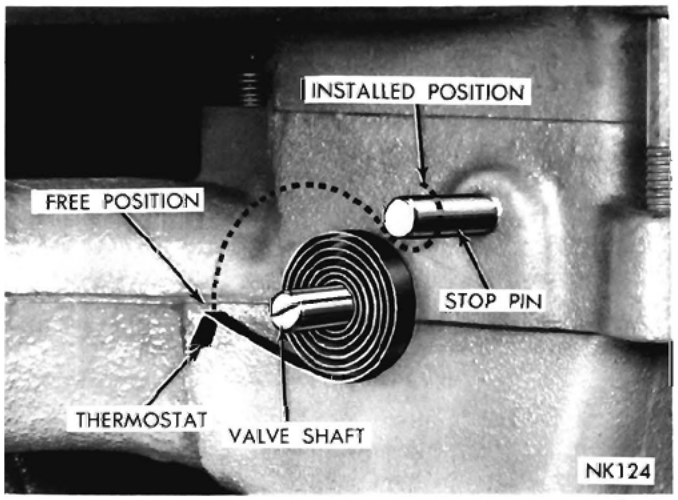

Fig. 15—Installing Thermostat (170 and 225 Cu. In. Engines)

(2) Unhook the thermostat from the stop pin and remove from the valve shaft slot.

(3) If the valve shaft is binding in the manifold, apply Manifold Heat Control Valve Solvent, Part Number 1879318.

(4) Examine the bumper stop on the counterweight. If damaged, replace with a new one.

Installation

(1) Place the shaft in the extreme clockwise position. Place a new thermostat in the shaft slot (Fig. 15) and position it with the outer end in the lower left hand position.

(2) Wrap the outer end of the thermostat clockwise and engage it under the stop pin (Fig. 15).

(3) Place the counterweight on the shaft, with the shield in the upward position and insert the lock in the shaft slot (Fig. 16).

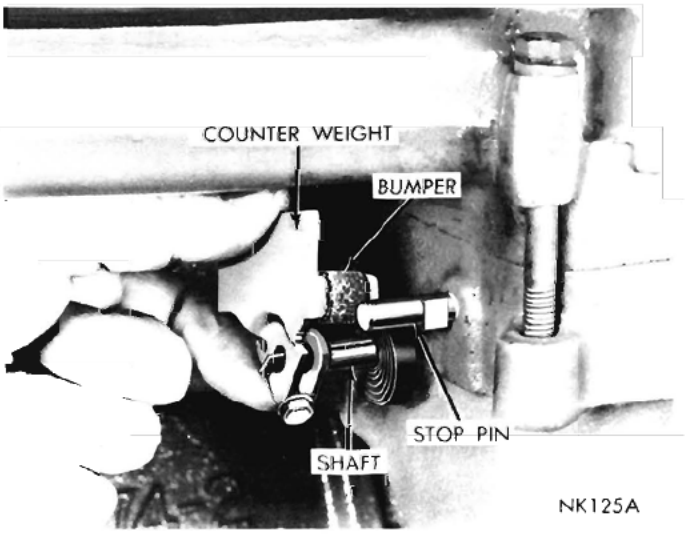

Fig. 16—Installing Counterweight (170 and 225 Cu. In. Engines)

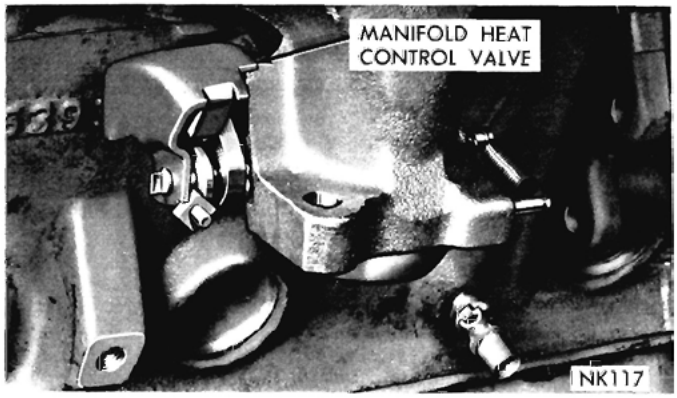

Fig. 17—Manifold Heat Control Valve (273 Cu. In. Engines)

(4) Center the counterweight on the shaft and turn the valve counterclockwise until the bumper passes the stop pin (Fig. 16).

(5) Press the counterweight on the shaft until it is seated. Tighten the clamp bolt (Fig. 16) to 50 inch-pounds with C-3380 Torque Wrench.

(6) Make sure that the anti-rattle spring on opposite end of the shaft is in place. Test the operation of the valve.

MANIFOLD HEAT CONTROL VALVE (273, 318, 361 and 426 Cu. In. Engines)

The application of a few drops of Manifold Heat Control Valve Solvent, Part Number 1879318, every six months, to both ends of the manifold heat control valve shaft at the bushings will keep the valve working freely. The solvent should be applied when the engine is **COOL** and allowed to soak several minutes. Work the valve back and forth until it turns freely.

Operation of the manifold heat control valve (Figs. 17, 18 and 20) should be inspected periodically. With the engine idling, accelerate momentarily to wide open throttle. The counterweight should respond by moving counterclockwise approimately ½ inch and return to its original position. If no movement is observed, the shaft is binding due to accumulation of deposits or the thermostat is weak or broken.

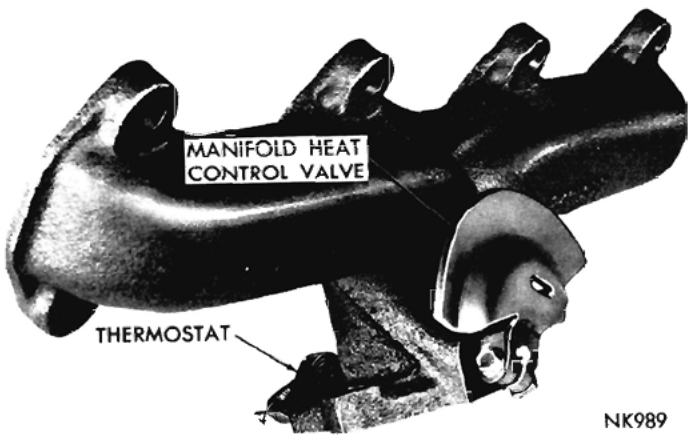

Fig. 18—Manifold Heat Control Valve (318 Cu. In. Engines)

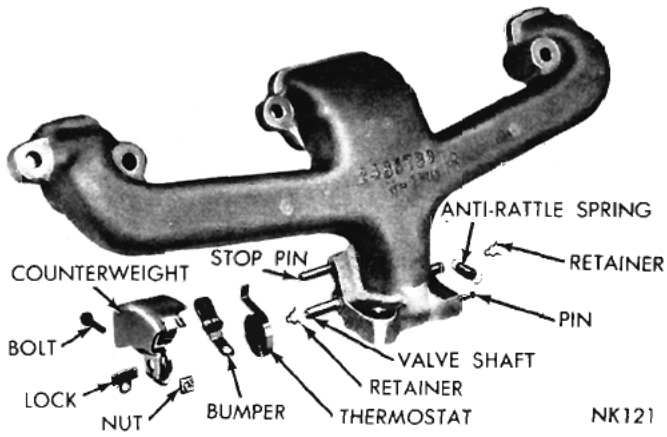

Fig. 19—Manifold Heat Control Valve (273 Cu. In. Engine)

Removal (All 8 Cylinder Engines Except 318 Cu. In. Engine)

(1) Remove the counterweight, lock and bumper from the end of shaft by loosening the clamp bolt (Figs. 19, 20 and 21).

(2) Unhook the thermostat from the stop pin and remove from the valve shaft slot.

Counterweight-Removal (318 Cu. In. Engine)

(1) Remove the counterweight and the bumper from the outer end of the valve shaft by loosening the clamp bolt (Figs. 18 and 22).

Thermostat—Removal (318 Cu. In. Engine)

(1) To replace the thermostat on the inner end of the valve shaft, first remove the anti-rattle spring (Figs. 18 and 22).

(2) Unhook the thermostat from the stop pin and slide from the valve shaft.

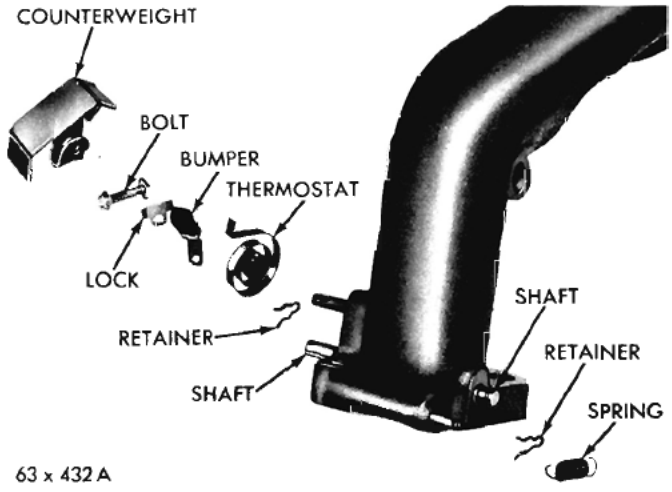

Fig. 20—Manifold Heat Control Valve—Rear Outlet Manifold (361, 383 and 426 Cu. In. Engines)

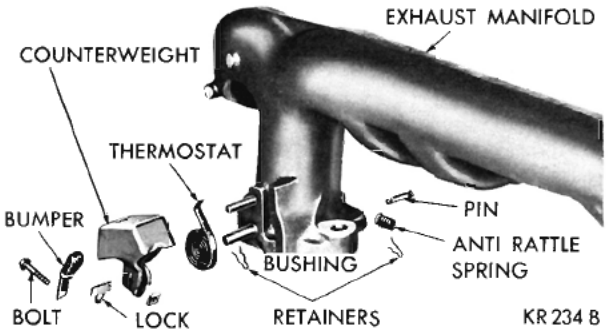

Fig. 21—Manifold Heat Control Valve—Center Outlet Manifold (361, 383 and 426 Cu. In. Engines)

Cleaning and Inspection

Move the valve shaft back and forth and test the operation. If the shaft is binding in the manifold, apply Manifold Heat Control Valve Solvent, Part Number 1879318.

Installation (273 Cu. In. Engines)

(1) Place the shaft in the extreme counterclockwise position.

(2) Install a new thermostat in the shaft slot (Fig. 23) and position with the outer end in the lower right hand position.

(3) Wrap the outer end of the thermostat counterclockwise and engage under the stop pin (Fig. 23).

(4) Place the counterweight on the shaft with the shield in the downward position and insert the lock in the shaft slot.

(5) Center the counterweight on the shaft and turn the shaft clockwise until the bumper passes the stop pin (Fig. 24).

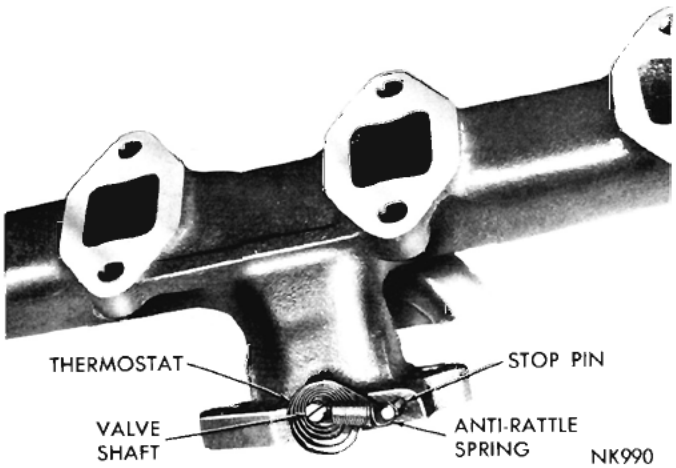

Fig. 22—Removing Thermostat—(318 Cu. In. Engine)

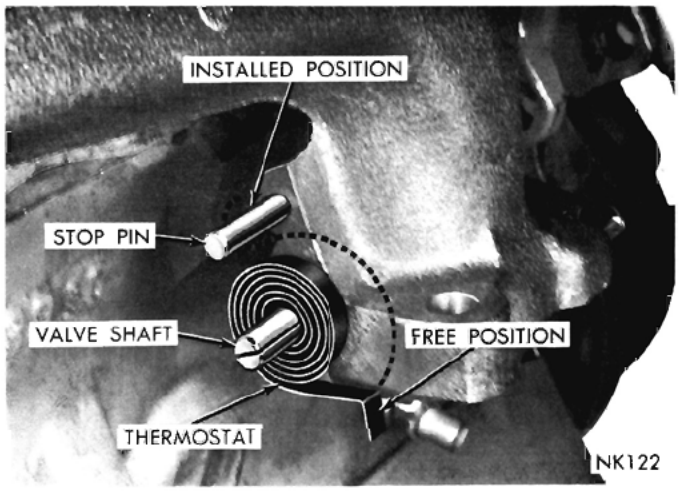

Fig. 23—Installing Thermostat (273 Cu. In. Engine)

(6) Press the counterweight on the shaft until seated. Tighten the clamp bolt 50 inch-pounds with Tool C-3380 Torque Wrench.

(7) Make sure the anti-rattle spring on the opposite end of the shaft is in place. Test the operation of the valve for freedom of movement.

Thermostat-Installation (318 Cu. In. Engine)

(1) Be sure the shaft retainer is in place on the inner end of the valve shaft. Place the valve shaft in the extreme clockwise position.

(2) Install a new thermostat in the slot in the inner end of the shaft (Fig. 25) with the outer end of the thermostat in the lower left hand position. Press the inner end of the thermostat into the shaft and seat firmly.

(3) Wrap the outer end of the thermostat clockwise and engage under the pin (Fig. 25).

(4) Install the anti-rattle spring on the pin and end of the valve shaft. Make sure it does not interfere with the thermostat.

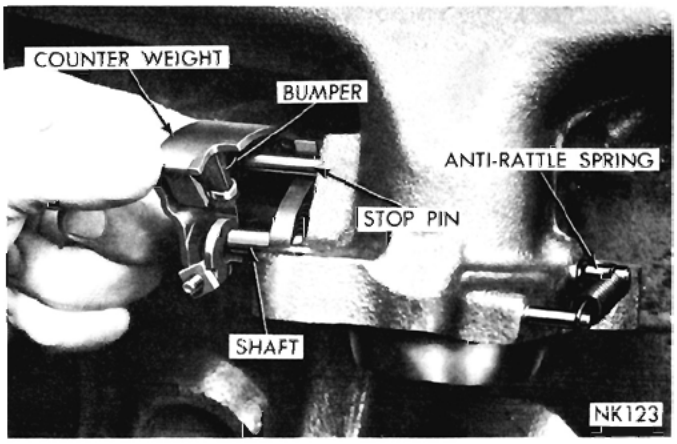

Fig. 24—Installing Counterweight (273 Cu. In. Engine)

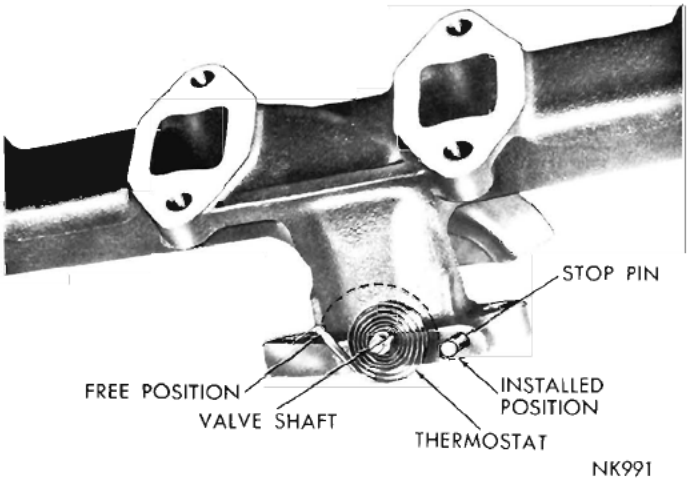

Fig. 25—Installing Thermostat (318 Cu. In. Engine)

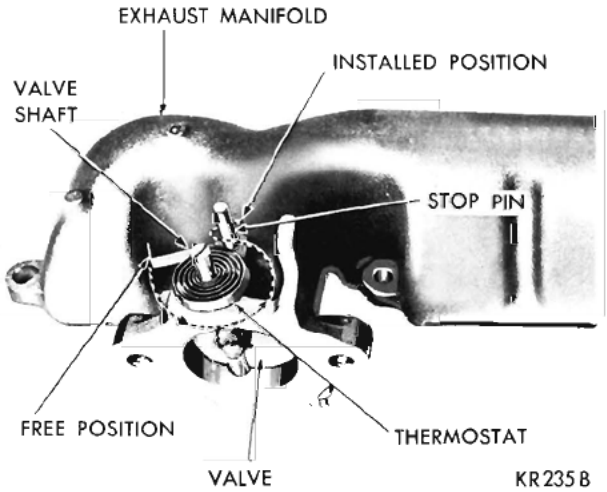

Fig. 27—Positioning the Thermostat

***Counterweight-Installation* (318 Cu. In. Engine)**

(1) Be sure the shaft retainer is in place on the outer end of the valve shaft.

(2) Install the counterweight and the bumper on the outer end of the valve shaft. The bumper should be located on the left side of the hub section of the counterweight and to the right side of the stop pin (Fig. 26). If the fabric on the bumper is worn, install a new bumper.

(3) Tighten the clamp bolt to 50 inch-pounds with Tool C-3380 Torque Wrench. Test the operation of the valve for freedom of movement.

INSTALLATION REAR OUTLET MANIFOLD (361, 383, and 426 Cu. In. Engines)

(1) Position the shaft in the extreme counterclockwise position.

(2) Place a new thermostat in the shaft slot with the outer end of the thermostat facing downward on the right side. Wrap the outer end of the thermostat clockwise and engage under the stop pin (Fig. 20).

(3) Place the counterweight on the shaft with the shield in the upper position and insert the lock in the shaft slot.

(4) Center the counterweight on the shaft and turn the valve counterclockwise until the bumper passes the stop pin.

(5) Press the counterweight on the shaft until it is seated. Tighten the clamp bolt to 50 inch-pounds, using Torque Wrench Tool C-3380.

(6) Make sure that the anti-rattle spring on the opposite end of the shaft is in place. Test the operation of the valve.

INSTALLATION—CENTER OUTLET MANIFOLD (361, 383 and 426 Cu. In. Engine)

(1) Position the shaft in extreme counterclockwise position.

(2) Place a new thermostat in the shaft slot with the outer end of the thermostat facing downward on the left side. Wrap the outer end of the thermostat counterclockwise and engage it under the stop pin (Fig. 27).

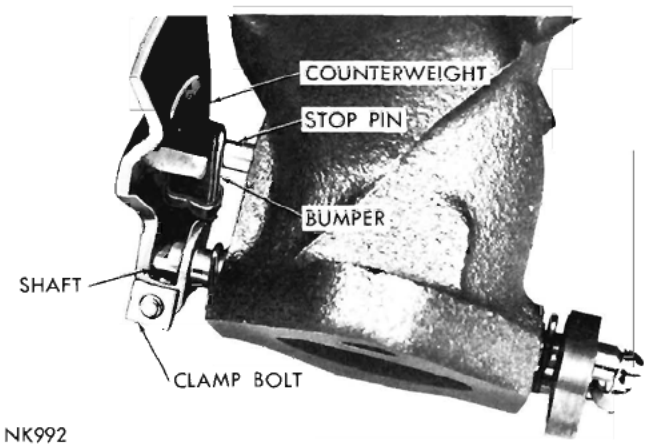

Fig. 26—Installing Counterweight (318 Cu. In. Engine)

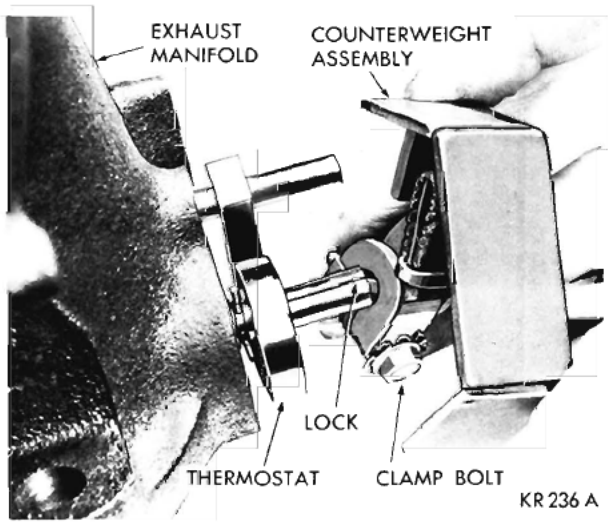

Fig. 28—Installing Counterweight

(3) Place the counterweight on the shaft with the shield in the upper position and insert the lock in the shaft slot.

(4) Center the counterweight on the shaft and turn the valve counterclockwise until the bumper passes the stop pin (Fig. 28).

(5) Press the counterweight on the shaft until it is seated. Tighten the clamp bolt to 50 inch-pounds, using Tool C-3380 Torque Wrench.

(6) Make sure the anti-rattle spring on the opposite end of the shaft is in place. Test operation of the valve.

FUEL SYSTEM (PUMP, CARBURETOR, TANK)

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GENERAL INFORMATION

The fuel system consists of the fuel tank, fuel pump, fuel filter, carburetor, fuel lines and vacuum lines. (See Figure 1.)

The fuel tank assembly consists of the tank, filler neck cap, air vent, and a fuel gauge sending unit.

In operation, the fuel pump draws fuel from the tank and forces it to the filter and carburetor. The carburetor meters the fuel into the air stream drawn into the engine, in quantities suitable for all engine speed and load conditions.

The fuel filter for 1965 is a paper element sealed, disposable type unit, located in the fuel line between the fuel pump and the carburetor. The filter unit should be replaced every 20,000 miles.

SERVICING THE CARBURETORS

Often, the carburetor is blamed for a great variety of trouble which is classed as "POOR CAR PERFORMANCE." Therefore, be definitely sure that the trouble is not located elsewhere before disassembling the carburetor.

When overhauling the carburetor, several items of importance should be observed to assure a good job:

(1) The carburetor must be completely disassembled.

(2) All parts (except the choke diaphragm assembly) should be cleaned in a suitable solvent then inspected for damage or wear.

(3) Use air pressure only, to clean the various orifices or channels.

(4) Replace questionable parts with NEW ONES. When checking parts removed from the carburetor, it is at times difficult to be sure they are satisfactory for further service. It is therefore recommended that in such case, NEW parts be installed.

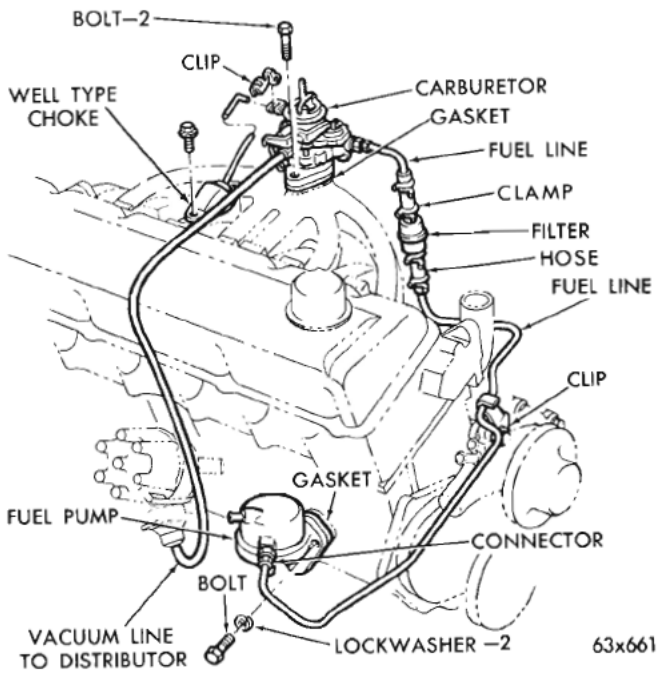

Fig. 1—Fuel System (Engine Compartment)

CLEANING CARBURETOR PARTS

The recommended solvent for gum deposits is denatured alcohol which is easily obtainable. However, there are other commercial solvents which may be used with satisfactory results.

The choke diaphragm can be damaged by solvents. Avoid placing the diaphragm assembly in **ANY** liquid. Clean the external surfaces with a clean cloth or a soft wire brush. Shake dirt or other foreign material from the stem (plunger) side of the diaphragm. Depressing the stem to the retracted position, will provide an additional hole for the removal of dirt. Compressed air can be used to remove loose dirt **but should not be connected to the vacuum diaphragm fitting.**

IMPORTANT: If the commercial solvent or cleaner recommends the use of water as a rinse, it should be "HOT." After rinsing, all trace of water must be blown from the passages with air pressure. It is further advisable to rinse all parts in clean kerosene or gasoline to be certain no trace of moisture remains. Never clean jets with a wire, drill, or other mechanical means, because the orifices may be-

come enlarged, making the mixture too rich for proper performance.

AUTOMATIC CHOKE—WELL TYPE

To function properly, it is important that all parts be clean and move freely. Other than an occasional cleaning, the choke requires no servicing. However, it is very important that the choke control unit work freely in the well and at the choke shaft. Move the choke rod up and down to check for free movement in the pivot. If the unit binds, a new choke unit should be installed. **The well type choke is serviced as an assembly. Do not attempt to repair or change the setting, unless authorized by service literature. Changes of the choke materially affect summer temperature cold starting and seldom are a satisfactory correction of driveability problems, which are generally associated with carburetors or vacuum diaphragms.**

When installing the well type choke unit, be certain that the coil housing does not contact the sides of the well in the exhaust manifold. Any contact at this point will affect choke operation. DO NOT lubricate any parts of the choke or the control unit. This causes an accumulation of dirt which will result in binding of the mechanism.

CLOSED CRANKCASE VENT SYSTEM

The closed crankcase ventilator valve is located in the crankcase vent tube cap and is connected to the carburetor throttle body via a rubber tube.

The function of the valve is to regulate the flow of unburned hydrocarbons from the crankcase and return them to the intake manifold. From here they enter the combustion chamber and then exit via the exhaust system as completely burned exhaust products.

For servicing procedures of this valve, refer to Engine Section of this Manual.

PART 1
SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
POOR IDLING	(a) Idle air bleed carbonized or of incorrect size.	(a) Disassemble the carburetor. Then, use compressed air to clear idle bleed after soaking it in a suitable solvent.
	(b) Idle discharge holes plugged or gummed.	(b) Disassemble the carburetor. Then, use compressed air to clear idle discharge holes after soaking the main and throttle bodies in a suitable solvent.
	(c) Throttle body carbonized or worn throttle shaft.	(c) Disassemble the carburetor. Check the throttle valve shaft for wear. If excessive wear is apparent, replace the throttle body assembly.
	(d) Damaged or worn idle mixture needle.	(d) Replace the worn or damaged idle needle. Adjust the mixture.
	(e) Low grade fuel or incorrect float level.	(e) Test the fuel level in the carburetor. Adjust as necessary to obtain the correct float level.
	(f) Loose main body to throttle body screws.	(f) Tighten the main body to throttle body screws securely to prevent air leaks and cracked housings.
	(g) Worn or corroded needle valve and seat.	(g) Clean and inspect the needle valve and seat. If found to be in questionable condition, replace assembly. Then, test fuel pump pressure. Refer to Specifications for correct fuel pump pressure.
POOR ACCELERATION	(a) Accelerator pump piston (or plunger) leather too hard, worn, or loose on stem.	(a) Disassemble the carburetor. Replace accelerator pump assembly if leather is hard, cracked or worn. Test follow-up spring for compression.
	(b) Faulty accelerator pump discharge ball.	(b) Disassemble the carburetor. Use compressed air to clean the discharge nozzle and channels after soaking the main body in a suitable solvent. Test the fuel pump capacity.

Condition	Possible Cause	Correction
	(c) Faulty accelerator pump inlet check ball.	(c) Disassemble the carburetor. Check the accelerator pump inlet, check ball for poor seat or release. If part is faulty, replace.
	(d) Incorrect fuel or float level.	(d) Test the fuel or float level in the carburetor. Adjust as necessary to obtain the correct float level.
	(e) Worn accelerator pump and throttle linkage.	(e) Disassemble the carburetor. Replace the worn accelerator pump and throttle linkage and measure for the correct position.
	(f) Manifold heat valve sticking.	(f) Free up manifold heat control valve, using recommended solvent.
CARBURETOR FLOODS OR LEAKS	(a) Cracked body.	(a) Disassemble the carburetor. Replace the cracked body. Make sure main to throttle body screws are tight.
	(b) Faulty body gaskets.	(b) Disassemble the carburetor. Replace the defective gaskets and test for leakage. Be sure the screws are tightened securely.
	(c) High float level.	(c) Test the fuel level in the carburetor. Make the necessary adjustment to obtain correct float level.
	(d) Worn needle valve and seat.	(d) Clean and inspect the needle valve and seat. If found to be in a questionable condition, replace the complete assembly and test the fuel pump pressure. Refer to specifications for correct fuel pump pressure.
	(e) Excessive fuel pump pressure.	(e) Test the fuel pump pressure. If the pressure is in excess of recommended pressure (refer to Specifications), replace fuel pump.
POOR PERFORMANCE MIXTURE TOO RICH	(a) Restricted air cleaner.	(a) Remove and clean the air cleaner.
	(b) Leaking float.	(b) Disassemble the carburetor. Replace leaking float. Test the float level and correct as necessary, to the proper level.
	(c) High float level.	(c) Adjust the float level as necessary to secure the proper level.
	(d) Excessive fuel pump pressure.	(d) Test the fuel pump pressure. Refer to specifications for recommended pressure. If pressure is in excess of recommended pressure, replace the fuel pump assembly.
	(e) Worn metering jet.	(e) Disassemble the carburetor. Replace the worn metering jet, using a new jet of the correct size and type.
CARBURETOR MIXTURES LEAN	(a) Air leak bypassing the carburetor.	(a) Correct the air leak.
	(b) Carburetor has economy metering system.	(b) Install standard metering jets and/or step-up wires.
ENGINE RUNS EXCESSIVELY RICH AFTER COLD START		
CHOKE SYSTEM RICH	(a) Choke thermostat adjustment richer than specified.	(a) Adjust the choke.
	(b) Choke thermostat distorted rich by overheating.	(b) Replace, since this problem can be corrected by use of proper choke assembly.

14-4 FUEL SYSTEM—DIAGNOSIS

Condition	Possible Cause	Correction
	(c) Choke vacuum diaphragm inoperative or misadjusted.	(c) Repair or replace the vacuum unit.
	(d) Choke Vacuum passage blocked or leaking.	(d) Open the passage. Correct any leaks.
CARBURETOR RICH	(a) Incorrect gasket or gasket installation between carburetor and intake manifold.	(a) Replace or correct.
EXCESSIVE STALLS AFTER COLD START		
CHOKE SYSTEM LEAN	(a) Check items under "Poor Starting—Choke Valve Fails to Close."	
	(b) Choke vacuum diaphragm adjustment lean.	(b) Adjust to Specification.
ENGINE OUTPUT LOW	(a) Fast idle speed low.	(a) Adjust to specification.
	(b) Fast idle cam position adjustment incorrect.	(b) Adjust to specification.
	(c) Engine lubrication oil of incorrect viscosity.	(c) Recommend 5W-20.
CARBURETOR LEAN	(a) Curb idle very lean.	(a) Adjust the idle mixture.
	(b) Air leak bypassing the carburetor.	(b) Correct the air leak.
POOR COLD ENGINE STARTING		
INCORRECT PROCEDURE	(a) Throttle must be opened to free choke system. Best position for all temperatures and all conditions is ⅓ open.	(a) Instruct owner in correct procedure for starting.
CHOKE VALVE FAILS TO CLOSE	(a) Choke thermostat adjustment leaner than specified.	(a) Adjust the choke thermostat.
	(b) Choke thermostat corroded such that it has cracked and distorted lean.	(b) Replace the choke thermostat assembly.
	(c) Choke linkage, shaft or related parts corroded, bent or dirty such that the system is not entirely free to move from the open to the closed position.	(c) Repair, clean or replace linkage as required.
	(d) Choke valve improperly seated.	(d) Relocate the choke valve.
	(e) Air cleaner interferes with choke shaft or linkage.	(e) Rotate cleaner to correct position, and tighten.
	(f) Air cleaner gasket interferes with choke valve or linkage.	(f) Install gasket properly.
LOW ENGINE OUTPUT (10°F or lower)	(a) Engine lubricating oil of incorrect viscosity.	(a) Recommend 5W-20.
	(b) Valve clearing incorrect.	(b) Adjust tappets.
	(c) Choke thermostat adjustment incorrect, rich.	(c) Adjust to correct setting.
ENGINE RUNS LEAN, FIRST HALF MILE		
CHOKE LEAN	(a) Check items under (Poor Starting).	(a) See "Choke Valve Fails to Close."
	(b) Diaphragm adjustment lean.	(b) Adjust to specification.
ENGINE RUNS LEAN AFTER HALF MILE		
ENGINE HEAT INSUFFICIENT	(a) Heat valve stuck open.	(a) Free up with solvent.
	(b) Heat valve thermostat distorted.	(b) Replace thermostat.
	(c) Heat valve failed within exhaust. See engine section for proper diagnosis.	(c) Replace heat valve.
	(d) Water temperature sub-normal.	(d) Test engine. Replace if necessary.

FUEL PUMP

Condition	Possible Cause	Correction
FUEL PUMP LEAKS—FUEL	(a) Worn, ruptured or torn diaphragm.	(a) Install a new fuel pump.
	(b) Loose diaphragm mounting plates.	(b) Install a new fuel pump.
	(c) Loose inlet or outlet line fittings.	(c) Tighten the line fittings.
FUEL PUMP LEAKS—OIL	(a) Cracked or deteriorated pull rod oil seal.	(a) Install a new pump.
	(b) Loose rocker arm pivot pin.	(b) Install a new fuel pump.
	(c) Loose pump mounting bolts.	(c) Tighten the mounting bolts securely.
	(d) Defective pump to block gasket.	(d) Install a new gasket.
INSUFFICIENT FUEL DELIVERY	(a) Vent in tank filler cap restricted. This will also cause collapsed fuel tank.)	(a) Install new cap, and inspect tank for leaks.
	(b) Leaks in fuel line or fittings.	(b) Tighten the line fittings.
	(c) Dirt or restriction in fuel tank.	(c) Install a new fuel filter and clean out the tank.
	(d) Worn, ruptured, or torn diaphragm.	(d) Install a new pump.
	(e) Frozen gas lines.	(e) Thaw the lines and drain the tank.
	(f) Improperly seating valves.	(f) Install a new fuel pump.
	(g) Vapor lock.	(g) Install heat shield where lines or pump are near exhaust.
	(h) Low pressure.	(h) Install a new fuel pump.
	(i) Incorrect fuel pump.	(i) Install correct fuel pump.
	(j) Restricted fuel filter.	(j) Install a new filter.
FUEL PUMP NOISE	(a) Loose mounting bolts.	(a) Tighten the mounting bolts.
	(b) Scored or worn rocker arm.	(b) Install a new fuel pump.
	(c) Weak or broken rocker arm spring.	(c) Install a new spring.

PART 2

HOLLEY 1920 R SERIES CARBURETORS

Description

The Holley carburetors models R-3053A R-3054A R-3055A and R-3056A used on the 170 cubic inch engine, are equipped with a spring staged choke, as shown in (Fig. 1). Since all the Holley carburetors are serviced in the same manner, the spring staged choke adjustment will be covered separately and indicated as such in the service procedures.

The Holley carburetors used on the 225 cubic inch engine, models R-3057A R-3059A R-3060A and (high performance) R-3058A with manual and automatic transmissions are serviced the same as the previously mentioned carburetors. Refer to (Fig. 2). Since the service procedures are identical on all Holley carburetors, the illustrations showing the various disassembly procedures will not always show any one specific carburetor.

The spring staged choke, shown in (Fig. 1) is a device incorporated in the choke mechanism which limits the choke blade closing torque when cranking the engine at temperatures below zero. Thus the spring staging of the choke is a better match for the engine's starting mixture requirements at both the low and

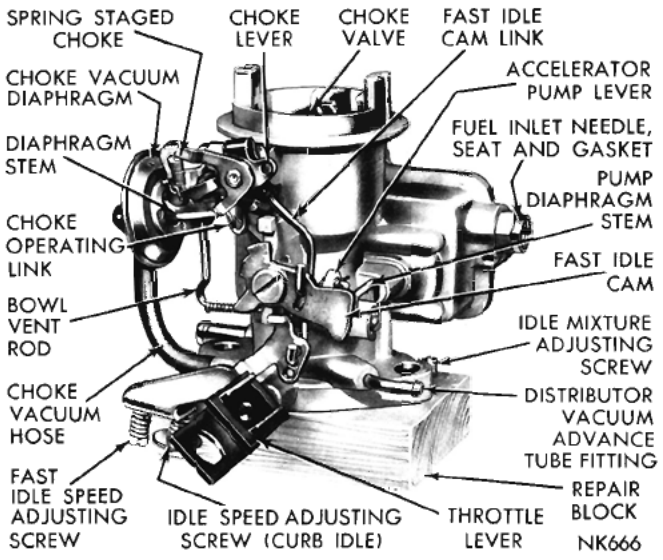

Fig. 1—Carburetor Assembly (R-3053, and R-3054 Typical of R-3055 and R-3056)

moderate temperatures.

Fuel from the bowl flows into the four basic fuel metering systems, which are: the idle system, the main metering system, the power enrichment system and the accelerating pump system.

The choke valve located in the bore of the carburetor is connected to a well type automatic choke. A thermostatic coil spring provides fuel for cold starting by closing the choke valve. After a cold start, the choke vacuum diaphragm controls fuel delivery during engine warm-up.

Additional fuel for acceleration is supplied by a diaphragm type, mechanically operated pump. The pump is operated by a lever connected by linkage to the throttle shaft. An override spring on the pump insures a prolonged discharge of fuel for smoother operation.

A power valve mounted in the metering body, actuated by manifold vacuum, delivers the additional fuel necessary for full power and high speed operation.

The fuel bowl is vented by an external vent valve located in the top of the bowl. The vent valve is connected by linkage to the throttle lever, so that the valve is opened a prescribed distance when the vehicle is at idle or completely shut down.

SERVICE PROCEDURES

DISSASSEMBLY

To disassemble the carburetor for cleaning or overhauling, refer to (Figs. 1, 2, and 3), then proceed as follows:

(1) Place the carburetor assembly on repair stand Tool C-3886.

(2) Remove the vacuum hose between the carburetor throttle body fitting and the vacuum diaphragm.

(3) Remove the "E" clip from the choke operating link and disengage the link from the diaphragm plunger (stem) and the choke lever. Refer to (Fig. 1 or 2).

(4) Remove the choke vacuum diaphragm and bracket assembly and place to one side to be cleaned as a special item.

NOTE: As the vacuum diaphragm bracket is being removed, the bowl vent valve rod, spring and washer assembly, (Fig. 4) will drop off.

(5) Using a ⅝" wrench, remove the fuel inlet nee-

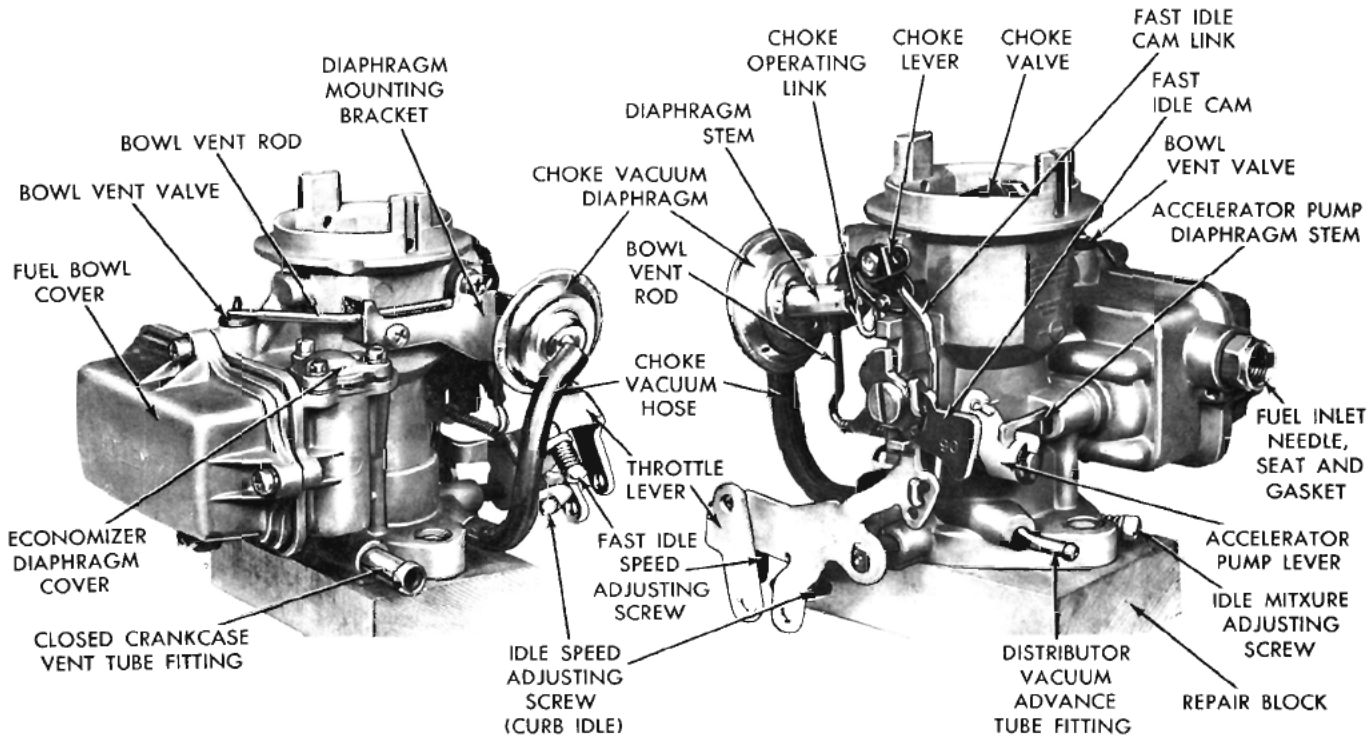

Fig. 2—Carburetor Assembly (R-3059, and R-3060 Typical of R-3057 and R-3058)

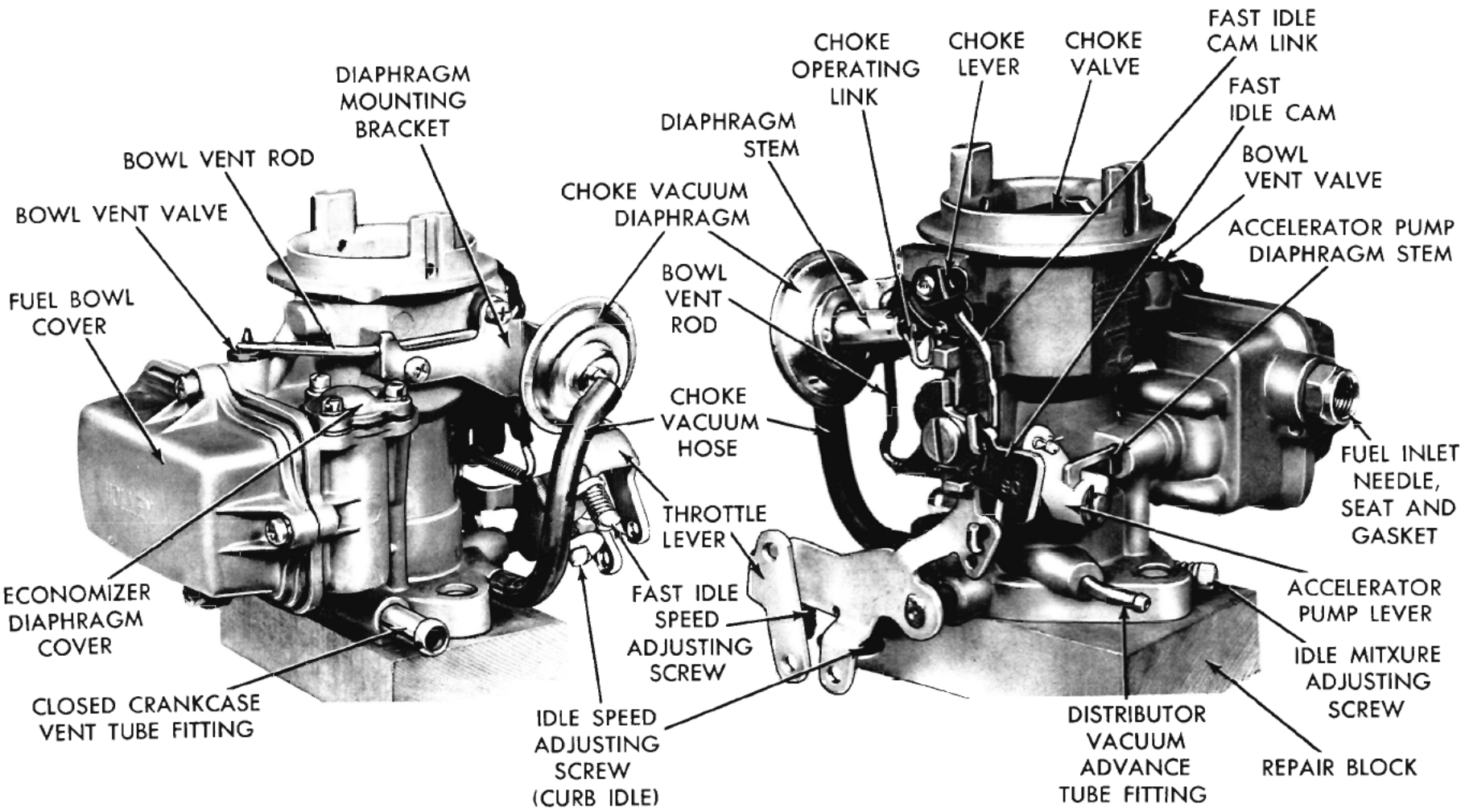

Fig. 3—Carburetor Assembly Disassembled View Typical

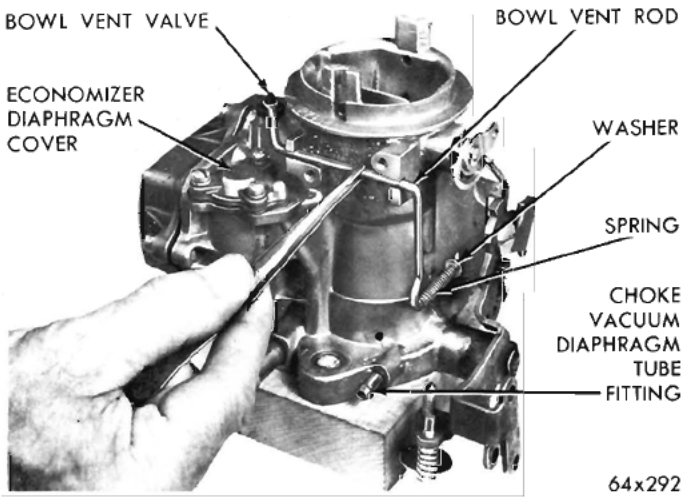

Fig. 4—Removing or Installing Bowl Vent Rod

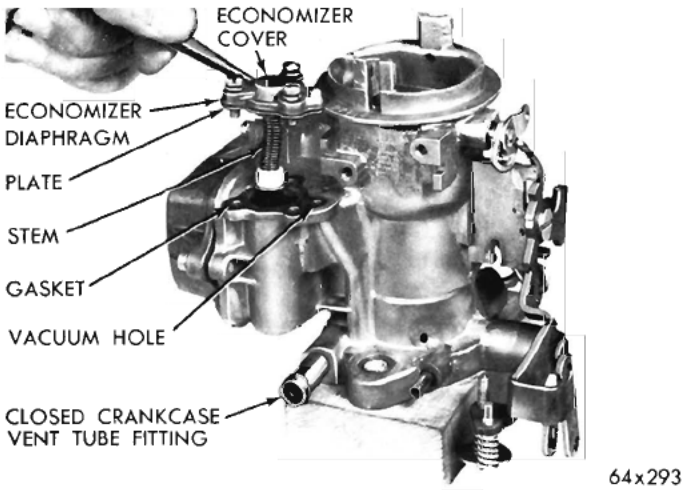

Fig. 5—Removing or Installing the Economizer

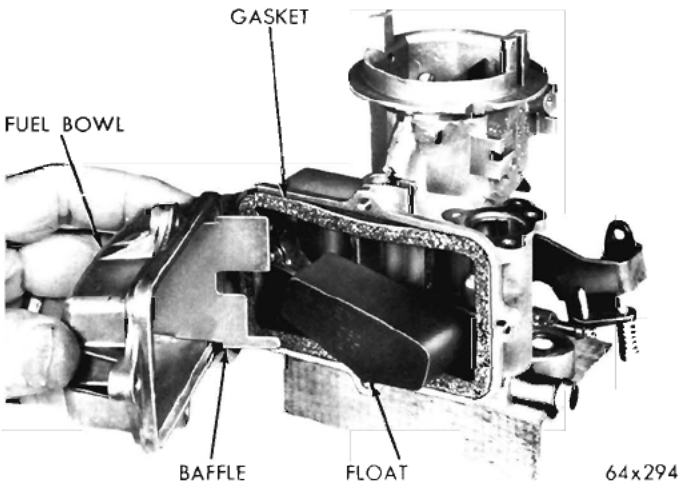

Fig. 6—Removing or Installing Fuel Bowl

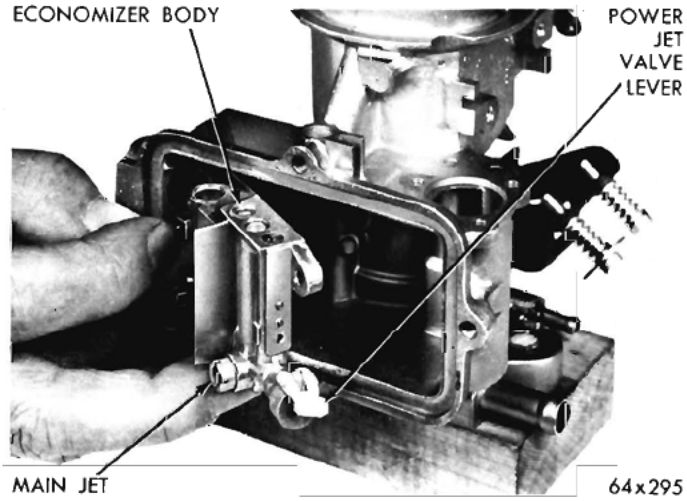

Fig. 7—Removing or Installing Economizer Body

dle valve and seat.

(6) Remove the economizer retaining screws, then lift economizer cover, diaphragm and stem out of the carburetor, as shown in (Fig. 5).

(7) Remove the fuel bowl attaching screws, then remove the fuel bowl, baffle and gasket, as shown in (Fig. 6). Slide baffle out of bowl. Discard the gasket. Remove the float bumper spring.

(8) Using a suitable tool, remove the float retaining clip, then slide float off the fulcrum pin.

(9) Remove the screws that attach the economizer body and plugs, then remove the economizer body as shown in (Fig. 7).

(10) Tilt the pump lever on its pivot until the hook on the pump diaphragm stem can be released. Slide the pump diaphragm and spring out of the fuel bowl. Refer to (Fig. 8).

(11) Using Tool C-3748, remove the main jet from the economizer body. See (Fig. 9).

(12) Using a suitable tool, remove the pump lever retaining clip. Slide lever off pivot and disengage link from throttle lever.

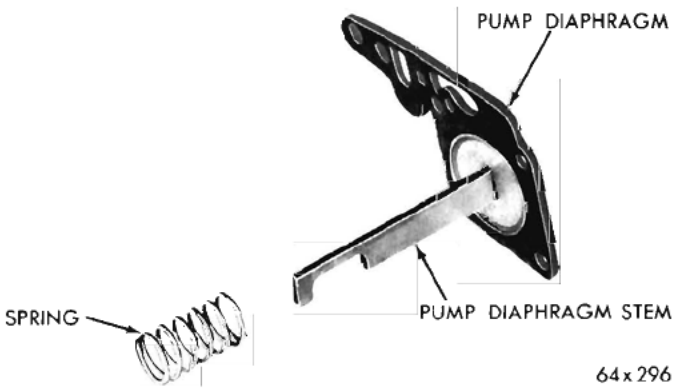

Fig. 8—Pump Diaphragm and Spring

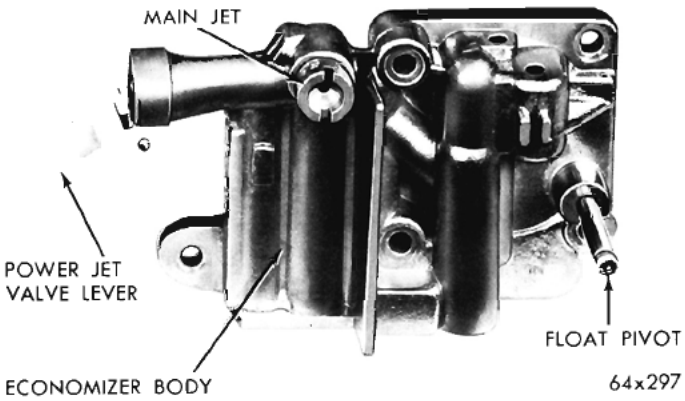

Fig. 9—Economizer Body Assembly

(13) Remove the fast idle cam retaining screw, then remove cam, and at the same time, disengage the fast idle cam rod.

(14) Remove the idle air mixture adjusting screw and spring from the throttle flange.

(15) Remove the fast idle and curb idle speed screws and springs from the throttle lever.

(16) Remove the screws that hold the choke valve to the choke shaft. **These screws are staked to prevent loosening, and extreme care is necessary, to avoid breaking off in the choke shaft.**

(17) Lift out the choke valve. Withdraw the choke shaft and lever out of the carburetor.

The carburetor assembly now has been disassembled as far as necessary for cleaning and inspection. It is usually not advisable to remove the throttle shaft and valve from the throttle flange, unless wear or damage necessitates the installation of new parts.

INSPECTION AND ASSEMBLY

Throttle Body

(1) Check the throttle shaft for excessive wear in the throttle body. If wear is extreme, it is recommended that the carburetor assembly be replaced rather than installing a new shaft in old body.

During manufacture, the location of the idle transfer port and the spark advance control ports to the throttle valve is carefully established for one particular assembly.

If a new shaft should be installed in an old, worn throttle body, it would be very unlikely that the original relationship of the ports to the valve would be obtained. Changing the relationship of the valve to the ports would adversely affect normal car operation between the speeds of 15 and 30 miles per hour. However, if it has been determined that a new shaft or valve is to be installed, adhere to the following instructions:

(2) Mark the position of the throttle valve in the bore.

(3) Remove the screws that hold the throttle valve to the shaft, then slide the valve out of the bore.

CAUTION: These screws are staked on the opposite side and care should be used at removal so as not to break in the shaft.

(4) Slide the throttle shaft out of the throttle body.

(5) Install new throttle shaft and lever (or new valve).

(6) Install NEW screws but do not tighten. Hold the valve in place, with the fingers pressing on the high side of valve. Tap the valve lightly with a screwdriver to seat in the throttle bore. Now, tighten the screws securely and stake by squeezing with pliers.

(7) Install the idle mixture screw and spring in the throttle body. (The tapered portion must be straight and smooth. If the tapered portion is grooved or ridged, a new idle mixture screw should be installed to insure having correct idle mixture control.) **Do not use a screwdriver.** Turn the screw **lightly** against its seat with the fingers. Back off 1 full turn for approximate adjustment.

Assembling the Carburetor

(1) Slide the choke shaft into the air horn, then install the choke valve.

(2) Install the choke valve attaching screws but do not tighten. Hold the valve closed, with the fingers pressing on the high side of the valve. Tap the valve lightly with a screwdriver to seat in the air horn. Tighten the attaching screws securely and stake by squeezing with pliers.

(3) Test the choke valve for binding by rotating the lever through the extent of its full travel.

(4) Install the fast idle and curb idle speed screws and springs in the throttle lever.

(5) Engage the pump cam link with the lever and throttle lever, then install cam and secure with clip. When installing the link, be sure link is in the center hole of throttle lever.

(6) Refer to (Fig. 8), then slide the pump spring over the pump diaphragm stem. Install the assembly in position in the fuel bowl and at the same time, engage the hook on the diaphragm stem with the recess in the pump lever.

(7) Install the main jet in the economizer body, using Tool C-3748. Refer to (Fig. 9).

(8) Turn the carburetor with bowl opening up then position the main well and equalizer body in the carburetor, as shown in (Fig. 7). Install screws and tighten securely.

(9) Engage the choke link with the choke lever and fast idle cam. Place cam in position, then install retaining screw. Tighten screw securely.

(10) Slide the float into position over the fulcrum

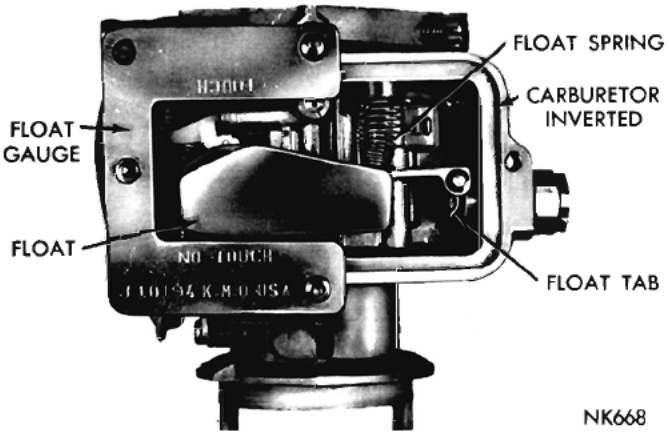

Fig. 10—Measuring the Float Setting

pin and secure with retainer clip.

(11) Install the fuel inlet needle, seat and new gasket. Tighten seat securely. Install the float bumper spring. Check the float setting as follows:

Measuring the Float Setting

With the carburetor inverted, slide the float gauge C-3903 into position and check the setting on the "touch" leg of the gauge, as shown in (Fig. 10). The float should just touch the gauge. Reverse the gauge and check the "No touch" leg. The float should just clear the gauge.

If an adjustment is necessary, bend the float tab (which touches the head of the fuel inlet needle) using needle nosed pliers. **Do not allow the float tab to contact the float needle head during this operation as the synthetic rubber tip of the needle can be compressed, giving a false setting.**

Recheck float setting as described above after adjustment.

(1) Slide the economizer diaphragm and stem assembly into position, making sure the vacuum holes are aligned and that the stem is on the power valve. Refer to (Fig. 5). Install cover and retaining screws. Tighten screws securely.

(2) Slide the baffle into position in the fuel bowl, now, place the fuel bowl gasket on the cover. Place the fuel bowl in position, install screws and washers and tighten alternately. (Be sure gasket is sealed in the recess section of the main body. Tighten the screws gently so as to compress only the lock-washers. Screws drawn down too tightly could distort the fuel bowl and cause a leak.)

Installing the Choke Vacuum Diaphragm

Inspect the diaphragm vacuum fitting to insure that the passage is not plugged with foreign material. Leak check the diaphragm to determine if it has internal leaks. To do this, first depress the diaphragm stem. Then place a finger over the vacuum fitting to seal the opening. Release the diaphragm stem. If the stem moves more than $^1/_{16}$ inch in 10 seconds, the leakage is excessive and the assembly must be replaced. Install the diaphragm as follows:

(1) Slide the bowl vent valve rod assembly in position on the air horn. Hold the rod centered in its grooves, using a finger.

(2) Install the vacuum diaphragm assembly on the air horn, being sure the vent rod is in position. Install the diaphragm attaching screws and tighten securely.

(3) Install the choke operating link in position between the diaphragm plunger (stem) and the choke lever. Install the "E" clip to secure.

(4) Inspect the vacuum diaphragm fitting and remove any dirt or foreign material which could plug the vacuum passage. Inspect the rubber hose for cracks, before placing it on the correct fitting. Refer to (Fig. 1).

Do not connect the vacuum hose to the diaphragm fitting until after the vacuum kick adjustment has been made. (See Carburetor Adjustments.)

ADJUSTMENTS

It is very important that the following adjustments be made on a reconditioned carburetor and in the sequence listed.

Fast Idle Speed and Cam Position Adjustment

The fast idle engine speed adjustment should be made on the vehicle, as described in "Fast Idle Speed Adjustment" (On the Vehicle) Paragraph. However, the Fast Idle Cam Position Adjustment can be made on the bench. This adjustment is important to assure that the speeds of each cam step occur at the proper

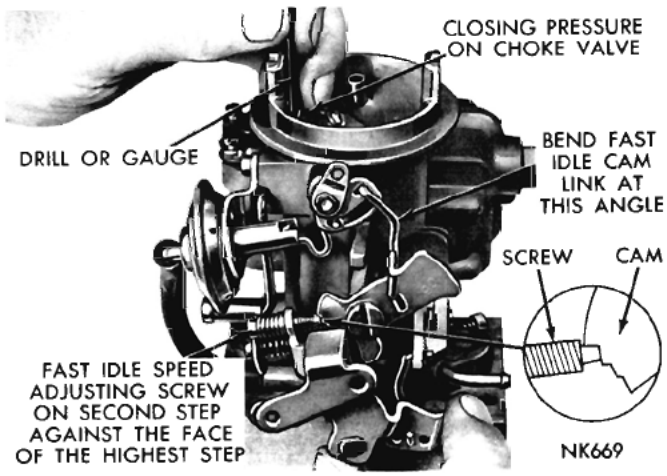

Fig. 11—Fast Idle Cam Position Adjustment

time during engine warm-up. Adjust as follows:

(1) With the fast idle speed adjusting screw contacting the step on the fast idle cam shown in (Fig. 11), move the choke valve toward the closed position with light pressure. Insert a $^{5}/_{64}$ inch drill or gauge between the choke valve and the wall of the air horn.

(2) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

(3) If an adjustment is necessary, bend the fast idle link at the lower angle, using Tool T109-213, until the correct valve opening has been obtained. Refer to (Fig. 11).

When the correct fast idle position cam adjustment has been made, the choke unloader (wide open kick) adjustment has also been obtained. No further adjustment is required.

Vacuum Kick Adjustment—(This test can be made **On** or **Off** the Vehicle.)

The choke diaphragm adjustment controls the fuel delivery while the engine is running. It positions the choke valve within the air horn by action of the linkage between the choke shaft and the diaphragm. The diaphragm must be energized to measure the vacuum kick adjustment. Use either a distributor test machine with a vacuum source or vacuum supplied by another vehicle. Adjust as follows:

(1) With the engine **Not** running, open the throttle valve far enough to allow the choke valve to be moved to the closed position.

(2) Disconnect the vacuum hose from the diaphragm and connect the hose from the vacuum supply, as shown in (Fig. 12). (A minimum of 10 inches of mercury (HG) will be required.)

(3) Insert a number 32 drill (170 cu. in. engine,

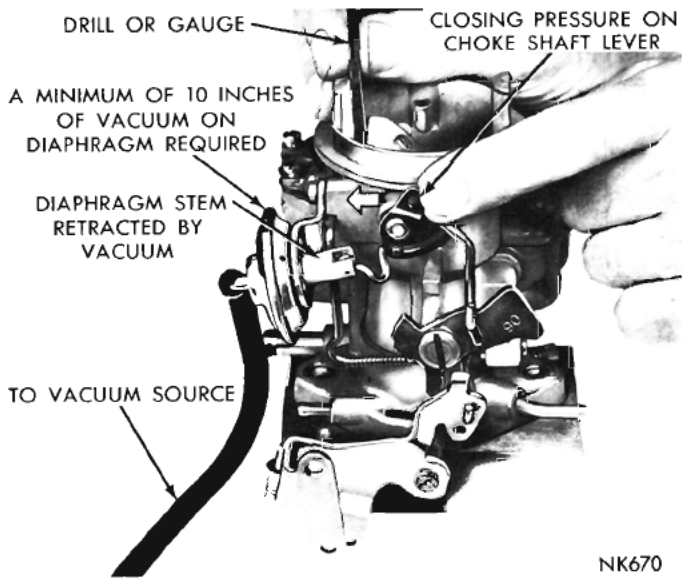

Fig. 12—Measuring the Choke Vacuum Kick Setting

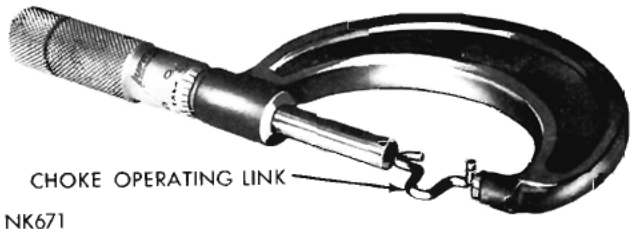

Fig. 13—Choke Operating Link Measurements

manual transmission), between the choke valve and the wall of the air horn, or a number 42 drill (170 cu. in. engine, automatic transmission) or a ($^{3}/_{32}$ inch) gauge in the above location. Use a number 32 drill on the 225 cu. in. engine (manual transmission) or a number 46 drill or gauge on the 225 cu. in. engine (automatic transmission), as above. (Refer to (Fig. 12). Apply sufficient closing pressure on the choke shaft lever to provide the smallest choke valve opening possible without distortion of the diaphragm link. Note that the cylindrical stem of the diaphragm will extend as an internal spring is compressed. The spring must be fully compressed for proper measurement of the kick adjustment.

(4) An adjustment will be necessary, if a slight drag is not obtained as the drill or gauge is being removed.

The adjustment of this opening will require the removal of the choke operating link.

CAUTION: Damage to the diaphragm and the choke lever can result if the link is not removed for the bending operation.

(5) Remove the "E" clip and disengage the choke operating link from the diaphragm stem (plunger),

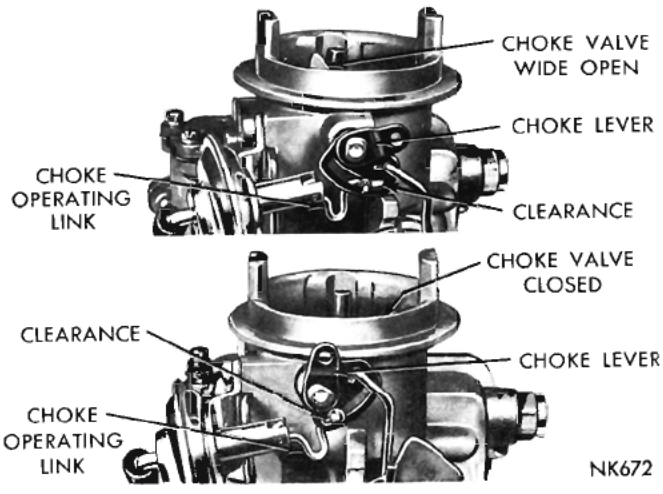

Fig. 14—Choke Operating Link Clearances

then disengage the link from the choke lever. (The best bending results will be obtained by using a vise and a pair of pliers.)

(6) Bend the choke operating link at the angle to provide the correct choke valve opening.

CAUTION: A correction in the length of the link of .010 inch, will result in a change of .010 inch in the choke valve opening.

As an example, if the choke valve opening is .010 inch in error, the correction in the link length would be .010 inch.

A "1" inch micrometer will be helpful in establishing the original length of the link, as shown in Figure 13, before completing the adjustment.

(7) Install the choke operating link and recheck the choke valve opening, using a gauge or drill. Refer to (Fig. 12).

Reinstall the vacuum hose to the diaphragm fitting and make the following check:

(8) With no vacuum applied to the diaphragm, some clearance should exist between the choke operating link and the choke lever slot, in both the open and closed choke valve positions, as shown in (Fig. 14). **This clearance is necessary to allow the choke valve to close for starting as well as fully open, after the engine reaches the normal operating temperature.**

If a clearance does not exist in both of these positions, a recheck of the operating link adjustment should be made.

Free movement of the choke valve between the closed and open positions is very necessary.

This free movement should also exist between the kick and the open choke valve positions with the engine running. If binding does exist, the choke operating link has been improperly bent and should be corrected.

*Idle Speed (On the Vehicle)**

To make the idle speed adjustment, the engine must be thoroughly warmed up. A much more reliable idle adjustment can usually be obtained if the car has been driven a minimum of five miles. For the best results, it is recommended that tachometer be used in this adjustment. (Before making the idle speed adjustment, observe the following precautions.)

Because the alternator can charge at idle speeds and impose a load on the engine, the headlights should be turned on. This will assure setting the idle to compensate for the alternator load. On cars equipped with automatic transmissions, unsnap the ball joint connection at the accelerator shaft bell crank. If this is not done, it is possible that the carburetor throttle will be held open against the stop in the transmission. The carburetor would therefore not respond to adjustment of the idle speed screw. After the proper idle speed has been obtained at the carburetor, screw the ball joint connector up or down until the ball on the bell crank will exactly mate with the socket. Snap into place.

To make the idle speed adjustment, proceed as follows:

(1) Turn the idle speed screw **in** or **out** to obtain 550 r.p.m. (Be sure that the choke valve is fully open and that the fast idle adjusting screw is not contacting the cam.)

(2) Adjust the idle mixture screw to obtain the highest r.p.m. While making the adjustment, carefully watch the tachometer and notice that the speed can be decreased by turning the screw in either direction from the setting that gave the highest r.p.m. reading.

(3) From the highest idle speed setting, turn the mixture screw clockwise (leaner) until the speed starts to drop. Turn the screw in the opposite direction (counter-clockwise) just far enough to recover the speed that was lost.

This procedure will assure that the idle has been set to the leanest mixture possible for smooth idle. **This setting is very important.**

Since the correct speed was originally set using the speed screw, the speed obtained after finding the leanest smooth idle setting will probably be too fast.

(4) Readjust the speed screw to obtain correct idle speed. Repeat steps 2 and 3 above.

*Fast Idle Speed Adjustment (On the Car)**

To set the fast idle speed on the car, connect a tachometer to the vehicle, then set the curb idle speed and proceed as follows:

(1) With the engine running and the transmission in the neutral position, open the throttle slightly.

(2) Close the choke valve about 20 degrees then allow the throttle to close. Return the choke valve to the open position.

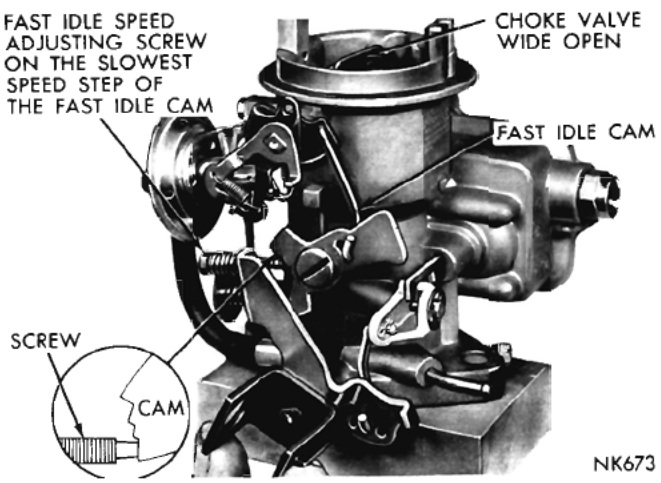

Fig. 15—Fast Idle Speed Adjustment (on the vehicle)

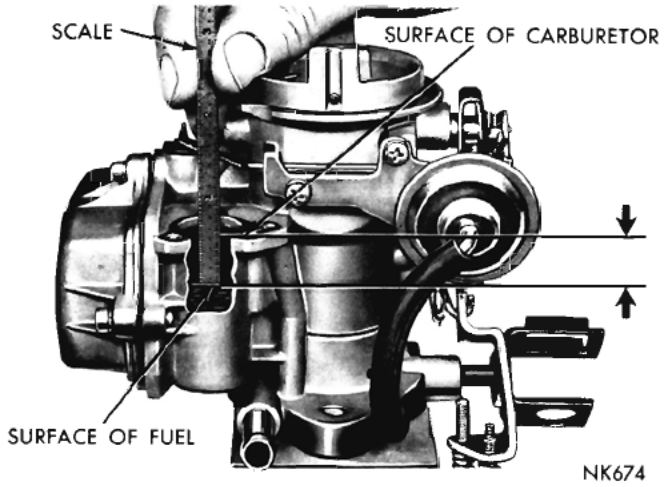

Fig. 16—Measuring the Wet Fuel Level

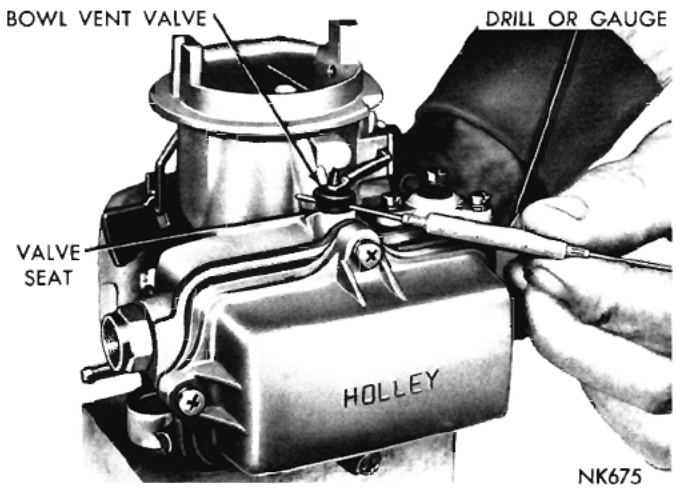

Fig. 17—Measuring the Bowl Vent Opening

(3) The fast idle speed adjusting screw should contact the slowest speed step on the fast idle cam, as shown in (Fig. 15).

(4) With the engine warmed-up to the normal operating temperature, turn the fast idle speed adjusting screw **in** or **out** to secure 700 r.p.m. **Reposition the cam and throttle after every screw adjustment to apply normal throttle closing torque.**

Measuring the Wet Fuel Level

With the engine running and the car on a level floor, the fuel level can be checked or measured through the economizer diaphragm opening. Using a 6″ scale with a depth gauge, measure the distance from the machined surface of the opening to the exact fuel surface, as shown in (Fig. 16). The measurement should be $^{27}/_{32}$″.

Bowl Vent Adjustment

With the throttle valve at curb idle speed, it should be possible to insert a $^{1}/_{16}$″ (.0625″) drill between the bowl vent and the seat, as shown in (Fig. 17). This measurement should never exceed .090 inch ($^{3}/_{32}$″ drill.)

If an adjustment is necessary, bend the vent rod at the horizontal portion until correct clearance has been obtained. Be sure vent rod does not bind in the guide after adjusting.

*After Approx. 500 Miles (If Necessary)

Spring Staged Choke Adjustment

To check the spring staged choke for correct operating clearance, refer to (Fig. 18), then proceed as follows:

The following steps are required to check this adjustment:

(1) With the choke closed, press the hub lever firmly in the closing direction.

(2) Check the clearance between the hub lever and the shaft lever, as shown in (Fig. 18).

(3) The clearance in this position, should be from .020 to .040 inches.

(4) If an adjustment is necessary, bend the lever tang slightly, until correct clearance has been obtained.

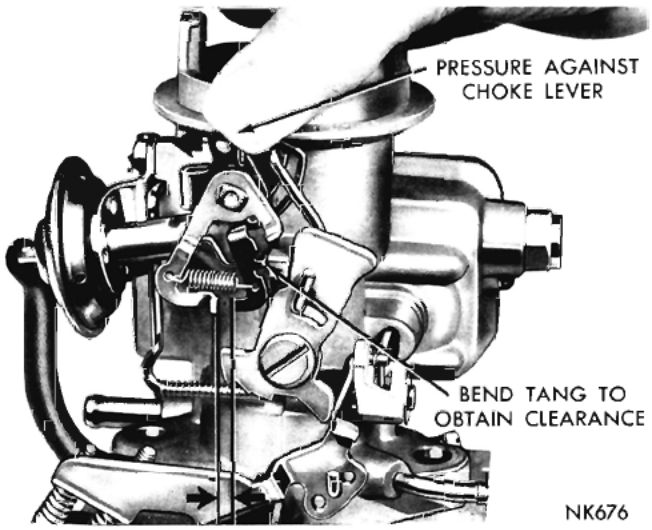

Fig. 18—Spring Staged Choke Clearance

PART 3

BBS SERIES CARBURETOR

Description

The BBS series carburetor is a single throat downdraft carburetor.

The BBS-3833S and the BBS-3834S carburetors used on the 170 cu. in. engine are equipped with a spring staged choke, as shown in (Fig. 1). The BBS-3835S and the BBS-3836S carburetors are used on the 170 cubic inch engine when equipped with air conditioning and the cable control throttle linkage.

The BBS-3839S and the BBS-3840S carburetors used on the 225 cu. in. engine are equipped with the conventional choke mechanism, but have the cable control throttle lever, as shown in (Fig. 2).

The BBS-3841S carburetor on the 170/225 cu. in. engine (taxi application) and the BBS-3837S and the BBS-3838S used on the 225 cu. in. engine (High Performance with manual and automatic transmissions), the BBS-3839 and BBS-3840S carburetors used when equipped with air conditioning are serviced the same as the previously mentioned BBS carburetors.

Since the service procedures are identical on all BBS carburetors, the illustrations showing the various disassembly procedures will not always show any one specific carburetor.

The spring staged choke, shown in (Fig. 1) is a device incorporated in the choke mechanism which limits the choke blade closing torque when cranking the engine at temperatures below zero. Thus the spring staging of the choke is a better match for the engine's starting mixture requirements at the low temperatures.

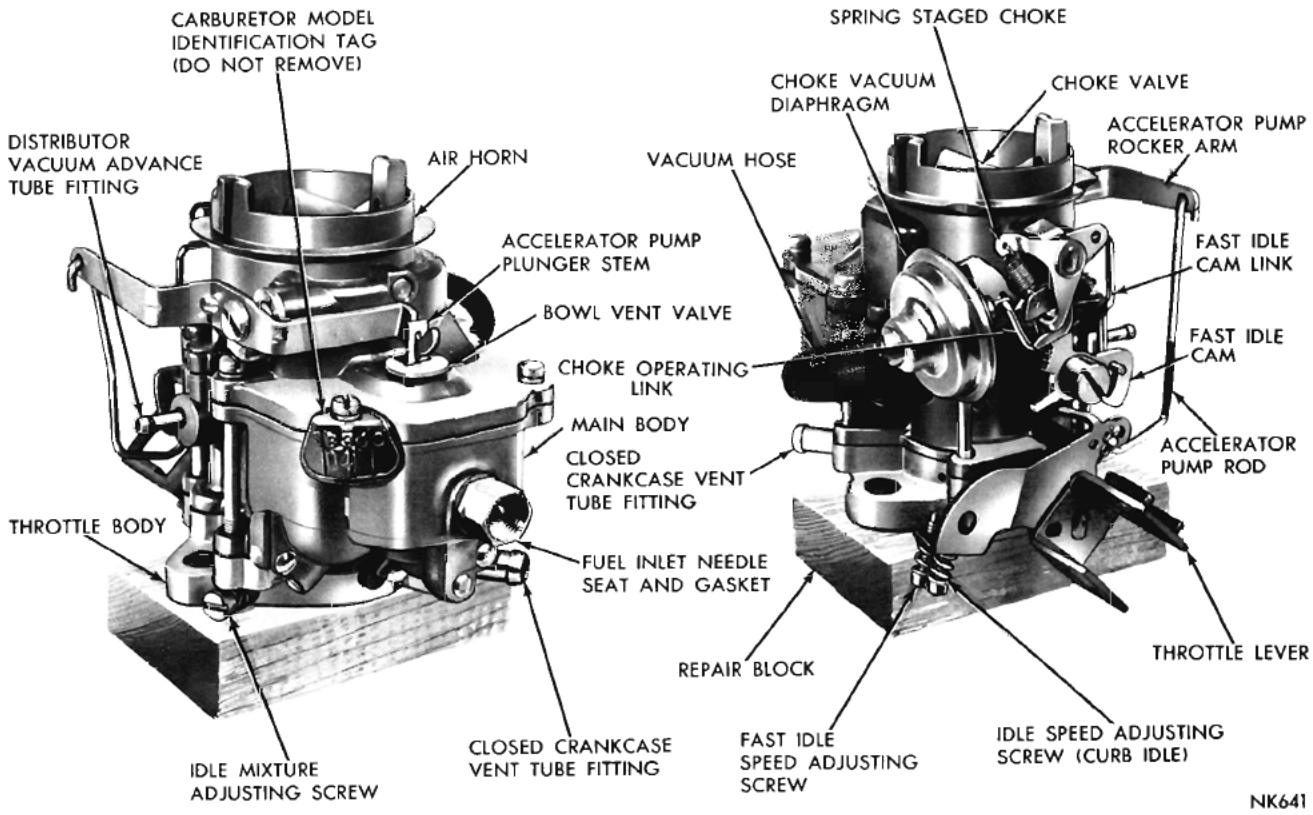

Fig. 1—Carburetor Assembly (BBS-3833S and BBS-3834S, Typical of BBS-3835S and BBS-3836S)

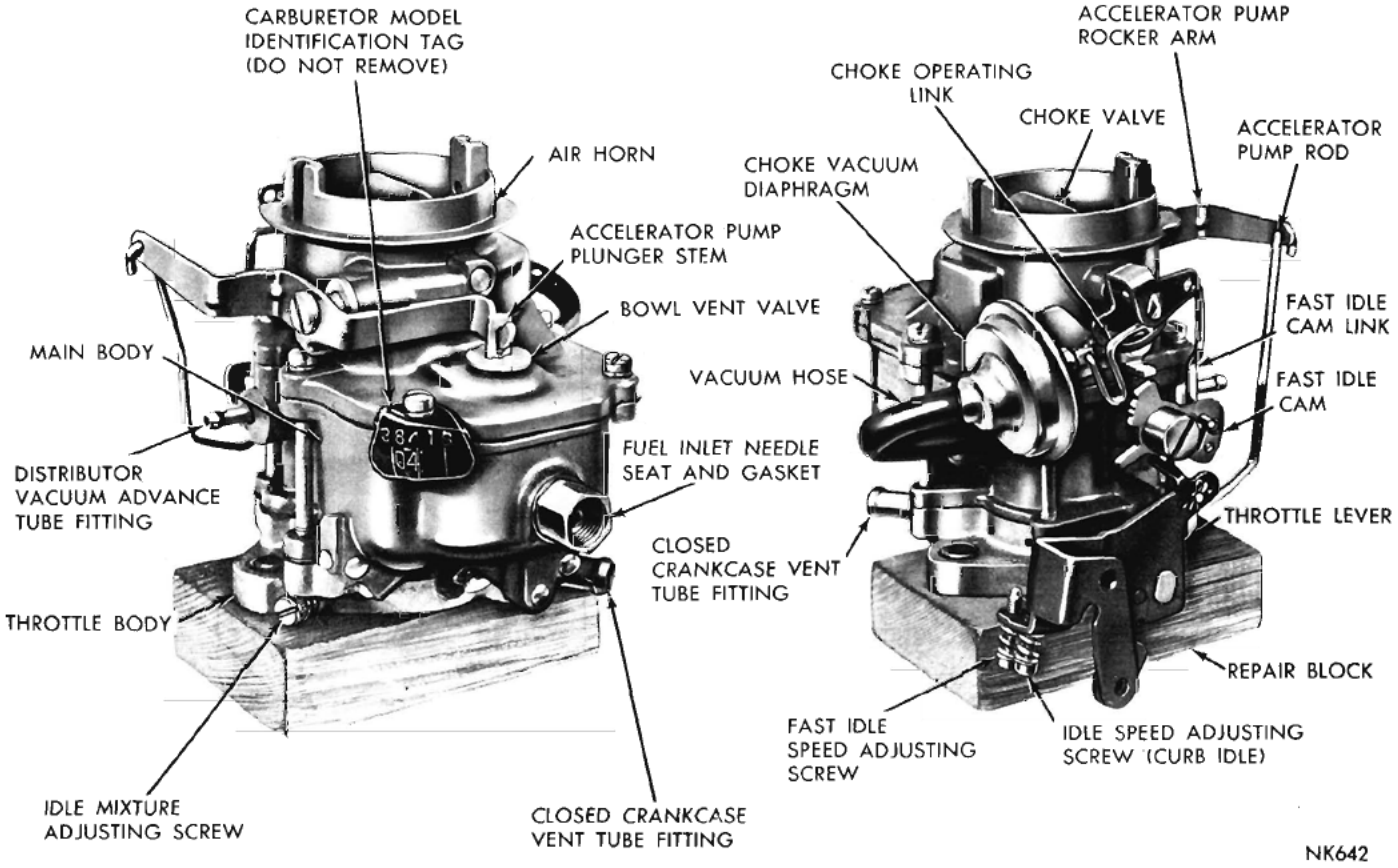

Fig. 2—Carburetor Assembly (BBS-3839S, BBS-3840S and S-3841S Typical of BBS-3837S and BBS-3838S

SERVICE PROCEDURES

DISASSEMBLY

To disassemble the carburetor for cleaning or overhaul, refer to (Figs. 1 or 2), and proceed as follows:

(1) Place the carburetor assembly on repair block, Tool C-3225.

(2) Remove hairpin clip and disengage the accelerator pump operating rod.

(3) Remove the vacuum hose between the carburetor main body and the vacuum diaphragm.

(4) Remove the clip from the choke operating link and disengage the link from the diaphragm plunger (stem) and the choke lever. Refer to (Fig. 1).

(5) Remove the vacuum diaphragm and bracket assembly and place to one side to be cleaned as a special item. A liquid cleaner may damage the diaphragm material.

(6) Remove the air horn retaining screws.

(7) Tilt the air horn toward the throttle lever far enough to disengage the fast idle cam link from the fast idle cam, as shown in (Fig. 3). Lift air horn up and away from main body. Discard the gasket.

(8) Disengage the accelerator pump plunger from the rocker arm, by pushing up on the bottom of plunger and sliding plunger shaft off hook. Slide plunger out of air horn and remove bowl vent valve, spring seat and spring. If the old plunger can be used

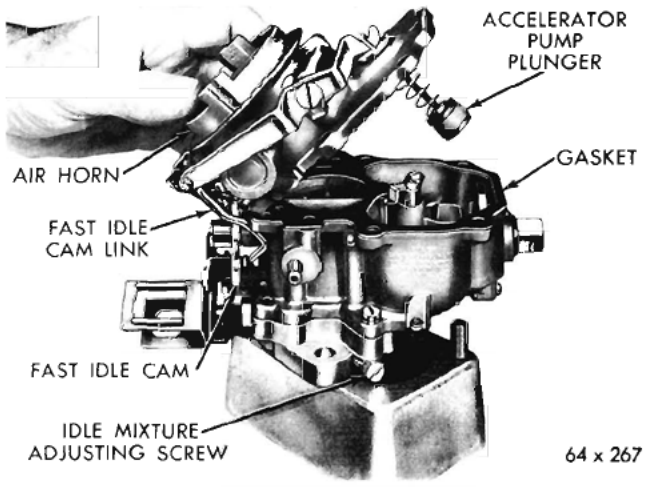

Fig. 3—Removing or Installing Air Horn

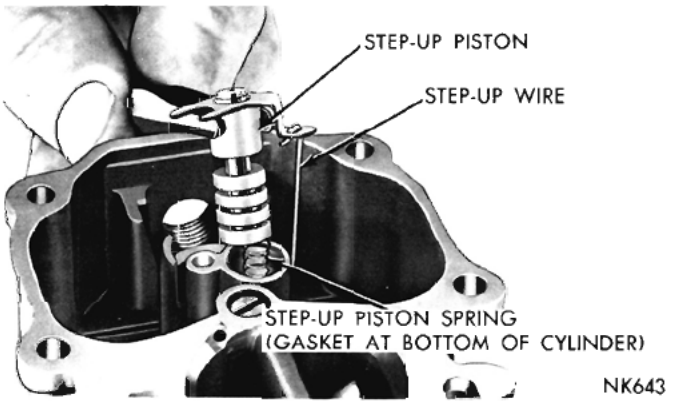

Fig. 4—Removing or Installing Step-Up Piston

again, or if a new plunger is to be installed, place the plunger in a jar of clean gasoline or kerosene to prevent the leather from drying out.

(9) Lift out the float fulcrum pin retainer, then lift out the floats and fulcrum pin.

(10) Remove the fuel inlet needle valve, seat and gasket from the main body.

(11) Remove the step-up piston retaining screw, and slide step-up piston and rod out of well, as shown in (Fig. 4). Now lift out the step-up piston spring. Remove the step-up piston gasket from the bottom of the well.

(12) Remove the main metering jet and gasket, as shown in (Fig. 5).

(13) Unscrew and remove the idle orifice tube, as shown in (Fig. 6).

(14) Invert the carburetor and drop out the accelerator pump check balls from their respective seats.

(15) Using Tool T109-43 plug remover, remove the accelerator pump jet plug. Using Tool T109-59T, remove the accelerator pump jet, as shown in (Fig. 7).

(16) Unscrew and remove the idle mixture adjusting screw and spring.

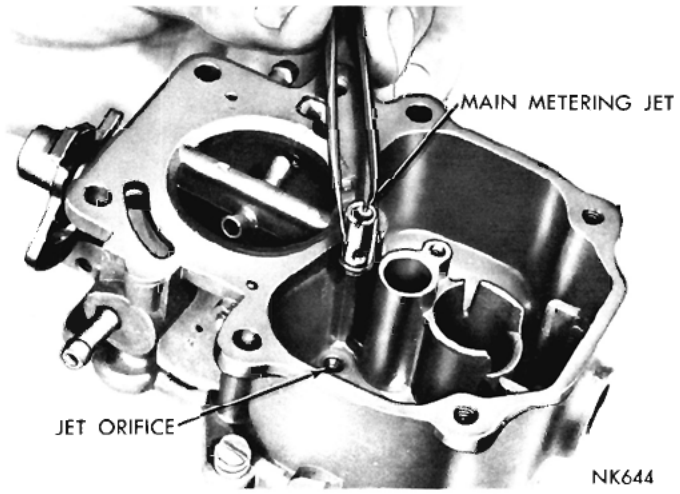

Fig. 5—Removing or Installing Main Metering Jet

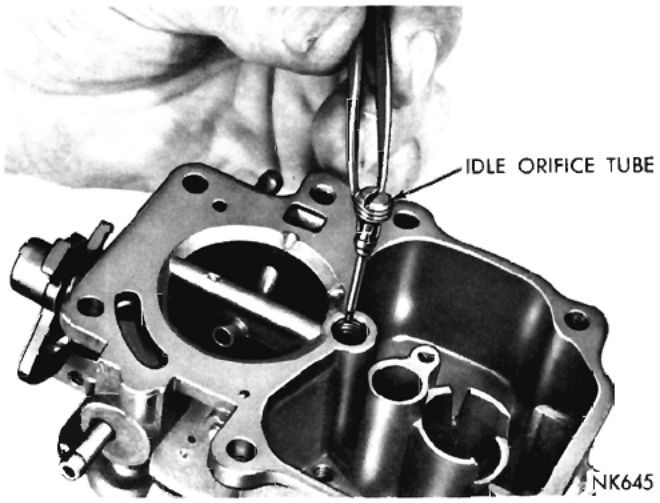

Fig. 6—Removing or Installing Idle Orifice Tube

The carburetor now has been disassembled into three main units, namely, the air horn, main body and throttle body and the component parts of each disassembled as far as necessary for cleaning and inspection.

It is usually not advisable to remove the throttle shaft or valve from the throttle body, unless wear or damage necessitates the installation of new parts.

INSPECTION AND ASSEMBLY

Throttle Body

(1) Check the throttle shaft for excessive wear in the throttle body. If wear is extreme, it is recommended that the throttle body assembly be replaced rather than installing a new shaft in the old body.

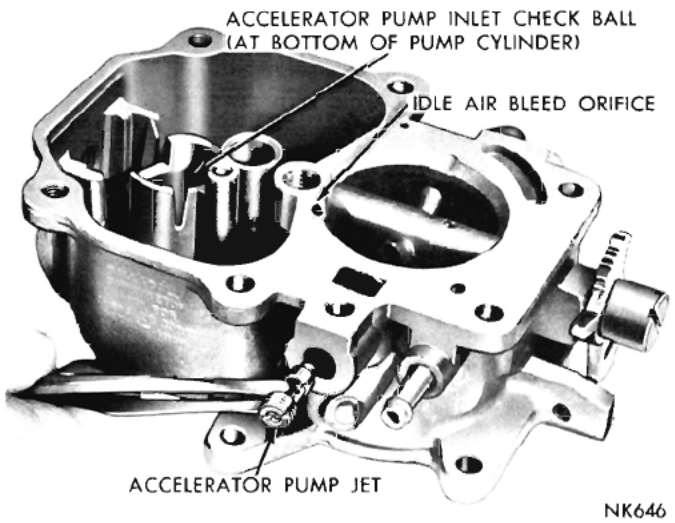

Fig. 7—Removing or Installing Accelerator Pump Jet

During manufacture, the location of the idle transfer port and the spark advance control ports to the throttle valve is carefully established for one particular assembly. See (Fig. 8).

If a new shaft should be installed in an old, worn throttle body, it would be very unlikely that the original relationship of the ports to the valve would be obtained. Changing the relationship of the valve to the ports would adversely affect normal car operation between the speeds of 15 and 30 miles per hour. However, if it has been determined that a new shaft or valve is to be installed, adhere to the following instructions:

(2) Mark the position of the throttle valve in the bore, so that it can be reinstalled in the same position.

(3) Remove the screws that hold the throttle valve to the shaft, then slide the valve out of the bore.

CAUTION: These screws are staked on the opposite side and care should be used at removal so as not to break off in the shaft.

(4) Slide the throttle shaft out of the throttle body.

(5) Install new throttle shaft and lever (or new valve).

(6) Install NEW screws but do not tighten. Hold the valve in place, with the fingers pressing on the high side of valve. Tap the valve lightly with a screwdriver to seat in the throttle bore. Now tighten the screws securely and stake by squeezing with pliers.

(7) Install the idle mixture screw and spring in the throttle body. (The tapered position must be straight and smooth. If the tapered portion is grooved or ridged, a new idle mixture screw should be installed to insure having correct idle mixture control). **Do not use a screwdriver.** Turn the screw **lightly** against its seat with the fingers. Back off 1 full turn for approximate adjustment.

Main Body

(1) Install the accelerator pump discharge and intake check balls in their respective passages, as shown in (Fig. 9).

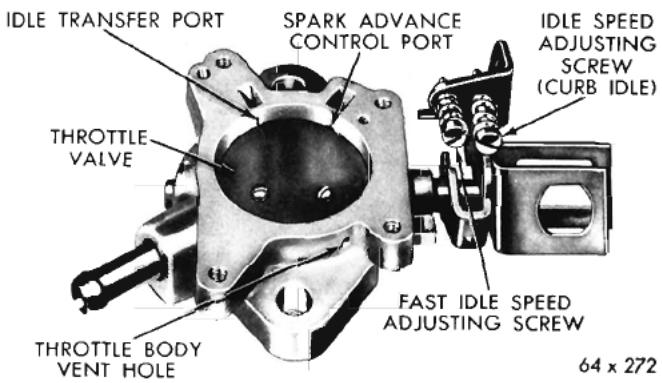

Fig. 8—Ports in Relation to Throttle Valves

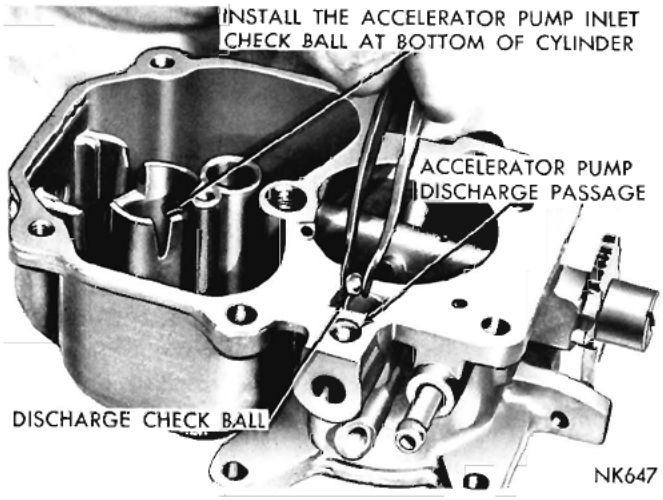

Fig. 9—Installing Accelerator Pump Discharge and Intake Check Balls

To check the accelerator pump system fuel inlet and discharge check balls proceed as follows:

(2) Pour clean gasoline into the carburetor bowl, approximately ½ inch deep. Remove the pump plunger from the jar of gasoline and slide down into the pump cylinder. Raise the plunger and press lightly on the plunger shaft to expel air from the pump passage.

(3) Using a small clean brass rod, hold the discharge check ball down firmly on its seat. Again raise the plunger and press downward. No fuel should be emitted from either the intake or discharge passage, as shown in (Fig. 10).

If any fuel does emit from either passage, it indicates the presence of dirt or a damaged check ball. Clean the passage again and repeat test. If leakage is still evident, install a NEW check ball. The fuel inlet check ball is located at the bottom of the plunger well.

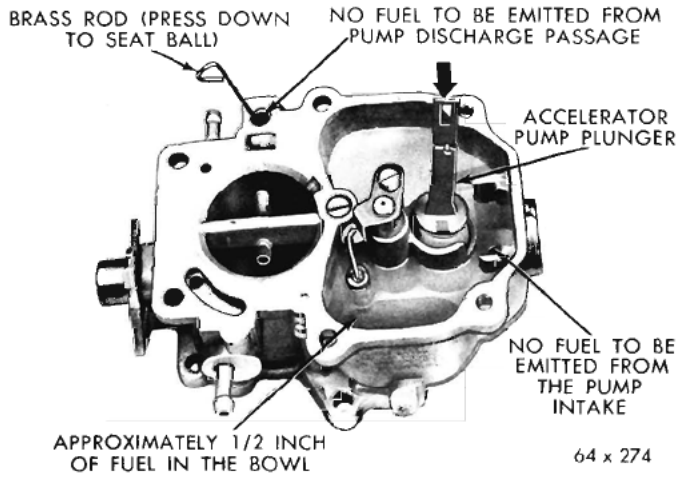

Fig. 10—Testing Accelerator Pump Intake and Discharge Check Balls

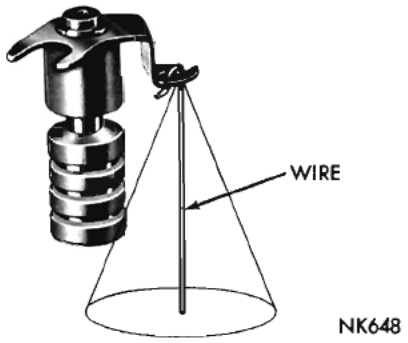

Fig. 11—Step-Up Piston Wire Free Play

(4) Install the accelerator pump jet, as shown in (Fig. 7). Tighten securely, using Tool T109-59T. Install a new plug and drive tightly in place.

(5) Install the idle orifice tube, refer to (Fig. 6). Tighten securely.

(6) Install the main metering jet and gasket refer to (Fig. 5). Tighten securely.

(7) Before installing the step-up piston, be sure the step-up rod is able to move freely each side of the vertical position, as shown in (Fig. 11). The step-up rod must be straight and smooth.

(8) Slide the step-up piston gasket down into position in the piston well, then install the step-up piston spring and step-up piston and rod (Refer to Figure 4). Install retaining screw and tighten securely. Carefully guide the step-up rod into the main metering jet. Be sure the step-up piston slides freely in its cylinder. A step-up piston stuck in the **UP** position will cause a rich mixture at part throttle, whereas a piston stuck in the **DOWN** position will cause a lean mixture at wide open throttle and poor acceleration.

Measuring the Float Setting

The carburetors are equipped with a synthetic rubber tipped fuel inlet needle. The needle tip is a rubber material which is not affected by gasoline and is stable over a wide range of temperatures. The tip is flexible enough to make a good seal on the needle seat.

The use of the new inlet needle requires a new procedure in adjusting the float setting. Care should be taken to perform this operation accurately in order to secure the best performance and fuel economy.

To correctly set the float height, when the carburetor is being overhauled, proceed as follows:

(1) Install the floats with the fulcrum pin and pin retainer in the main body.

(2) Install the needle, seat and gasket in the body and tighten securely.

(3) Invert the main body so that the weight of the floats **only,** is forcing the needle against the seat. Hold finger against retainer to fully seat the fulcrum pin.

(4) Using Tool T109-282 or T109-220; or a T scale, check the float, as shown in (Fig. 12). There should be $^{1}/_{4}$ or $^{9}/_{32}$ inch (Taxi) (depending on carburetor, Refer to Specifications), from the surface of the fuel bowl to the crown of each float at the center.

If an adjustment is necessary, bend the lip of the float lever either in or out until correct setting has been obtained.

CAUTION: Do not attempt to change the setting without removing the float, as the synthetic rubber tip can be compressed sufficiently to cause a false setting which will affect level of fuel in the bowl.

After being compressed, the tip is very slow to recover its original shape. Recheck as described in Step 4 above.

NOTE: It is very important that the float lip be perpendicular to the needle or slanted not more than 10 degrees away from the needle when the float is set correctly.

(5) Place a new gasket on the throttle body and position the main body making sure they are aligned.

Air Horn

Check the freedom of the choke mechanism in the air horn. The shaft must float free to operate correctly.

(1) Assemble pump plunger, spring and spring seat and slide plunger shank through opening in air horn. Install bowl vent cap over plunger shank, then engage with pump rocker arm. (On the BBS-3841S carburetor, be sure the hairpin clip is in the upper position on the plunger rod; all others in the middle position.)

(2) Place a new gasket on the main body, then install air horn by tilting air horn, as shown in (Fig. 3), in order to engage fast idle link with fast idle cam. After engaging link, slowly lower air horn and at the same time guide accelerator plunger into its well.

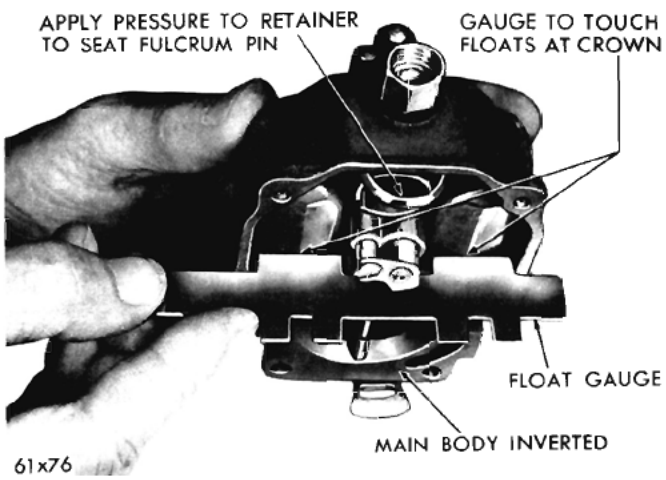

Fig. 12—Measuring the Float Setting

(3) Install air horn attaching screws. Tighten securely.

(4) Install the accelerator pump operating rod and secure with hairpin clip. Normal operation of the accelerator pump is obtained by installing pump rod in the center hole of the throttle arm. (On the BBS-3841S carburetor, be sure the pump rod is in the short stroke hole of the throttle arm).

Choke Vacuum Diaphragm

Inspect the diaphragm vacuum fitting to insure that the passage is not plugged with foreign material. Leak test the diaphragm to determine if it has internal leaks. To do this, first depress the diaphragm stem. Then place a finger over the vacuum fitting to seal the opening. Release the diaphragm stem. If the stem moves more than $^1/_{16}$ inch in ten seconds, the leakage is excessive and the assembly must be replaced.

Install the diaphragm assembly on the air horn as follows:

(1) Assemble to the air horn and tighten the attaching screws securely.

(2) Install the choke operating link in position between the diaphragm plunger (stem) and the choke lever. Install the clip to secure.

(3) Inspect the rubber hose for cracks before placing it on the correct carburetor fitting. Refer to (Fig. 1). Do not connect the vacuum hose to the diaphragm fitting until after the vacuum kick adjustment has been made. (See Carburetor Adjustments.)

ADJUSTMENTS

It is very important that the following adjustments be made on a reconditioned carburetor, and in the sequence listed:

Accelerator Pump and Bowl Vent

When assembling the accelerator pump to the air horn, note that the hairpin clip (which opens the bowl vent) can be placed in any one of three positioning notches. These notches correspond to the long, medium and short pump stroke holes in the throttle lever. Normally, the bowl vent clip on the pump stem will be at the middle notch and the pump operating rod in the medium stroke hole.

The proper procedure is to adjust the amount of bowl vent opening instead of measuring and setting the height of the pump plunger.

To check or set the adjustment, proceed as follows:

(1) Back off the idle speed adjusting screw. Open the choke valve, so that when the throttle valves are closed, the fast idle adjusting screw will not contact the fast idle cam.

(2) Be sure the pump operating rod is in the medium stroke hole in the throttle lever, and that the bowl vent clip on the pump stem is in the center notch.

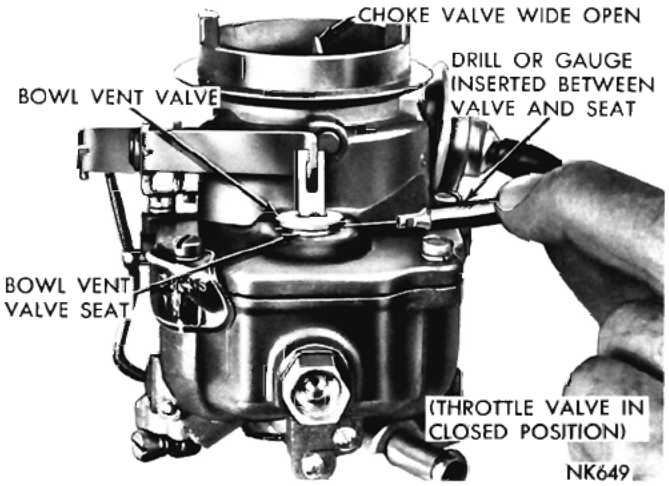

Fig. 13—Measuring Bowl Vent Opening

(3) Close the throttle valves tightly. It should be just possible to insert a $^1/_{16}$ inch drill (.060) between the bowl vent and the air horn, as shown in (Fig. 13).

If an adjustment is necessary, bend the pump operating rod, using Tool T109-213, at the lower angle, until the correct bowl vent opening has been obtained.

This is an important adjustment, since too much lift at the bowl vent will result in considerable loss in low speed fuel economy.

Remember that if the pump operating rod is moved to either the short or long stroke position, a corresponding change must be made in the location of the bowl vent clip, and the amount of lift of the bowl vent should be retested and adjusted.

The accelerator pump travel is automatically taken care of when the bowl vent is properly adjusted.

Fast Idle Speed and Cam Position

The fast idle engine speed adjustment should be made on the vehicle, as described in the Fast Idle Speed Adjustment (On the Vehicle) Paragraph. However, the fast idle cam position adjustment can be made on the bench. This adjustment is important to assure that the speeds of each cam step occur at the proper time during engine warm-up. Adjust as follows:

(1) With the fast idle speed adjusting screw contacting the step on the fast idle cam shown in (Fig. 14), move the choke valve toward the closed position with light pressure. Insert a drill or gauge between the choke valve and the wall of the air horn. (Refer to Specifications for Drill or Gauge Size.)

(2) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

(3) If an adjustment is necessary, bend the fast idle rod at the upper angle, using Tool T109-213, un-

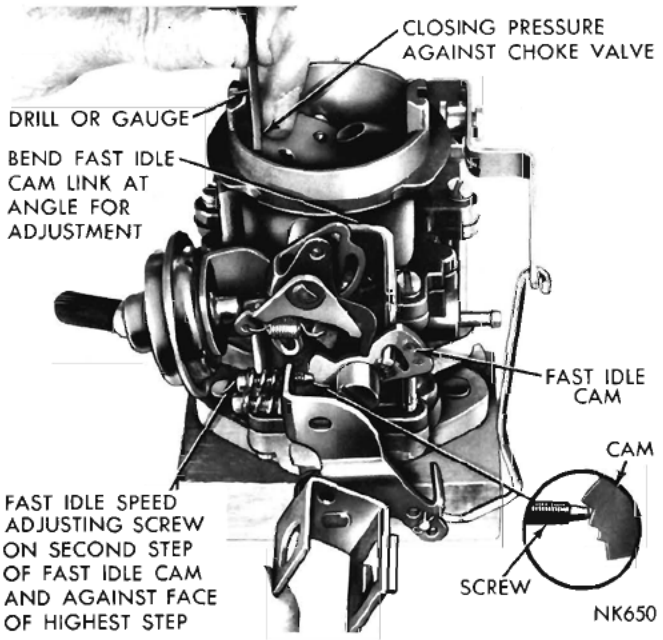

Fig. 14—Fast Idle Cam Position Adjustment

til the correct valve opening has been obtained. Refer to (Fig. 14).

Vacuum Kick Adjustment

(This test can be made **On** or **Off** the vehicle.)

The choke diaphragm adjustment controls the fuel delivery while the engine is running. It positions the choke valve within the air horn by action of the linkage between the choke shaft and the diaphragm. The diaphragm must be energized to measure the vacuum kick adjustment. Use either a distributor test machine with a vacuum source, or vacuum supplied by another vehicle.

(1) With the engine **Not** running, open the throttle valves far enough to allow the choke valve to be moved to the closed position.

(2) Disconnect the vacuum hose from the diaphragm and connect the hose from the vacuum supply, as shown in (Fig. 15). (A minimum of 10 inches of mercury (HG) will be required.)

(3) Insert the specified drill or gauge between the choke valve and the wall of the air horn. Refer to (Fig. 15). Apply sufficient closing pressure on the choke shaft lever to provide the smallest choke valve opening possible without distortion of the diaphragm link. Note that the cylindrical stem of the diaphragm will extend, as an internal spring is compressed. The spring must be fully compressed for proper measurement of the kick adjustment.

(4) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

The adjustment of this opening will require the removal of the choke operating link.

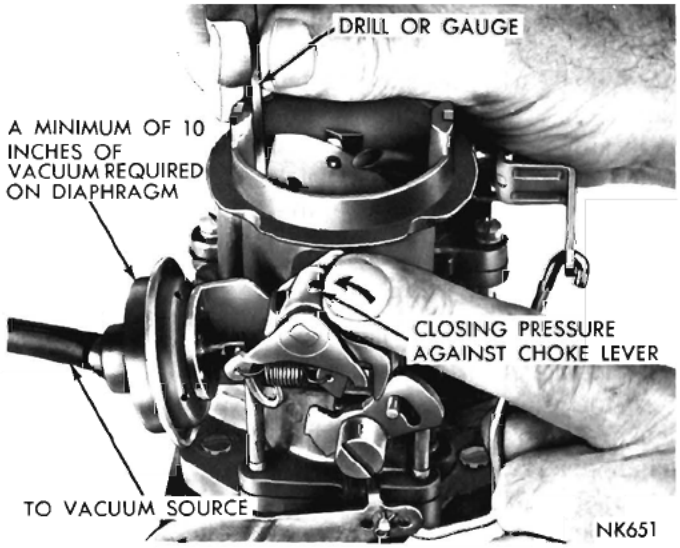

Fig. 15—Vacuum Kick Adjustment

CAUTION: Damage to the diaphragm and the choke lever slot can result, if the link is not removed for the bending operation.

(5) Remove the clip and disengage the choke operating link from the diaphragm stem, then disengage the link from the choke lever. (The best bending results will be obtained by using a vise and a pair of pliers.)

(6) Bend the choke operating link at the angle to provide the correct choke valve opening.

CAUTION: A correction in the length of the link of .010 inch, will result in a change of .015 inch in the choke valve opening.

As an example, if the choke valve opening is 0.015 inch in error, the correction in the link length would be .010 inch.

A 2 inch micrometer will be helpful in establishing the original length of the link, as shown in (Fig. 16), before completing the adjustment.

(7) Install the choke operating link and recheck the choke valve opening, using a gauge or drill. Refer to (Fig. 15).

Reinstall the vacuum hose to the diaphragm and

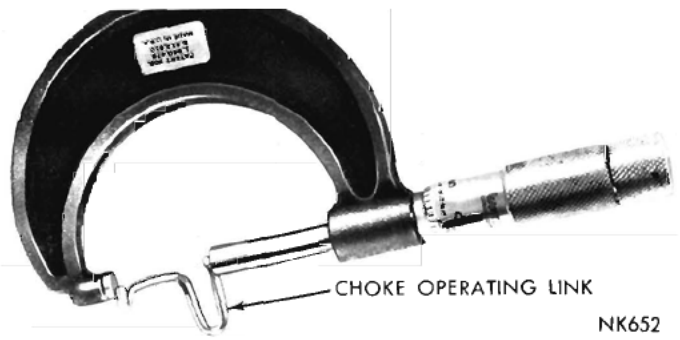

Fig. 16—Choke Operating Link Measurements

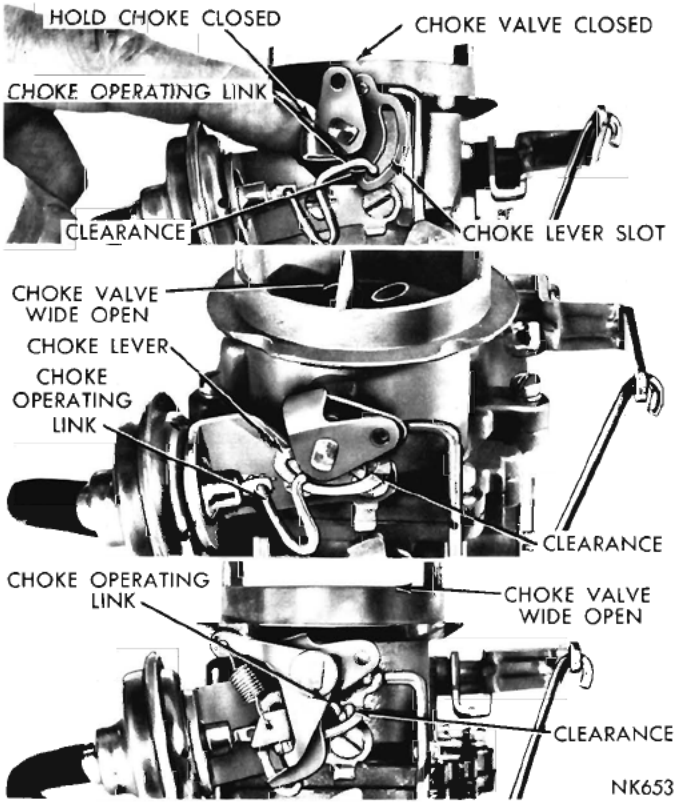

Fig. 17—Choke Operating Link Clearances

make the following check:

(8) With no vacuum applied to the diaphragm, some clearance should exist between the choke operating link and the choke lever slot, in both the open and closed choke valve positions, as shown in (Fig. 17). **This clearance is necessary to allow the choke valve to close for starting as well as fully open after the engine reaches the normal operating temperature.**

If a clearance does not exist in both of these positions, a recheck of the operating link adjustment should be made.

NOTE: Free movement of the choke valve between the closed and open positions is very necessary.

This free movement should also exist between the kick and the open choke valve positions with the engine running. If binding does exist, the choke operating link has been improperly bent and should be corrected.

Choke Unloader (Wide Open Kick)

(1) Hold the throttle valve in the wide open position, insert Tool T109-28 or $^{3}/_{16}$ drill between the upper edge of the choke valve and the inner wall of the air horn, as shown in (Fig. 18).

(2) If no drag is felt, or if too much drag is apparent, bend the unloader tang on the throttle lever, until correct clearance has been obtained.

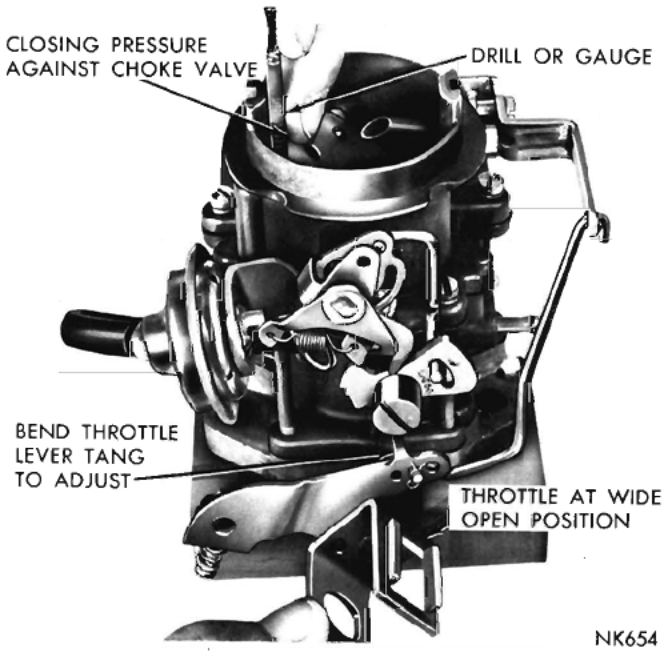

Fig 18—Measuring the Choke Unloader Setting (wide open kick)

Idle Speed Adjustment (Curb Idle)

To make the idle speed adjustment, the engine must be thoroughly warmed up. A much more reliable idle adjustment can usually be obtained if the car has been driven a minimum of five miles. For the best results, it is recommended that a tachometer be used in this adjustment. (Before making the idle speed adjustment, observe the following precautions:)

Because the alternator can charge at idle speeds and impose a load on the engine, the headlights should be turned on. This will assure setting the idle to compensate for the alternator load. On cars equipped with automatic transmissions, unsnap the ball joint connection at the accelerator shaft bell crank. If this is not done, it is possible that the carburetor throttle will be held open against the stop in the transmission. The carburetor would therefore not respond to adjustment of the idle speed screw. After the proper idle speed has been obtained at the carburetor, screw the ball joint connector up or down until the ball on the bell crank will exactly mate with the socket. Snap into place.

To make the idle speed adjustment, proceed as follows:

(1) Turn the idle speed screw **in** or **out** to obtain 550 r.p.m. (Be sure that the choke valve is fully open and that the fast idle adjusting screw is not contacting the cam.)

(2) Adjust the idle mixture screw to obtain the highest r.p.m. While making the adjustment, carefully watch the tachometer and notice that the speed can be decreased by turning the screw in either direc-

tion from the setting that gave the highest r.p.m. reading.

(3) From the highest idle speed setting, turn the mixture screw clockwise (leaner) until the speed starts to drop. Turn the screw in the opposite direction (counter-clockwise) just far enough to recover the speed that was lost.

This procedure will assure that the idle has been set the leanest mixture possible for smooth idle. **This setting is very important.**

Since the correct speed was originally set using the speed screw, the speed obtained after finding the leanest smooth idle setting will probably be too fast.

(4) Readjust the speed screw to obtain correct idle speed. Repeat steps 2 and 3 above.

Fast Idle Speed (On the vehicle after Approximately 500 miles if necessary)

To set the fast idle speed on the car, connect a tachometer to the vehicle, then set the curb idle speed and proceed as follows:

(1) With the engine running, and the transmission in the neutral position, open the throttle slightly.

(2) Close the choke valve about 20 degrees then allow the throttle to close. Return the choke valve to the open position.

(3) The fast idle speed adjusting screw should be contacting the slowest speed step on the fast idle cam, as shown in (Fig. 19).

(4) With the engine warmed-up to the normal operating temperature, turn the fast idle speed adjusting screw **in** or **out** to secure 700 r.p.m. **Reposition the cam and throttle after every screw adjustment to apply normal throttle closing torque.**

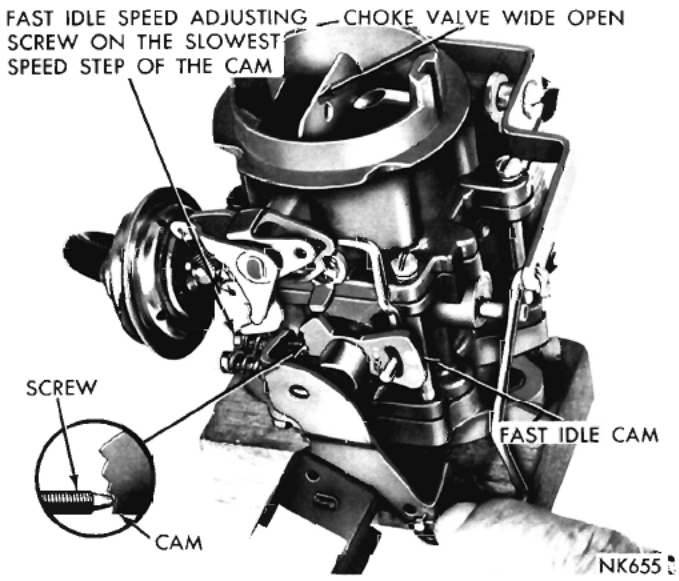

Fig. 19—Fast Idle Speed Adjustment (on the vehicle)

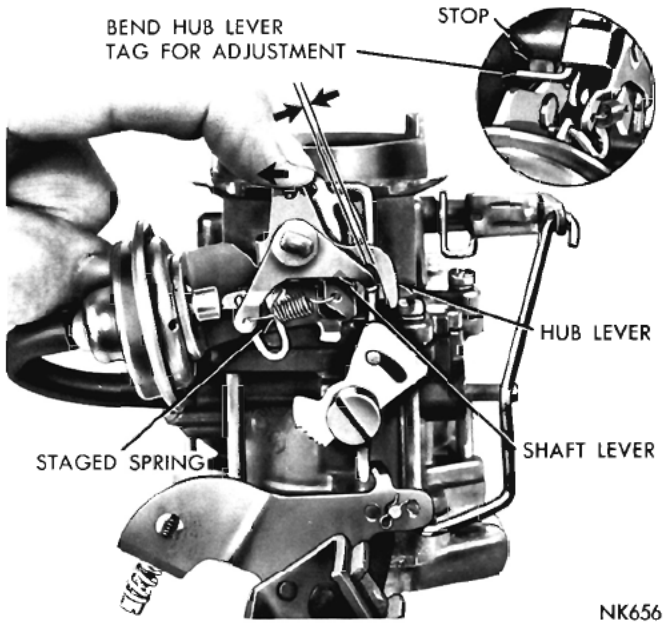

Fig. 20—Spring Stage Choke Adjustment

Spring Staged Choke Adjustment

To check the spring staged choke for correct operating clearance, refer to (Fig. 20), then proceed as follows:

(1) Push on the hub lever with the finger, at the closed choke position. A small opening should exist between the shaft and the hub levers, as shown in (Fig. 20).

(2) Using a drill or gauge, measure the opening. The opening should be from .010 to .040 inches.

(3) If an adjustment is necessary, bend the hub lever tang until the correct opening has been obtained.

The Float Setting (On the Vehicle)

To check the float setting with the carburetor mounted on the vehicle, proceed as follows:

(1) Remove the accelerator pump operating rod.

(2) Remove two of the long air horn attaching screws and two short screws, then install the two short screws in place of the two long screws removed. This will hold the main body to the throttle body. Tighten screws securely.

(3) Remove the remaining air horn screws, then tilt the air horn far enough to disengage the fast idle cam link from the fast idle cam. Remove the air horn and gasket.

Check the float setting as follows:

(4) Seat the float fulcrum pin by pressing on the fulcrum pin retainer.

There should be enough fuel in the bowl to raise the float so that the lip bears firmly against the needle. Additional fuel may be admitted by slightly de-

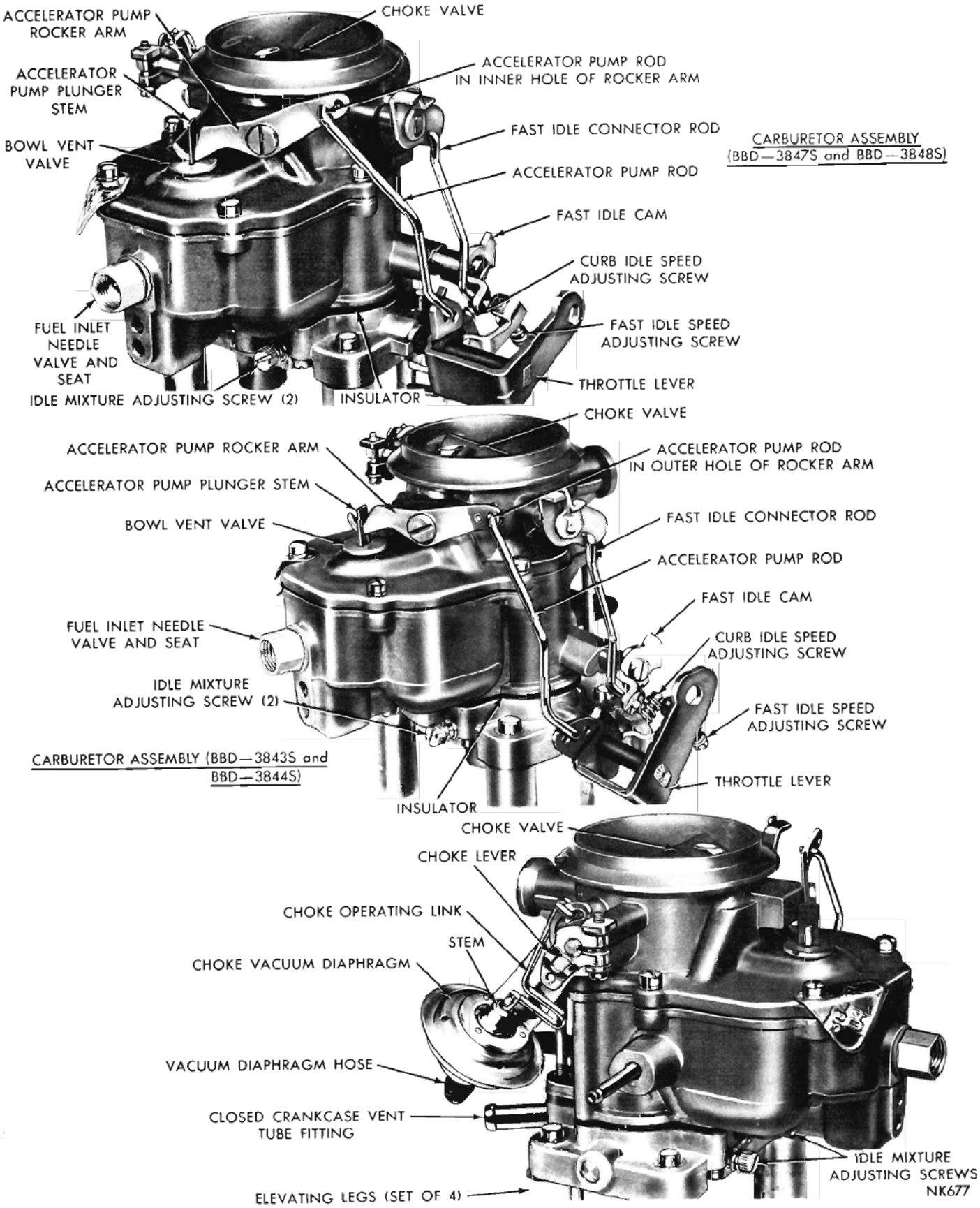

Fig. 1—Carburetor Assembly

pressing the float. If the fuel pressure in the line is insufficient to force additional fuel into the bowl, add the necessary fuel from a clean container.

CAUTION: Since the manifolds may be hot, it is dangerous to spill fuel on these surfaces. Therefore, take the necessary precautions to avoid spillage.

(5) With only the pressure of the buoyant float holding the float lip against the inlet needle, check the float setting, using Tool T109-239 or a "T" scale. There should be ¼ inch from the surface of the bowl (gasket removed) to the crown of the floats at the center. ($^{9}/_{32}$ on certain Carburetors.)

If an adjustment is necessary, hold the float on the bottom of the bowl, then bend the float lip toward or away from the needle. Recheck the ¼ inch setting again, then repeat the lip bending operation as required.

CAUTION: When bending the float lip, do not allow the lip to push against the needle as the tip can be compressed sufficiently to cause a false setting which will affect correct level of the fuel in the bowl.

After being compressed, the tip is very slow to recover its original shape.

It is very important that the float lip be perpendicular to the needle or slanted not more than 10 degrees away from the needle when the float is correctly set.

(6) Reassemble the air horn.

PART 4

BBD SERIES (1 ¼ INCH) CARBURETOR

SERVICE PROCEDURES

DISASSEMBLY

To disassemble the carburetor for cleaning or overhaul, refer to (Fig. 1), and proceed as follows:

(1) Place the carburetor assembly on repair block Tool C-3225.

(2) Remove the hairpin clips and disengage the accelerator pump operating rod. On the 273 cubic inch engine, the accelerator pump rod is located in the outer hole of the accelerator pump rocker arm and in the inner hole of the rocker arm for the 318 cubic inch engine; refer to (Fig. 1).

(3) Remove the hairpin clip and disengage the fast idle connector rod from the fast idle cam and choke lever.

(4) Remove the vacuum hose between the carburetor main body and the vacuum diaphragm.

(5) Remove the clip from the choke operating link and disengage the link from the diaphragm plunger (stem) and the choke lever. Refer to (Fig. 1).

(6) Remove the choke vacuum diaphragm and bracket assembly and place to one side to be cleaned as a special item. **A liquid cleaner may damage the diaphragm material.**

(7) Remove the air horn retaining screws and lift air horn straight up and away from main body, as shown in (Fig. 2). Discard the gasket.

(8) Disengage the accelerator pump plunger from the rocker arm by pushing up on the bottom of plunger and sliding plunger shaft off hook. Slide plunger out of air horn and remove the bowl vent valve, spring seat and spring.

If the old plunger can be used again, or if a new plunger is to be installed, place the plunger in a jar of clean gasoline or kerosene to prevent the leather from drying out.

(9) Remove the fuel inlet needle valve, seat and gasket from the main body.

(10) Lift out the float fulcrum pin retainer, then lift out the floats and fulcrum pin.

(11) Remove the step-up piston retaining screw, and slide step-up piston and rods out of well, as shown in (Fig. 3). Now, lift out the step-up piston spring. Remove the step-up piston gasket from the bottom of the well.

(12) Remove the main metering jets, as shown in

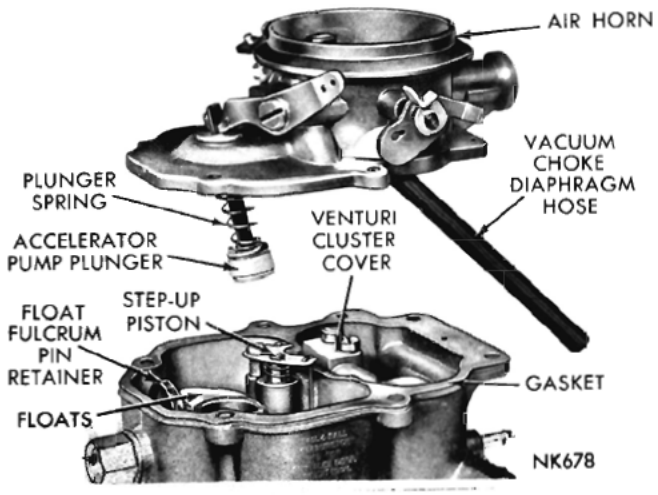

Fig. 2—Removing or Installing Air Horn

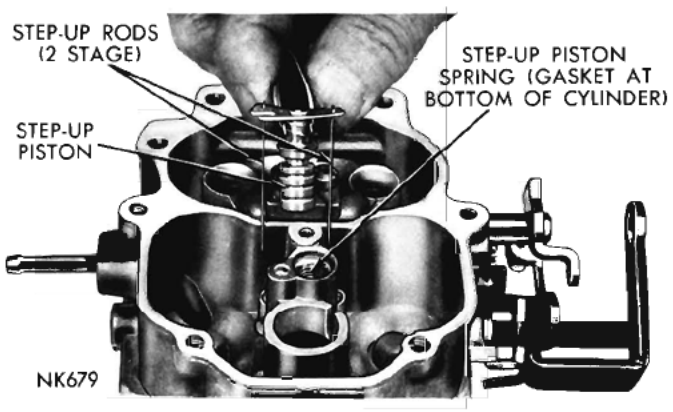

Fig. 3—Removing or Installing Step-Up Piston

(Fig. 4).

(13) Remove the venturi cluster screws, then lift the venturi cluster and gaskets up and away from main body, as shown in (Fig. 5). Discard the gaskets.

Do not remove the idle orifice tubes or main vent tubes from the cluster. They can be cleaned in a solvent and dried with compressed air.

(14) Invert the carburetor and drop out the accelerator pump discharge and intake check balls.

(15) Remove the idle mixture adjusting screws and springs from the throttle body.

(16) Remove the screws that attach the throttle body to the main body. Separate the bodies.

(17) Test the freeness of the choke mechanism in the air horn. The choke shaft must float free to operate correctly. If the choke shaft sticks in the bearings, or appears to be gummed from deposits in the air horn, a thorough cleaning will be required.

The carburetor now has been disassembled into three main units, namely, the air horn, main body and throttle body and the component parts of each disassembled as far as necessary for cleaning and inspection.

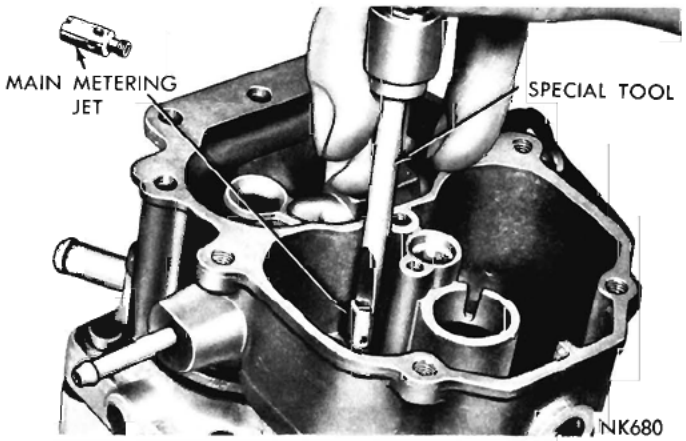

Fig. 4—Removing or Installing Main Metering Jets

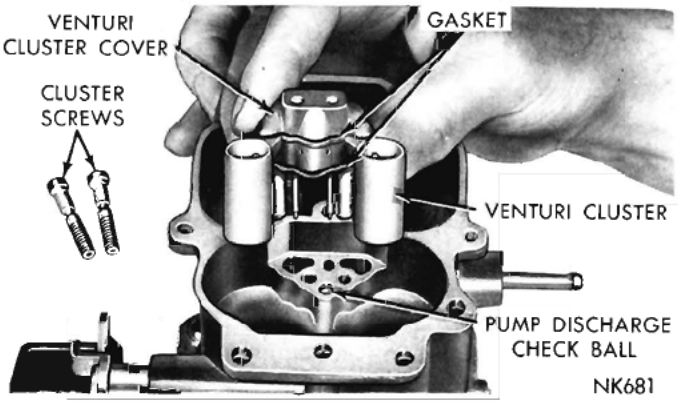

Fig. 5—Removing or Installing Venturi Cluster

It is usually not advisable to remove the throttle shaft or valves from the throttle body, unless wear or damage necessitates the installation of new parts.

INSPECTION AND ASSEMBLY

Throttle Body

(1) Check the throttle shaft for excessive wear in the throttle body. (If wear is extreme, it is recommended that the throttle body assembly be replaced rather than installing a new shaft in the old body).

During manufacture, the location of the idle transfer port and the spark advance control ports to the throttle valve, is carefully established for one particular assembly. (See Fig. 6.)

If a new shaft should be installed in an old, worn throttle body, it would be very unlikely that the original relationship of the ports to the valves would be obtained. Changing the relationship of the valves to the ports would adversely affect normal car operation between the speeds of 15 and 30 miles per hour. However, if it has been determined that a new shaft or valves is to be installed, adhere to the following instructions:

(2) Mark the position of the throttle valves to the shaft, then slide the valves out of the bores.

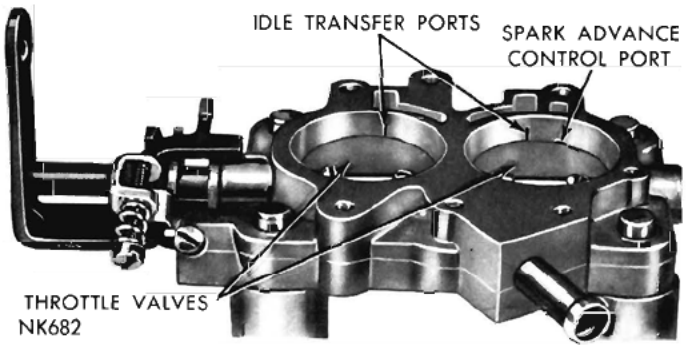

Fig. 6—Ports in Relation to Throttle Valves

CAUTION: These screws are staked on the opposite side and care should be used at removal so as not to break off in the shaft.

(4) Slide the throttle shaft out of the throttle body. Remove the fast idle speed screw lever.

(5) Slide the fast idle speed screw lever over new throttle shaft and insert into throttle body.

(6) Install throttle valves in their respective bores (with the valve numbers toward manifold flange). Install **NEW** screws but do not tighten. Hold the valves in place, with the fingers pressing on the high sides of the valves. Tap the valves lightly with a screwdriver to seat valves in the throttle bores. Tighten the screws securely and stake by squeezing with pliers.

(7) Install the idle mixture screws and springs in the throttle body. (The tapered portion must be straight and smooth. If the tapered portion is grooved or ridged, new idle mixture screws should be installed to insure having correct idle mixture control). **Do Not Use a Screwdriver.** Turn the screws **lightly** against their seats with the fingers. Back off 1 full turn for approximate adjustment.

Main Body

(1) Invert the main body and place the insulator in position, then place the throttle body on main body and align. Install screws and tighten securely.

(2) Install the accelerator pump discharge check ball ($^5/_{32}$ inch diameter) in the discharge passage, as shown in (Fig. 7). Drop the accelerator pump intake check ball ($^3/_{16}$ inch diameter) into the bottom of the pump cylinder.

To check the accelerator pump system; fuel inlet and discharge check balls, proceed as follows:

(3) Pour clean gasoline into the carburetor bowl, approximately ½ inch deep. Remove the pump plunger from the jar of gasoline and slide down into the pump cylinder. Raise the plunger and press lightly on the plunger shaft to expel air from the pump passage.

(4) Using a small clean brass rod, hold the discharge check ball down firmly on its seat. Again raise

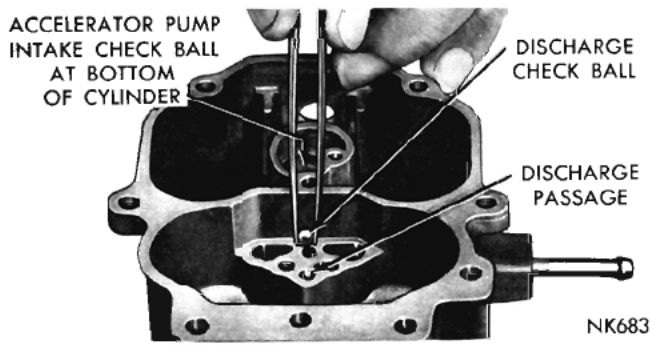

Fig. 7—Installing Accelerator Pump Discharge Check Ball

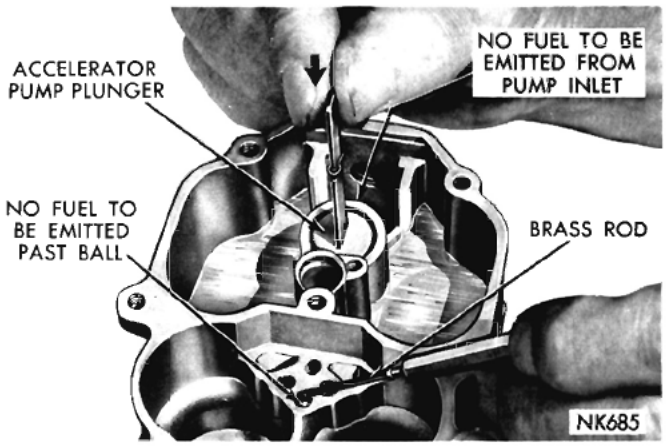

Fig. 8—Testing Accelerator Pump Intake and Discharge Check Balls

the plunger and press downward. No fuel should be emitted from either the intake or discharge passage, as shown in (Fig. 8).

If any fuel does emit from either passage, it indicates the presence of dirt or a damaged check ball or seat. Clean the passage again and repeat test. If leakage is still evident, install new check balls. The fuel inlet check ball is located at the bottom of the plunger well. Remove fuel from bowl.

(5) Install new gaskets on venturi cluster, then install in position in the main body. Refer to (Fig. 5). Install the cluster screws and tighten securely.

(6) Install the main metering jets and tighten securely. Refer to (Fig. 4).

(7) Before installing the step-up piston, be sure the step-up rods are able to move freely each side of the vertical position, as shown in (Fig. 9). The step-up rods must be straight and smooth.

(8) Slide the step-up piston gasket down into position in the piston well, then install the step-up piston spring and step-up piston and rods. Carefully guide the step-up rods into the main metering jets. Refer to

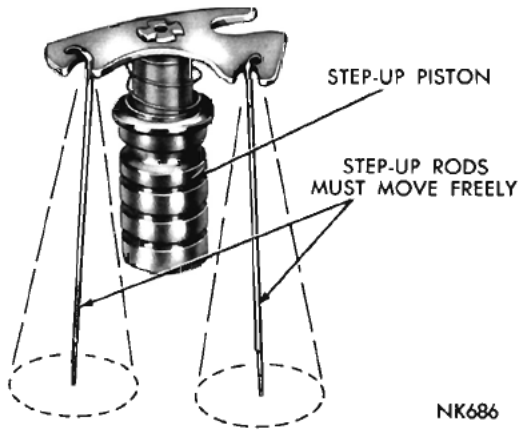

Fig. 9—Step-Up Piston and 2 Stage Rods

(Fig. 3). Install retaining screw and tighten securely.

A step-up piston stuck in the **UP** position will cause a rich mixture at part throttle, whereas a piston stuck in the **DOWN** position will cause a lean mixture at wide open throttle and poor acceleration.

Measuring the Float Setting

The carburetors are equipped with a synthetic rubber tipped fuel inlet needle. The needle tip is a rubber material which is not affected by gasoline and is stable over a wide range of temperatures. The tip is flexible enough to make a good seal on the needle seat, and to give increased resistance to flooding.

The use of the new inlet needle requires a new procedure in adjusting the float setting. Care should be taken to perform this accurately in order to secure the best performance and fuel economy.

To correctly set the float height, when the carburetor is being overhauled, proceed as follows:

(1) Install the floats with the fulcrum pin and pin retainer in the main body.

(2) Install the needle, seat and gasket in the body and tighten securely.

(3) Invert the main body (catch the pump intake check ball) so that the weight of the floats **only,** is forcing the needle against the seat. Hold finger against retainer to fully seat the fulcrum pin.

(4) Using Tool T109-282 or a "T" scale, check the float, as shown in (Fig. 10). There should be ¼ inch from the surface of the fuel bowl to the crown of each float at the center.

If an adjustment is necessary, hold the floats on the bottom of the bowl and bend the float lip toward or away from the needle. Recheck the ¼ inch setting again then repeat the lip bending operation as required.

CAUTION: When bending the float lip, do not allow the lip to push against the needle as the synthetic rubber tip can be compressed sufficiently to cause a false setting which will affect correct level of fuel in the bowl.

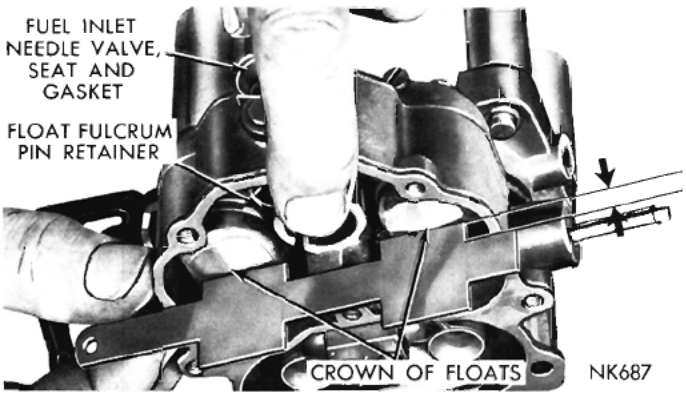

Fig. 10—Measuring the Float Setting

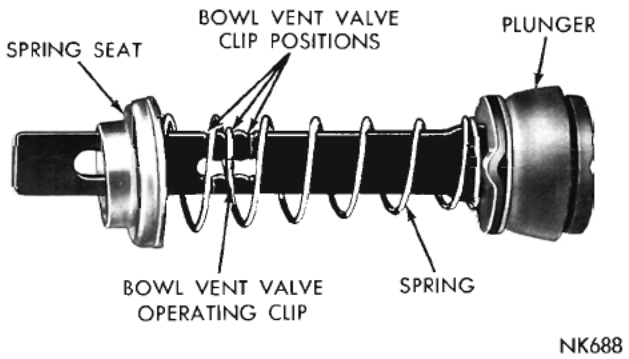

Fig. 11—Accelerator Pump Assembly

After being compressed, the tip is very slow to recover its original shape.

It is very important that the float lip be perpendicular to the needle or slanted not more than ten degrees away from the needle when the float is set correctly.

Air Horn

(1) Assemble the pump plunger, spring and spring seat, as shown in (Fig. 11). Slide plunger shaft through opening in air horn. Install bowl vent valve over plunger shaft, then engage with pump rocker arm.

(2) Place a new gasket on the main body, then install the air horn. Refer to (Fig. 2). Install attaching screws and tighten securely. (When installing air horn be sure the leather on the plunger does not fold back).

(3) Engage the fast idle connector rod in the choke lever and fast idle cam. Secure with hairpin clip.

(4) Engage the accelerator pump operating rod in the proper hole in the rocker arm (depending on carburetor) and in the center hole in the throttle lever. Refer to (Fig. 1). Install clips to secure.

Choke Vacuum Diaphragm

Inspect the diaphragm vacuum fitting to insure that the passage is not plugged with foreign material. Leak check the diaphragm to determine if it has internal leaks. To do this, first depress the diaphragm stem, then place a finger over the vacuum fitting to seal the opening. Release the diaphragm stem. If the stem moves more than $^{1}/_{16}$ inch in 10 seconds, the leakage is excessive and the assembly must be replaced.

Install the diaphragm assembly on the airhorn as follows:

(1) Assemble to the airhorn and tighten the attaching screws securely.

(2) Install the choke operating link in position between the diaphragm plunger (stem) and the choke lever. Install the clip to secure.

(3) Inspect the rubber hose for cracks before plac-

ing it on the correct carburetor fitting. Refer to (Fig. 1). Do not connect the vacuum hose to the diaphragm fitting until after the vacuum kick adjustment has been made. (See Carburetor Adjustments.)

ADJUSTMENTS

It is very important that the following adjustments be made on a reconditioned carburetor, and in the sequence listed:

Accelerator Pump and Bowl Vent

When assembling the accelerator pump to the air horn, note that the hair pin clip (which opens the bowl vent) can be placed in any one of the three positioning notches. These notches correspond to the long, medium and short pump stroke holes in the throttle lever. Normally, the bowl vent clip on the pump stem will be at the middle notch and the pump operating rod in the medium stroke hole.

The proper procedure is to adjust the amount of bowl vent opening instead of measuring and setting the height of the pump plunger.

To check or set the adjustment, proceed as follows:

(1) Back off the idle speed adjusting screw. Open the choke valve so that the fast idle cam allows the throttle valves to be completely seated in the bores.

(2) Be sure the pump operating rod is in the medium stroke hole in the throttle lever, and that the bowl vent clip on the pump stem is in the center notch.

(3) Close the throttle valves tightly. It should be just possible to insert a $^{1}/_{16}$ inch drill between the bowl vent and its seat, as shown in (Fig. 12).

If an adjustment is necessary, bend the pump operating rod, using Tool T109-213, at the lower angle, until the correct bowl vent opening has been obtained.

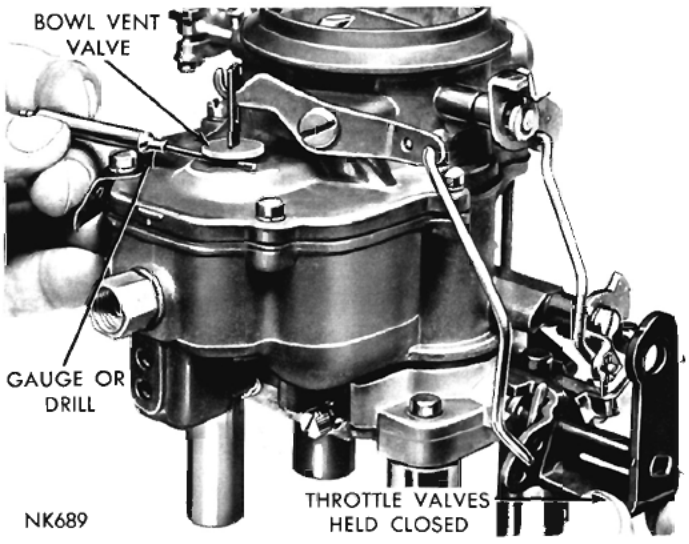

Fig. 12—Measuring Bowl Vent Opening

This is an important adjustment, since too much lift at the bowl vent will result in considerable loss in low speed fuel economy.

Remember that if the pump operating rod is moved to either the short or long stroke position, a corresponding change must be made in the location of the bowl vent clip, and the amount of lift of the bowl vent rechecked and adjusted.

Fast Idle Speed and Cam Position Adjustment

The fast idle engine speed adjustment should be made on the vehicle, as described in the Fast Idle Speed Adjustment (On the Vehicle) Paragraph. However, the Fast Idle Cam Position Adjustment can be made on the bench. This adjustment is important to be sure that the speeds of each cam step occur at the proper time during the warm-up. Adjust as follows:

(1) With the fast idle speed adjusting screw contacting the step on the fast idle cam shown in (Fig. 13), move the choke valve toward the closed position with light pressure. Insert a $^{7}/_{64}$ inch (manual trans. or automatic trans.) drill or gauge between the choke valve and the wall of the air horn.

(2) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

(3) If an adjustment is necessary, bend the stop of the shaft lever, using Tool T109-22, until the correct valve opening has been obtained. Refer to (Fig. 13).

Vacuum Kick Adjustment—(This test can be made On or Off the vehicle.)

The choke diaphragm adjustment controls the fuel

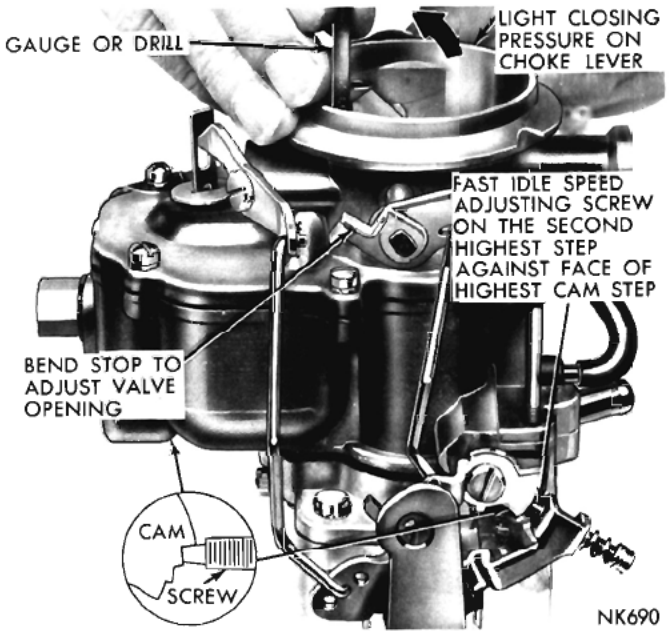

Fig. 13—Fast Idle Cam Position Adjustment

delivery while the engine is running. It positions the choke valve within the air horn by action of the linkage between the choke shaft and the diaphragm. The diaphragm must be energized to measure the vacuum kick adjustment. Use either a distributor test machine with a vacuum source or vacuum supplied by another vehicle. Adjust as follows:

(1) With the engine **Not** running, open the throttle valves far enough to allow the choke valve to be moved to the closed position.

(2) Disconnect the vacuum hose from the diaphragm and connect the hose from the vacuum supply as shown in (Fig. 14). (A minimum of 10 inches of mercury (HG) will be required.)

(3) Insert the specified size drill or gauge between choke valve and the wall of the air horn. Refer to (Fig. 1). Apply sufficient closing pressure on the choke shaft lever to provide the smallest choke valve opening possible without distortion of the diaphragm link. Note that the cylindrical stem of the diaphragm will extend as an internal spring is compressed. The spring must be fully compressed for proper measurement of the kick adjustment.

(4) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

The adjustment of this opening will require the removal of the choke operating link.

CAUTION: Damage to the diaphragm and the choke lever slot can result, if the link is not removed for the bending operation.

(5) Remove the clip and disengage the choke operating link from the diaphragm stem, then disengage the link from the choke lever. (The best bending results will be obtained by using a vise and a pair of pliers.)

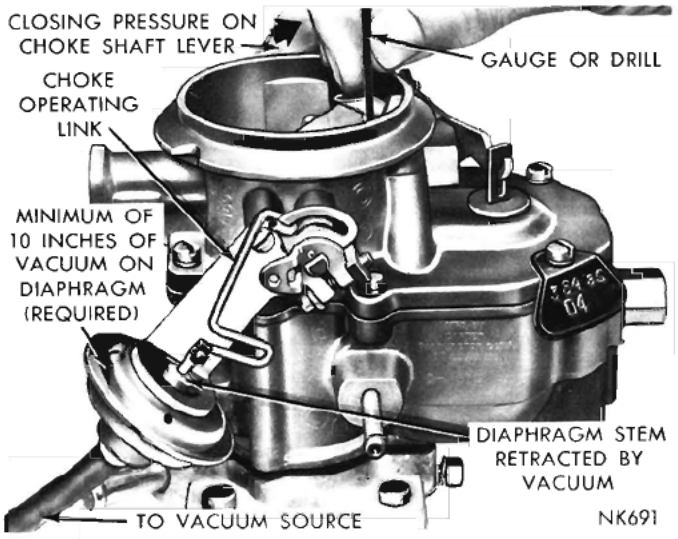

Fig. 14—Measuring the Choke Vacuum Kick Setting

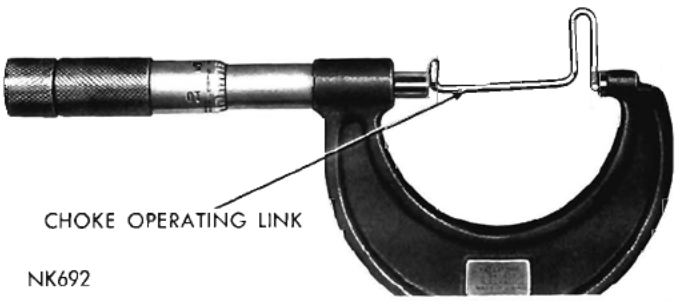

Fig. 15—Choke Operating Link Measurements

(6) Bend the choke operating link at the angle to provide the correct choke valve opening.

CAUTION: A correction in the length of the link of .010 inch, will result in a change of .015 inch in the choke valve opening.

As an example, if the choke valve opening is 0.015 inch in error, the correction in the link length would be .010 inch.

A "2" inch micrometer will be helpful in establishing the original length of the link, as shown in (Fig. 15), before completing the adjustment.

(7) Install the choke operating link and recheck the choke valve opening, using a guage or drill. Refer to (Fig. 14).

(8) Reinstall the vacuum hose to the diaphragm

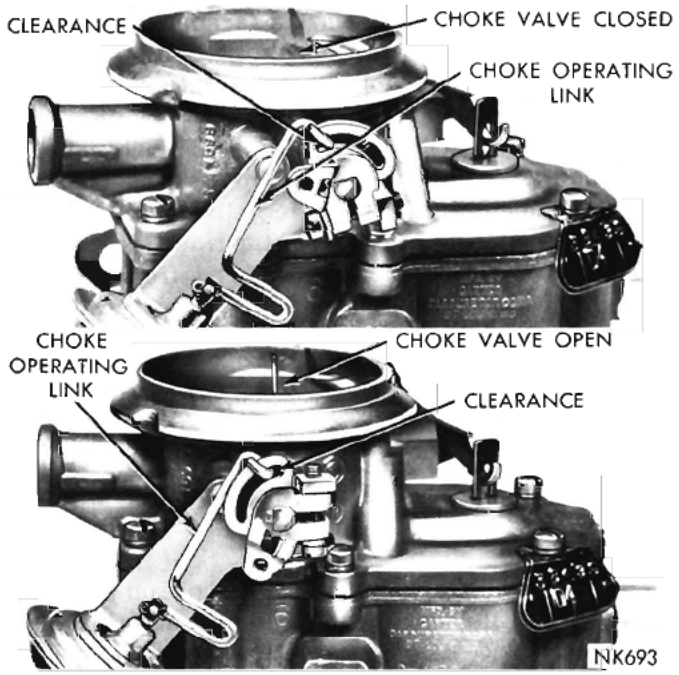

Fig. 16—Choke Operating Link Clearances

and with no vacuum applied to the diaphragm, some clearance should exist between the choke operating link and the choke lever slot, in both the open and closed choke valve positions, as shown in (Fig. 16). **This clearance is necessary to allow the choke valve to close for starting as well as fully open after the engine reaches the normal operating temperature.**

If a clearance does not exist in both of these positions, a recheck of the operating link adjustment should be made.

Free movement of the choke valve between the closed and open positions is very necessary.

This free movement should also exist between the kick and the open choke valve positions with the engine running. If binding does exist, the choke operating link has been improperly bent and should be corrected.

Choke Unloaded (Wide Open Kick)

(1) Hold the throttle valves in the wide open position. Insert Tool T109-31 or ¼" drill shank between the upper edge of the choke valve and the inner wall of the air horn, as shown in (Fig. 17).

(2) If no drag is felt, or if too much drag is apparent, bend the unloader tang on the throttle lever, until correct clearance has been obtained.

Idle Speed Adjustment (Curb Idle)

To make the idle speed adjustment, the engine must be thoroughly warmed up. A much more reliable idle adjustment can usually be obtained if the car has been driven a minimum of five miles. For the best results, it is recommended that a tachometer be used in this adjustment. (Before making the idle speed adjustment, observe the following precautions):

Because the alternator can charge at idle speeds and impose a load on the engine, the headlights should be turned on (high beam). This will assure setting the idle to compensate for the alternator load. On vehicles equipped with the automatic transmission, disconnect the transmission control rod from the ball joint on the carburetor lever so that the stop in the transmission will not interfere with the free movement of the carburetor throttle lever.

(1) Turn the idle speed screw **in** or **out** to obtain 500 r.p.m. (On cars with air conditioning, set the idle speed at 500 r.p.m., with air conditioning **On.**) Be sure that the choke valve is fully open and that the fast idle adjusting screw is not contacting the fast idle cam.

(2) Turn each idle mixture screw to obtain the highest r.p.m. While making the adjustment, watch the tachometer and notice that the speed can be decreased by turning the screws in either direction from the setting that gave the highest r.p.m. reading.

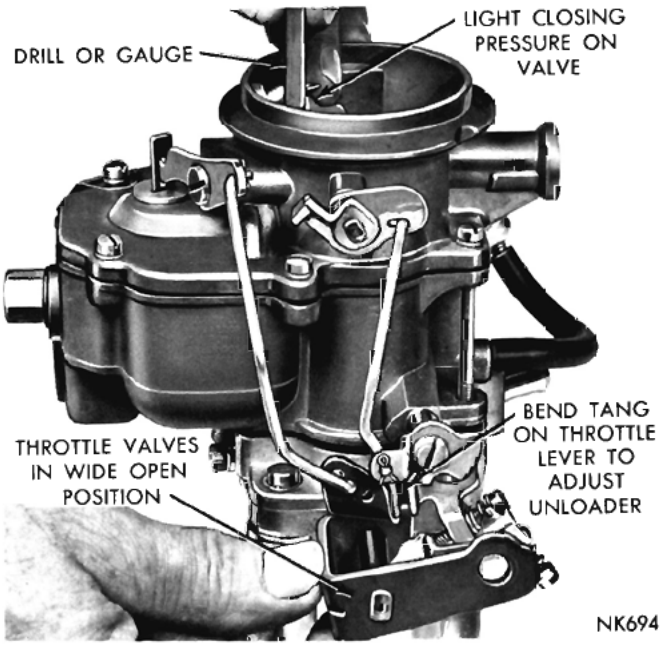

Fig. 17—Measuring the Choke Unloader Setting

(3) Readjust to 500 r.p.m. with the idle speed screw.

(4) Turn each idle mixture adjusting screw in the clockwise direction (leaner) until there is a slight drop in r.p.m. Now, turn each screw out counter-clockwise (richer) just enough to regain the lost r.p.m.

This procedure will assure that the idle has been set to the leanest mixture possible for smooth idle. **This setting is very important.**

Since the correct speed was originally set using the speed screw, the speed obtained after finding the leanest smooth idle setting will probably be too fast.

(5) Readjust the speed screw to obtain correct idle

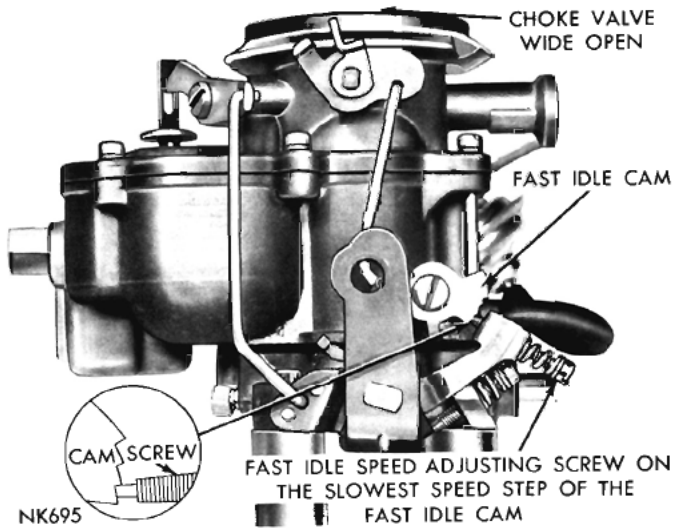

Fig. 18—Fast Idle Speed Adjustment (on the vehicle)

speed. Repeat steps 2 and 4 above if necessary. After the proper idle speed has been obtained, refer to (Fig. 3) of the Throttle Linkage Group in this Section, for the procedure on adjusting the transmission control rod.

Fast Idle Speed (On the Vehicle after Approximately 500 miles if necessary)

To set the fast idle speed on the car, connect a tachometer, then set the curb idle speed and proceed as follows:

(1) With the engine running and the transmission in the neutral position, open the throttle slightly.

(2) Close the choke valve about 20 degrees then allow the throttle to close. Return the choke valve to the open position.

(3) The fast idle speed adjusting screw should be contacting the slowest speed step on the fast idle cam, as shown in (Fig. 18).

(4) With the engine warmed-up to the normal operating temperature, turn the fast idle speed adjusting screw **in** or **out** to secure 700 r.p.m. **Reposition the cam and throttle after every screw adjustment to apply normal throttle closing torque.**

BBD (1½ INCH) CARBURETORS

The Ball and Ball carburetor is of the dual downdraft type. Each throat has its own throttle valve, idle and main metering systems and are supplemented by the float, accelerating and power systems.

On each BBD series carburetor, the model number is stamped on metal tag attached to air horn. Do not remove or destroy this tag, as it is the only means provided for carburetor model identification. Before attempting to repair or overhaul carburetor, refer to model number and secure a repair kit for number indicated on tag.

SERVICE PROCEDURES

DISASSEMBLY

To disassemble the carburetor for cleaning or overhauling, refer to (Fig. 1), then proceed as follows:

(1) Insert three Tool T109-287S and one Tool

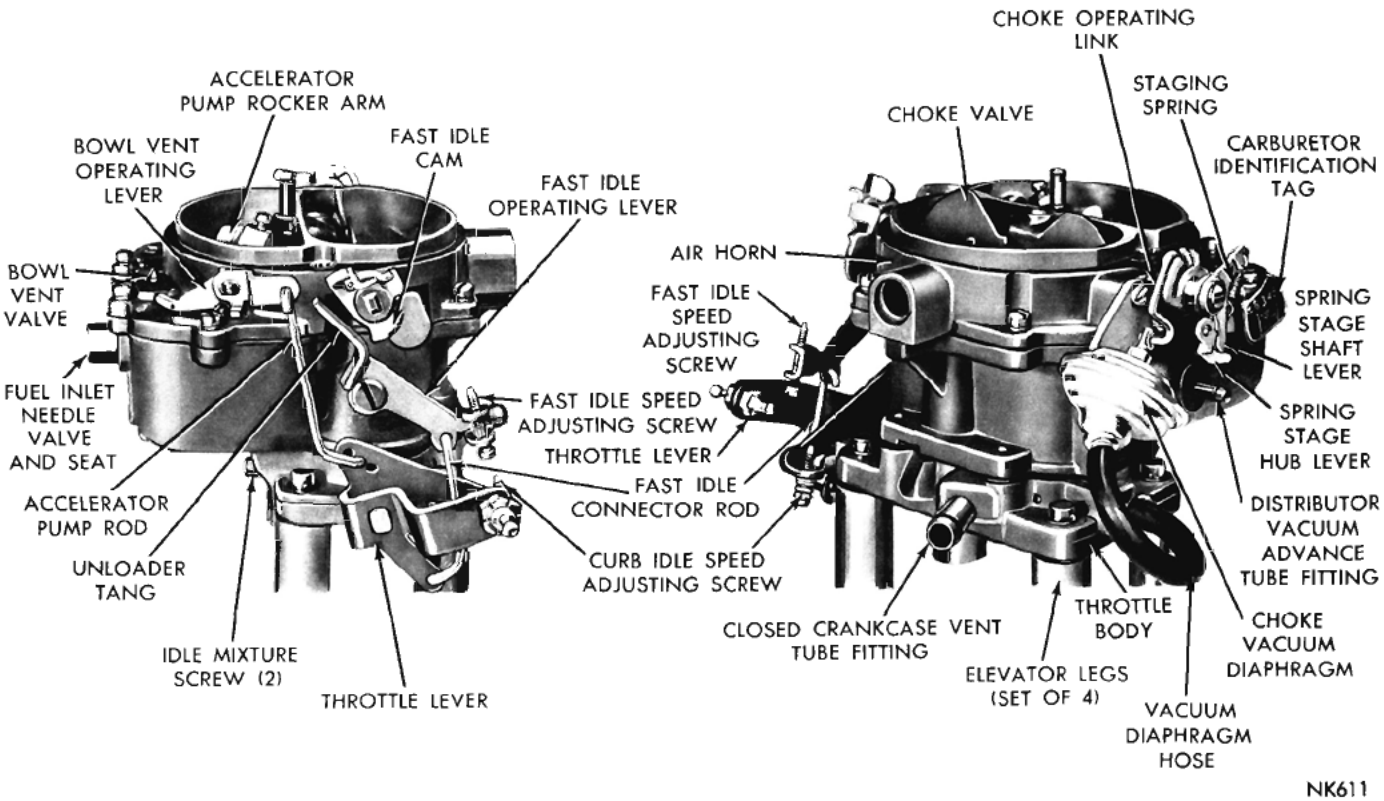

Fig. 1—Carburetor Assembly (BBD-3849S and BBD-3850S)

T109-288S elevating legs through the carburetor throttle body stud holes. (These tools are used to protect the throttle valves from damage and to provide a suitable base for working.)

(2) Remove the hairpin clip and disengage the fast idle connector rod from the throttle and fast idle levers.

(3) Remove the hairpin clip and disengage the accelerator rod from the throttle lever and the pump rocker arm.

(4) Remove the vacuum hose between the carburetor throttle body fitting and the vacuum diaphragm.

(5) Remove the clip from the choke operating link and disengage the link from the diaphragm plunger and the choke lever. Refer to (Fig. 1).

(6) Remove the vacuum diaphragm and bracket assembly and place to one side, to be cleaned as a special item. **A liquid cleaner may damage the diaphragm material.**

(7) Remove the air horn retaining screws and lift air horn straight up and away from the main body. Discard the gasket (2 screws recessed).

(8) Disengage the accelerator pump plunger from the accelerator pump arm by pushing up on bottom of plunger and sliding plunger shaft off hook. Slide plunger out of air horn and remove the compression spring and seat.

If the old plunger can be used again or if a new plunger is to be installed, place the plunger in a jar of clean gasoline or kerosene to prevent the leather from drying out.

(9) Remove the fuel inlet needle valve, seat and gasket from the main body.

(10) Lift out the float fulcrum pin retainer, and lift out the floats and fulcrum pin.

(11) Remove the step-up piston and retaining screw and slide the step-up piston and rods out of well, as shown in (Fig. 2). Lift out the step-up piston spring.

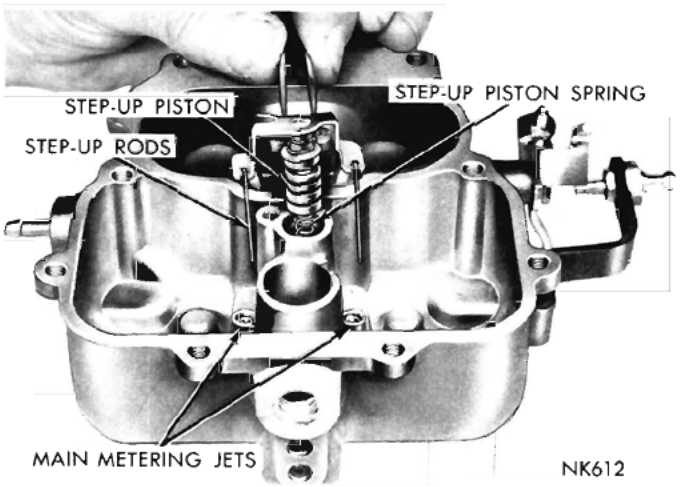

Fig. 2—Removing or Installing the Step-Up Piston

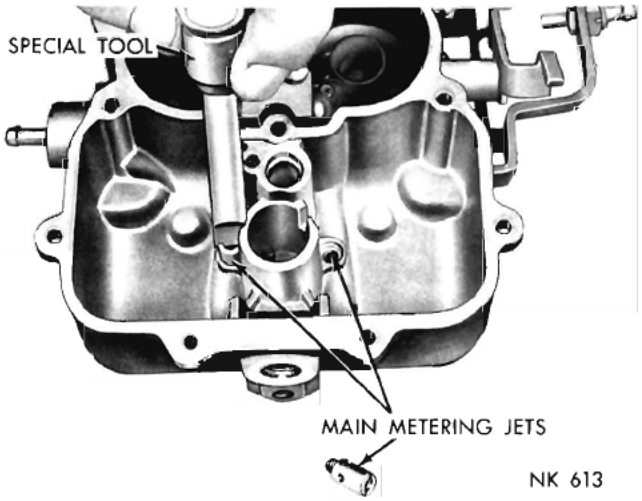

Fig. 3—Removing or Installing the Main Metering Jets

Remove the step-up piston gasket from the bottom of the well.

(12) Remove the main metering jets as shown in (Fig. 3).

(13) Remove the venturi cluster screws, then lift the venturi cluster and gaskets up and away from the main body, as shown in (Fig. 4). Discard the gaskets. **Do not remove the idle orifice tubes or the main vent tubes from the cluster.** They can be cleaned in a solvent and dried with compressed air.

(14) Invert the carburetor and drop out the accelerator pump discharge check ball and the intake check ball. (The intake check ball is the largest.)

(15) Remove the idle mixture adjusting screws and springs from the throttle body.

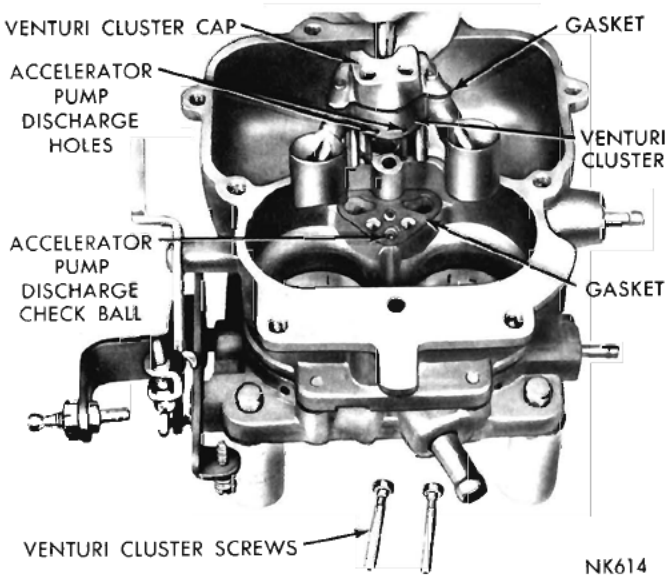

Fig. 4—Removing or Installing the Venturi Cluster

(16) Remove the screws that attach the throttle body to the main body. Separate the bodies and discard the gasket.

The carburetor now has been disassembled into three sub-assemblies, the air horn, main body and throttle body and the components of each disassembled as far as necessary for cleaning and inspection.

It is usually not advisable to remove the throttle shaft or valves from the throttle body, unless wear or damage necessitates the installation of new parts. There is about .005 inch clearance between the throttle shaft and the throttle shaft bores in the throttle body. Any clearance over .010 inch is excessive and a new throttle shaft and/or throttle body should be installed.

INSPECTION AND ASSEMBLY

Throttle Body

(1) Inspect the throttle shaft and throttle body for excessive wear. If either or both are worn to the point where the carburetor operation will be affected, replace as required.

During manufacture, the location of the idle transfer port and the spark advance control ports to the throttle valve, is carefully established for one particular assembly, refer to (Fig. 5).

If a new shaft should be installed in an old, worn throttle body, it would be very unlikely that the original relationship of the ports to the valves would be obtained. Changing the relationship of the valves to the ports would adversely affect normal car operation between the speeds of 15 and 30 miles per hour. If it has been determined, however, that a new shaft or valves is to be installed, adhere to the following instructions:

(2) Mark the position of the throttle valves in the bores. Be sure the idle speed screw is backed off.

(3) Remove the screws that hold the throttle valves to the shaft and slide the valves out of the bores.

NOTE: These screws are staked on the opposite side and care should be used at removal so as not to break off in the shaft.

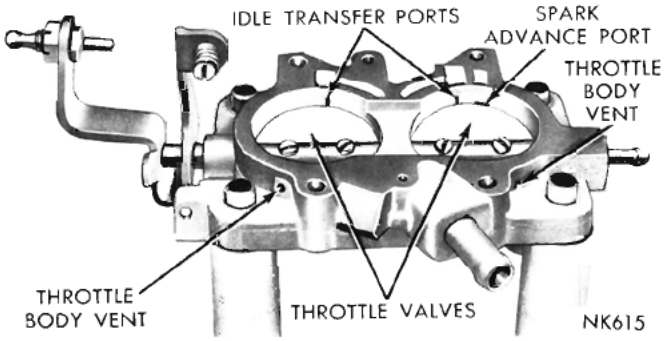

Fig. 5—Ports in Relation to the Throttle Valves

Remove the staked end of the screws with a file.

(4) Slide the throttle shaft and lever out of the body.

(5) Install new throttle shaft and lever.

(6) Install throttle valves in their respective bores (with the valve numbers toward the manifold). Install new screws but do not tighten. Hold the valves in place, with the fingers pressing on the high sides of the valves. Tap the valves lightly with a screwdriver to seat in the throttle bores. Tighten the screws securely and stake by squeezing with pliers.

(7) Install the idle mixture screws and springs in the throttle body. (The tapered portion must be straight and smooth. If the tapered portion is grooved or ridged, new idle mixture screws should be installed to insure having correct idle mixture control). **Do not use a screwdriver.** Turn the screws **lightly** against their seats with the fingers. Back off one full turn for approximate adjustment.

Main Body

(1) Invert the main body and place a new gasket in position and place the throttle body on the main body and align. Install screws and tighten securely.

(2) Install the accelerator pump discharge check ball in the discharge passage and check the accelerator pump system, fuel inlet and discharge check balls as follows:

(3) Pour clean gasoline into the carburetor bowl, approximately ½ inch deep. Remove the pump plunger from the jar of gasoline, flex the leather several times, then slide down into the pump cylinder. Raise the plunger and press lightly on the plunger shaft to expel all air from the pump passage.

(4) Using a small clean brass rod, hold the discharge check ball down firmly on its seat. Again raise

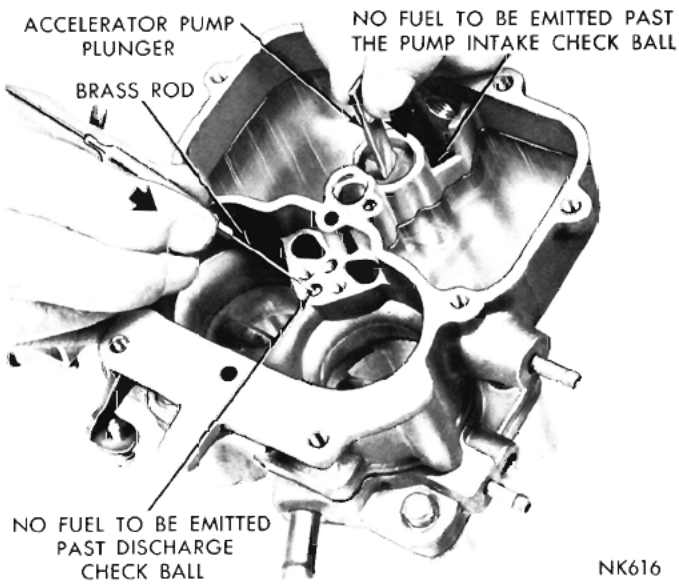

Fig. 6—Testing the Accelerator Pump Intake and Discharge Balls Check

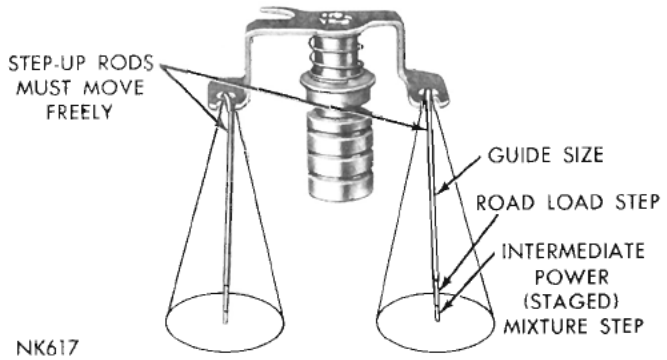

Fig. 7—Step-up Rods Free Play

the plunger and press downward. No fuel should be emitted from either the intake or discharge passage, as shown in (Fig. 6).

If any fuel does emit from either passage, it indicates the presence of dirt or a damaged check ball seat. Check the passage again and repeat test. If leakage is still evident, install a new check ball. The fuel inlet check ball is located at the bottom of the plunger well.

(5) Install new gaskets on the venturi cluster, and install in position in the main body. Install the cluster screws and tighten securely. Test pump discharge by pressing pump plunger down. Two fine streams of fuel should be forced from the cluster. If either stream is restricted or diverted, remove cluster and reclean. After test, pour the fuel from the bowl and remove pump plunger.

(6) Install the main metering jets. Tighten securely. Refer to (Fig. 3).

(7) Before installing the step-up piston, be sure the step-up rods are able to move freely, each side of the vertical position, as shown in (Fig. 7). The step-up rods must be straight, smooth and free to move forward and backward from vertical.

(8) Slide the step-up piston gasket down into position in the piston well, then install the step-up piston spring, step-up piston and rods. Carefully guide the step-up rods into the main metering jets (Fig. 2). Install the retaining screw and tighten securely. Check piston for free operation in the well.

A step-up piston stuck in the **Up** position will cause a rich mixture at part throttle, whereas a piston stuck in the **Down** position will cause a lean mixture at wide open throttle and poor acceleration.

Measuring the Float Setting

The carburetors are equipped with a rubber-tipped fuel inlet needle. The rubber tip is flexible enough to make a good seal on the needle seat, and to give increased resistance to flooding.

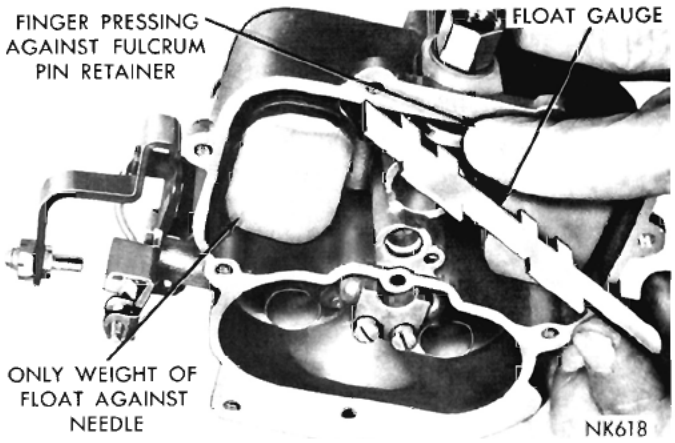

Fig. 8—Measuring the Float Setting

The use of the rubber-tipped needle requires a new procedure in adjusting the float setting. Care should be taken to perform this operation accurately in order to secure the best performance and fuel economy.

(1) To correctly set the float height when the carburetor is being overhauled, install the floats with the fulcrum pin and pin retainer in the main body.

(2) Install the rubber-tipped needle, seat and gasket in the body and tigten securely.

(3) Invert the main body so that the weight of the float only is forcing the needle against the seat. Hold finger against the retainer to fully seat the fulcrum pin.

(4) Using Tool T109-280 or a "T" scale, measure the float, as shown in (Fig. 8). There should be $^{5}/_{16}$ inch from the surface of the fuel bowl to the **crown of each float at the center.**

If an adjustment is necessary, hold the floats on the bottom of the bowl and bend the float lip toward or away from the needle. Recheck the $^{5}/_{16}$ inch setting again and repeat the lip bending operation as required.

CAUTION: When bending the float lip, do not allow the lip to push against the needle as the synthetic rubber tip can be compressed sufficiently to cause a false setting which will affect correct level of fuel in the bowl.

After being compressed, the tip is very slow to recover its original shape.

CAUTION: It is very important that the float lip be perpendicular to the needle or slanted not more than ten degrees away from the needle when the float height is correct.

Air Horn

(1) Test the freeness of the choke mechanism in the air horn. The choke shaft must float free to operate correctly. If the choke shaft sticks in the bearing areas, or appears to be gummed from deposits in the

air horn, a thorough cleaning will be required.

(2) Remove the accelerator pump plunger from the gasoline, slide the compression spring and spring seat over the shaft. Install the assembly in the air horn and engage with the accelerator pump arm.

(3) Place a new gasket on the main body, and install the air horn. Install attaching screws and tighten securely. (When installing air horn, be sure the leather on the plunger does not wrinkle or fold back.)

(4) Engage the accelerator pump rod with the pump rocker arm and install loose end in the center hole of throttle lever. Install hairpin clip to secure (Fig. 1).

(5) Engage the fast idle connector rod in the fast idle lever and throttle lever. Install hairpin clip to secure.

Choke Vacuum Diaphragm

Inspect the diaphragm vacuum fitting to be sure that the passage is not plugged with foreign material. Leak check the diaphragm to determine if it has internal leaks. To do this, first depress the diaphragm stem, then place a finger over the fitting to seal the opening. Release the stem. If the stem moves more than $^1/_{16}$ inch in ten (10) seconds, the leakage is excessive and the assembly must be replaced.

(1) Install the diaphragm assembly on the air horn and tighten the attaching screws securely.

(2) Install the choke operating link in position between the diaphragm plunger (stem) and the choke lever. Install the clip to secure.

(3) Inspect the rubber hose for cracks before placing it on the correct carburetor fitting. Do not connect the vacuum hose to the diaphragm fitting until after the vacuum kick adjustment has been made. (See Carburetor Adjustments.)

ADJUSTMENTS

It is very important that the following adjustments are made on a reconditioned carburetor and in the sequence listed:

Accelerator Pump

(1) Back off the idle speed adjusting screw. Open the choke valve so that the fast idle cam allows the throttle valves to be completely seated in the bores. Be sure that the pump connector rod is installed in the center hole of the throttle lever.

(2) Close the throttle valves tightly. Measure the distance between the top of the air horn and the end of plunger shaft, as shown in (Fig. 9). This measurement should be 1″ + or — $^1/_{64}$ inch.

(3) To adjust pump travel, bend the pump connector rod, using Tool T109-213, at the lower angle of rod, until correct setting has been obtained.

Fast Idle Speed and Cam Position Adjustment

The fast idle engine speed adjustment should be made on the vehicle, as described in the Fast Idle Speed Adjustment (On the Car) Paragraph. However, the Fast Idle Cam Position Adjustment can be made on the bench. This adjustment is important to assure that the speeds of each step of the cam occur at the proper time during engine warm-up.

(1) With the fast idle speed adjusting screw contact-

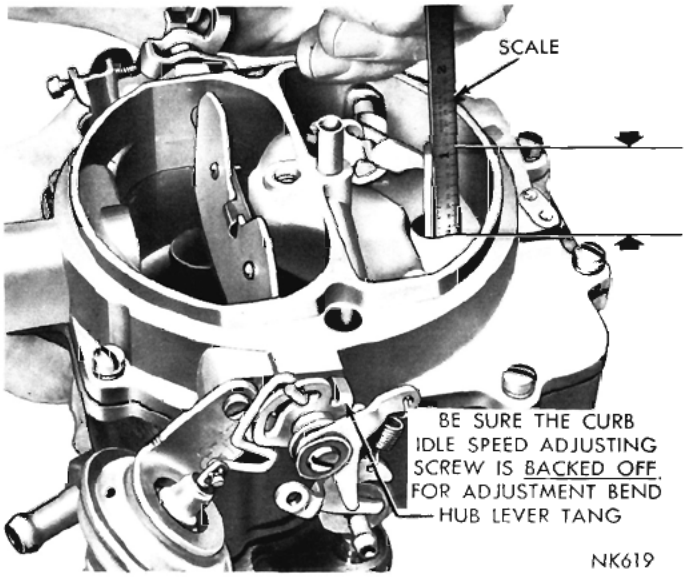

Fig. 9—Measuring the Accelerator Pump Setting

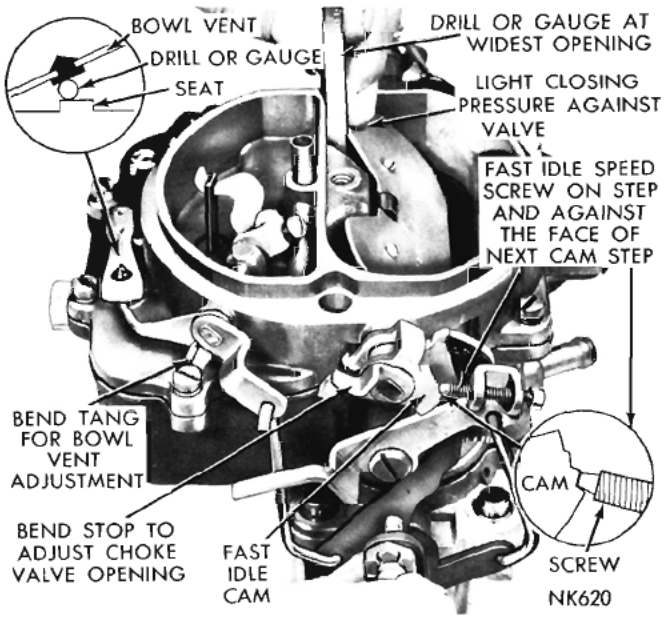

Fig. 10—Fast Idle Cam Position Adjustment

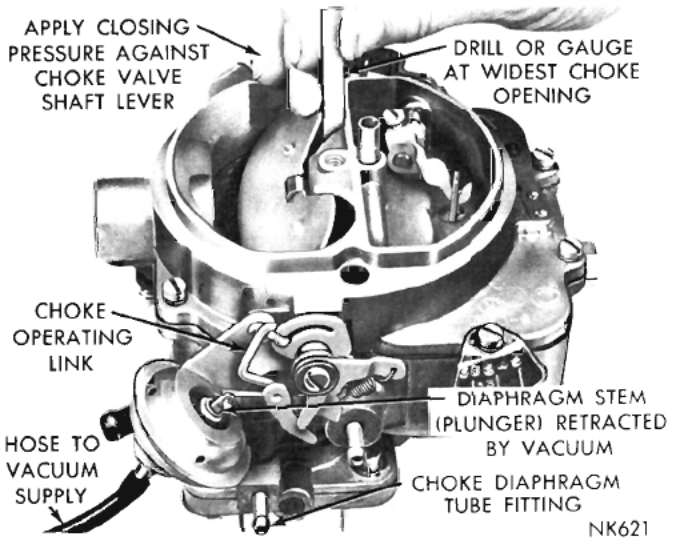

Fig. 11—Measuring the Choke Vacuum Kick Setting

ing the step on the fast idle cam shown in (Fig. 10), move the choke valve toward the closed position with light pressure. Insert a NO. 35 drill between the choke valve and the wall of the air horn.

(2) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

(3) If an adjustment is necessary, bend the stop on the choke shaft, using Tool T109-22 until the correct valve opening has been obtained. Refer to (Fig. 10).

The choke diaphragm adjustment controls the fuel delivery while the engine is running. It positions the choke valve within the air horn by action of the linkage between the choke shaft and the diaphragm. The diaphragm must be energized to measure the vacuum kick adjustment. Use either a distributor test machine with a vacuum source, or vacuum supplied by another vehicle.

(1) With the engine **Not** running, open the throttle valves far enough to allow the choke valve to be moved to the closed position.

(2) Disconnect the vacuum hose from the diaphragm and connect the hose from the vacuum supply, as shown in (Fig. 11). (A minimum of 10 inches of mercury (HG) will be required.)

(3) Insert a NO. 11 drill (Manual Trans.) or a NO. 22 drill (Auto. Trans.) between the choke valve and the wall of the air horn. Refer to (Fig. 11). Apply sufficient closing pressure on the choke shaft lever to provide the smallest choke valve opening possible without distortion of the diaphragm link. Note that the cylindrical stem of the diaphragm will extend as an internal spring is compressed. This spring must be fully compressed for proper measurement of the vacuum kick adjustment.

(4) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

The adjustment of this opening will require the removal of the choke operating link.

CAUTION: Damage to the diaphragm and the choke lever slot can result, if the link is not removed for the bending operation.

(5) Remove the clip and disengage the choke operating link from the diaphragm stem (plunger), then disengage the link from the choke lever. (The best bending results will be obtained by using a vise and a pair of pliers.)

(6) Bend the choke operating link to provide the correct choke valve opening.

CAUTION: A correction in the length of the link of .010 inch, will result in a change of .010 inch in the choke valve opening.

As an example, if the choke valve opening is .010 inch in error, the correction in the link length would be .010 inch.

A 2″ micrometer will be helpful in establishing the original length of the link, as shown in (Fig. 12), before completing the adjustment.

(7) Install the choke operating link and recheck the choke valve opening, using a gauge or drill. Refer to (Fig. 11).

(8) Reinstall the vacuum hose to the diaphragm and with no vacuum applied to the diaphragm, some clearance should exist between the choke operating link and the choke lever slot, in both the open and closed choke valve positions, as shown in (Fig. 13). **This clearance is necessary to allow the choke valve to close for starting as well as fully open position after the engine reaches the normal operating temperature.**

If a clearance does not exist in both of these positions, a recheck of the operating link adjustment should be made.

NOTE: Free movement of the choke valve between the closed and open positions is very necessary.

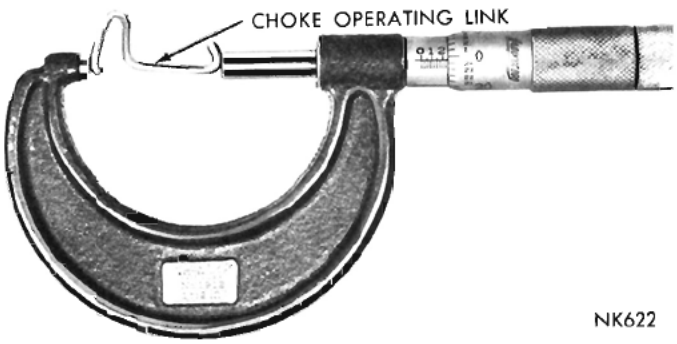

Fig. 12—Choke Operating Link Measurements

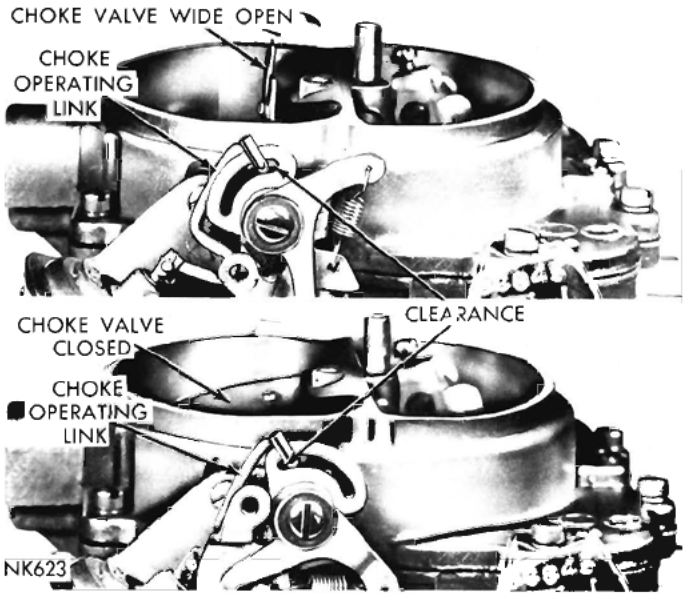

Fig. 13—Choke Operating Link Clearances

This free movement should also exist between the kick and the open choke valve positions with the engine running. If binding does exist, the choke operating link has been improperly bent and should be corrected.

Choke Unloader (Wide Open Kick)

(1) Hold the throttle valves in the wide open position. Insert Tool T109-31 (or a ¼" drill shank) between the upper edge of the choke valve and the inner wall of the air horn, as shown in (Fig. 14).

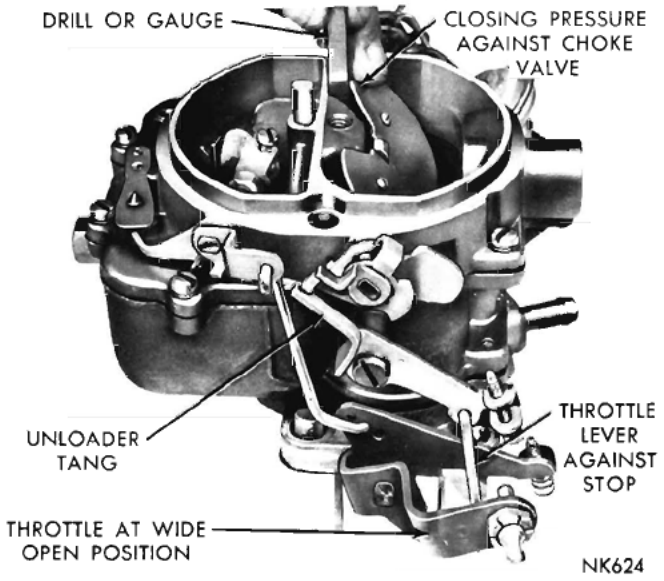

Fig. 14—Measuring the Choke Unloader Setting

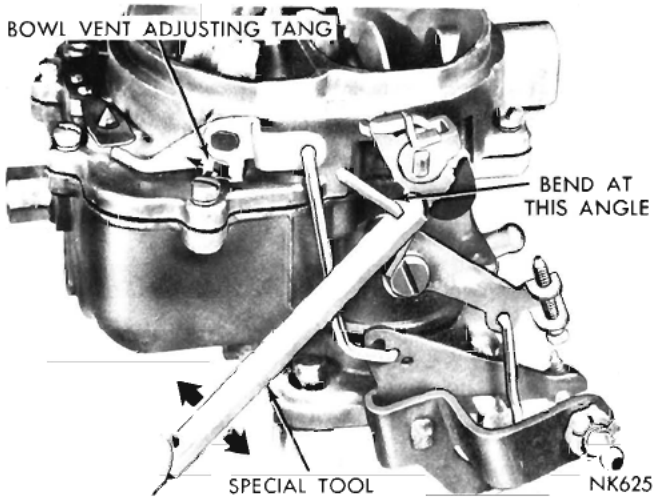

Fig. 15—Bending the Choke Unloader Tang

(2) With a finger lightly pressing against the valve, a slight drag should be felt as gauge is being withdrawn. If an adjustment is necessary, bend the tang on the fast idle lever, using Tool T109-22, as shown in (Fig. 15) until correct clearance has been obtained.

Bowl Vent Adjustment

NOTE: Any adjustment to the accelerator pump means, that the bowl vent valve must be readjusted.

(1) With the throttle valves at curb idle, there should be $^{1}/_{16}$ inch clearance between the bowl vent valve and the air horn, when measured at the innermost or smallest dimension with a drill shank.

(2) If an adjustment is necessary, bend the short tang on the vent valve operating lever, using Tool T109-22, until correct opening has been obtained.

Idle Speed Adjustment (Curb Idle)

To make the idle speed adjustment, the engine must be thoroughly warmed up. A more reliable idle adjustment can usually be obtained if the car has been driven a minimum of five miles. For best results, it is recommended that a tachometer be used in this adjustment.

The following precautions should be taken before making the idle speed adjustment:

(1) To make the idle speed adjustment, turn the idle speed screw in or out to obtain 500 rpm. (On cars with air conditioning, set the idle speed at 500 rpm **with air conditioning On.**) Be sure the choke valve is fully open and that the fast idle adjusting screw is not contacting the fast idle cam.

(2) Turn each idle mixture screw **in** or **out** to obtain the highest rpm. While making the adjustment, watch the tachometer and notice that the speed can be decreased by turning the screws in either direction from the setting that gave the highest rpm reading.

(3) Readjust to 500 rpm with the idle speed screw. (With air conditioning ON.)

(4) Turn each idle mixture adjusting screw in the clockwise direction (leaner) until there is a slight drop in rpm. Turn each screw out, counterclockwise (richer) just enough to regain the lost rpm.

This procedure will assure that the idle has been set to the leanest mixture possible for smooth idle. **This setting is very important.**

Since the correct speed was originally set, using the speed screw, the speed obtained after finding the leanest smooth idle will probably be too fast.

(5) Readjust the speed screw to obtain correct idle speed. Repeat steps 2 and 4 above if necessary.

Checking Float Setting (On the Vehicle)

(1) Remove the hairpin clip and disengage the accelerator pump rod from the throttle lever and the pump rocker arm. Disconnect the automatic choke rod by unsnapping clip.

(2) Remove the air horn attaching screws and lift the air horn straight up and away from the main body. Remove the gasket.

(3) Set the float fulcrum pin by pressing a finger against the fulcrum pin retainer.

There should be enough fuel in the bowl to raise the floats so that the lip bears firmly against the needle. Additional fuel may be admitted by slightly depressing the float. If the fuel pressure in the line is insufficient to force the additional fuel into the bowl, add the necessary fuel from a clean container.

WARNING: Since the manifolds may be hot, it is dangerous to spill fuel onto these surfaces. Take the necessary precautions to avoid spillage.

(4) With only the pressure from the buoyant float holding the lip against the inlet needle, check the float setting, using Tool T109-280, or a "T" scale. There should be $^{5}/_{16}$ inch from the surface of the bowl (gasket removed) to the crown of the floats at the center.

If an adjustment is necessary, hold the floats on the bottom of the bowl, then bend the float lip toward or away from the needle. Recheck the $^{5}/_{16}$ inch setting again, then repeat the lip bending operation as required.

NOTE: When bending the float lip, do not allow the lip to push against the needle as the rubber tip can be compressed sufficiently to cause a false setting which will affect correct level of fuel in the bowl.

NOTE: After being compressed, the rubber tip is very slow to recover its original shape. It is very important that the float lip be perpendicular to the needle or slanted not more than 10 degrees away from the needle when the float is set correctly.

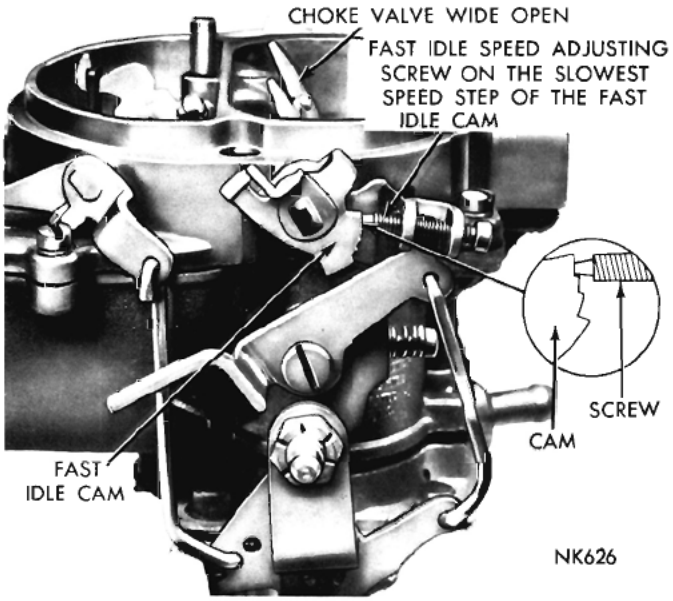

Fig. 16—Fast Idle Speed Adjustment (on the vehicle)

(5) After the float has been correctly set, reassemble the air horn.

*Fast Idle Speed (On the Vehicle)**

To set the fast idle speed on the car, connect a tachometer, then set the curb idle speed and proceed as follows:

(1) With the engine running and the transmission in the neutral position, open the throttle slightly.

(2) Close the choke valve about 20 degrees, then allow the throttle to close. Return the choke valve to the open position.

(3) The fast idle adjusting screw should be con-

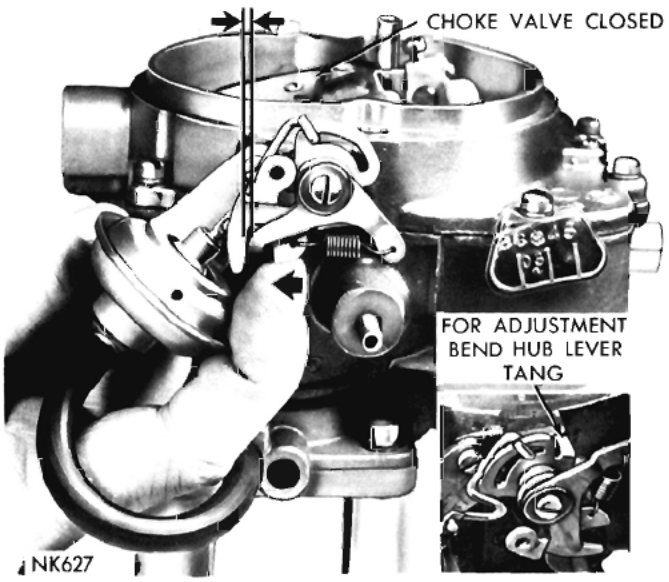

Fig. 17—Spring Staged Choke Adjustment

tacting the slowest speed step on the fast idle cam, (Fig. 16).

(4) With the engine warmed-up to the normal operating temperature, turn the fast idle adjusting screw **in** or **out** to secure 700 rpm. (Automatic Transmission) or 600 rpm (Manual Transmission). **Reposition the cam and throttle after every screw adjustment to apply normal throttle closing torque.** *After Approx. 500 Miles (If Necessary).

Spring Staged Choke Adjustment

The new spring staged choke, shown in (Fig. 17) is a device incorporated in the choke mechanism which limits the choke blade closing torque when cranking the engine at temperatures below zero. Thus the spring staging of the choke is a better match for the engine's starting mixture requirements at the low temperatures.

To check the spring staged choke for correct operating clearance, refer to Figure 20, then proceed as follows:

(1) Push on the hub lever with the finger, at the closed choke position. A small opening should exist between the shaft and the hub levers, as shown in (Fig. 17).

(2) Using a drill or gauge, measure the opening. The opening should be from .020 to .030 inches.

(3) If an adjustment is necessary, bend the hub lever tang until the correct opening has been obtained.

PART 5

WW3 STROMBERG CARBURETORS

Description

There are two models of the WW3 series carburetor, depending on the type of transmission with which the vehicle is equipped. The same basic design applies to all models regardless of adaptions. Refer to Specifications for detailed information.

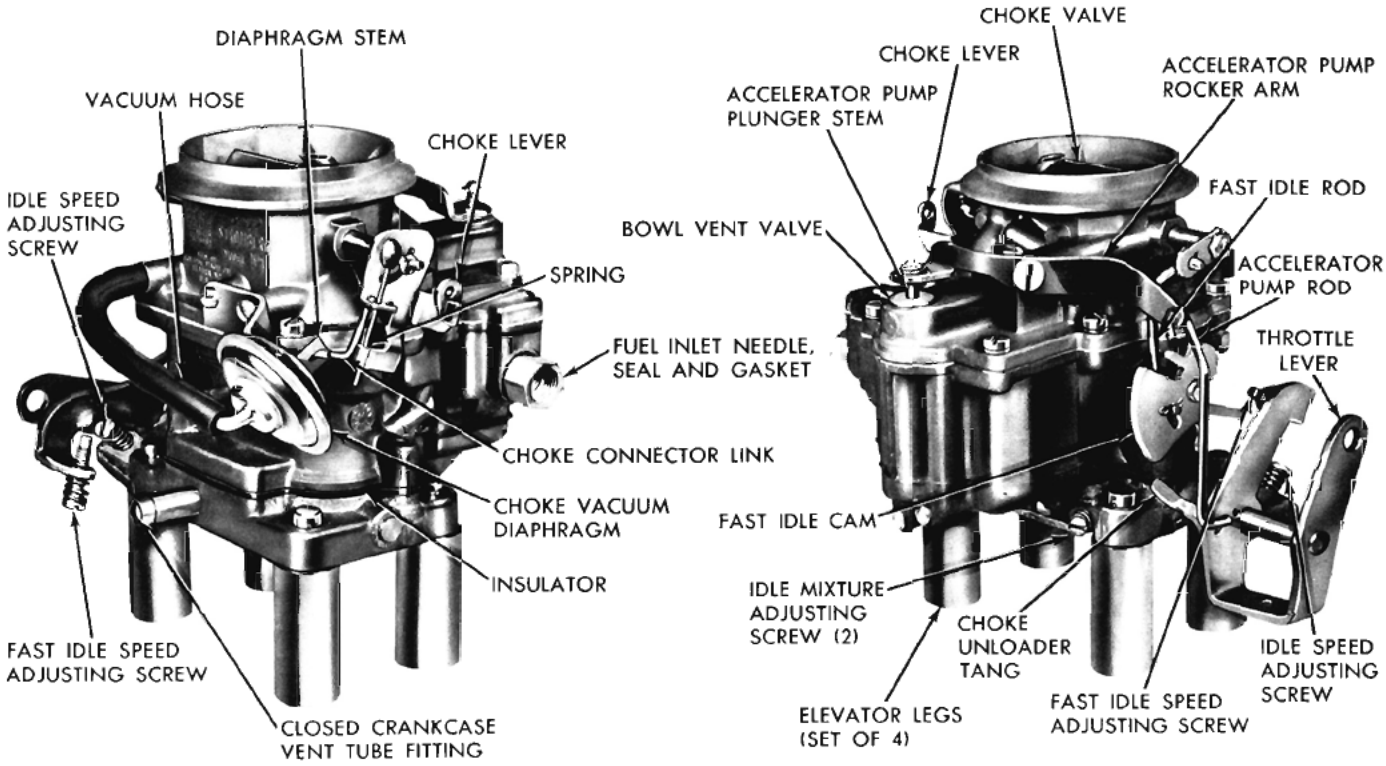

Fig. 1—Carburetor Assembly (WW3-248, 249, 250 and 251)

SERVICE PROCEDURES

DISASSEMBLY

To disassemble the carburetor for cleaning or overhauling, refer to (Fig. 1), then proceed as follows:

(1) Place the carburetor assembly on repair block Tool C-3225. (This Tool is used to protect the throttle valves from damage and to provide a suitable base for working.)

(2) Remove the cotterpin that holds the pump operating rod in the center hole of the throttle lever. Disengage rod from lever.

(3) Remove the clip that retains the fast idle rod, then disconnect the rod.

(4) Remove the vacuum hose between the carburetor air horn and the vacuum diaphragm.

(5) Remove the "E" clip from the choke operating link at the choke lever and disengage the link from the vacuum diaphragm stem (plunger). Refer to (Fig. 1).

(6) Remove the choke vacuum diaphragm and bracket assembly and place to one side to be cleaned as a special item. **A liquid cleaner may damage the diaphragm material.**

(7) Remove the air horn attaching screws and remove the air horn.

(8) Disengage the accelerator pump plunger rod from the rocker arm by removing the clip; and the bowl vent valve. Slide the plunger and rod out of the air horn. Slide the compression spring off the rod.

NOTE: Place the accelerator pump plunger in a jar of clean gasoline or kerosene to prevent the leather from drying out.

(9) Remove the vacuum power piston from the air horn, using an open end wrench and a support, as shown in (Fig. 2). (Exert sufficient pressure on end of wrench to force piston out of air horn. This assembly is staked and care should be used at removal.)

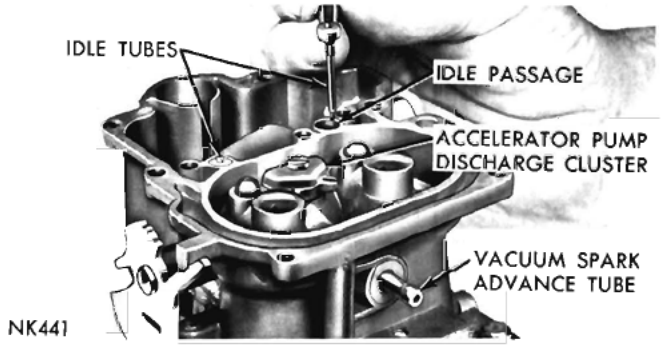

Fig. 3—Removing or Installing Idle Tubes

(10) Lift the idle tubes out of the main body, as shown in (Fig. 3). (The idle tubes are interchangeable.)

(11) Remove the screw and gasket from the accelerator pump discharge cluster, then lift off cluster and gasket, as shown in (Fig. 4).

(12) Invert the carburetor main body, and drop out the accelerator pump inlet and discharge check balls.

(13) **Do not attempt to remove the high-speed bleed-**

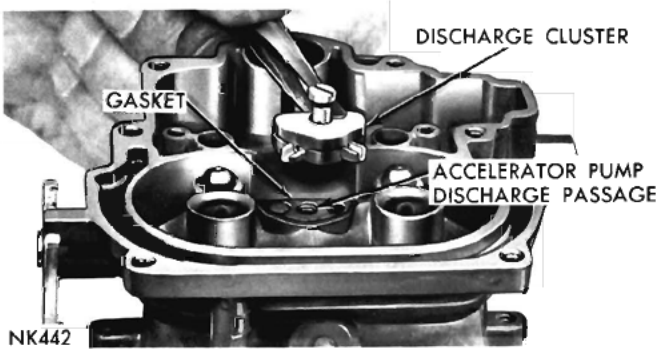

Fig. 4—Removing or Installing Discharge Cluster

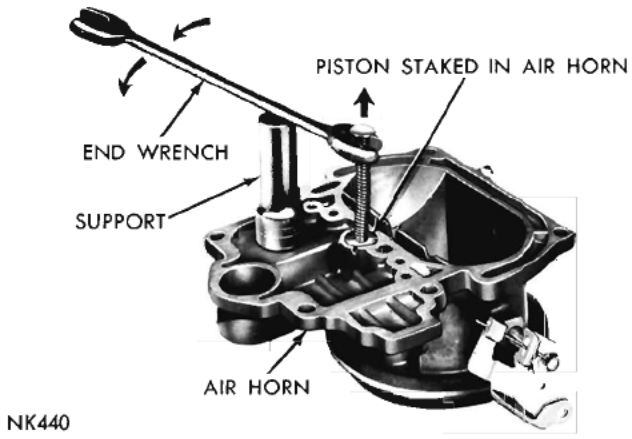

Fig. 2—Removing the Vacuum Power Piston

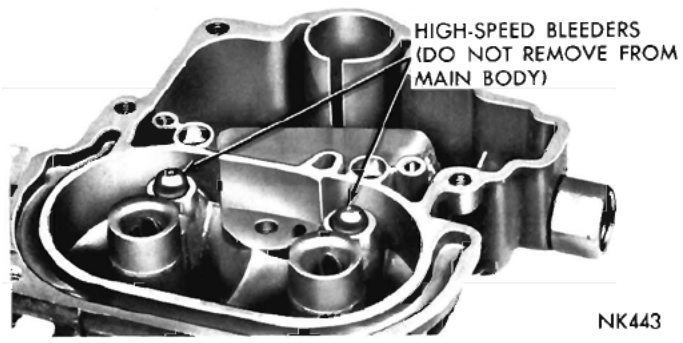

Fig. 5—High-Speed Bleeders

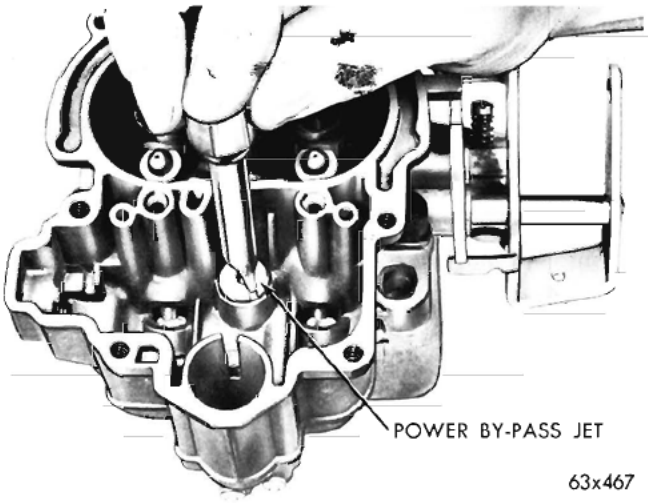

Fig. 6—Removing or Installing Power By-Pass Jet

ers located in the main discharge strut section of the carburetor main body. See (Fig. 5).

(14) Remove the fuel inlet needle valve seat and gasket assembly. Discard the gasket.

(15) Using a small screwdriver, pry out the float fulcrum pin retaining spring. (Cup the hand over the float chamber to prevent the spring from flying out.) Lift out the float and fulcrum pin.

(16) Remove the power by-pass jet and gasket, as shown in (Fig. 6).

(17) Remove the screws and lockwashers that hold the throttle body to the main body. Lift off the throttle body.

(18) With the main body in an inverted position, remove the main jet plugs; using Tool 73598 and 73609. Discard the plug gaskets.

(19) Using Tool 73606, remove the main metering jets, as shown in (Fig. 7). Do not substitute the main metering jets No. 388208 used in previous carburetors for No. 388539. (New type.)

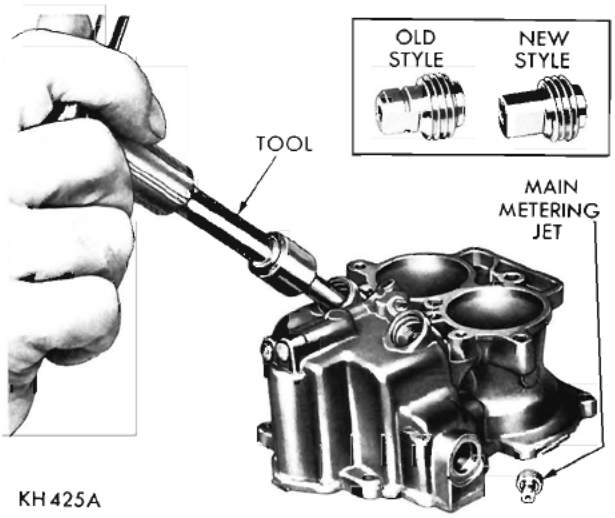

Fig. 7—Removing or Installing Main Metering Jets

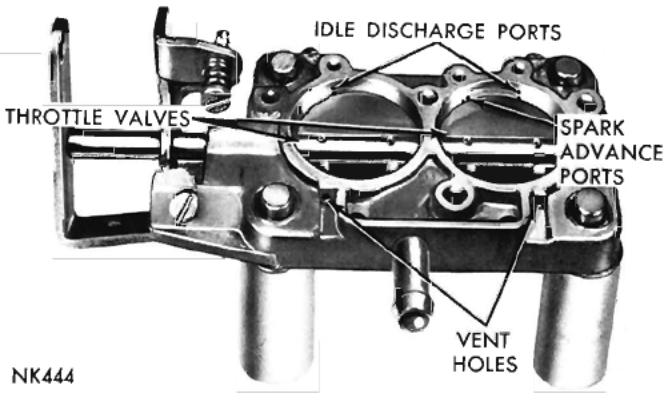

Fig. 8—Ports in Relation to Throttle Valves

(20) Remove the main discharge jets (or tubes), using Tool 73608. This Tool has tapered right hand thread and should be screwed into jet. The threads that are formed in the jet during removal, will not damage the jet.

(21) Unscrew and remove the idle mixture adjusting screws and springs, from the throttle body.

The carburetor now has been disassembled into three units, the air horn, main body and throttle body, and the component parts of each disassembled as far as necessary for cleaning and inspection.

NOTE: It is usually not advisable to remove the throttle shaft or valves unless wear or damage necessitates installation of new parts. To install new valves or throttle shaft, refer to "Inspection and Reassembly" Paragraph.

INSPECTION AND ASSEMBLY

Throttle Body

(1) Check the throttle shaft for excessive wear in the throttle body. If wear is extreme, it is recommended that the throttle body be replaced, rather than installing a new throttle shaft in the old body.

During manufacture, the location of the idle transfer port and the spark advance control ports to the valves is carefully established for one particular assembly. See (Fig. 8).

If a new shaft should be installed in an old worn throttle body, it would be very unlikely that the original relationship of these ports to the valves would be obtained. Changing the port relationship would adversely affect normal car operation between the speeds of 15 and 30 miles per hour. However, if it has been determined that a new shaft is to be installed, adhere closely to the following instructions:

(2) Mark the valves to be sure each is replaced in

the same bore from whence removed.

(3) Remove the screws, that hold the throttle valves to the throttle shaft, then slide the valves out of the throttle shaft.

CAUTION: These screws are staked on the opposite side and care should be used at removal so as not to break the screws in the shaft.

(4) Slide the throttle shaft out of the throttle body.

(5) Install the new throttle shaft and lever in the throttle body. The fast idle lever should rest against the idle speed adjusting screw. **The idle speed adjusting screw must be backed out when seating the valves in the following operation.**

The "dash" stamped on the valves must be toward the idle port and visible from the top of the throttle body when valves are installed.

(6) Slide the valves in position through the throttle shaft, then insert **NEW** screws, but do not tighten. Hold the valves in place with the fingers. (Fingers pressing on the high side of valves.)

(7) Tap the valves lightly with a screwdriver to seat in the throttle bores. Holding the valves in this position, tighten screws securely and stake by squeezing with pliers.

(8) Install the two idle mixture adjusting screws and springs in the throttle body. (The tapered portion must be straight and smooth.) If the tapered portion is grooved or ridged, a new idle mixture adjusting screw should be installed to insure having correct idle mixture control.

Idle Mixture Screw Adjustment

Do not use a screwdriver. The adjustment should be made with the fingers. Turn the idle mixture adjusting screw lightly against its seat, then back off one full turn for approximate adjustment.

Reassembling the Carburetor Main Body

(1) Place the main discharge jets (or tubes) firmly on Tool 73608, as shown in (Fig. 9). Slide them into position in the main body. Be sure the opening in the end of tube (diagonal cut end) is facing the opposite side of the small venturi. **These two jets must be seated firmly in the main body.**

(2) Insert the main metering jets in the body over the discharge jets (or tubes) just installed. Tighten securely, using Tool 73606. See (Fig. 7).

(3) Slide new copper gaskets in the main jet plug openings, then insert the plugs and tighten securely.

(4) Place the assembled throttle body on the inverted main body and position the insulator. Install screws and lockwashers, then tighten securely.

(5) Invert the carburetor and place on repair block C-3225, then install the power by-pass jet and new gaskets.

The change from the lean road load mixture to the richer wide open throttle maximum power mixture is made with an intermediate step. This is accomplished with a spring loaded two position power jet, actuated by vacuum on the power jet piston. The purpose of this two stage action is to secure best fuel economy in the lower road load speed range without sacrificing performance in the intermediate speed range.

During initial or part throttle operation, the vacuum above the piston is sufficient to overcome the compression spring and hold the piston in the up position. As the throttle valves are opened the manifold vacuum drops and the piston compression spring moves the piston down to open the first stage valve (upper) of the power by-pass jet, as shown in (Fig. 12). This meters additional fuel through the upper hole, into the main metering system.

With increased demand for power and a further drop in vacuum, the piston moves down an additional amount to open the second stage valve (lower) as shown in (Fig. 12), and meters an additional amount

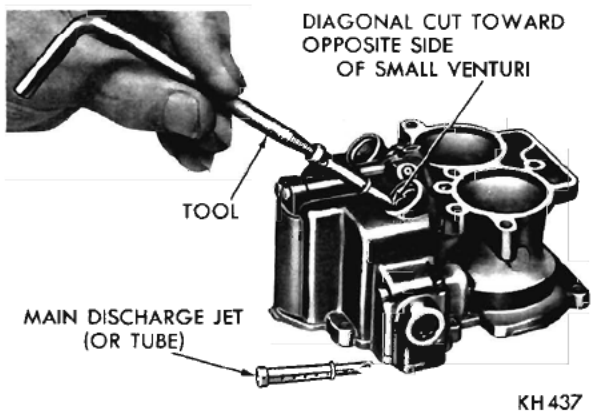

Fig. 9—Installing Main Discharge Jets (or tubes)

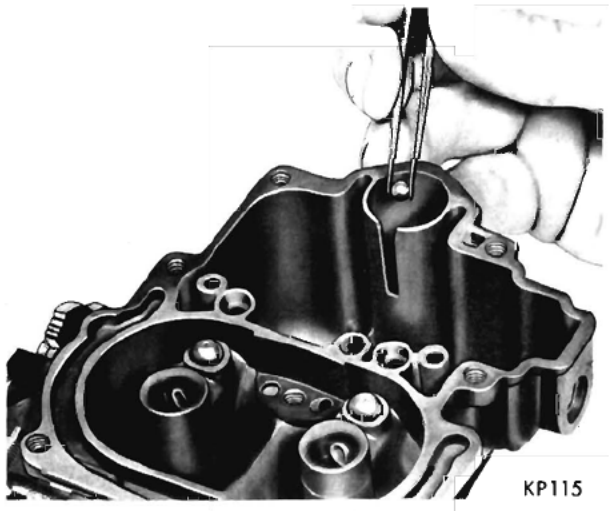

Fig. 10—Installing Accelerator Pump Check Ball

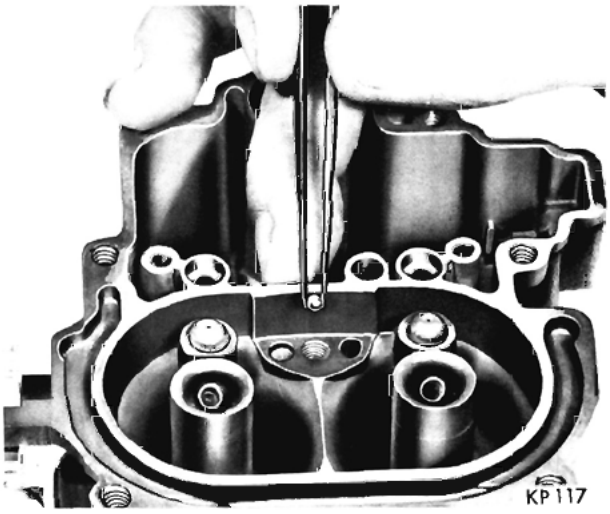

Fig. 11—Installing Discharge Check Ball

of fuel through the hole at the bottom of the power by-pass jet.

When the demand for power is satisfied and the throttle opening is decreased, the manifold vacuum builds up to raise the power piston and closes the 2nd stage valve (lower) cutting off the supply of fuel through the bottom hole of the jet. A further reduction of power closes the 1st stage valve (upper) cutting off the supply of fuel through the upper hole.

No changes in service procedures are required except to be sure the Power By-Pass Jet is clean.

(6) Install the accelerator pump inlet check ball ($^3/_{16}$ inch diameter) in the check ball seat at the bottom of the pump cylinder, as shown in (Fig. 10).

(7) Install the accelerator pump discharge check ball (⅛ inch diameter) in the orifice in the center passage of the discharge strut section of the main body, as shown in (Fig. 11).

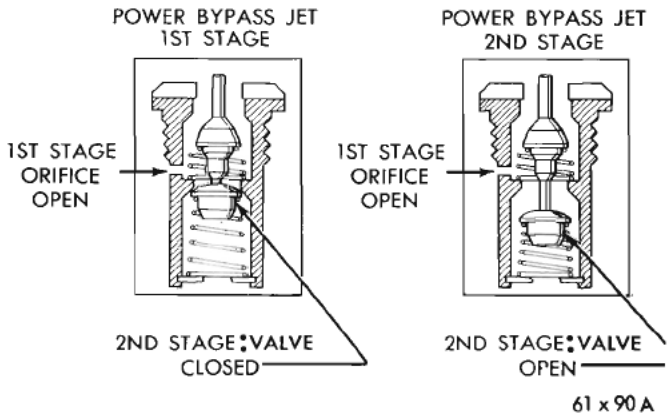

Fig. 12—Power By-Pass Jet (1st and 2nd Stage Operation)

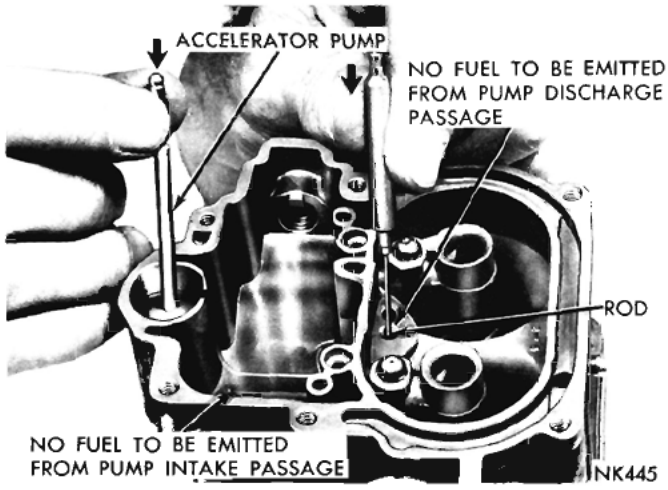

Fig. 13—Testing Accelerator Pump Intake and Discharge Check Balls

Accelerator Pump Test

(1) Pour clean gasoline into the carburetor bowl, approximately ½ inch deep. Remove the accelerator pump plunger from the jar of gasoline and slide it down into the pump cylinder. Raise the plunger and press lightly on the plunger shaft to expel the air from the pump passage.

(2) Using a small clean brass rod, hold the discharge check ball firmly down on its seat. Again raise the plunger and press downward. No fuel should be emitted from either the intake or discharge passage, as shown in (Fig. 13).

(3) If any fuel does emit from either the intake or discharge passages, it indicates the presence of dirt or an imperfect check ball seat. The passage should be recleaned and then thoroughly blown out with compressed air. Examine the check ball seat for signs of damage that would not allow the ball to seat properly.

(4) Reinstall check ball and test again. If still leaking, place a piece of drill rod down on ball and rap sharply with hammer. Remove the old check ball and install new ball. Then retest. (This operation forms a new ball seat in the carburetor casting.)

(5) Install the discharge cluster gasket, cluster and screw. Tighten securely. See (Fig. 4).

Again depress the accelerator pump plunger. A clear straight stream should emit from each cluster jet. If the streams are not identical (if either one is diverted or restricted), a new discharge cluster should be installed.

After test, pour the gasoline from the carburetor bowl and remove the accelerator pump plunger.

(6) Check the float for leaks or damage. If satisfactory for further service, install in position in the carburetor bowl.

(7) Assemble the fuel inlet needle valve, seat and gasket, then insert in position in the main body. Tight-

en securely. (If the needle is ridged or badly worn, install a new needle valve and seat assembly.)

(8) Install the float fulcrum pin retaining spring in position and force under lip of boss to keep fulcrum pin in position.

Measuring the Float Height

The carburetors are equipped with a synthetic rubber tipped fuel inlet needle. The needle tip is a rubber material which is not affected by gasoline and is stable over a wide range of temperatures. The tip is flexible enough to make a good seal on the needle seat, and to give increased resistance to flooding.

The use of the new inlet needle requires a new procedure in adjusting the float setting. Care should be taken to perform this operation accurately in order to secure the best performance and fuel economy.

To correctly set the float height when the carburetor is being overhauled proceed as follows:

(1) Install the float with the fulcrum pin and retaining spring in the main body.

(2) Install the needle, seat and gasket in the body and tighten securely.

(3) Invert the main body so that the weight of the float **only** is forcing the needle against the seat.

(4) Using Tool 73725 or a "T" scale, check the float, as shown in (Fig. 14). There should be $^{7}/_{32}$ inch from the surface of the fuel bowl (gasket removed) to the top of the float at the center.

If an adjustment is necessary, hold the float on the bottom of the bowl, then bend the float lip toward or away from the needle, using Tool 73605. Recheck the $^{7}/_{32}$ inch setting again then repeat the lip bending operation as required.

CAUTION: When bending the float lip, do not allow the lip to push against the needle as the synthetic rubber tip can be compressed sufficiently to cause a false setting which will affect correct level of fuel in the bowl.

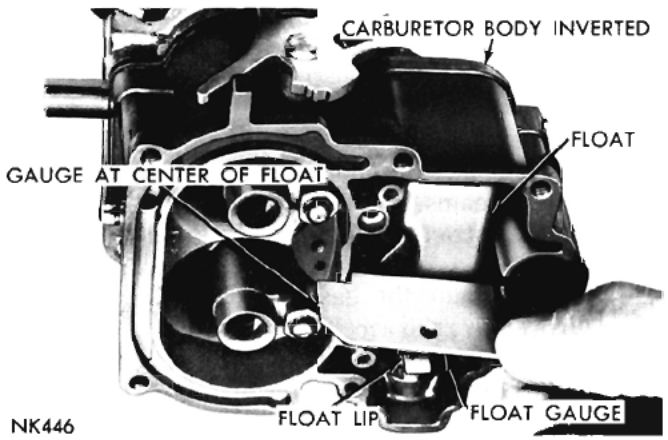

Fig. 14—Measuring the Float Setting

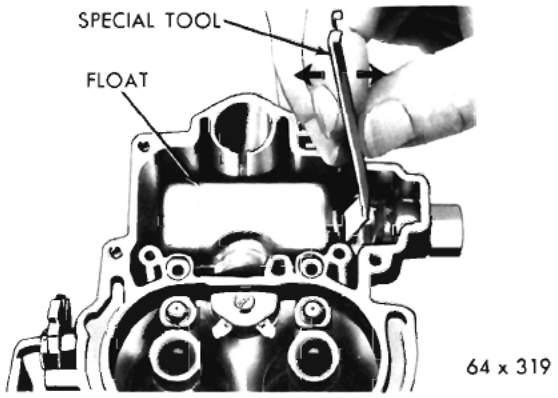

Fig. 15—Bending Float Lip

After being compressed, the tip is very slow to recover its original shape.

It is very important that the float lip be perpendicular to the needle or slant not more than 10 degrees away from the needle when the float is set correctly. Do not bend float lip by forcing float. Use Tool 73605, as shown in (Fig. 15).

(5) To change the float setting, bend the float lip toward the needle to lower, and away from needle to raise the float.

Install the idle tubes in the main body. See (Fig. 3). **These tubes are interchangeable.**

Assembling Air Horn

To reassemble the air horn, refer to (Fig. 1), then proceed as follows:

(1) Remove the accelerator pump plunger from the jar of gasoline. If the leather is hard, cracked or worn, install a new plunger and shaft.

(2) Slide the compression spring over the plunger shaft. Insert the assembly through the air horn.

(3) Slide bowl vent valve over shaft and down

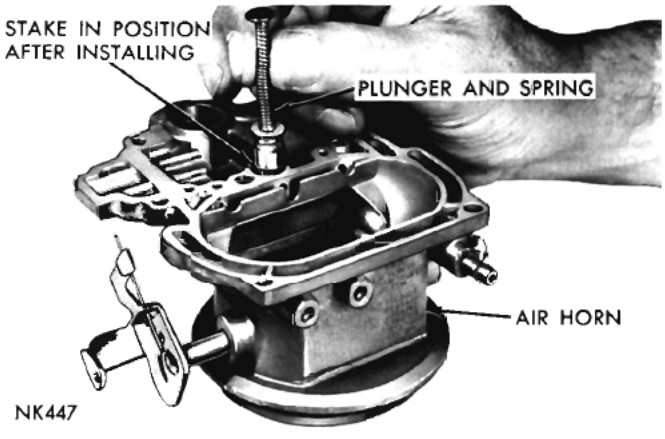

Fig. 16—Installing Vacuum Power Piston

against seat. Engage pump shaft with pump arm and secure with clip.

(4) Install the vacuum power piston and plunger in the air horn, as shown in (Fig. 16). Lock in position by prick punching on the retaining rim. Compress the piston plunger to be sure no binding exists. If the piston sticks or binds enough to hinder smooth operation, install a new piston assembly.

(5) Slide a new air horn gasket over accelerator pump plunger, and down against air horn. Now, lower air horn straight down on main body, with the accelerator pump plunger sliding into its well. (Be sure the leather on the pump does not curl or fold back.) Install air horn retaining screws and lockwashers, then tighten securely.

(6) Install the accelerator pump and fast idle connector rods, then work the accelerator pump plunger several times, to be sure it operates freely.

Choke Vacuum Diaphragm

Inspect the vacuum diaphragm fitting to insure that the passage is not plugged with foreign material. Leak check the diaphragm to determine if it has internal leaks. To do this, first depress the diaphragm stem. Then place a finger over the vacuum fitting to seal the opening. Release the diaphragm stem. If the stem moves more than $^{1}/_{16}$ inch in 10 seconds, the leakage is excessive and the assembly must be replaced.

(1) Assemble to the air horn and tighten the attaching screws securely.

(2) Install the choke operating link in position between the diaphragm plunger (stem) and the choke lever. Install the clip to secure.

(3) Inspect the rubber hose for cracks before placing it on the correct carburetor fitting. Refer to (Fig. 1). Do not connect the vacuum hose to the diaphragm fitting until after the vacuum kick adjustment has been made. (See Carburetor Adjustments.)

ADJUSTMENTS

It is very important that the following adjustments be made on a reconditioned carburetor and in the sequence listed, namely,

Cam Position Adjustment
Vacuum Kick Adjustment
Unloader Adjustment (wide open kick)
Accelerator Pump Travel Adjustment
Fast Idle Speed

Fast Idle Speed and Cam Position Adjustment

The fast idle engine speed adjustment should be made on the vehicle, as described in the Fast Idle Speed Adjustment (On the Vehicle) Paragraph. However, the Fast Idle Cam Position Adjustment can be made on the bench. This adjustment is important to assure that the speeds of each cam step occur at the proper time during engine warm-up. Adjust as follows:

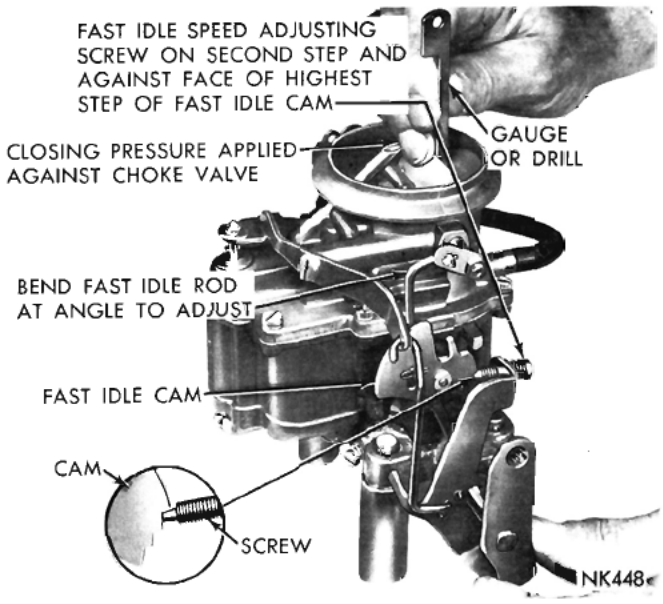

Fig. 17—Fast Idle Cam Position Adjustment

(1) With the fast idle speed adjusting screw contacting the step on the fast idle cam, shown in (Fig. 17), move the choke valve toward the closed position with light pressure. Insert a $^{9}/_{64}$ inch drill or gauge between the choke valve and the wall of the air horn.

(2) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

(3) If an adjustment is necessary, bend the fast idle

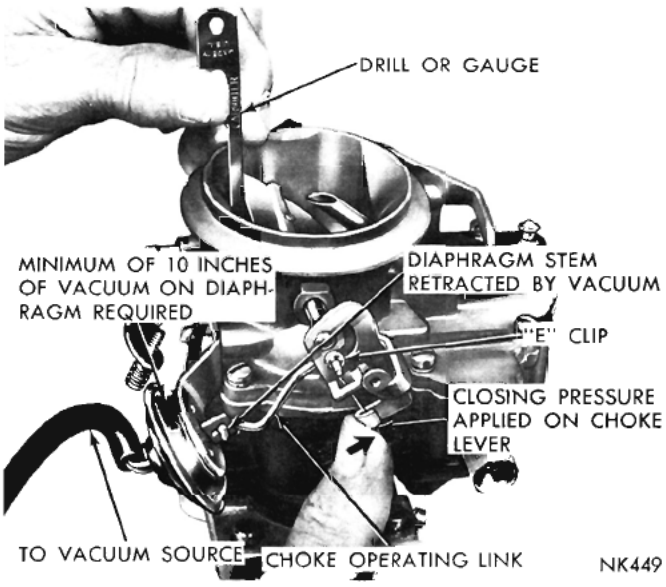

Fig. 18—Measuring the Choke Vacuum Kick Setting

rod at the upper angle, using Tool T109-213, until the correct valve opening has been obtained. Refer to (Fig. 17).

Vacuum Kick Adjustment

(This test can be made **On** or **Off** the vehicle.)

The choke diaphragm adjustment controls the fuel delivery while the engine is running. It positions the choke valve within the air horn by action of the linkage between the choke shaft and diaphragm. The diaphragm must be energized to measure the vacuum kick adjustment. Use either a distributor test machine with a vacuum source or vacuum supplied by another vehicle. Adjust as follows:

(1) With the engine **Not** running, open the throttle valves far enough to allow the choke valve to be moved to the closed position.

(2) Disconnect the vacuum hose from the diaphragm and connect the hose from the vacuum supply as shown in (Fig. 18). (A minimum of 10 inches of mercury (HG) will be required.)

(3) Insert the specified drill or gauge between the choke valve and the wall of the air horn. Refer to (Fig. 18). Apply sufficient closing pressure on the choke shaft lever to provide the smallest choke valve opening possible without distortion of the diaphragm link. Note that the link must deflect a wire spring before it reaches the end of travel within the lever slot. The link must travel to the end of the slot for proper measurement of the kick adjustment.

(4) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

The adjustment of this opening will require the removal of the choke operating link.

CAUTION: Damage to the diaphragm and the choke lever slot can result, if the link is not removed for the bending operation.

(5) Remove the clip and disengage the choke operating link from the choke lever, then disengage the link from the diaphragm stem. (The best bending results will be obtained by using a vise and a pair of pliers.)

(6) Bend the choke operating link at the angle to provide the correct choke valve opening.

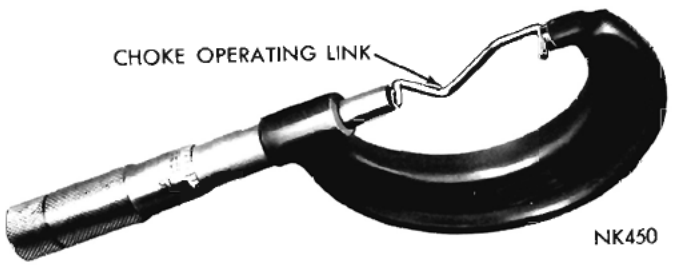

Fig. 19—Choke Operating Link Measurement

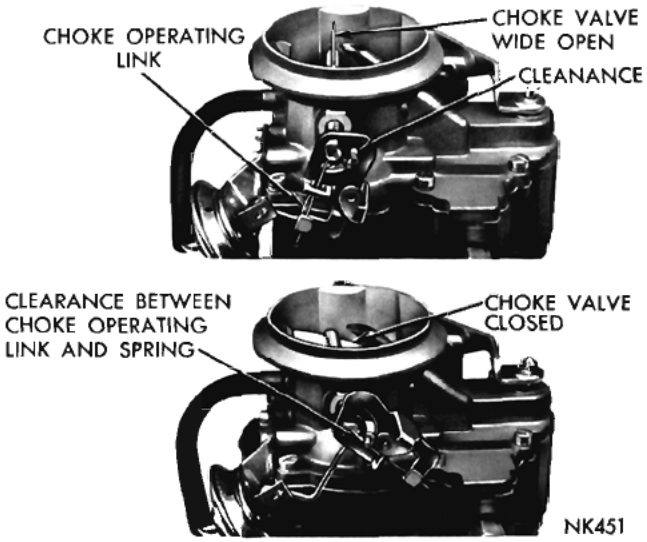

Fig. 20—Choke Operating Link Clearances

CAUTION: A correction in the length of the link of .010 inch, will result in a change of .020 inch in the choke valve opening.

As an example, if the choke valve opening is .020 inch in error, the correction in the link length would be .010 inch.

A "2" inch micrometer will be helpful in establishing the original length of the link, as shown in (Fig. 19), before completing the adjustment.

(7) Install the choke operating link and recheck the choke valve opening, using a drill or gauge. Refer to (Fig. 18).

(8) Reinstall the vacuum hose to the diaphragm and with no vacuum applied to the diaphragm, some clearance should exist between the choke operating link and the choke lever slot, in both the open and closed choke positions, as shown in (Fig. 20). **This clearance is necessary to allow the choke valve to close for starting as well as fully open after the engine reaches normal operating temperature.**

If a clearance does not exist in both of these positions, a recheck of the operating link adjustment should be made.

NOTE: Free movement of the choke valve between the closed and open positions is very necessary.

This free movement should also exist between the kick and the open choke valve positions with the engine running. If binding does exist, the choke operating link has been improperly bent and should be corrected.

Unloader Adjustment (Wide Open Kick)

(1) To make the unloader adjustment, lightly hold the choke valve closed, then open the throttle valves to wide open position. The choke valve should open sufficiently to allow a $^{5}/_{16}$" drill to be inserted be-

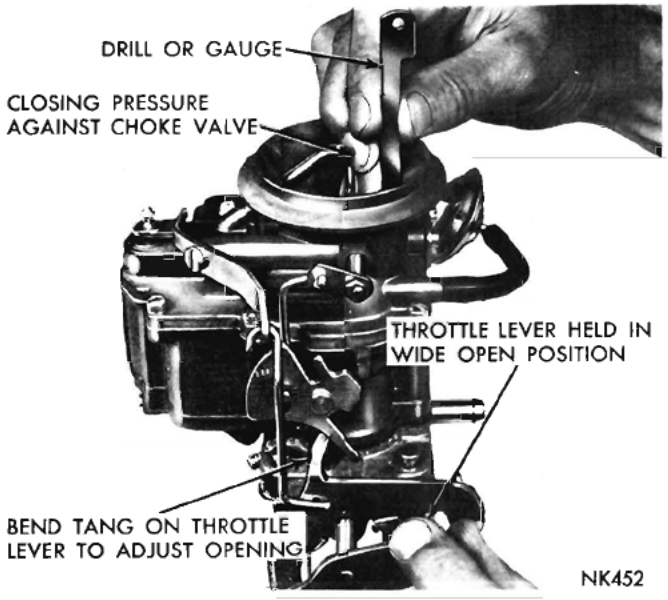

Fig. 21—Unloader Adjustment (wide open kick)

tween the choke valve and wall of air horn, as shown in (Fig. 21).

(2) To adjust, bend the tang on the throttle lever using Tool T109-214, as shown in (Fig. 21).

(3) Hold choke open and then open and close the throttle valves. Failure to obtain full throttle operation indicates improper assembly of the choke mechanism.

(4) With the throttle valves held in open position, open the choke valve slowly to wide open position. There should be no bind throughout the entire travel of choke mechanism.

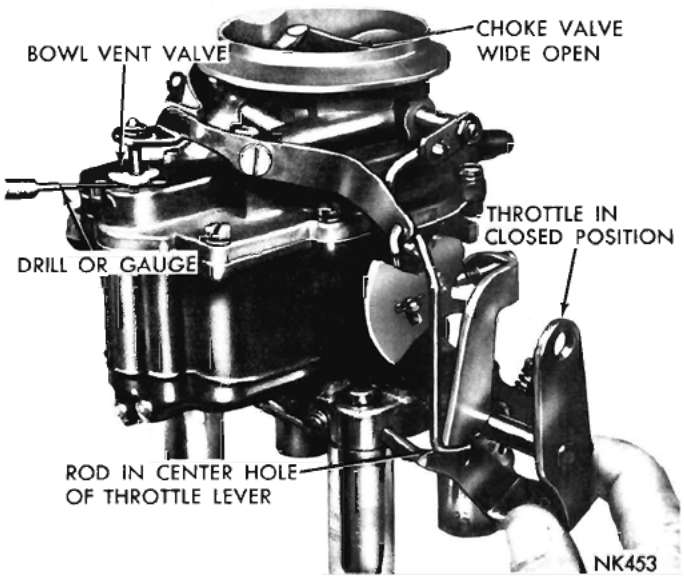

Fig. 22—Measuring Bowl Vent Valve Opening

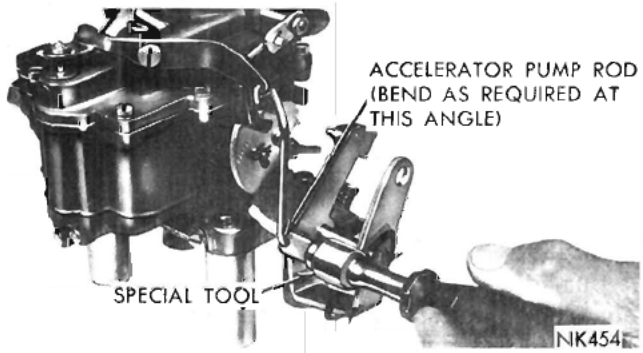

Fig. 23—Bending Accelerator Pump Rod

Accelerator Pump and Bowl Vent Adjustment

When assembling the accelerator pump to the air horn, note that the horseshoe clip (which opens the bowl vent) can be placed in any one of the three positioning notches. These notches correspond to the long, medium and short pump stroke holes in the throttle lever. Normally, the bowl vent clip on the pump stem will be at the middle notch and the pump rod in the medium stroke hole.

The proper procedure is to adjust the amount of bowl vent opening instead of measuring and setting the height of the pump plunger.

To check or set the adjustment, proceed as follows:

(1) Back off idle speed adjusting screw. Open the choke valve, so that when the throttle valves are closed, the fast idle adjusting screw will not contact the fast idle cam.

(2) Be sure the pump rod is in the medium stroke hole in the throttle lever, and that the bowl vent clip on the pump stem is in the center notch.

(3) Close the throttle valves tightly. It should be just possible to insert a $^{5}/_{64}$ inch drill between the bowl vent and the vent seat protruding through the air horn, as shown in (Fig. 22).

If an adjustment is necessary, bend the pump rod, using Tool T109-213 at the lower angle, until the correct bowl vent opening has been obtained, as shown in (Fig. 23).

This is an important adjustment, since too much lift at the bowl vent will result in considerable loss in low speed fuel economy.

Remember that if the pump rod is moved to either the short or long stroke position, a corresponding change must be made in the location of the bowl vent clip, and the amount of the lift of the bowl vent rechecked and adjusted.

NOTE: The accelerator pump travel is automatically taken care of when the bowl vent is properly adjusted.

Idle Speed Adjustment (Curb Idle)

To make the idle speed adjustment, the engine

must be thoroughly warmed up. A much more reliable idle adjustment can usually be obtained if the car has been driven a minimum of five miles. For the best results, it is recommended that a tachometer be used in this adjustment. (Before making the idle speed adjustment observe the following precautions):

Because the alternator can change at idle speeds and impose a load on the engine, the headlights should be turned on (high beam). This will assure setting the idle to compensate for the alternator load. On vehicles equipped with the automatic transmission, disconnect the transmission control rod from the ball joint on the carburetor lever so that the stop in the transmission will not interfere with the free movement of the carburetor lever.

To make the idle speed adjustment, proceed as follows:

(1) Turn the idle speed screw in or out to obtain 500 r.p.m. (With air conditioning **On,** set the idle speed at 500 r.p.m.). Be sure the choke valve is fully open and the fast idle adjusting screw is not contacting the fast idle cam.

(2) Turn each idle mixture screw to obtain the highest r.p.m. While making the adjustment, watch the tachometer and notice that the speed can be decreased by turning the screws in either direction from the setting that gave the highest r.p.m. reading.

(3) Readjust to 500 with the idler speed screw.

(4) Turn each idle mixture adjusting screw in the clockwise direction (leaner) until there is a slight drop in r.p.m. Now, turn each screw out, counterclockwise (richer) just enough to regain the lost r.p.m.

This procedure will assure that the idle has been set to the leanest mixture possible for smooth idle. **This setting is very important.**

Since the correct speed was originally set using the speed screw, the speed obtained after finding the leanest smooth idle setting will probably be too fast.

(5) Readjust the speed screw to obtain correct idle speed. Repeat steps 2 and 4 above if necessary.

After the proper idle speed has been obtained, refer to (Fig. 3), in the Throttle Linkage Section of this Group for the procedure on adjusting the transmission control rod.

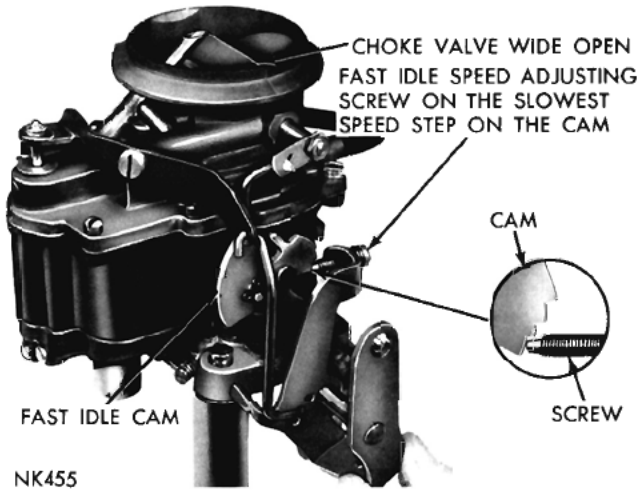

Fig. 24—Fast Idle Speed (on the Vehicle)

Fast Idle Speed (On the Vehicle After Approximately 500 miles if required)

To set the fast idle speed on the car, connect a tachometer, then set the curb idle speed and proceed as follows:

(1) With the engine running and the transmission in the neutral position, open the throttle slightly.

(2) Close the choke valve about 20 degrees then allow the throttle to close. Return the choke valve to the open position.

(3) The fast idle speed adjusting screw should be contacting the slowest speed step on the fast idle cam, as shown in (Fig. 24).

(4) With the engine warmed-up to the normal operating temperature, turn the fast idle speed adjusting screw **in** or **out** to secure 700 r.p.m. **Reposition the cam and throttle after every screw adjustment, to apply normal throttle closing torque.**

PART 6

WWC3 STROMBERG CARBURETOR

Description

The WWC3 Series Stromberg carburetor is a dual throat downdraft type, with each throat having its own idle system, main metering system and throttle valve. The idle and main metering systems are supplemented by the float system, the accelerating system and the power system.

The WWC3 Series carburetor incorporates an idle system vent, operated from the throttle linkage, a double venturi cluster which in addition to the small venturi also includes the discharge nozzles, the main discharge tubes and the idle in a single assembly.

SERVICE PROCEDURES

DISASSEMBLY

To disassemble the carburetor for cleaning or overhaul, refer to (Figs. 1 and 2), then proceed as follows:

(1) Install four elevating legs, Tool T109-287S in the mounting flange holes in the throttle body. These legs are used to protect the throttle valves from damage and to provide a suitable base for working.

(2) Remove the hairpin clip that holds the pump rod in the center of the pump arm. Remove rod from slot and disengage from the throttle lever.

(3) Remove the hairpin clip that holds the fast idle rod in the fast idle cam. Disengage rod from cam, then rotate rod to disengage from choke lever.

(4) Remove the three short air horn attaching screws, then remove the two long air horn attaching screws. Install two short screws through the main body into the throttle body to hold the bodies together. Refer to (Fig. 3).

(5) Remove the vacuum hose between the carburetor air horn and the vacuum diaphragm.

(6) Remove the clip from the choke operating link

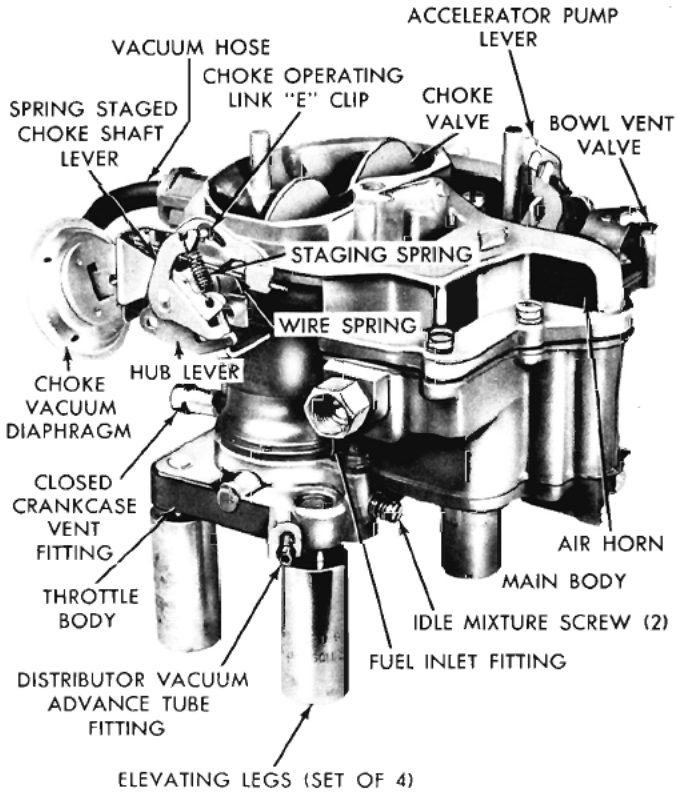

Fig. 1—Carburetor Assembly WWC-3-254 or WWC3-255 (Right Side)

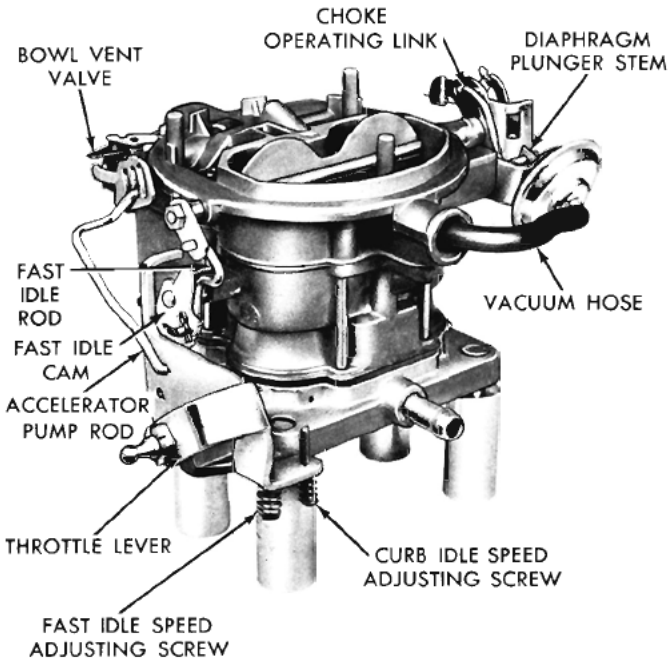

Fig. 2—Carburetor Assembly WWC3-254 or WWC3-255 (Left Side)

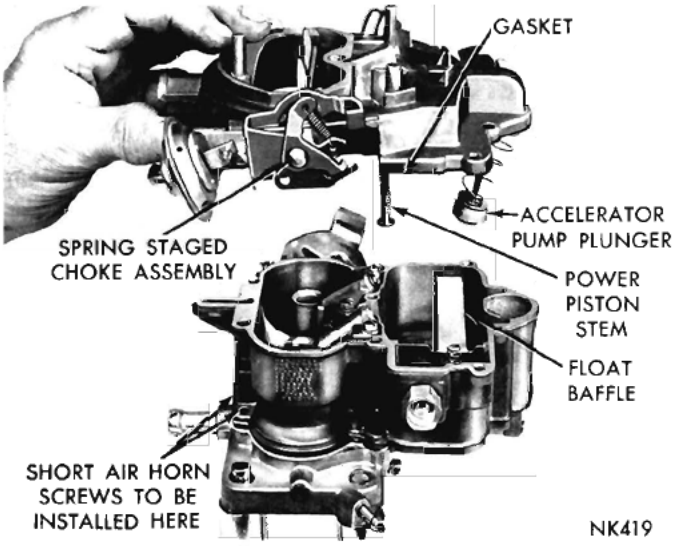

Fig. 3—Removing or Installing the Air Horn

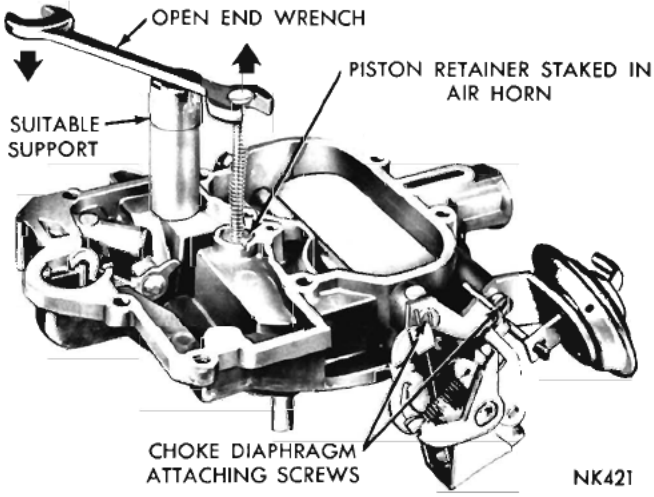

Fig. 5—Removing the Vacuum Power Piston

and disengage the link from the diaphragm plunger (stem) and the choke lever. (Refer to Fig. 1.)

(7) Remove the remaining air horn attaching screws, then lift air horn straight up and away from main body, as shown in (Fig. 3).

Disassembling the Air Horn

(1) Disengage the accelerator pump plunger from the pump arm hook by tilting down and out from under hook, as shown in (Fig. 4). Remove the compression spring.

Place the accelerator pump plunger in a jar of clean gasoline or kerosene to prevent the leather from drying out.

(2) Remove the vacuum power piston from the air horn, using an open end wrench and wood block, as shown in (Fig. 5). (Exert sufficient pressure on end of wrench to force piston out of its well in air horn.) (This assembly is staked in the air horn and care should be used at removal.) Discard air horn gasket.

(3) Remove the choke vacuum diaphragm and bracket assembly and place to one side to be cleaned as a special item. **A liquid cleaner may damage the diaphragm material.**

(4) Test the freeness of the choke mechanism in the air horn. The choke shaft must float free to operate correctly. If the choke shaft sticks in the bearing area or appears to be gummed from deposits in the air horn, a thorough cleaning will be required.

Main Body

(1) Remove the float fulcrum pin spring, then remove the fuel inlet needle valve, seat and gasket.

(2) Slide the float baffle up out of its grooves, then remove the float and fulcrum pin.

(3) Remove the venturi cluster attaching screws, then remove the venturi cluster gasket, as shown in (Fig. 6). Discard the gasket.

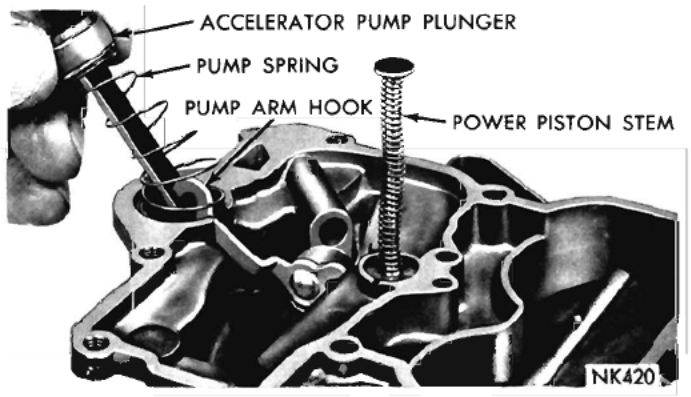

Fig. 4—Removing or Installing the Accelerator Pump Plunger

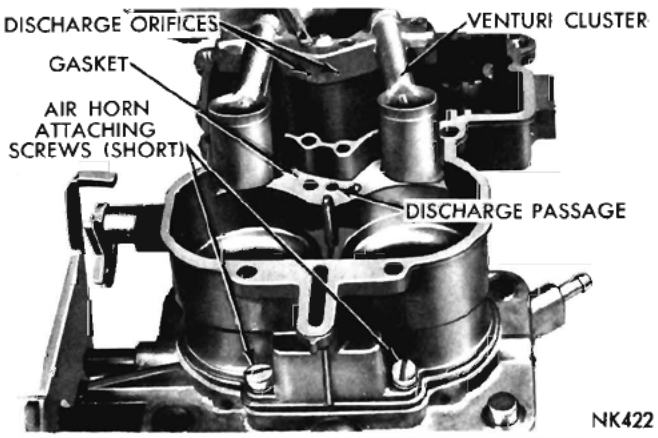

Fig. 6—Removing or Installing the Venturi Cluster

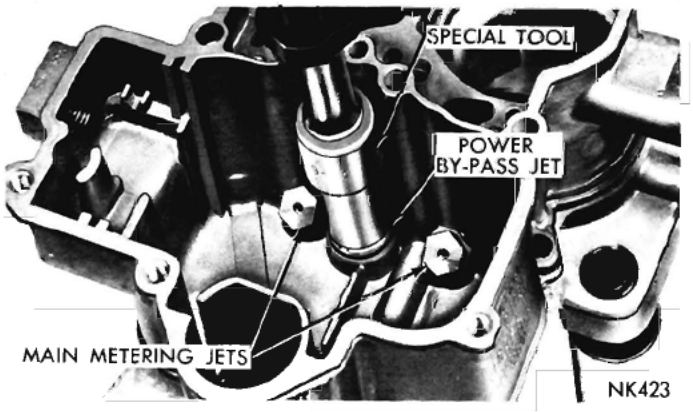

Fig. 7—Removing or Installing the Power By-Pass Jet

(4) Invert the carburetor main body and drop out the discharge check ball from the discharge passage, refer to (Fig. 6), and the accelerator pump inlet check ball from the pump well.

(5) Using T109-73S, remove the power by-pass jet and gasket, as shown in (Fig. 7).

(6) Using Tool T109-173, remove the two main metering jets, as shown in (Figs. 7 or 8).

(7) Remove the two air horn screws, used to hold the main and throttle bodies together. Separate the throttle and main bodies, and discard the gasket.

Throttle Body

(1) Unscrew and remove the two idle mixture adjusting screws and springs from the throttle body.

(2) The carburetor now has been disassembled into three units, namely, the air horn, main body and throttle body and the component parts of each disassembled as far as necessary for cleaning and inspection.

It is usually not advisable to remove the throttle shaft or valves unless wear or damage necessitates installation of new parts. To install new valves or throttle shaft, refer to Inspection and Reassembly paragraph. There is about .005 inch clearance between the throttle shaft and the throttle shaft bores in the throttle body. Any clearance over .010 inch is excessive and a new throttle shaft and/or throttle body should be installed.

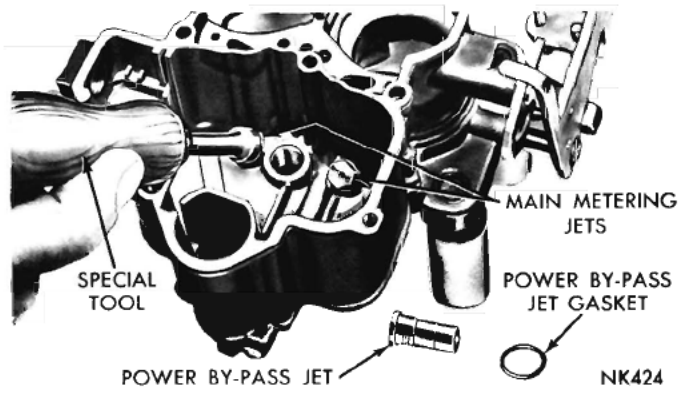

Fig. 8—Removing or Installing the Main Metering Jets

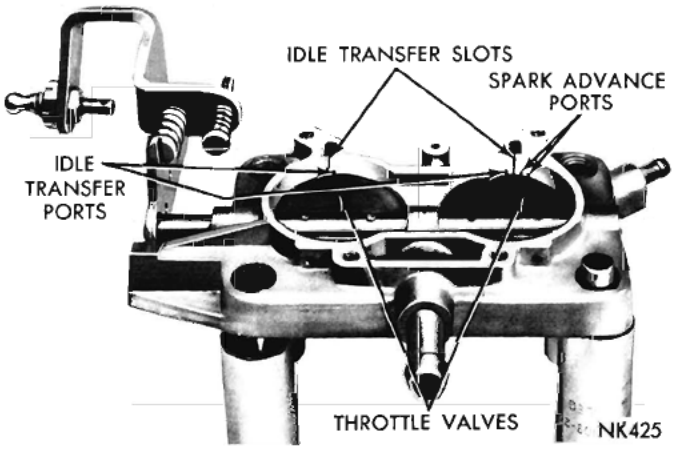

Fig. 9—Ports in Relation to Throttle Valves

INSPECTION AND ASSEMBLY

Throttle Body

(1) Check the throttle shaft for excessive wear in the throttle body. If wear is extreme, it is recommended that the throttle body be replaced, rather than installing a new throttle shaft in the old body.

During manufacture, the location of the idle transfer ports and the spark advance control ports to the valves are carefully established for one particular as-

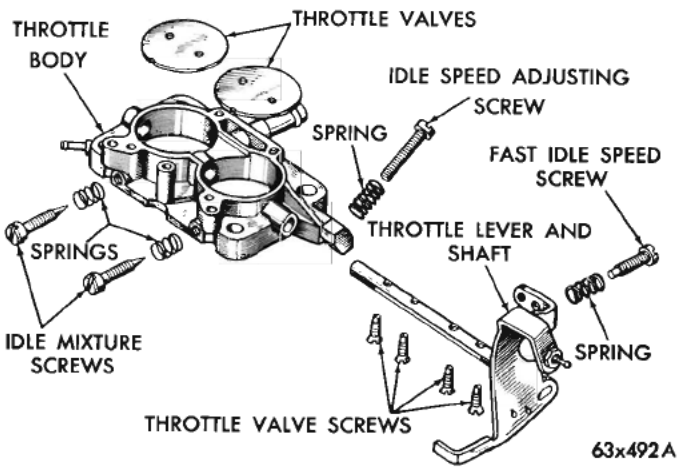

Fig. 10—Throttle Body (Exploded View)

sembly. See (Fig. 9).

If a new shaft should be installed in an old worn throttle body, it would be very unlikely that the original relationship of these ports to the valves would be obtained. Changing the port relationship would adversely affect normal car operation between the speeds of 15 and 30 miles per hour. However, if it has been determined that a new shaft or valves are to be installed, adhere closely to the following instructions:

To install a new throttle shaft or valves, refer to (Fig. 10), then proceed as follows:

(2) Mark the valves to be sure each is replaced in its original bore, if replacing throttle shaft only.

(3) Remove the screws that hold the throttle valves to the shaft. Slide the valves out of shaft and bore.

CAUTION: These screws are staked on the opposite side and care should be used at removal so as not to break the screws in the shaft. Remove the staking with a file.

(4) Slide the throttle shaft and lever out of the throttle body.

(5) Install the new throttle shaft and lever in the throttle body. **The idle speed adjusting screw must be backed off when seating the valves in the following operation.**

(6) Slide the valves down into position. Install **new** screws but do not tighten. Hold the valves in place with the fingers pressing on the high side of valves.

(7) Tap the valve lightly with a screwdriver to seat in the throttle bores. Holding the valves in this position, tighten the screws securely and stake by squeezing with pliers.

(8) Install the two idle mixture adjusting screws and springs in the throttle body. (The tapered portion must be straight and smooth.) If the tapered portion is grooved or ridged, a new idle mixture adjusting screw should be installed to insure having correct idle mixture control.

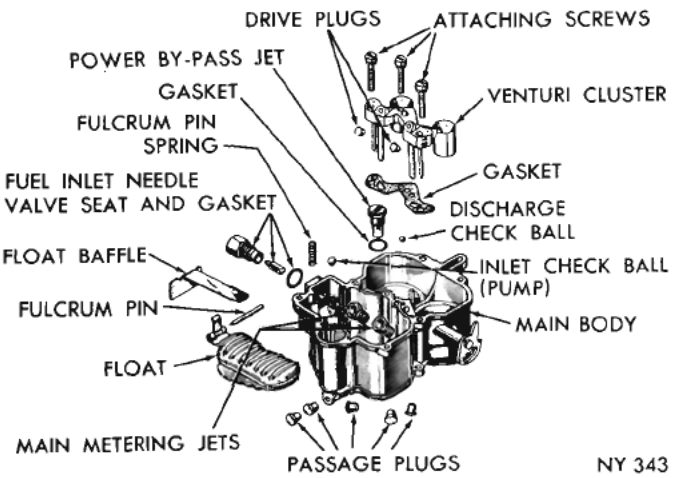

Fig. 11—Main Body (Exploded View)

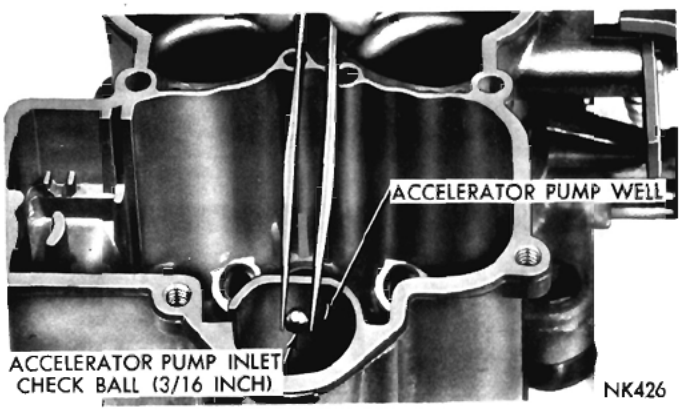

Fig. 12—Installing Accelerator Pump Inlet Check Ball

Idle Mixer Screw Adjustment

Turn the screws **lightly** against their seats, then back off one and a half turns for an approximate setting.

Main Body

To assemble the main body, refer to (Fig. 11), then proceed as follows:

(1) Place a new gasket on the throttle body, then install main body. Install two short screws to secure.

(2) Install the main metering jets in the main body. Tighten securely, using Tool T109-173. Refer to (Fig. 8).

(3) Install the power by-pass jet and new gasket. Tighten securely, using Tool 73598. Refer to (Fig. 7).

(4) Install the accelerator pump inlet check ball ($^3/_{16}$ inch) in the pump well, as shown in (Fig. 12).

(5) Install the accelerator pump discharge check ball (⅛ inch) in the discharge passage, as shown in (Fig. 13).

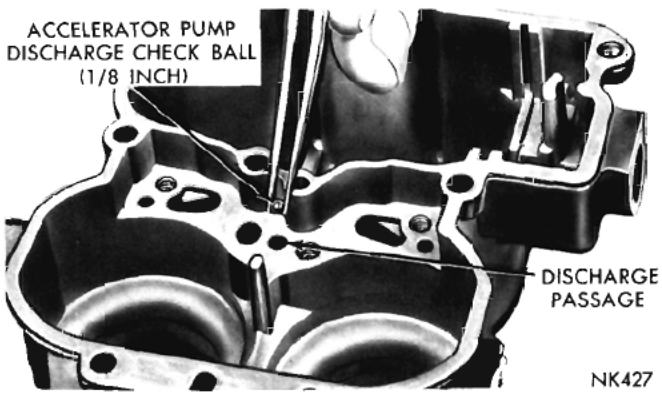

Fig. 13—Installing the Discharge Check Ball

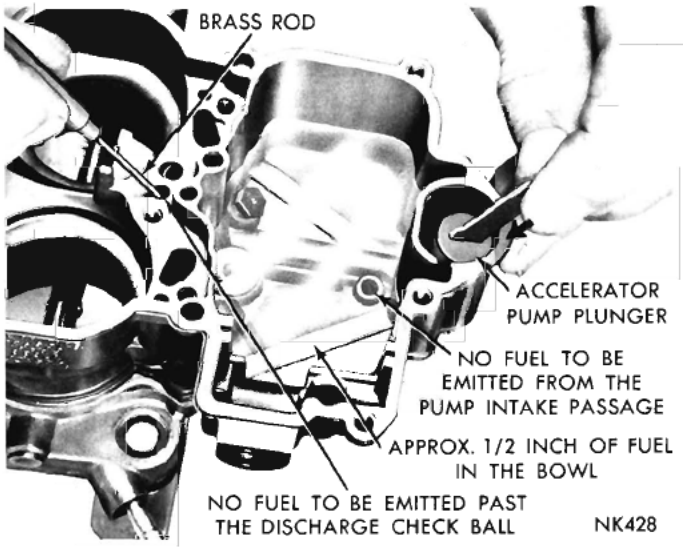

Fig. 14—Testing Accelerator Pump Discharge and Inlet Check Balls

Accelerator Pump Test

(1) Pour clean gasoline into the carburetor bowl approximately ½ inch deep. Remove the accelerator pump plunger from the jar of gasoline and slide down in its well. Raise the plunger and press lightly in the plunger shaft to expel the air from the pump passage.

(2) Using a small clean brass rod, hold the discharge check ball firmly down on its seat. Raise the pump plunger and press downward. No fuel should be emitted from either the intake or discharge passage, as shown in (Fig. 14).

(3) If any fuel does emit from either the intake or discharge passages, it indicates the presence of dirt or an imperfect seat. The passages should be recleaned and then thoroughly blown out with compressed air. Examine the ball seat for signs of damage that would not allow the check ball to seat properly.

(4) Reinstall the check ball and test again. If still leaking, place a piece of drill rod down on the check ball and rap sharply with a hammer. Remove the old check ball and install a new one. Then retest. (This operation forms a new ball seat in the carburetor casting.)

(5) Install the venturi cluster gasket, then slide the venturi cluster down into position. Install attaching screws and tighten securely. Refer to (Fig. 6).

Again depress the accelerator plunger. A clear straight stream should emit from each jet orifice. If the streams are not identical (if either one is restricted or diverted), remove venturi cluster and reclean.

After test, pour gasoline from the bowl and remove the pump plunger.

(6) Check the float for leak or damage. If satisfactory for further service, install in position in the bowl.

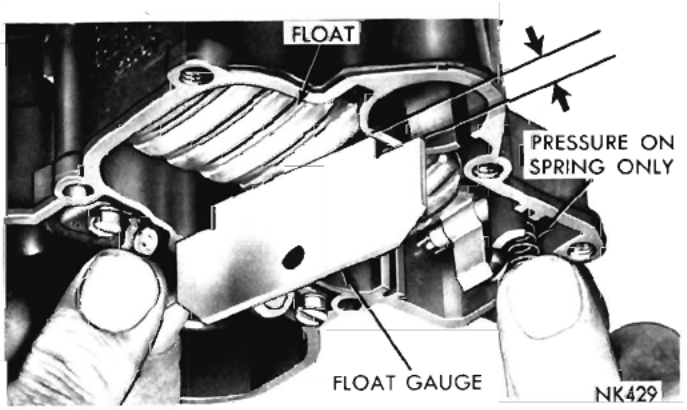

Fig. 15—Measuring the Float Setting

(7) Assemble the fuel inlet needle valve, seat and gasket, then insert in the main body. Tighten securely. (If the needle valve is ridged or grooved, or badly worn, a new inlet needle valve assembly should be installed.)

Measuring the Float Height

The carburetor is equipped with a synthetic rubber-tipped fuel inlet needle.

(1) Invert the main body so that the weight of the floats only is forcing the needle against the seat. **Be sure hinge pin does not drop out of the float hinge.** Hold down with the fulcrum pin spring.

(2) Using Tool 73725 or a "T" scale, measure the float level, as shown in (Fig. 15). There should be $^{5}/_{32}$ inch from the surface of the fuel bowl to the crown of the float at the center.

If an adjustment is necessary, remove the float, and the fulcrum spring. Bend the lip of the float lever either in or out until the correct setting has been obtained.

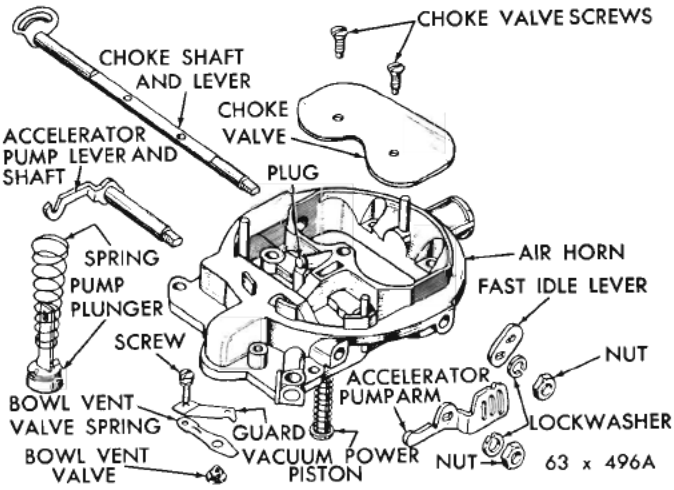

Fig. 16—Air Horn (Exploded View)

CAUTION: Do not attempt to change the setting without removing the float, as the synthetic rubber tip can be compressed sufficiently to cause a false setting, which will affect correct level of fuel in the bowl.

NOTE: It is important that the float lip is perpendicular to the needle or slanted not more than 10 degrees away from the needle when the float is set correctly. Do not bend float lip by forcing float, use Tool 73605.

(3) Install the float, then slide the float baffle down into position. Install the fulcrum pin spring.

Assembling the Air Horn

To assemble the air horn, refer to (Fig. 16), then proceed as follows:

(1) Slide the choke shaft and lever into the air horn with the choke lever pointing down and away from air horn. Slide the choke valve down into the slot in shaft.

(2) Hold the choke valve closed, and install new screws. **DO NOT TIGHTEN.** Holding the valve in the closed position, tap gently with a screwdriver, to center and locate the valve.

(3) Tighten attaching screws securely, then stake by squeezing with pliers. Reinstall the fast idle lever and secure with lockwasher and nut.

(4) Remove the accelerator pump plunger from the jar of gasoline. Check the leather. If the leather is hard, cracked, or worn, install a new pump plunger. (Be sure to flex the leather several times before installing plunger in air horn.)

(5) Slide the compression spring over plunger shaft, then slide plunger over hook and into position. Refer to (Fig. 4).

(6) Install a new air horn gasket, then install the vacuum power piston in air horn. Lock in position by prick punching on the air horn rim. Compress the piston plunger to be sure no binding exists. If the piston sticks or binds enough to hinder smooth operation, install a new piston assembly.

(7) Install the air horn assembly on the main body, guiding the pump plunger into its well. (Be sure the leather does not curl or fold back.) Install retaining screws and tighten securely. Refer to (Fig. 2). **The choke valve must be held partially closed while installing the air horn.**

(8) Remove the two short screws holding the main body and throttle body together, refer to (Fig. 3), and install the air horn. Reinstall the two long screws and tighten securely.

(9) Install the fast idle rod and secure with hairpin clip.

(10) Install the pump rod and secure with hairpin clip. (Be sure rod is in the center slot of arm, refer to (Fig. 1). Work the accelerator pump plunger several times, to be sure it operates smoothly.

Choke Vacuum Diaphragm

Inspect the diaphragm vacuum fitting to be sure that the passage is not plugged with foreign material. Leak check the diaphragm to determine if it has internal leaks. To do this, first depress the stem, then place a finger over the fitting to seal the opening. Release the stem. If the stem moves more than $^1/_{16}$ inch in 10 seconds, the leakage is excessive and the assembly must be replaced.

(1) Install the diaphragm assembly on the air horn and tighten the attaching screws securely.

(2) Install the choke operating link in position between the diaphragm plunger (stem) and the choke lever. Install clip to secure. **Be sure the link is on the proper side of the wire spring. See (Fig. 1).**

(3) Inspect the rubber hose for cracks before placing it on the correct carburetor fitting. Refer to (Fig. 2). Do not connect the vacuum hose to the diaphragm fitting until after the vacuum kick adjustment has been made. (See Carburetor Adjustments.)

ADJUSTMENTS

It is very important that the following adjustments be made on a reconditioned carburetor and in the sequence listed, namely:

Fast Idle Cam Position Setting
Vacuum Kick Adjustment
Unloader Adjustment (wide open kick)
Accelerator Pump Travel
Bowl Vent Valve Setting

Fast Idle Speed and Cam Position Adjustment

The fast idle engine speed adjustment should be

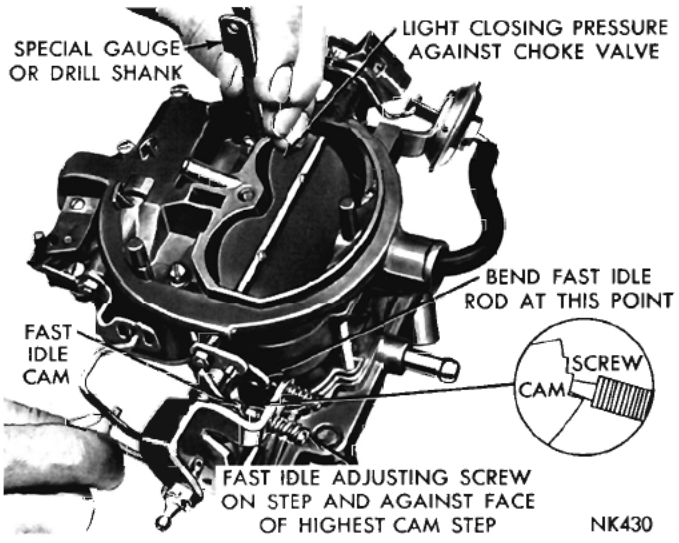

Fig. 17—Fast Idle Cam Position Adjustment

made on the vehicle, as described in the Fast Idle Speed Adjustment (On the Car) Paragraph. However, the Fast Idle Cam Position Adjustment can be made on the bench. This adjustment is important to assure that the speeds of each step of the cam, occur at the proper time during engine warm-up.

To make the fast idle cam position adjustment refer to (Fig. 17), then proceed as follows:

(1) With the fast idle speed adjusting screw contacting the step on the fast idle cam shown in (Fig. 17), move the choke valve toward the closed position with light pressure. Insert a NO. 41 drill or gauge T109-125 (Auto. Transmission or Manual Trans.) between the choke valve and the wall of the air horn.

(2) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

(3) If an adjustment is necessary, bend the fast idle rod at the upper angle, using Tool T109-213, until the correct valve opening has been obtained.

Vacuum Kick Adjustment

(This test can be made **ON** or **OFF** the vehicle.)

The choke diaphragm adjustment controls the fuel delivery while the engine is running. It positions the choke valve within the air horn by action of the linkage between the choke shaft and the diaphragm. The diaphragm must be energized to measure the vacuum kick adjustment. Use either a distributor test machine with a vacuum source, or vacuum supplied by another vehicle.

(1) With the engine **Not** running, open the throttle valves far enough to allow the choke valve to be moved to the closed position.

(2) Disconnect the vacuum hose from the diaphragm and connect the hose from the vacuum supply, as shown in (Fig. 18). (A minimum of 10 inches of mercury (HG) will be required.)

(3) Insert a NO. 17 drill or gauge T109-205 (Manual Trans.) or a NO. 35 drill (Auto. Trans.) between the

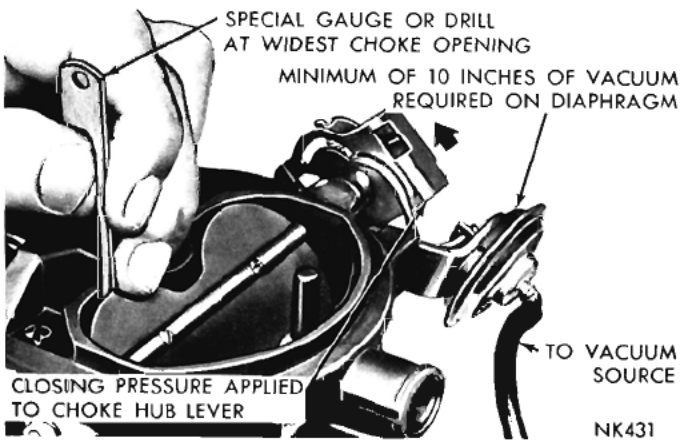

Fig. 18—Measuring the Vacuum Kick Setting

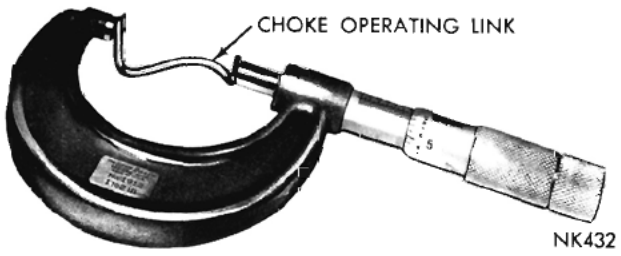

Fig. 19—Choke Operating Link Measurement

choke valve and the wall of the air horn. Refer to (Fig. 18). Apply sufficient closing pressure on the choke shaft lever to provide the smallest opening possible, without distortion of the diaphragm link. Note that the link must deflect a wire spring before it reaches the end of travel within the lever slot. The link must travel to the end of the slot for proper measurement of the kick adjustment.

(4) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

The adjustment of this opening will require the removal of the choke operating link.

CAUTION: Damage to the diaphragm and the choke lever slot can result if the link is not removed for the bending operation.

(5) Remove the clip and disengage the choke operating link from the choke lever, then disengage the link from the diaphragm stem. (The best bending results will be obtained by using a vise and a pair of pliers.)

(6) Bend the choke operating link at the angle to provide the correct choke valve opening.

CAUTION: A correction in the length of the link of .010 inch, will result in a change of .010 inch in the choke valve opening.

As an example, if the choke valve opening is .010 inch in error, the correction in the link length would be .010 inch.

A 2″ micrometer will be helpful in establishing the original length of the link, as shown in (Fig. 19) before completing the adjustment.

(7) Install the choke operating link and recheck the choke valve opening, using a gauge or drill. Refer to (Fig. 18).

Reinstall the vacuum hose to the diaphragm and make the following check:

(8) With no vacuum applied to the diaphragm, some clearance should exist between the choke operating link and the choke lever slot, in both the open and closed choke valve positions, as shown in (Fig. 20).

NOTE: This clearance is necessary to allow the choke valve to close for starting as well as fully

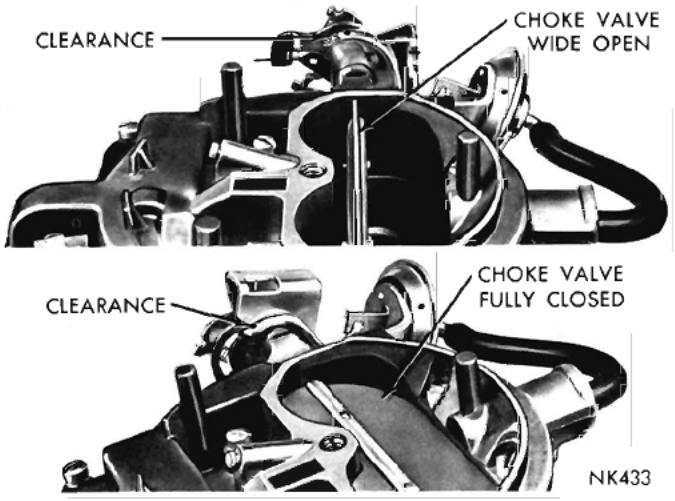

Fig. 20—Choke Operating Link Clearances

open after the engine reaches the normal operating temperature.

If a clearance does not exist in both of these positions, a recheck of the operating link adjustment should be made.

NOTE: Free movement of the choke valve between the closed and open positions is very necessary.

This free movement should also exist between the kick and the open choke valve positions with the engine running. If binding does exist, the choke operating link has been improperly bent and should be corrected.

Unloaded Adjustment (Wide Open Kick)

To make the unloaded adjustment, refer to (Fig. 21), then proceed as follows:

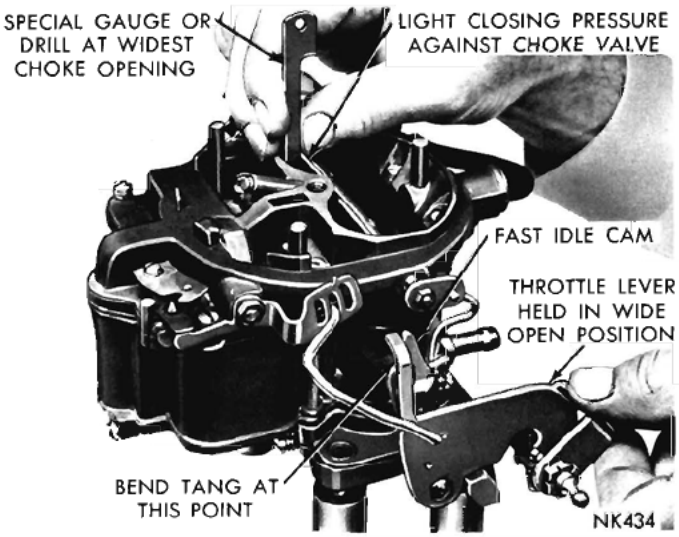

Fig. 21—Choke Unloader Adjustment (Wide Open Kick)

(1) Lightly hold the choke valve closed, then open the throttle valves to the wide open position. The choke valve should open sufficiently to allow a $^{15}/_{64}$ inch drill or gauge T109-32 to be inserted between the choke valve and the wall of the air horn as shown.

(2) To adjust, bend the tang on the throttle lever, using Tool T109-214 until correct opening has been obtained.

(3) Hold the choke valve open and then open and close the throttle valves. Failure to obtain full throttle operation indicates improper assembly or adjustment of the choke mechanism.

(4) With the throttle valves held in an open position, the choke valve should fall open freely. There should be no bind throughout the entire travel of the choke mechanism.

Accelerator Pump Travel

To check the accelerator pump travel, refer to (Fig. 22) then proceed as follows:

(1) With the throttle valves fully closed, measure the pump travel from the fully closed to the fully open throttle.

(2) This travel should be $^{11}/_{32}$ inch Manual Trans. and $^{7}/_{16}$ inch Auto. Trans. as shown.

(3) If an adjustment is necessary, bend the pump rod at the point shown, using Tool T109-213, until correct travel has been obtained.

Bowl Vent Valve Setting

To make the bowl vent valve setting, refer to (Fig. 23) then proceed as follows:

This setting is made after the pump travel setting.

(1) With the throttle valves at curb idle, there should be $^{1}/_{16}$ inch clearance between the bowl vent valve and the air horn, when measured (at the center of the vent valve and the seat) with a gauge or drill shank.

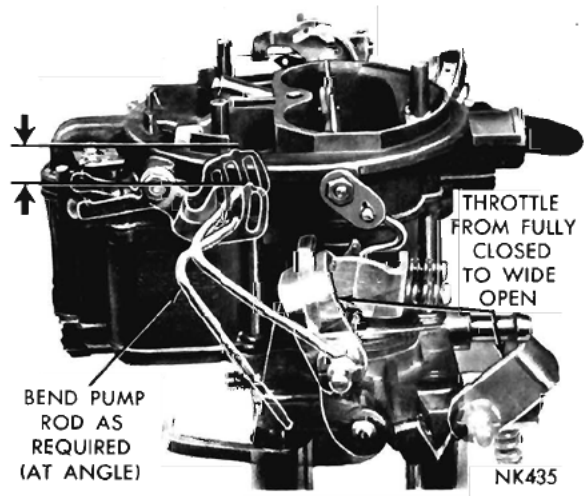

Fig. 22—Accelerator Pump Travel

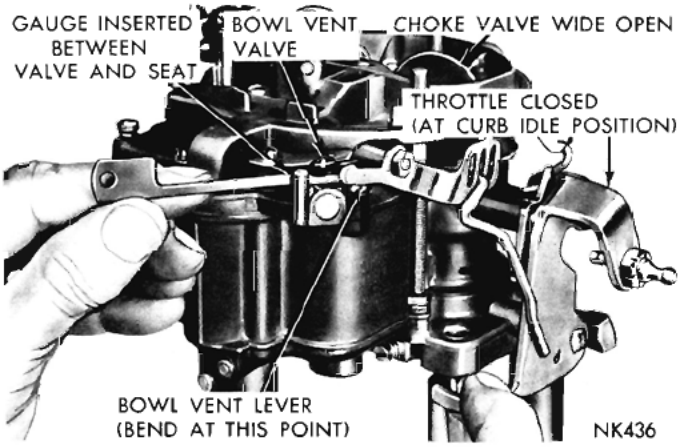

Fig. 23—Measuring the Bowl Vent Valve Opening

(2) If an adjustment is necessary, bend the bowl vent lever, using Tool T109-214, until correct opening has been obtained.

NOTE: Any adjustment to the accelerator pump setting, means that the bowl vent must be readjusted.

Idle Speed Adjustment

The idle speed adjustment is made after the carburetor has been installed on the engine.

For the best results, it is recommended that a tachometer be used in this adjustment.

(1) Turn the idle speed screw in or out to obtain 500 rpm. (On vehicles with air conditioning, set the idle speed at 500 rpm, with air conditioning ON.) Be sure the choke valve is fully open and that the fast idle adjusting screw is not contacting the fast idle cam (engine off fast idle).

(2) Turn each idle mixture screw **in** or **out** until smooth idle has been obtained.

(3) Readjust to 500 rpm with the idle speed screw.

(4) Repeat the idle mixture screw adjustment.

*Fast Idle Speed (On the Vehicle)**

To set the fast idle speed on the car, connect a tachometer to the vehicle, then set the curb idle speed and proceed as follows:

(1) With the engine running and the transmission in the neutral position, open the throttle slightly.

(2) Close the choke valve about 20 degrees then allow the throttle to close. Return the choke valve to the open position.

(3) The fast idle speed adjusting screw should be contacting the lowest step on the fast idle cam, as shown in (Fig. 24).

(4) With the engine warmed-up to the normal operating temperature, turn the fast idle speed adjusting screw **in** or **out** to secure 700 r.p.m. (Automatic Transmission) or 700 r.p.m. (Manual Transmission). **Reposition the cam and throttle after every screw adjustment to apply normal throttle closing torque.**

*After Approx. 500 Miles. (If Necessary).

Measuring the Float Setting or Fuel Level (On the Vehicle)

Remove the three short air horn to main body attaching screws. Then remove one long air horn to throttle body screw next to fuel bowl and assemble short screw through main body flange and thread into the throttle body. Remove long screw from side away from fuel bowl and on opposite side and assemble short screw through main body flange. Securely tighten. Remove the air horn as follows:

(1) Remove the spring clip and disconnect the choke operating rod.

(2) Remove the hairpin clip and disconnect the fast idle rod.

(3) Remove the hairpin clip that holds the pump rod in the center slot of the pump arm. Disconnect the pump rod.

(4) Remove the remaining two long screws and lift off the air horn.

Check the float setting as follows:

(5) Seat the float fulcrum pin by pressing finger against the fulcrum pin spring.

There should be enough fuel in the bowl to raise the float so that the lip bears firmly against the needle. Additional fuel may be admitted by slightly depressing the float. If the pressure in the line is insufficient to force additional fuel into the bowl, add the necessary fuel from a clean container.

CAUTION: Since the manifolds may be hot, it is dangerous to spill onto these surfaces. Therefore, take the necessary precautions to avoid spillage.

(6) With only the pressure from the buoyant float holding the lip against the inlet needle, check the float setting, using Tool 73725 or "T" scale. There

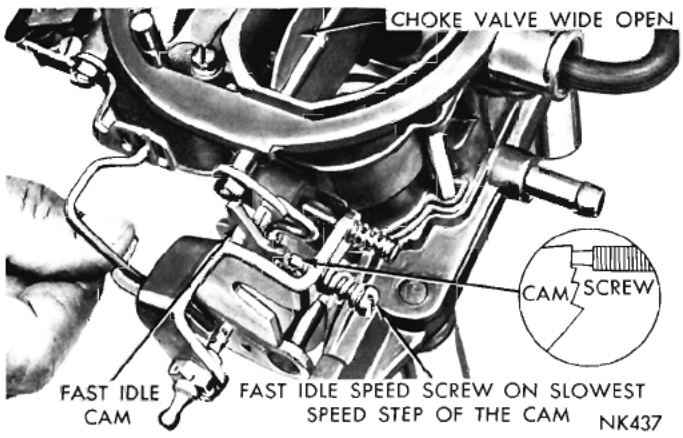

Fig. 24—Fast Idle Speed Adjustment (on the Engine)

should be $^{5}/_{32}$ inch from the surface of the bowl (gasket removed) to the top of the float at the center.

If an adjustment is necessary, hold the float on the bottom of the bowl, then bend the float lip toward or away from the needle, using Tool 73605. Recheck the inch setting again, then repeat the lip bending operation as required.

CAUTION: When bending the float lip, do not allow the lip to push against the needle as the rubber tip can be compressed sufficiently to cause a false setting which will affect correct level of fuel in the bowl. After being compressed, the rubber tip is very slow to recover its original shape.

It is very important that the float lip be perpendicular to the needle or slanted not more than 10 degrees away from the needle when the float is set correctly.

(7) Reassemble the air horn.

Spring Staged Choke Adjustment

The new spring staged choke, shown in (Fig. 25) is a device incorporated in the choke mechanism which limits the choke blade closing torque when cranking the engine at temperatures below zero. Thus the spring staging of the choke is a better match for the engine's starting mixture requirements at the low temperatures.

To test the spring staged choke for correct operating clearance, refer to (Fig. 25), then proceed as follows:

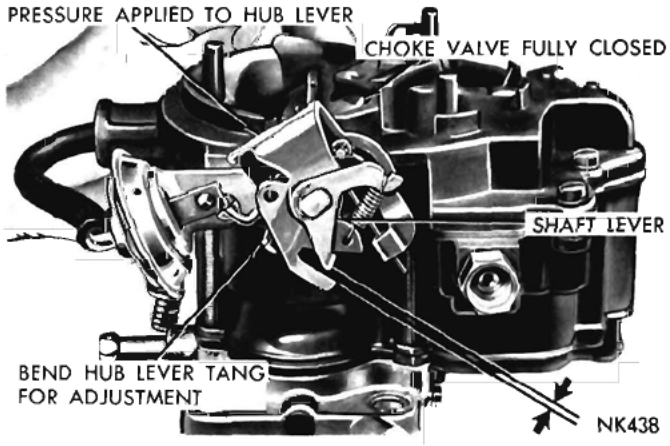

Fig. 25—Spring Staged Choke Clearance

(1) Push on the hub lever with the finger, at the closed choke position. A small opening should exist between the shaft and the hub levers, as shown in (Fig. 25).

(2) Using a drill or gage, measure the opening. The opening should be from .010 to .040 inch.

(3) If an adjustment is necessary, bend the hub lever tang until the correct opening has been obtained.

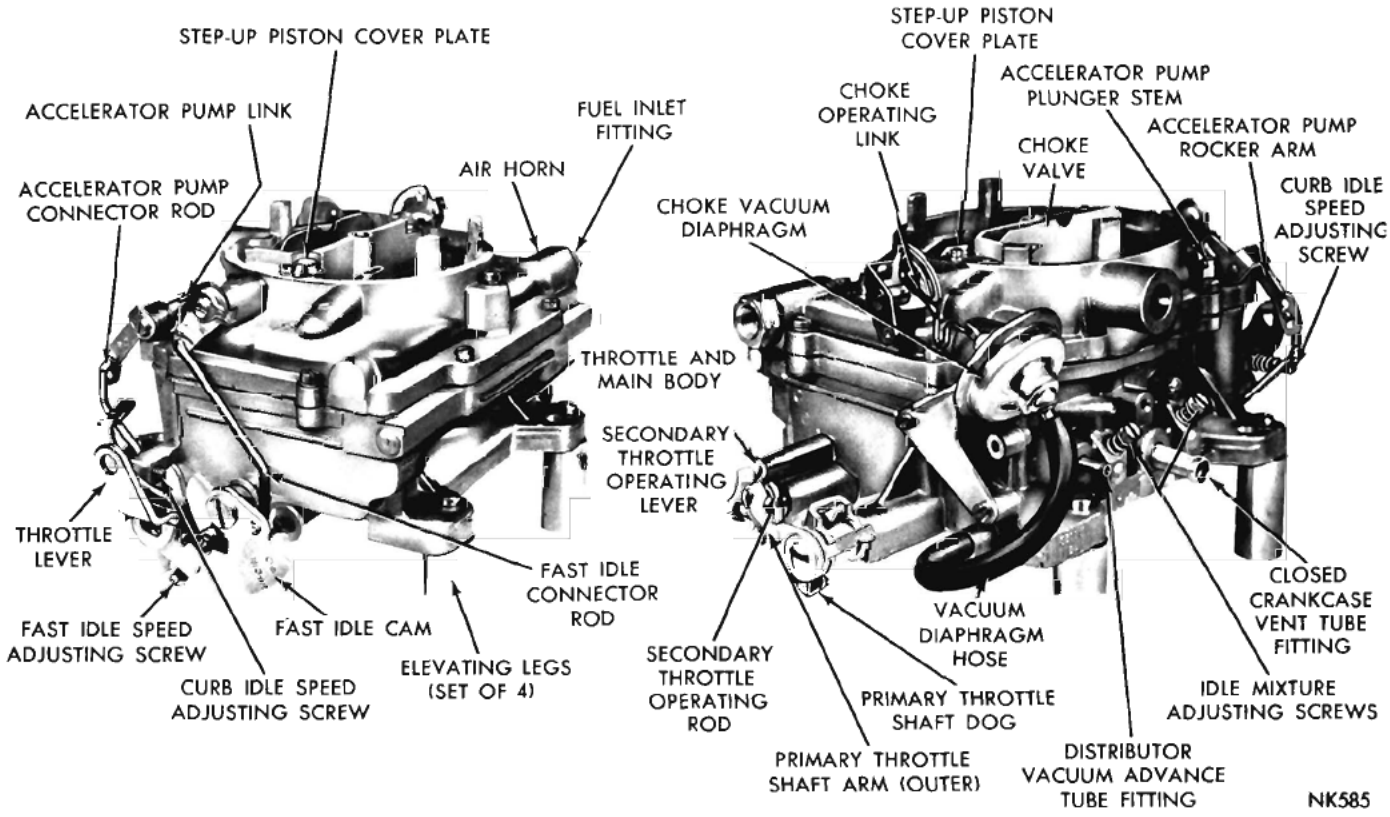

Fig. 1—Carburetor Assembly (AFB)

PART 7

AFB CARTER CABURETORS

Description

The AFB (aluminum four barrel) carburetor contains many features, some of which are the locations for the step-up rods and pistons. The step-up rods, pistons and springs are accessible for service without removing the air horn or the carburetor from the engine. The venturi assemblies (primary and secondary) are replaceable and contain many of the calibration points for both the high and low speed system. One fuel bowl feeds both the primary and secondary nozzles on the right side while the other fuel bowl takes care of the primary and secondary nozzles on the left side. This provides improved performance in cornering, quick stops and acceleration.

All the major castings of the carburetor are aluminum, with the throttle body cast integral with the main body. This allows an overall height reduction in the carburetor. The section containing the accelerator pump is termed the primary side of the carburetor. The rear section is the secondary. The five conventional systems used in previous four barrel carburetors are also used in this unit. The five conventional systems are, two float systems, two low speed systems, (primary side only) two high speed systems, one accelerator pump system and one automatic choke control system.

The AFB-3853S and AFB-3854S carburetors used on vehicles with 273 cubic inch engines are equipped with a pair of velocity valves, which control the secondary valve operation.

The throttle valves of the secondary half of the carburetor are mechanically connected to the primary valves and open with the primary after an approximate 60° lag; and continue to open until both primary and secondary throttle valves reach the wide open position simultaneously. As engine speed increases, the forces exerted by the velocity of intake air down through the venturis of the carburetor increases and tends to overcome the counterweight attached to the velocity shaft, permitting the offset velocity valves to position themselves according to engine requirements.

SERVICE PROCEDURES

DISASSEMBLY

To disassemble the carburetor for cleaning or overhaul, refer to (Fig. 1), then proceed as follows:

Air Horn Removal

(1) Place the carburetor assembly on repair stand Tool C-3400 or T-109-287S elevating legs. These tools are used to protect the throttle valves from damage and to provide a suitable base for working.

(2) Remove the hairpin clip that attaches the fast idle connector rod to the choke lever. Disengage rod from lever, then swing rod at an arc until it can be disengaged from the fast idle cam.

(3) Remove the clevis pin that holds the throttle connector rod in the center hole of the accelerator pump arm. Remove the hairpin clip that attaches the lower end of rod in the primary throttle shaft lever. Disengage rod from arm and lever, then remove from carburetor.

(4) Remove the screws attaching the step-up piston and rod cover plates. **Hold cover down with a finger to prevent the piston and rods from flying out.** Lift off the plates and slide the step-up pistons and rods out of the air horn, as shown in (Fig. 2). Remove the step-up piston springs.

(5) Remove the vacuum hose between the carburetor throttle body and the vacuum diaphragm.

(6) Remove the clip from the choke operating link and disengage the link from the diaphragm plunger (stem) and the choke lever. Refer to (Fig. 1).

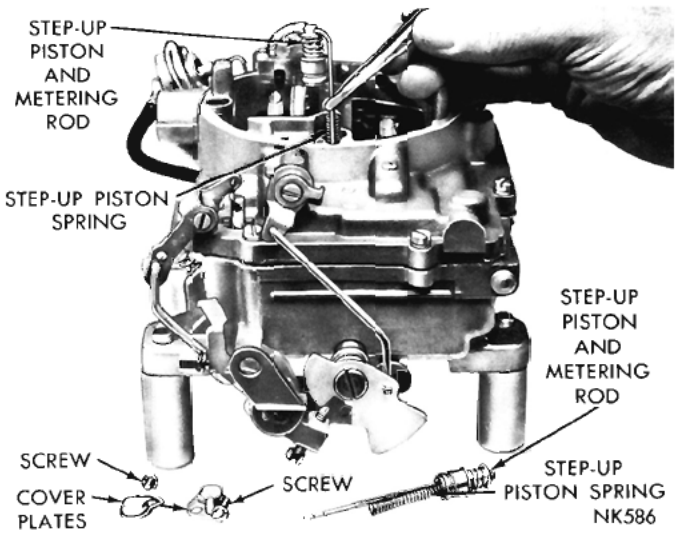

Fig. 2—Removing or Installing Step-Up Pistons and Rods

(7) Remove the vacuum diaphragm and bracket assembly and place to one side to be cleaned as a special item. **A liquid cleaner may damage the diaphragm material.**

(8) Remove the ten screws that attach the air horn to the main body. (1 screw in hole in air horn). Lift air horn straight up and away from the main body. **When removing air horn, use care so as not to bend or damage the floats.** Remove the accelerator pump and plunger lower spring from the pump cylinder.

Disassembling the Air Horn

Place the air horn in an inverted position on the bench (to protect the floats) then proceed to disassemble as follows:

(1) Using a suitable Tool, remove the float fulcrum pins, (left and right) then lift the float up and out of bosses on air horn.

NOTE: It is suggested that the float on the pump side be marked so that the floats can be re-installed in their respective positions.

(2) Remove the two needle valves from their respective seats, after marking the one on the pump side for identification. Using a wide blade screw driver, remove the needle valve seats. Be sure each needle valve is returned to its original seat at reassembly.

(3) Remove the spring clip that holds the throttle connector rod in the center hole of the pump arm. Remove the pump arm pivot screw and lift off the pump arm, at the same time, disengage the link from the arm and the pump stem. Slide the accelerator pump plunger and spring out of the air horn. Remove gasket.

(4) Place the accelerator pump plunger in a jar of clean gasoline or kerosene, to prevent the leather from drying out.

(5) Remove the fuel inlet fitting and filter screen from the air horn.

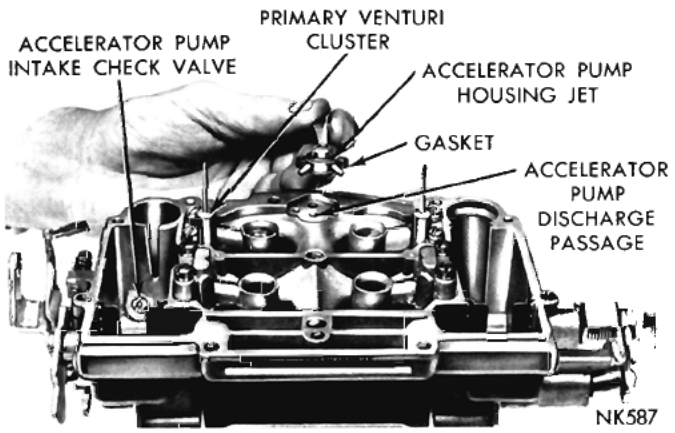

Fig. 3—Removing or Installing Accelerator Pump Jet Housing

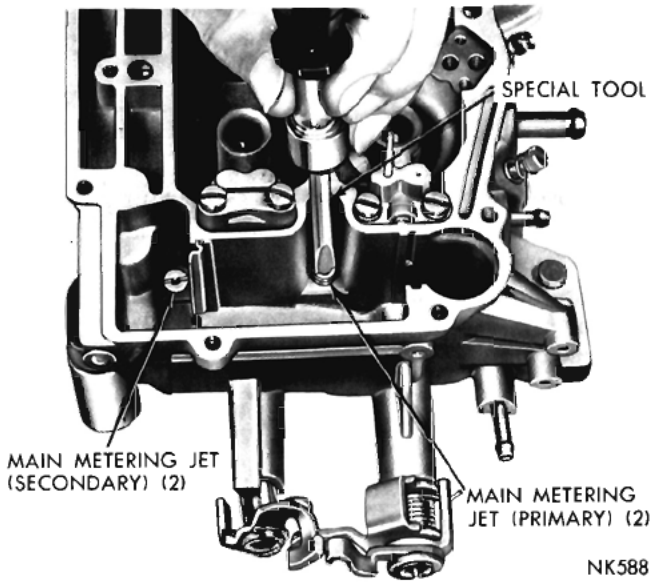

Fig. 4—Removing or Installing Main Metering Jet

(6) Test the freeness of the choke mechanism in the air horn. The choke shaft must float free to operate correctly. If the choke shaft sticks in the bearing area, or appears to be gummed from deposits in the air horn, a thorough cleaning will be required.

Main Body Disassembly

(1) Remove the screws that attach the accelerator pump jet housing to the main body. Lift out the jet housing and gasket as shown in (Fig. 3). Discard the gasket. Now, invert the main body and drop out the discharge check needle from the discharge passage.

(2) Using Tool T109-58, remove the main metering jets (primary side), as shown in (Fig. 4). **The primary and secondary main metering jets are not inter-**

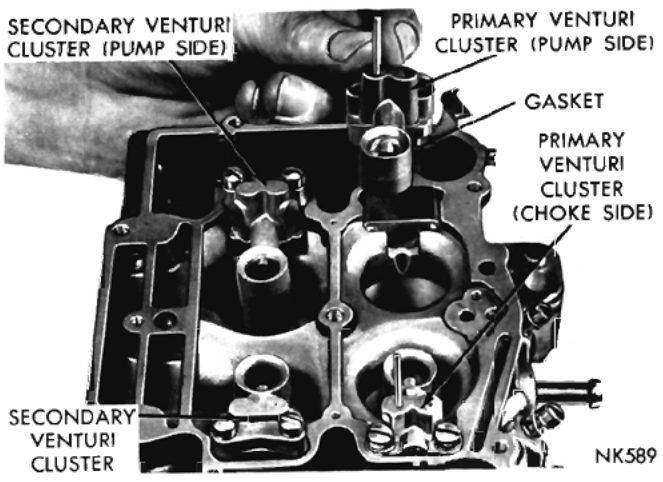

Fig. 5—Removing or Installing Primary Venturi Cluster

changeable. It is very important that these jets be installed in their respective locations in the main body at reassembly.

(3) Again using Tool T109-58, remove the main metering jets (secondary side), as shown in (Fig. 4).

(4) Remove the screws that attach the primary venturi (choke and pump side) to the main body. Lift the venturi straight up and away from the main body, as shown in (Fig. 5). Discard the gaskets.

The venturi assemblies are not interchangeable, side for side and must be reinstalled in their original locations at reassembly.

(5) Remove the screws that attach the secondary venturi (choke and pump side) to the main body. Lift the secondary venturi assemblies straight up and away from the body, as shown in (Fig. 6).

(6) Lift the velocity valves and counterweights out of the secondary throttle bores.

(7) Using Tool T109-59, screw driver bit, remove the accelerator pump intake check valve located inside the fuel bowl, adjacent to the accelerator pump cylinder.

(8) Remove the two idle mixture adjusting screws and springs from the throttle body portion of the main casting.

The carburetor now has been disassembled into two units, namely the air horn and the main and throttle body casting. The component parts of each have been disassembled as far as necessary for cleaning and inspection.

It is usually not advisable to remove the throttle shafts or valves unless wear or damage necessitates the installation of new parts. During the manufacture of the carburetor, the location of the idle transfer ports and the idle discharge ports to the valve is carefully established for one particular assembly, as shown in (Fig. 7). The valves are milled to give the proper port relation.

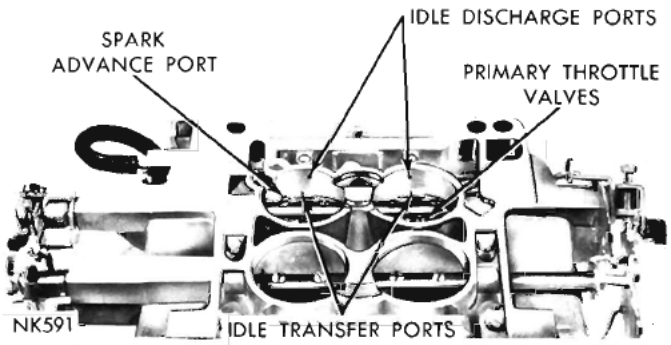

Fig. 7—Ports in Relation to Throttle Valves

If new throttle shafts should be installed in an old worn body, it would be very unlikely that the original relationship of these ports to the valves would be obtained. A very slight change in the port relationship to the valves would adversely affect normal carburetor operation, between the speeds of 15 and 30 miles per hour.

It is recommended that if the throttle shafts are excessively worn, that a new carburetor be installed. However, if the throttle valves have become nicked, burred or damaged, new valves may be installed, providing the following instructions are carefully followed.

CAUTION: The screws that attach the throttle valves are staked on the opposite side and care should be used in removal so as not to break the screws in the throttle shaft. Remove the staked portion of the screws with a file.

Remove the screws that attach the primary throttle valves to the throttle shaft and slide valve (or valves) out of bores.

Remove the screws that attach the secondary throt-

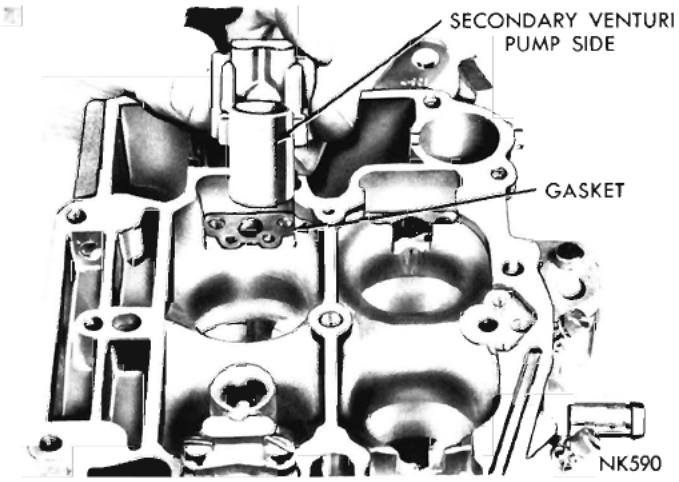

Fig. 6—Removing or Installing Secondary Venturi Cluster

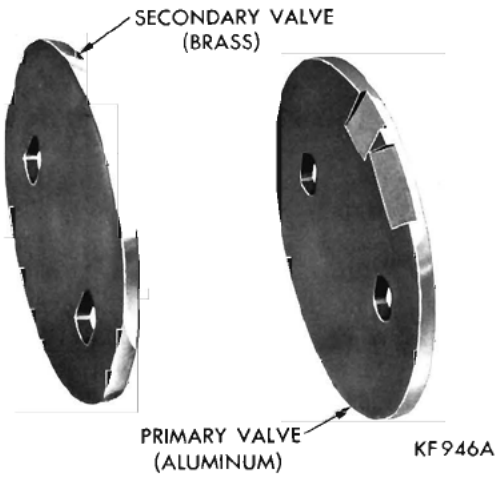

Fig. 8—Throttle Valve Identification

tle valves to the throttle shaft and slide valve (or valves) out of bores.

The primary valves and secondary valves are not interchangeable and should be kept separate in order that each may be returned to its respective bore. (See Fig. 8).

INSPECTION AND ASSEMBLY

(1) Slide the primary throttle valve (or valves) into their respective bores, install new screws, but do not tighten. Be sure the idle speed adjusting screw is backed out. Hold the valves in place with fingers. (Fingers pressing on the high side of valves.)

(2) Tap the valves lightly in this position, tighten screws securely. Stake screws by squeezing with pliers.

(3) Install the two idle mixture adjusting screws and springs in the throttle body portion of the casting. The tapered portion must be straight and smooth. If the tapered portion is grooved or ridged, a new idle mixture adjusting screw should be installed to insure having correct idle mixture control. **Do not use a screw driver.** The adjustment should be made with the fingers. Turn the idle mixture adjusting screws lightly against their seats, then back off one full turn for an approximate adjustment.

(4) Install the velocity valves and counterweights in position in the secondary throttle bores. (Be sure that the valve shaft is free and does not bind after installing the secondary venturis.)

(5) Place new secondary venturi gaskets in position, then install the secondary venturi (pump and choke side) by lowering straight down on gaskets. Install attaching screws and tighten securely.

NOTE: Be sure all the metering holes and vent tubes are clean, in both the primary and secondary venturi.

(6) Place new primary venturi gaskets in position, then install the primary venturi (pump and choke side) by lowering straight down on the gaskets. Refer to (Fig. 5). Install attaching screws and tighten securely.

(7) Install the primary and secondary main metering jets, using Tool T109-58. Refer to (Fig. 4). Tighten jets securely.

(8) Install the accelerator pump intake check ball using Tool T-109-59.

Accelerator Pump Test

(1) Pour clean gasoline into the carburetor bowl (approximately ½ inch deep). Remove the accelerator pump plunger from the jar of gasoline. Flex the leather several times, then slide into the pump cylinder.

(2) Install the accelerator pump discharge check needle in the discharge passage. Raise the pump plunger and press lightly on the plunger shaft to expel air from the pump passages. Using a small clean brass rod, hold the discharge check needle firmly on its seat. Again raise the plunger and press downward. No fuel should be emitted from either the intake or discharge passage.

(3) If fuel does emit from the intake passage, remove the intake check ball and reclean the passage. Fuel leakage at the discharge check needle indicates the presence of dirt or a damaged check needle. Clean again and then install a new check needle. Retest for leakage.

(4) If either the intake check assembly or discharge check needle leaks after above test and service fix, attempt to reseat as follows:

Intake Check Ball

Remove the intake check assembly from the throttle body. Install a new check assembly, then retest as described previously.

Discharge Check Needle

(1) With the discharge check needle installed, insert a piece of drill rod down on the needle. Lightly tap the drill rod with a hammer to form a new seat. Remove and discard old needle and install a new one. Retest as described previously. If the service fix does not correct the condition, a new carburetor will have to be installed.

(2) Install the accelerator pump discharge check needle, jet housing and gasket. Install housing and attaching screws. Tighten screws securely.

(3) Press down on the accelerator pump plunger shaft, and as the plunger is being depressed, a clear straight stream should emit from each jet. If the streams are not identical, (if either one is diverted or restricted) a new accelerator pump jet housing should be installed. After test, pour the gasoline from the carburetor bowl and remove pump plunger.

Assembling the Air Horn

(1) Slide the fuel inlet screen into the fuel line fitting, then install in air horn. Tighten securely.

(2) Check to see if the leather on the accelerator pump plunger is hard, cracked or worn. If any sign of wear or deterioration is evident, install a new plunger assembly.

(3) When reassembling, make sure the large diameter of the pivot screw enters the hole in the pump arm and that the shoulder on the screw has not pinched the pump arm.

The carburetors are equipped with synthetic rubber tipped fuel inlet needles. The needle tip is a rubber material which is not affected by gasoline and is stable over a wide range of temperatures. The tip is flexible enough to make a good seal on the needle seat, and to give increased resistance to flooding.

The use of the new inlet needles requires that care

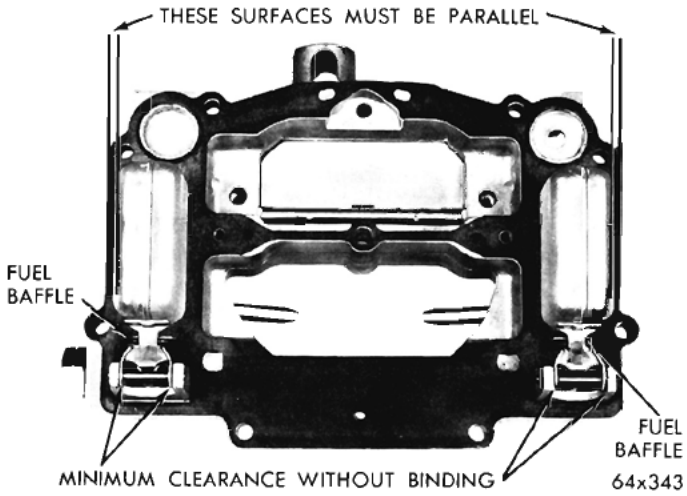

Fig. 9—Measuring Float Alignment

be used when making float adjustments. Avoid applying any pressure on the floats which might compress the tip of the fuel inlet needles. **The tip can be compressed sufficiently to cause a false setting which will affect correct level of fuel in the bowl.**

(4) Place a new air horn to main body gasket in position on the air horn, then install the float needle valve seats. (Be sure each needle seat and needle is reinstalled in its original position.)

(5) Slide the right and left floats into position in the air horn, then install the float fulcrum pins. **(Be sure the marked float is installed on the pump side of the air horn.)** See disassembly procedures.

(6) After the floats have been installed, check the float alignment, level and drop settings as follows:

Float Alignment Setting

(1) Sight down the side of each float shell to determine if the side of the float is parallel to the outer edge of the air horn casting, as shown in (Fig. 9).

(2) If the sides of the float are not in alignment with the edge of casting, bend the float lever by applying pressure to the end of the float shell with the thumb. **To avoid damage to the float, apply only enough pressure to bend the float lever.**

(3) After aligning the floats, remove as much clearance as possible between the arms of the float lever and the lugs of the air horn. To do this, bend the float lever. The arms of the float lever should be as parallel as possible to the inner surfaces of the lugs or the casting.

Float Level Setting

(1) With the air horn inverted, the air horn gasket in place and the float needle seated, slide float gauge (refer to specifications for carburetor being worked on) between the top of the float (at outer end) and the air horn gasket, as shown in (Fig. 10). Float should just touch gauge (T109-106).

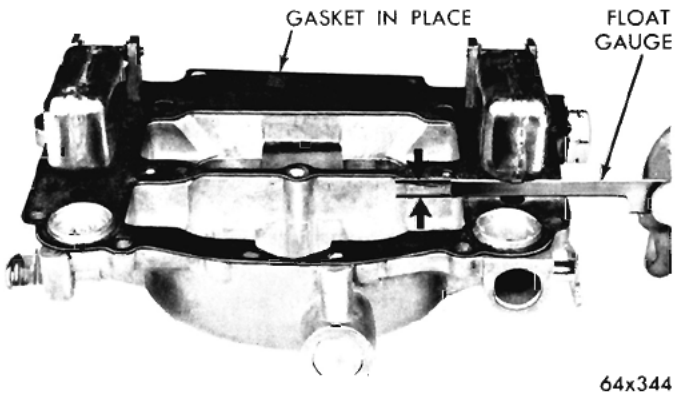

Fig. 10—Measuring Float Height

(2) Check the other float in the same manner. If an adjustment is necessary, bend the float arm using Tool T109-22, until correct clearance has been obtained. After bending arm, recheck the float alignment.

Float Drop Setting

(1) Holding the air horn in an upright position, measure the distance from the top of the floats (outer end) to the air horn gasket, as shown in (Fig. 11). This measurement should be ¾ inch. If an adjustment is necessary, bend the stop tabs on the float levers until the correct drop setting has been obtained. Bend the tab toward the needle seat to lessen the drop, or away from the seat to increase the drop.

(2) After the floats have been checked and adjusted, continue to assemble the carburetor as follows:

(3) Place the accelerator pump plunger lower spring in the pump cylinder, then lower the air horn carefully down on the main body. Care must be taken

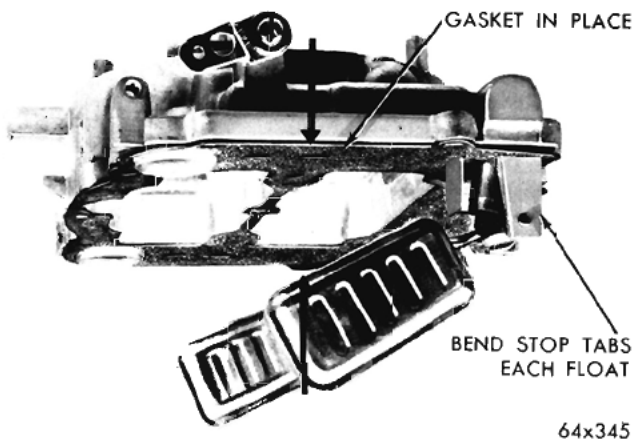

Fig. 11—Measuring Float Drop

to center the small brass main bleed tubes so that they will pass through the holes in the air horn without being damaged.

NOTE: Be sure the fuel baffles on the air horn, slide down in front, (bowl side) of the float chamber baffles, or the air horn will not index correctly with the main body and can cause the floats to hang up. Be sure the leather on the plunger does not curl or wrinkle. Accelerator pump operation will be affected if this precaution is not observed.

(4) Install the 10 air horn attaching screws and tighten securely. (The two long screws should be installed in the holes that are located at the air cleaner mounting surface. The 1 inch screw at the front and the 1½ inch at the rear.

The change from the low speed, best fuel economy, road load mixtures to the richer wide open throttle full power mixtures is now accomplished in two steps. This has made it possible to secure best low speed fuel economy without sacrificing performance in the intermediate speed range. To do this, there is a new step-up piston and spring assembly, new metering rods with three diameters, and new style primary metering jets, as shown in (Fig. 12).

(5) Slide the step-up piston spring into the piston cylinders, followed by the step-up pistons and step-up rods. Install the cover plates and attaching screws while holding the step-up pistons down in position. Tighten screws securely.

(6) Slide the choke piston into its cylinder in the air horn, guiding the link into the slot in the choke valve lever. Align hole, then install attaching cotter pin. Place a new welch plug over cylinder opening and secure with a ball peen hammer. Check the fit of the choke valve in air horn. The valve should be evenly spaced on all sides. Loosen screws and reposition if necessary.

(7) Engage the throttle connector rod with the primary throttle shaft lever, then install hairpin clip. Install clevis clip to the rod and pump arm.

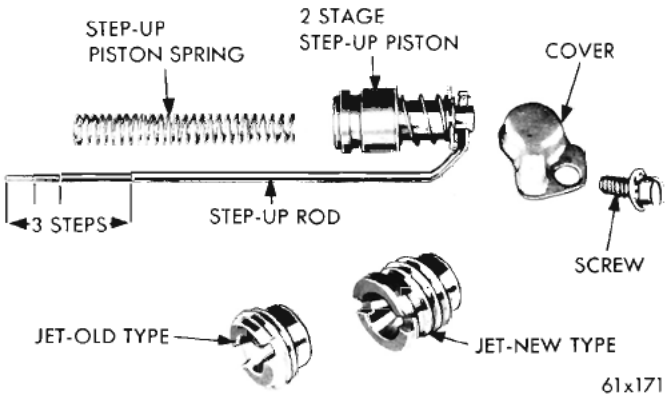

Fig. 12—Step-Up Piston, Rod and Jet

(8) Engage the lower end of the fast idle connector rod with the fast idle cam, then swing in an arc to lock in cam. Slide other end of rod into the choke shaft lever and secure with hairpin clip.

Installing the Vacuum Diaphragm

Inspect the diaphragm vacuum fitting to be sure that the passage is not plugged with foreign material. Leak check the diaphragm to determine if it has internal leaks. To do this, first depress the diaphragm stem, then place a finger over the vacuum fitting to seal the opening. Release the diaphragm stem. If the stem moves more than $^{1}/_{16}$ inch in ten (10) seconds, the leakage is excessive and the assembly must be replaced.

(1) Install the diaphragm assembly on the carburetor and tighten the attaching screws securely.

(2) Install the choke operating link in position between the diaphragm plunger (stem) and the choke lever. Install the clip to secure.

(3) Inspect the rubber hose for cracks, before placing it on the correct carburetor fitting. Refer to (Fig. 1). Do not connect the vacuum hose to the diaphragm fitting until after the vacuum kick adjustment has been made. (See Carburetor Adjustments.)

ADJUSTMENTS

The following adjustments should be made with the carburetor on the bench for ease of working, and, should be made in the following order:

Fast Idle Speed and Cam Position Adjustment

The fast idle engine speed adjustment should be

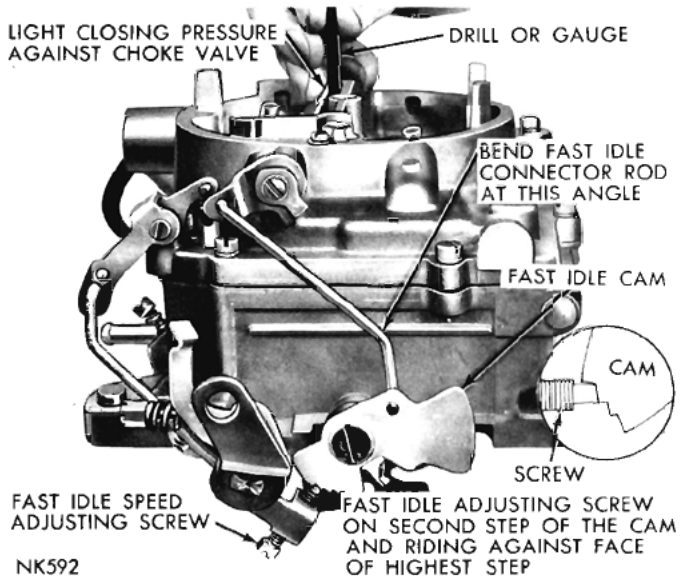

Fig. 13—Fast Idle Cam Position Adjustment

made on the vehicle, as described in the Fast Idle Speed adjustment (On the Vehicle Paragraph.) However, the fast Idle Cam Position Adjustment can be made on the bench.

This adjustment is important to assure that the speeds of each cam step occur at the proper time during engine warm-up. Adjust as follows:

(1) With the fast idle speed adjusting screw contacting the step on the fast idle cam, shown in (Fig. 13), move the choke valve toward the closed position with light pressure. Insert a NO. 50 drill between the choke valve and the wall of the air horn.

(2) An adjustment will be necessary if a slight drag is not obtained as the drill is being removed.

(3) If an adjustment is necessary, bend the fast idle connector rod at the angle, using Tool T109-213 until the correct valve opening has been obtained. Refer to (Fig. 13).

Vacuum Kick Adjustment
(This test can be made ON or OFF the vehicle.)

The choke diaphragm adjustment controls the fuel delivery while the engine is running. It positions the choke valve within the air horn by action of the linkage between the choke shaft and the diaphragm. The diaphragm must be energized to measure the vacuum kick adjustment. Use either a distributor test machine with a vacuum source, or vacuum supplied by another vehicle.

(1) With the engine **Not** running, open the throttle valves far enough to allow the choke valve to be moved to the closed position.

(2) Disconnect the vacuum hose from the diaphragm and connect the hose from the vacuum supply, as shown in (Fig. 14). (A minimum of 10 inches of mercury (HG) will be required.

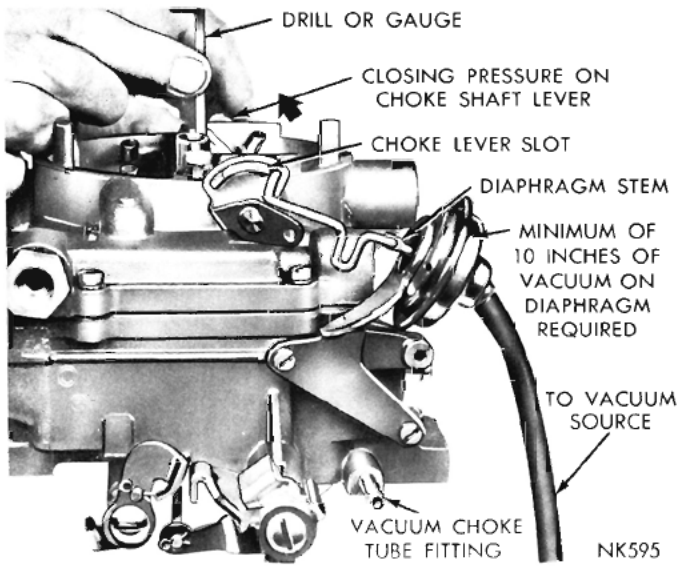

Fig. 14—Measuring the Choke Vacuum Kick Setting

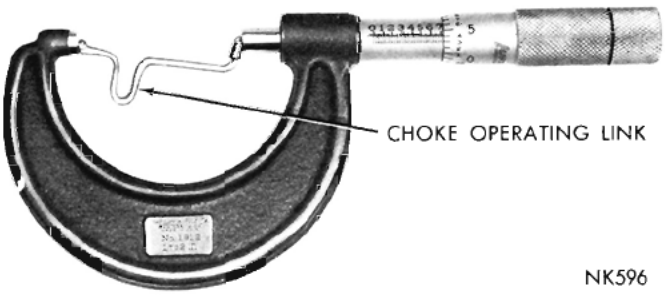

Fig. 15—Choke Operating Link Measurement

(3) Insert the specified drill between the choke valve and the wall of the air horn. Refer to (Fig. 14). Apply sufficient closing pressure on the choke shaft lever to provide the smallest choke valve opening possible without distortion of the diaphragm link. Note that the cylindrical stem of the diaphragm will extend as an internal spring is compressed. The spring must be fully compressed for proper measurement of the kick adjustment.

(4) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

The adjustment of this opening will require the removal of the choke operating link.

CAUTION: Damage to the diaphragm and the choke lever slot can result, if the link is not removed for the bending operation.

(5) Remove the clip and disengage the choke operating link from the choke lever, then disengage the link from the diaphragm stem. (The best bending results will be obtained by using a vise and a pair of pliers.)

(6) Bend the choke operating link to provide the correct choke valve opening.

CAUTION: A correction in the length of the link of .015 inch, will result in a change of .010 inch in the choke valve opening.

As an example, if the choke valve opening is .010 inch in error, the correction in the link length would be .015.

A 2″ micrometer will be helpful in establishing the original length of the link, as shown in (Fig. 15), before completing the adjustment.

(7) Install the choke operating link and recheck the choke valve opening, using a drill or gauge. Refer to (Fig. 14).

Reinstall the vacuum hose to the diaphragm and make the following check:

(8) With no vacuum applied to the diaphragm,

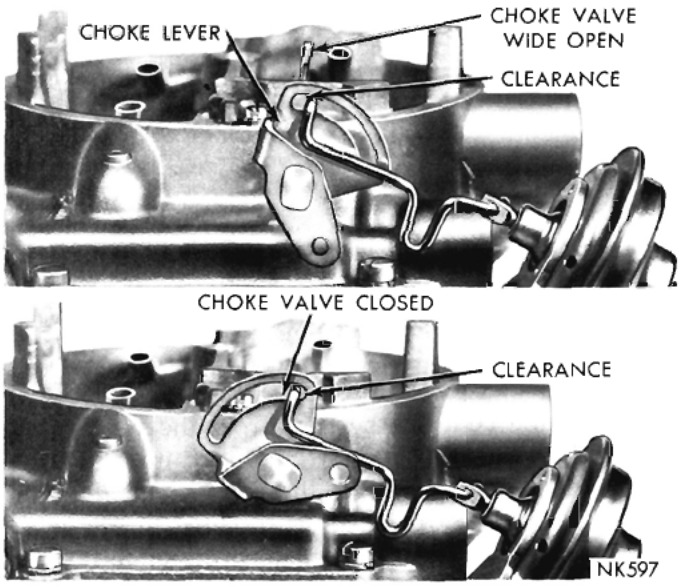

Fig. 16—Choke Operating Link Clearances

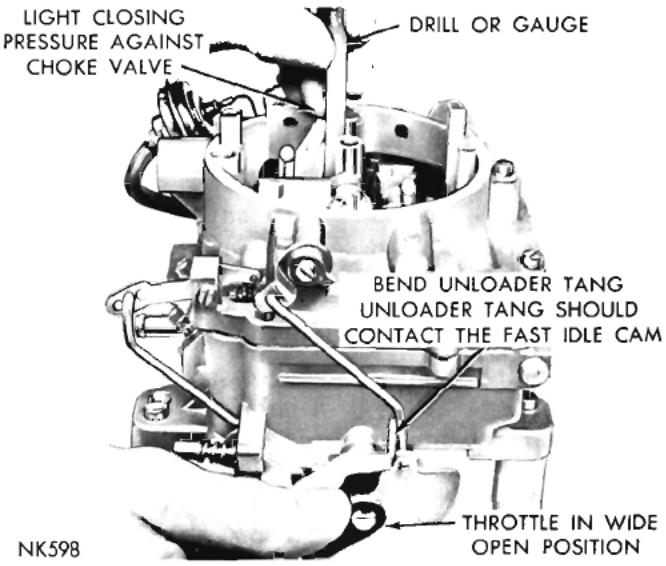

Fig. 17—Measuring Choke Unloader (wide open Kick)

some clearance should exist between the choke operating link and the choke lever slot, in both the open and closed choke valve positions, as should in (Fig. 16).

NOTE: This clearance is necessary to allow the choke valve to close for starting as well as fully open after the engine reaches the normal operating temperature.

If a clearance does not exist in both of these positions, a recheck of the operating link adjustment should be made.

NOTE: Free movement of the choke valve between the closed and open positions is very necessary.

This free movement should also exist between the kick and the open choke valve positions with the engine running. If binding does exist, the choke operating link has been improperly bent and should be corrected.

Choke Unloader Adjustment

With the throttle valves in the wide open position, it should be possible to insert Tool T109-80 (3/8 inch) gauge between the upper edge of the choke valve and the inner wall of the air horn, as shown in (Fig. 17).

If an adjustment is necessary, bend the unloader lip on the throttle shaft lever, using Tool T109-41, until correct opening has been obtained.

Accelerator Pump Adjustment

Move the choke valve to wide open position, to release the fast idle cam. Back off the idle speed adjusting screw (curb idle) until the throttle valves are seated in the bores.

Measure the distance from the top of the air horn to the top of the plunger shaft, using a "T" scale, as shown in (Fig. 18). This distance should be $^{7}/_{16}$ inch.

If an adjustment is necessary, bend the throttle connector rod at the lower angle, using Tool T109-213, until correct travel has been obtained.

Secondary Throttle Lever Adjustment

To check the secondary throttle lever adjustment, block the choke valve in the wide open position and invert the carburetor. Slowly open the primary throttle valve until it is possible to measure $^{21}/_{64}$ inch between the lower edge of the primary valve and the bore (opposite idle port) as shown in (Fig. 19). At this measurement, the secondary valves should just start to open. If an adjustment is necessary, bend the sec-

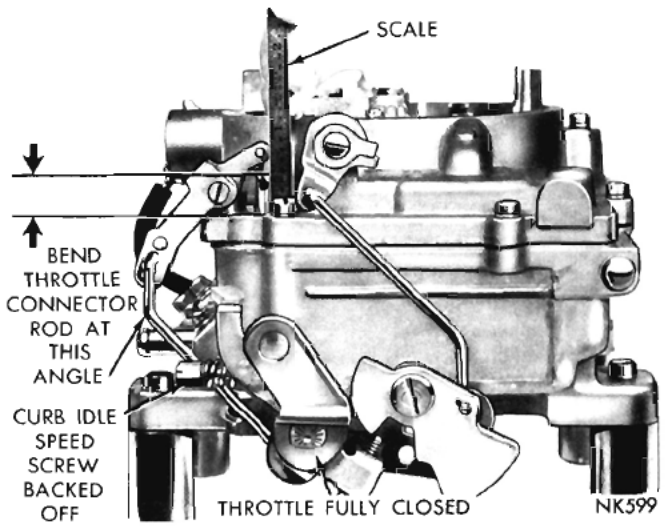

Fig. 18—Measuring the Accelerator Pump Adjustment

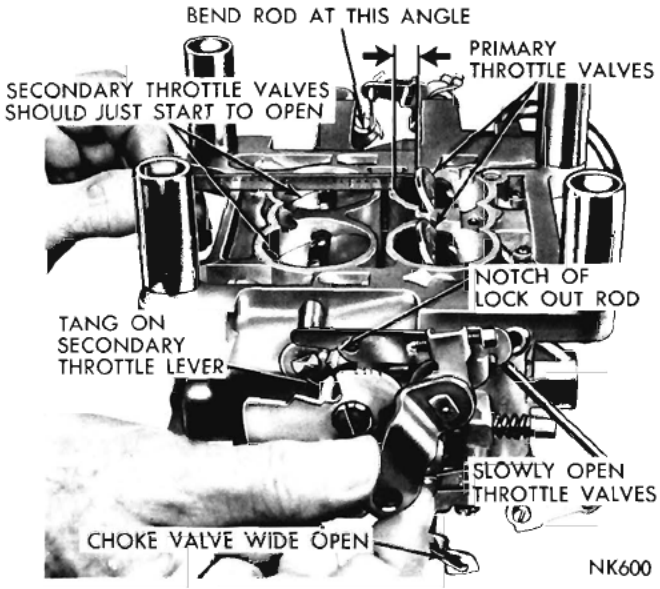

Fig. 19—Measuring the Secondary Throttle Adjustment

ondary throttle operating rod at the angle, using Tool T109-213, until correct adjustment has been obtained.

With the primary and secondary throttle valves in the tightly closed position, it should be possible to insert Tool T109-29 (.020″) wire gauge, between the positive closing shoes on the secondary throttle levers, as shown in (Fig. 20).

If an adjustment is necessary, bend the shoe on the secondary throttle lever, using Tool T109-22, until correct clearance has been obtained.

Secondary Throttle Lock-Out Adjustment

Crack the throttle valves, then manually open and close the choke valve. The tang on the secondary throttle lever should freely engage in the notch of the lockout dog. Refer to (Fig. 19).

If an adjustment is necessary, bend the tang on the secondary throttle lever, until engagement has been made. Use Tool T109-22 for this operation.

After adjustments have been made, reinstall carburetor on engine, using a new gasket.

It is suggested that the carburetor be filled with clean gasoline. This will help prevent dirt that is trapped in the fuel system, from being dislodged by the free flow of fuel, as the carburetor is primed.

Idle Speed Adjustment—(Curb Idle)

To make the idle speed adjustment, the engine must be thoroughly warmed up. A much more reliable idle adjustment can usually be obtained if the car has been driven a minimum of five miles. For the best results, it is recommended that a tachometer be used in this adjustment. Carburetors used on 273 cubic inch engines are equipped with a by-pass air bleed for setting the idle speed, other Models use idle speed

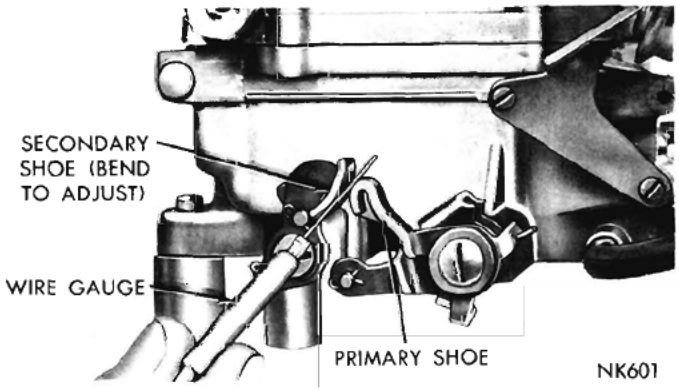

Fig. 20—Measuring Clearance Between Closing Shoes

screws. (Before making the idle speed adjustment observe the following precautions:)

On cars equipped with the automatic transmission, loosen the nut in the sliding link of the carburetor to bellcrank rod so that the stop in the transmission will not interfere with the free movement of the carburetor throttle lever.

To make the idle speed adjustment, proceed as follows:

(1) Turn the idle speed screw **in** or **out** to obtain 500 r.p.m. (With air conditioning **On,** set the idle speed at 500 r.p.m.) Be sure the choke valve is fully open and that the fast idle adjusting screw is not contacting the fast idle cam.

(2) Turn each idle mixture screw to obtain the highest r.p.m. While making the adjustment, carefully watch the tachometer and notice that the speed can be decreased by turning the screws in either direction from the setting that gave the highest r.p.m. reading.

(3) Readjust to 500 r.p.m. with the idle speed screw.

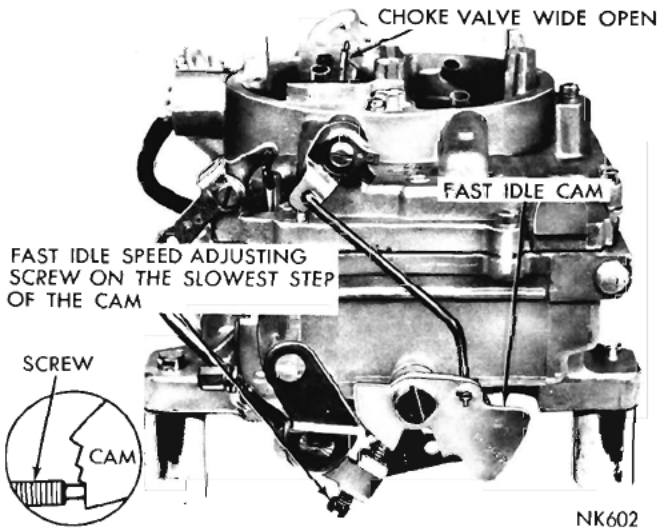

Fig. 21—Fast Idle Speed Adjustment (on the vehicle)

(4) Turn each idle mixture adjusting screw in the clockwise direction (leaner) until there is a slight drop in r.p.m. Now, turn each screw out, counterclockwise (richer) just enough to regain the lost r.p.m.

This procedure will assure that the idle has been set to the leanest possible mixture for smooth idle. **This setting is very important.**

Since the correct speed was originally set using the speed screw, or by-pass idle air bleed screw, the speed obtained after finding the leanest smooth idle setting will probably be too fast.

(5) Readjust the speed screw or by-pass idle air bleed screw to obtain the correct idle speed. Repeat steps 2 and 4 above if necessary.

NOTE: After the proper idle speed has been obtained refer to Figure in the Throttle Linkage Section of this Group for the procedure on adjusting the transmission control rod.

Fast Idle Speed (On the vehicle)*

To set the fast idle speed on the car, connect a tachometer to the vehicle, then set the curb idle speed and proceed as follows:

(1) With the engine running and the transmission in the neutral position, open the throttle slightly.

(2) Close the choke valve about 20 degrees, then allow the throttle to close. Return the choke valve to the wide open position.

(3) The fast idle speed adjusting screw should be contacting the slowest speed step on the fast idle cam, as shown in (Fig. 21).

(4) With the engine warmed-up to the normal operating temperature, turn the fast idle speed adjusting screw **in** or **out** to secure 700 r.p.m. **Reposition the cam and throttle after every fast idle speed screw adjustment to apply normal throttle closing torque.**

*After Approx. 500 Miles (Minimum Break In Period).

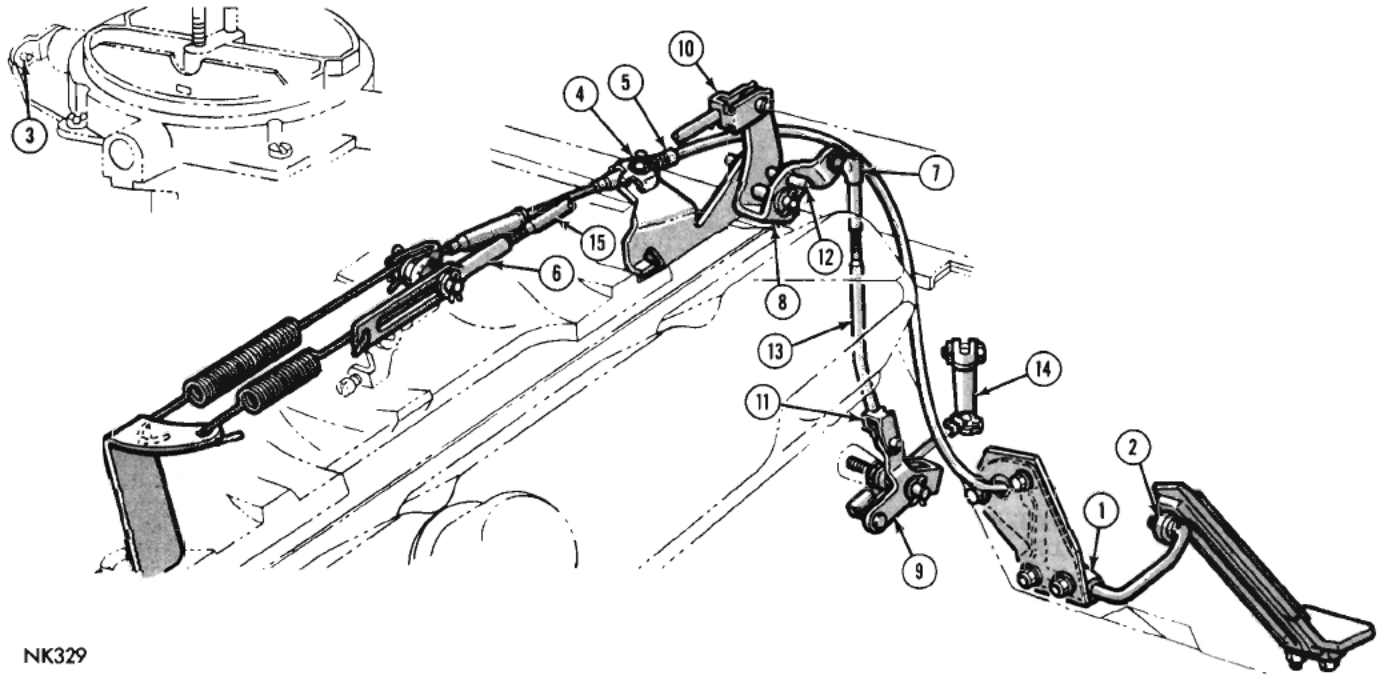

Fig. 1—Throttle Linkage Adjustment (Model AP-2 with 318-383 or 426 Cu. In. Eng.)

PART 8

THROTTLE LINKAGE ADJUSTMENT

AUTOMATIC TRANSMISSION (Fig. 1)

(Model AP-2 with 318-383 or 426 Cu. In. Eng.)

(1) Apply a thin film of multi-purpose grease on both ends of the accelerator shaft [1] where it turns in the bracket, nylon roller [2] where it contacts the pedal, pivot points of both upper [8] and lower [9] transmission linkage bellcranks, also the clipped ends of transmission linkage bearings areas [10] [11].

(2) Disconnect the return spring and slotted transmission rod [6] from the carburetor lever pin. Disconnect the transmission intermediate rod ball socket [7] from the upper bellcrank ball end.

(3) Disconnect choke [3] at carburetor or block choke valve in full open position. Open throttle slightly to release fast idle cam, then return carburetor to curb idle.

(4) With a $^{3}/_{16}$ inch diameter rod [12] placed in the holes provided in the upper engine mounted bellcrank and lever [8], adjust the length of the intermediate transmission rod [13] by means of the threaded adjustment at the upper end. The ball socket [7] must line up with the ball end with the rod held upward against the transmission stop [14].

(5) Assemble ball socket [7] to ball end and remove $^{3}/_{16}$ inch rod [12] from upper bellcrank and lever.

(6) Hold the carburetor rod [15] forward against the transmission stop [14] and adjust its length by means of the threaded adjustment so that the rear end of the slot in the adjusting link [6] just contacts the carburetor lever pin.

(7) Lengthen the carburetor rod [15] two full turns by turning the slotted link [6].

(8) Assemble slotted link [6] to the carburetor.

(9) Loosen the cable clamp nut [4], then adjust the position of the cable housing ferrule [5] in the clamp so that all slack is removed from the cable with the carburetor at curb idle. To remove slack from the cable, move the ferrule [5] in the clamp in the direction away from the carburetor lever.

(10) Back off ferrule [5] ¼ inch. This provides ¼ inch cable slack at idle. Tighten cable clamp nut [4].

(11) Route cable so it does not interfere with the carburetor rod [15] or upper bellcrank [8] throughout full throttle linkage travel.

(12) Connect choke rod [3] or remove blocking fixture.

MANUAL TRANSMISSION (Fig. 1)

(Model AP-2 with 318-383 or 426 Cu. In. Eng.)

(1) Apply a thin film of multi-purpose grease on both ends of the accelerator shaft [1] where it turns in the bracket, and nylon roller [2] where it contacts the pedal.

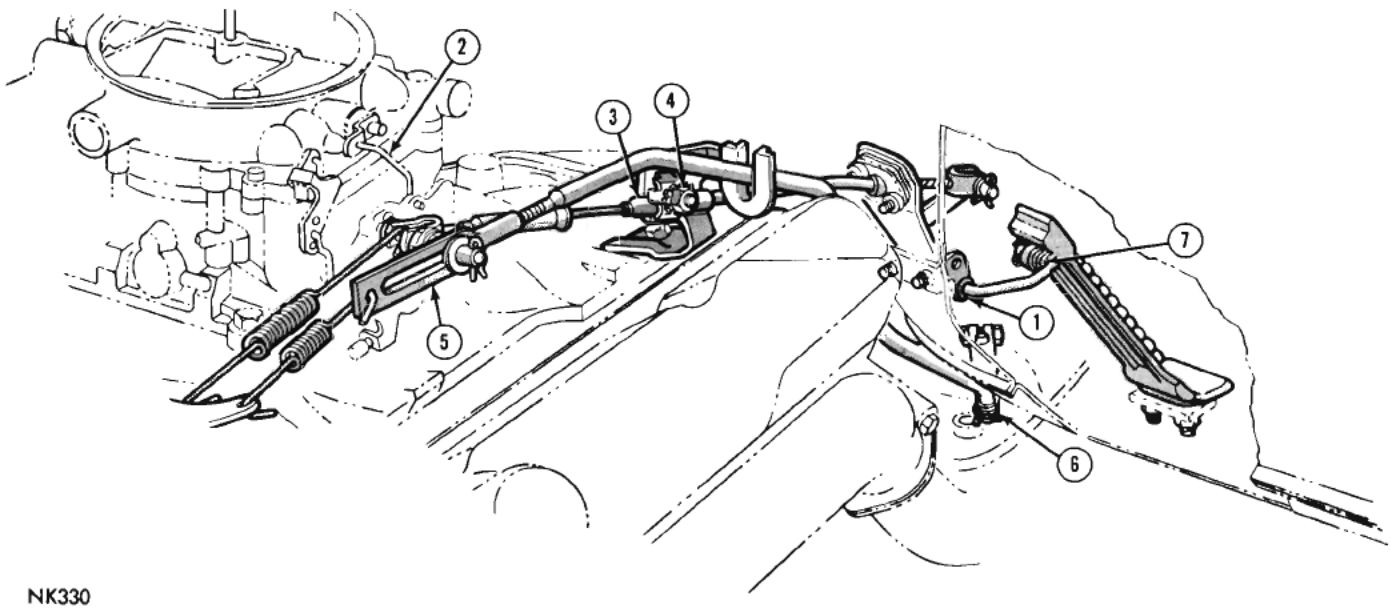

Fig. 2—Throttle Linkage Adjustment (Model AR-2 with 361-383 or 426 Cu. In. Eng.)

(2) Disconnect choke [3] at carburetor or block choke valve in full open position. Open throttle slightly to release fast idle cam, then return carburetor to curb idle.

(3) Loosen the cable clamp nut [4], then adjust the position of the cable housing ferrule [5] in the clamp so that the slack is removed from the cable with the carburetor at curb idle. To remove slack from the cable move the ferrule [5] in the clamp in the direction away from the carburetor lever.

(4) Back off ferrule [5] ¼ inch. This provides ¼ inch cable slack at idle. Tighten cable clamp nut. [4].

(5) Connect choke rod [3] or remove blocking fixture.

AUTOMATIC TRANSMISSION (Fig. 2)

(Model AR-2 with 361-383 or 426 Cu. In. Eng.)

(1) Apply a thin film of multi-purpose grease on both ends of the accelerator shaft [1] where it turns in the bracket, and nylon roller [7] where it contacts the pedal.

(2) Disconnect the return spring and slotted transmission rod [5] from the carburetor lever pin.

(3) Disconnect choke [2] at carburetor or block choke valve in full open position. Open throttle slightly to release fast idle cam, then return carburetor to curb idle.

(4) Hold the transmission lever [6] forward against its stop (rod or lever must not be moved vertically while holding against the stop) and adjust the length of the transmission rod by means of the threaded adjustment [5] at the upper end. The rear end of the slot should contact the carburetor lever pin without exerting any forward force.

(5) Lengthen rod by one full turn of the adjustment.

(6) Assemble slotted adjustment [5] to carburetor lever pin and install washer and retainer pin. Assemble transmission linkage return spring in place. To check transmission linkage freedom of operation, move slotted adjusted link [5] to the full rearward position, then allow it to return slowly, making sure it returns to the full forward position.

(7) Loosen the cable clamp nut [4], then adjust the position of the cable housing ferrule [3] in the clamp so that all slack is removed from the cable with the carburetor at curb idle. To remove slack from the cable, move the ferrule [3] in the clamp in the direction away from the carburetor lever.

(8) Back off ferrule [3] ¼ inch. This provides ¼ inch cable slack at idle. Tighten cable clamp nut [4].

(9) Route cable so that it does not interfere with the transmission rod throughout its full travel.

(10) Connect choke rod [2] or remove blocking fixture.

MANUAL TRANSMISSION (Fig. 2)

(Model AR-2 with 361-383 or 426 Cu. In. Eng.)

(1) Apply a thin film of multi-purpose grease on both ends of the accelerator shaft [1] where it turns in the bracket, and nylon roller [7] where it contacts the pedal.

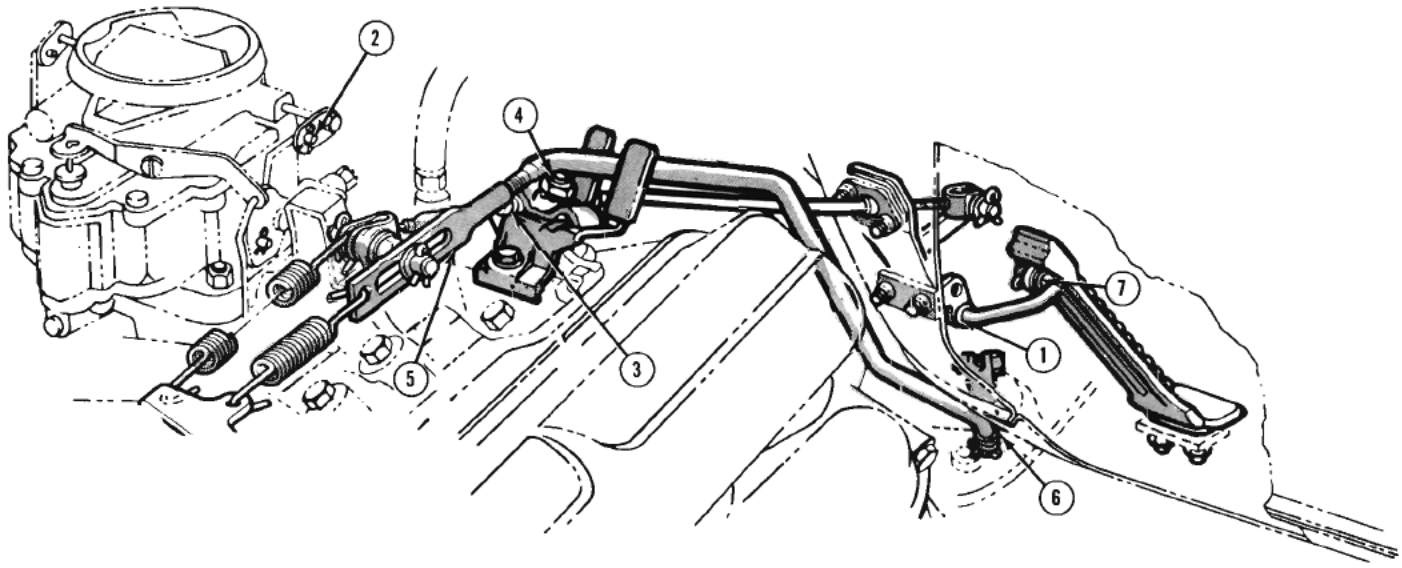

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Fig. 3—Throttle Linkage Adjustment (Model AR-2 with 273 or 318 Cu. In. Eng.)

(2) Disconnect choke [2] at carburetor or block choke valve in full open position. Open throttle slightly to release fast idle cam, then return carburetor to curb idle.

(3) Loosen the cable clamp nut [4], then adjust the position of the cable housing ferrule [3] in the clamp so that all slack is removed from the cable with the carburetor at curb idle. To remove slack from the cable move the ferrule [3] in the clamp in the direction **away** from the carburetor lever.

(4) Back off ferrule [3] ¼ inch. This provides ¼ inch cable slack at idle. Tighten cable clamp nut [4].

(5) Connect choke rod [2] or remove blocking fixture.

AUTOMATIC TRANSMISSION (Fig. 3)

(Model AR-2 with 273 or 318 Cu. In. Eng.)

(1) Apply a thin film of multi-purpose grease on both ends of the accelerator shaft [1] where it turns in the bracket, and nylon roller [7] where it contacts the pedal.

(2) Disconnect the return spring and slotted transmission rod [5] from the carburetor lever pin.

(3) Disconnect choke [2] at carburetor or block choke valve in full open position. Open throttle slightly to release fast idle cam, then return carburetor to curb idle.

(4) Hold the transmission lever [6] forward against its stop (rod or lever must not be moved vertically while holding against the stop) and adjust the length of the transmission rod by means of the threaded adjustment [5] at the upper end. The rear end of the slot should contact the carburetor lever pin without exerting any forward force.

(5) Lengthen rod by one full turn of the adjustment.

(6) Assemble slotted adjustment [5] to carburetor lever pin and install washer and retainer pin. Assemble transmission linkage return spring in place. To check transmission linkage freedom of operation, move slotted adjuster link [5] to the full rearward position, then allow it to return slowly, making sure it returns to the full forward position.

(7) Loosen the cable clamp nut [4], then adjust the position of the cable housing ferrule [3] in the clamp so that all slack is removed from the cable with the carburetor at curb idle. To remove slack from the cable, move the ferrule [3] in the clamp in the direction **away** from the carburetor lever.

(8) Back off ferrule [3] ¼ inch. This provides ¼ inch cable slack at idle. Tighten cable clamp nut [4].

(9) Route cable so that it does not interfere with the transmission rod throughout its full travel.

(10) Connect choke rod [2] or remove blocking fixture.

MANUAL TRANSMISSION (Fig. 3)

(Model AR-2 with 273 or 318 Cu. In. Eng.)

(1) Apply a thin film of multi-purpose grease on both ends of the accelerator shaft [1] where it turns in the bracket, and nylon roller [7] where it contacts the

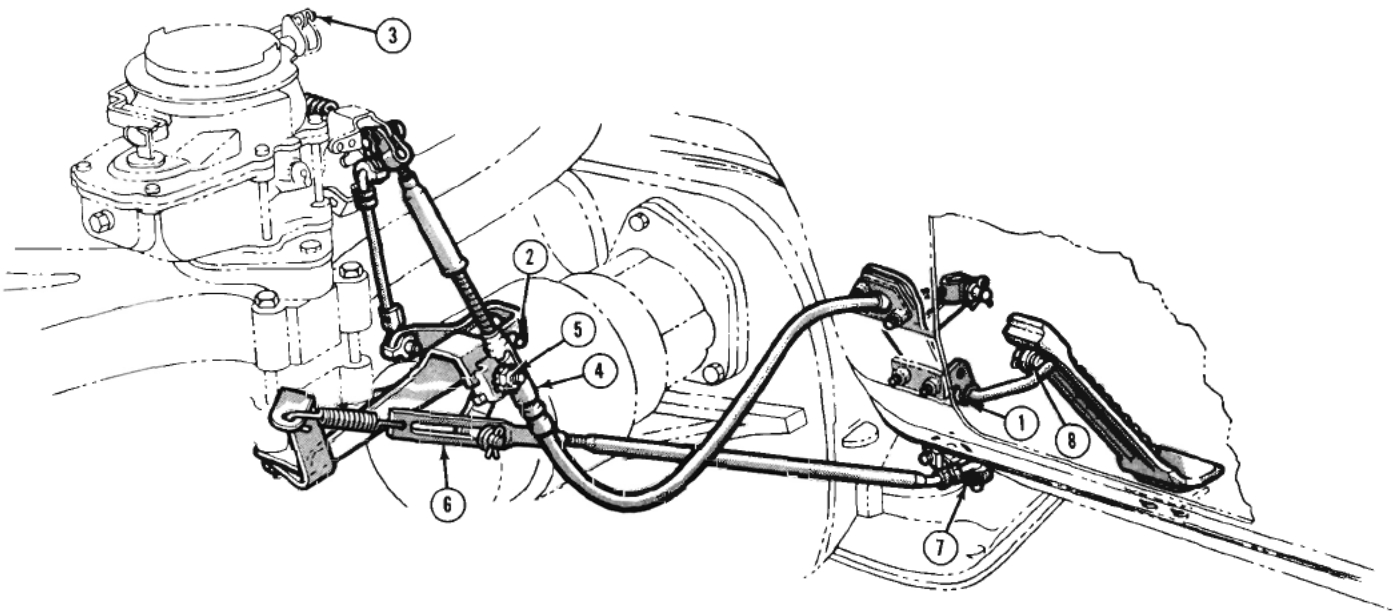

Fig. 4—Throttle Linkage Adjustment (Model AP-1, AR-1 with 225 Cu. In. Eng.)

pedal.

(2) Disconnect choke [2] at carburetor or block choke valve in full open position. Open throttle slightly to release fast idle cam, then return carburetor to curb idle.

(3) Loosen the cable clamp nut [4], then adjust the position of the cable housing ferrule [3] in the clamp so that all slack is removed from the cable with the carburetor at curb idle. To remove slack from the cable move the ferrule [3] in the clamp in the direction **away** from the carburetor lever.

(4) Back off the ferrule [3] ¼ inch. This provides ¼ inch cable slack at idle. Tighten cable clamp nut. [4].

(5) Connect choke rod [2] or remove blocking fixture.

AUTOMATIC TRANSMISSION (Fig. 4)

(Models AP-1, AR-1 with 225 Cu. In. Eng.)

(1) Apply a thin film of multi-purpose grease on both ends of the accelerator shaft [1] where it turns in the bracket, nylon roller [8] where it contacts the pedal, and the bellcrank pin [2].

(2) Disconnect the return spring and slotted transmission rod [6] from the bellcrank lever pin.

(3) Disconnect choke [3] at carburetor or block choke valve in full open position. Open throttle slightly to release fast idle cam, then return carburetor to curb idle.

(4) Hold the transmission lever [7] forward against its stop (rod or lever must not be moved vertically while holding against the stop) and adjust the length of the transmission rod by means of the threaded adjustment 6 at the upper end. The rear end of the slot should contact bellcrank lever pin without exerting any forward force.

(5) Lengthen rod by one full turn of the adjustment.

(6) Assemble slotted adjustment [6] to bellcrank lever pin and install washer and retainer pin. Assemble transmission linkage return spring in place. To check transmission linkage freedom of operation, move slotted adjuster link [6] to the full rearward position, then allow it to return slowly, making sure it returns to the full forward position.

(7) Loosen the cable clamp nut [5], then adjust the position of the cable housing ferrule [4] in the clamp so that all slack is removed from the cable with the carburetor at curb idle. To remove slack from the cable, move the ferrule [4] in the clamp in the direction **away** from the carburetor lever.

(8) Back off ferrule [4] ¼ inch. This provides ¼ inch cable slack at idle. Tighten cable clamp nut [5].

(9) Route cable so that it does not interfere with the transmission rod throughout its full travel.

(10) Connect choke rod [3] or remove blocking fixture.

MANUAL TRANSMISSION (Fig. 4)

(Models AP-1, AR-2 with 225 Cu. In. Eng.)

(1) Apply a thin film of multi-purpose grease on both ends of the accelerator shaft [1] where it turns in the bracket, and nylon roller [8] where it contacts the pedal.

(2) Disconnect choke [3] at carburetor or block choke valve in full open position. Open throttle slightly to release fast idle cam, then return carburetor to curb idle.

(3) Loosen the cable clamp nut [5], then adjust the position of the cable housing ferrule [4] in the clamp so that all slack is removed from the cable with the carburetor at curb idle. To remove slack from the cable move the ferrule [4] in the clamp in the direction **away** from the carburetor lever.

(4) Back off ferrule [4] ¼ inch. This provides ¼ inch cable slack at idle. Tighten cable clamp nut [5].

(5) Connect choke rod [3] or remove blocking fixture.

AUTOMATIC TRANSMISSION (Fig. 5)

(Model AV-2 with 273 Cu. In. Eng.)

(1) Apply a thin film of multi-purpose grease to both ends of the accelerator shaft [3] where it turns in the bracket, and bottom side of the pedal [4] where it contacts accelerator shaft lever. Also to pivot points of both upper [5] and lower [6] bellcranks, and the clipped ends of transmission linkage rod bearing areas [14] [15] and [16].

(2) Disconnect the return spring and carburetor rod ball socket [1] from carburetor or disconnect the transmission intermediate rod ball socket [2] from the upper bellcrank ball end.

(3) Disconnect choke [7] at carburetor or block choke valve in full open position. Open throttle slightly to release fast idle cam, then return carburetor to curb idle.

(4) Insert a 6 inch long $^3/_{16}$ inch diameter rod in the holes provided in the upper engine mounted bellcrank [5] and lever, adjust the length of the intermediate transmission rod by means of the threaded adjustment [9] at the upper end. The ball socket must line up with the ball end with the rod held downward against the transmission stop [10].

(5) Assemble ball socket [2] to ball end and remove $^3/_{16}$ inch rod [8] from upper bellcrank [5] and lever.

(6) Hold the carburetor rod [11] forward against the transmission stop [10] and adjust its length by means of the threaded adjustment [11] so that the ball socket [1] lines up with the ball end of the carburetor lever.

(7) Lengthen carburetor rod four turns by turning ball socket [1] counterclockwise.

(8) Assemble ball socket [1] to ball end and connect the return spring.

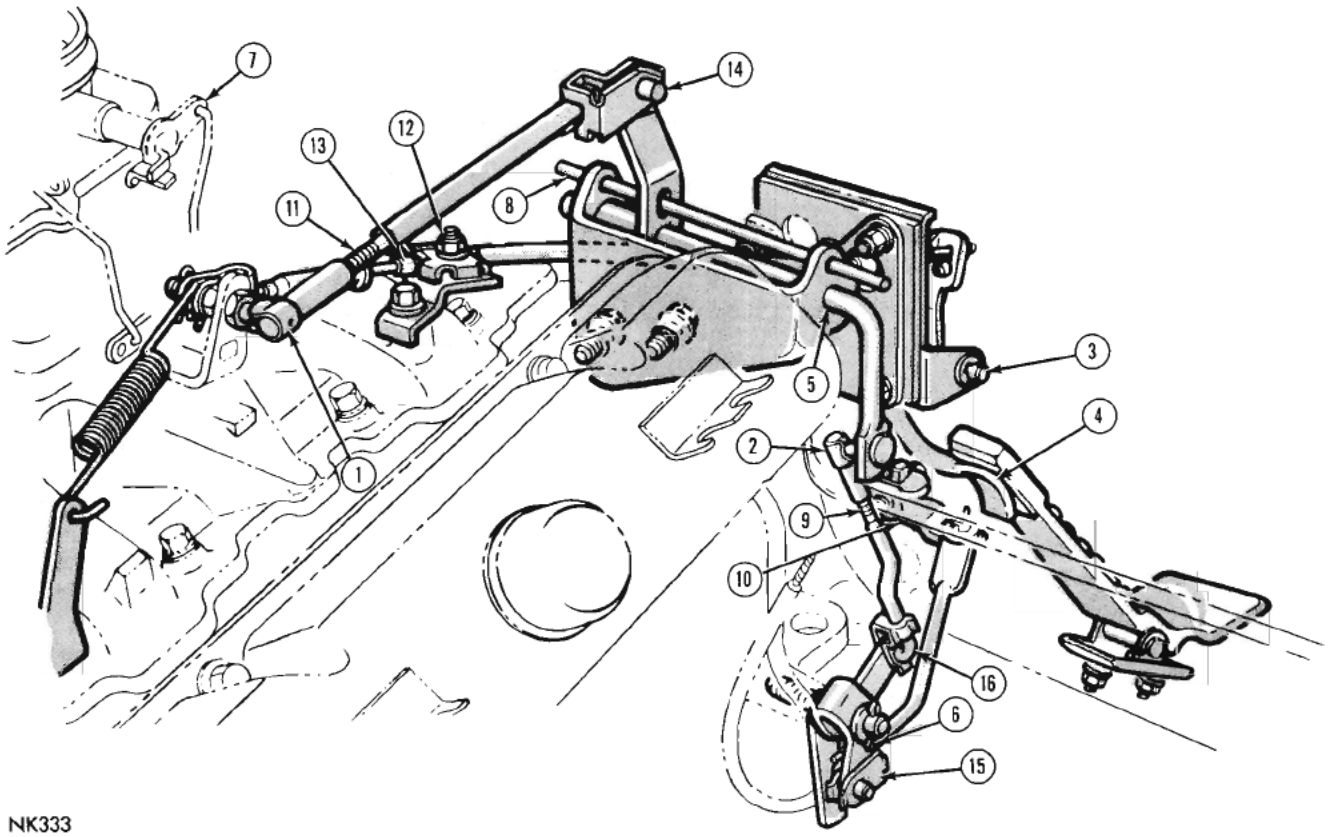

Fig. 5—Throttle Linkage Adjustment (Model AV-2, with 273 Cu. In. Eng.)

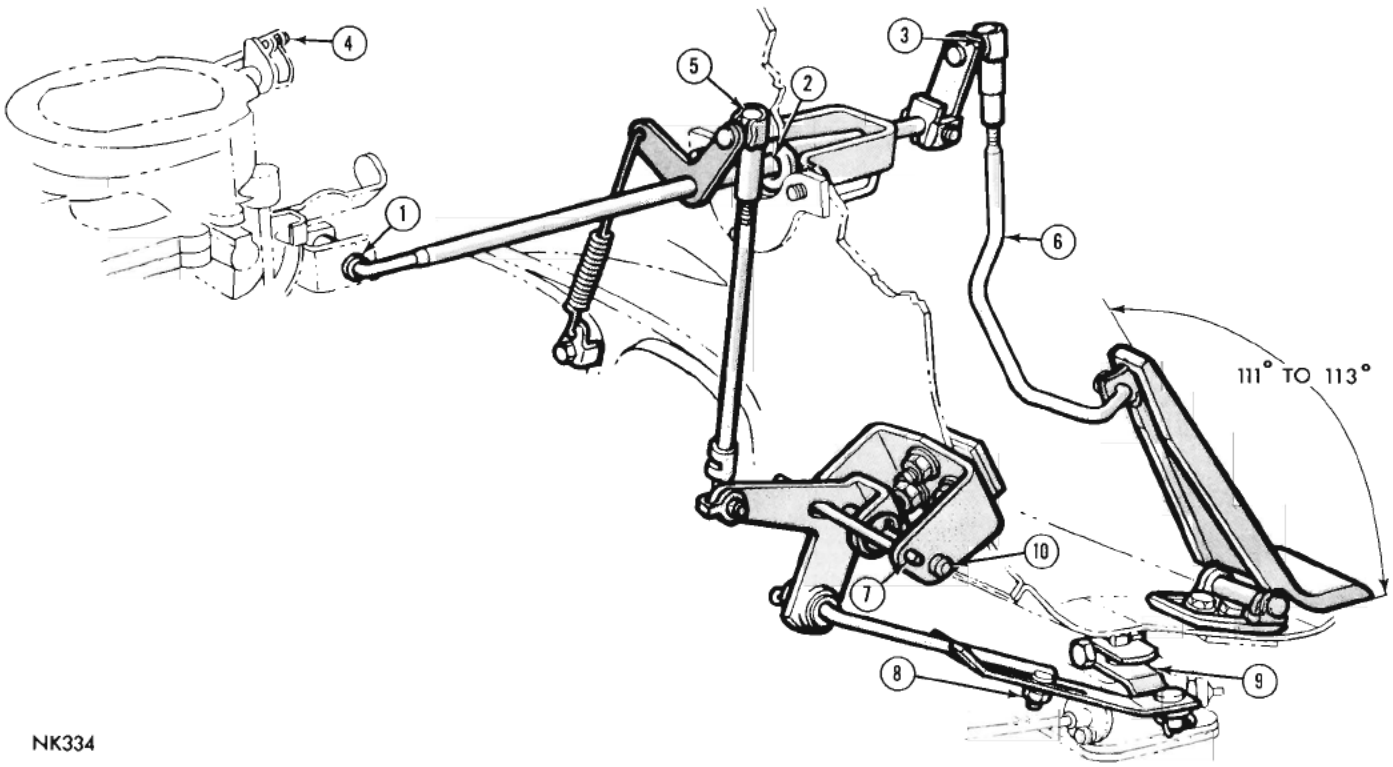

Fig. 6—Throttle Linkage Adjustment (Model AV-1, with 170-225 Cu. In. Eng.)

(9) Loosen the cable clamp nut [12], then adjust the position of the cable housing ferrule [13] in the clamp so that all slack is removed from the cable with the carburetor at curb idle. To remove slack from the cable, move the ferrule [13] in the clamp in the direction **away** from the carburetor lever.

(10) Back off ferrule [13] ¼ inch. This provides ¼ inch cable slack at idle. Tighten cable clamp nut [12].

(11) Route cable so that it does not interfere with the transmission rod throughout its full travel.

(12) Connect choke rod [7] or remove blocking fixture.

MANUAL TRANSMISSION (Fig. 5)

(Model AV-2 with 273 Cu. In. Eng.)

(1) Apply a thin film of multi-purpose grease to both ends of the accelerator shaft [3] where it turns in the bracket, and bottom side of the pedal [4] where it contacts accelerator shaft lever.

(2) Disconnect choke [7] at carburetor or block choke valve in full open position. Open throttle slightly to release fast idle cam, then return carburetor to curb idle.

(3) Loosen the cable clamp nut [12], then adjust the position of the cable housing ferrule [13] in the clamp so that all slack is removed from the cable with the carburetor at curb idle. To remove slack from the cable, move the ferrule [13] in the clamp in the direction **away** from the carburetor lever.

(4) Back off ferrule [13] ¼ inch. This provides ¼ inch cable slack at idle. Tighten cable clamp nut [12].

(5) Connect choke rod [7] or remove blocking fixture.

AUTOMATIC TRANSMISSION (Fig. 6)

(Model AV-1 with 170 or 225 Cu. In. Eng.)

(1) Apply a thin film of multi-purpose grease on the outside surface of carburetor lever isolator [1], and torque shaft plastic bushing [2], also the torque shaft ball stud [3] and bellcrank pin [10].

(2) Disconnect the transmission intermediate rod ball socket [5] from the bellcrank ball end.

(3) Disconnect choke at carburetor [4] or block choke valve in full open position. Open throttle slightly to release fast idle cam, then return throttle to curb idle.

(4) Loosen lock nut [8] in the transmission rod, insert a $^{3}/_{16}$ inch diameter rod [7] approximately 4 inches long in the holes provided in the transmission rod bellcrank bracket and lever assembly.

(5) Move the transmission lever [3] forward against the stop and tighten the transmission rod lock nut [8].

(6) Disconnect the top end of the accelerator pedal rod [6]. Adjust the length of this rod to provide a pedal angle of 111° to 113°. To increase pedal angle, increase the length of this rod by means of the screw adjustment. Reinstall the top end of the rod [6].

(7) Remove the $^{3}/_{16}$ inch diameter rod [7] from the transmission rod bracket and lever assembly. Adjust the length of the transmission bellcrank to torque shaft rod by means of the screw adjustment at top end. The correct rod length allows the ball socket to line up with the ball end when the rod is held upward against the transmission stop.

(8) Install the ball socket on torque shaft lever ball end. [5].

(9) Connect choke rod [4] or remove blocking fixture.

MANUAL TRANSMISSION (Fig. 6)

(Model AV-1 with 170 or 225 Cu. In. Eng.)

(1) Apply a thin film of multi-purpose grease on the outside surface of carburetor lever isolater [1], and torque shaft plastic bushing [2], also the torque shaft ball stud [3].

(2) Disconnect choke at carburetor [4] or block choke valve in full open position. Open throttle slightly to release fast idle cam, then return throttle to curb idle.

(3) Disconnect the top end of the accelerator pedal rod [6]. Adjust the length of this rod to provide a pedal angle of 111° to 113°. To increase pedal angle, increase the length of this rod by means of the screw adjustment. Reinstall the top end of the rod [6]. Connect the choke [4] rod or remove the blocking fixture.

PART 9

FUEL PUMP AND TANK

FUEL PUMP

Description

Three different models of fuel pumps are used in production. The same basic design applies to all three models. The service procedures for testing are the same.

Fuel pump model MS-3674S, shown in (Fig. 1), is used exclusively on the 170/225 cubic inch 6 cylinder engine. Model MS-3673S, shown in (Fig. 2) is used on the 273-318 cubic inch V-8 engine. Model MS-3672S, shown in (Fig. 3), is used on the 361-383-426 cubic inch engine.

The fuel pumps are driven by an eccentric cam that is cast on the camshaft in the 170/225 and 361-383-426 cubic inch engines, or by a pressed steel eccentric cam mounted on the gear end of the camshaft in the 273-318 cubic inch engine.

As the camshaft rotates, the eccentric cam presses down on the pump rocker arm. (On the 361-383-426 cubic inch engine, a push rod operates between the camshaft and the fuel pump rocker arm.) This action lifts the pull rod and diaphragm upwards against the fuel pump main spring, thus creating a vacuum in the valve housing and opens the inlet valve and fuel is drawn into the valve housing chamber. On the return stroke the main spring forces the diaphragm to the **down** position, which closes the inlet valve and expels the fuel in the valve housing chamber through the outlet valve, to the fuel filter and the carburetor.

The fuel pump is of the pressed steel type and cannot be disassembled for service. If a pump malfunction occurs, remove the old pump and install a new one.

The fuel filters (ceramic or paper) should be changed every 20,000 miles, to insure having an unrestricted flow of fuel at all times. **Do not attempt to clean.**

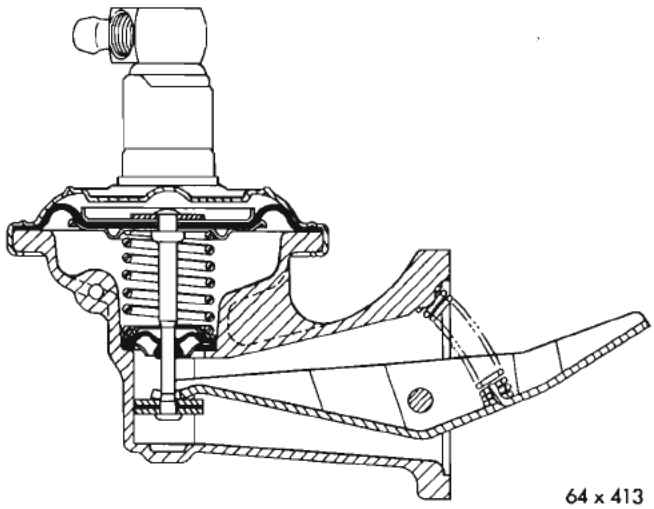

Fig. 1—Fuel Pump Assembly (170-225 Cu. In. Engine)

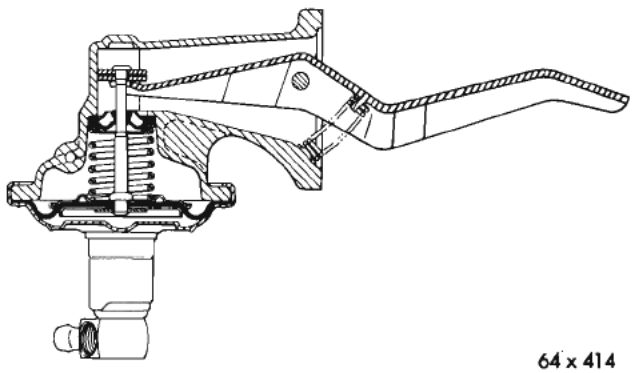

Fig. 2—Fuel Pump Assembly (273-318 Cu. In. Engine)

TESTING FUEL PUMPS (On the Engine)

If the fuel pump fails to supply fuel properly to the carburetor, the following tests should be made before removing the fuel pump from the vehicle.

If leakage is not apparent, test the pump for pressure.

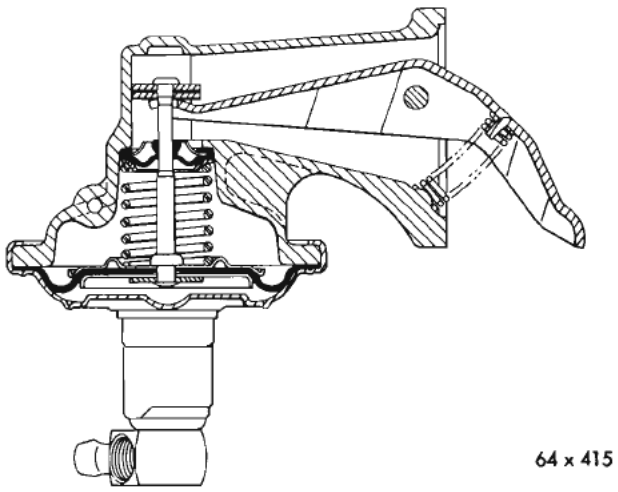

Fig. 3—Fuel Pump Assembly (361, 383 and 426 Cu. In. Eng.)

Pressure Test

(1) Insert a "T" fitting in the fuel line at the carburetor, as shown in (Fig. 4).

(2) Connect a 6 inch piece of hose between the "T" fitting and gauge Tool C-3411. (The hose should not exceed 6 inches. A longer hose may collect fuel and the additional weight of the fuel would be added to the pressure of the pump and result in an inaccurate reading).

(3) Vent the pump for a few seconds (this relieves the air trapped in the fuel chamber). If this is not done, the pump will not operate at full capacity and a low pressure reading will result.

(4) Connect a tachometer, then start the engine and run at 500 rpm. The reading should be from 3½ to 5 psi (or from 5 to 7 psi, depending on pump) and remain constant or return to zero, very, very slowly when the engine is stopped. An instant drop to zero indicates a leaky outlet valve. 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 main spring is too strong.

Vacuum Test

The vacuum test should be made with the fuel line disconnected from the carburetor. (This will allow the pump to operate at full capacity, which it must do to prime a dry carburetor). The vacuum reading should be at least 10 inches of vacuum at 500 r.p.m. with the fuel line disconnected at the carburetor.

Volume Test

The fuel pump should supply 1 quart of fuel in 1 minute or less at 500 rpm.

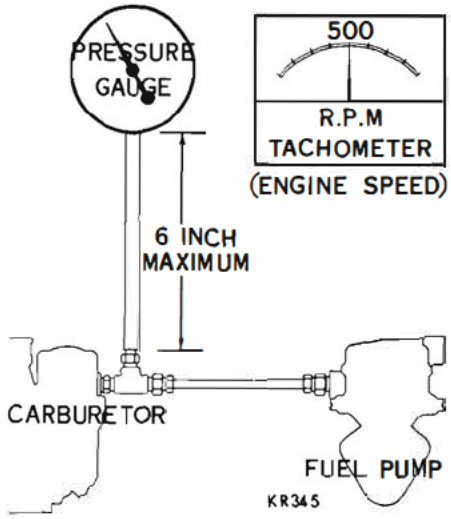

Fig. 4—Pressure Testing the Fuel Pump

Inlet Valve Test

To test the inlet valve, connect a vacuum gauge on the inlet fitting while the line is disconnected:

(1) Start the engine or crank over with starting motor. There should be a noticeable vacuum present, not alternated by blowback.

(2) If blowback is present, the inlet valve is not seating properly and a **new** pump should be installed.

If the fuel pump does not perform to the above test requirements, the fuel pump should be removed from the vehicle.

COOLING SYSTEM

MODEL APPLICATION	AV-1 170-225 Cu. In.	AV-2 273 Cu. In.	AR-1 225 Cu. In.	AR-2 273-318 Cu. In.	AR-2 361-383 Cu. In.	AR-2 426 Cu. In.	AP-1 225 Cu. In.	AP-2 318 Cu. In.	AP-2 383 Cu. In.	AP-2 426 Cu. In.
CAPACITY (Quarts)										
With Heater	12 13	18	13	18 21	17 17	17	13	21	17	17
Without Heater	11 12	17	12	17 20	16 16	16	12	20	16	16
RADIATOR TYPE	Tube and Spacer									
TRANSMISSION OIL COOLER										
Type	Concentric Tube									
Location	Radiator Bottom Tank									
Size	10"	10"	10"	10"	10"	12"	10"	10"	10"	12"
RADIATOR PRESSURE CAP										
Type	Pressure Vent									
Pressure Setting	12-15 PSI. Std. 15-16 PSI. A/C									
FAN										
Diameter—No. Blades	16"-4	17"-6	17"-4	18"-4	18"-4	18"-7	17"-4	18"-4	18"-4	18½"-7
A/C	17"-6	17"-7	18"-4	18"-7	18"-7	N.A.	18"-4	18½"-7	18½"-7	N.A.
FAN SPACER										
Thickness Std.	.90"	2.20"	1.40" NONE*	2.20"	1.40"	NONE	2.00" .90"*	2.20"	1.72"	NONE
A/C	.90"	NONE	1.24"	2.00"	NONE	N.A.	1.60"	NONE	NONE	N.A.
FAN DRIVE										
Silicone Fluid Filled—										
Thermal Control	NONE	A/C only	NONE	NONE	A/C only	NONE	NONE	A/C only	A/C only	NONE
Torque Control	NONE	NONE	NONE	NONE	NONE	Yes	NONE	NONE	NONE	Yes
THERMOSTAT										
Type	Pellet									
Setting	177°-184°F.									
RADIATOR FAN SHROUD										
Standard	NONE	NONE	NONE	NONE	NONE	BOX	NONE	NONE	NONE	BOX
A/C	BOX	BOX	RING	BOX	BOX	N.A.	BOX	BOX	BOX	N.A.
WATER PUMP TYPE	Centrifugal Ball Bearing									
IMPELLER SIZE Std.	3.50" 6 Blade	4.20" 10 Blade	3.50" 6 Blade	4.20" 10 Blade	4.38" 10 Blade	3.67" 6 Blade	3.50" 6 Blade	4.20" 10 Blade	4.38" 10 Blade	3.67" 6 Blade
A/C	3.50" 6 Blade	3.50" 6 Blade	3.50" 6 Blade	4.20" 10 Blade	3.67" 6 Blade	N.A.	3.50" 6 Blade	3.50" 6 Blade	3.67" 6 Blade	N.A.

A/C—Air Conditioning

*With A-727 transmission only

COOLING SYSTEM—(Continued)

ACCESSORY BELT DRIVES

TORQUE METHOD

Torque (Ft.-Lbs.) to be applied to components

ACCESSORY	USED BELT*					NEW BELT				
MODEL APPLICATION	170 Cu. In.	225 Cu. In.	273 Cu. In.	318 Cu. In.	361-383 413-426 Cu. In.	170 Cu. In.	225 Cu. In.	273 Cu. In.	318 Cu. In.	361-383 413-426 Cu. In.
POWER STEERING BRACKET										
Solid Bracket	45	45		50	55	80	80		85	90
Self Tightening					45					45
ALTERNATOR										
With Air Conditioning			45	30	40			70	50	60
			30****	45**				50****	70 **	
Without Air Conditioning	15	15	30	30	40	20	20	50	50	60
				25**					35**	
					30***					40***
A/C IDLER BRACKET	25	25		55		35	35		75	
FAN IDLER			50		35			85		50

*Any belt that has operated for a minimum of a half-hour is considered to be used.
**"C" Body only.
***"RB" Engine only.
****"B" Body only.

BELT DEFLECTION METHOD

DEFLECTION (INCHES) TO BE APPLIED AT MIDPOINT OF BELT SEGMENT UNDER A 5 LB. LOAD—SEE FIGURE 14

Accessory	*Used Belt*					*New Belt*				
	170 Cu. In.	225 Cu. In.	273 Cu. In.	318 Cu. In.	361-383 426 Cu. In.	170 Cu. In.	225 Cu. In.	273 Cu. In.	318 Cu. In.	361-383 426 Cu. In.
POWER STEERING	1/8	1/8	1/8	1/8	3/16	1/16	1/16	1/16	1/16	1/8
FAN BELT IDLER	—	—	—	—	1/8	—	—	—	—	1/16
ALTERNATOR										
Without A/C	1/4	1/4	1/4	1/4	1/4	5/32	1/8	1/8	1/8	1/8
With A/C	—	1/4	1/4*	1/4*	3/8	1/8	1/8	1/8*	1/8*	1/4
	—	—	3/8**	3/8**	—	—	—	1/4**	1/4**	—

*Single Belt
**Dual Belt

ELECTRICAL

BATTERY

Model Usage	AV-1 With 170 Cu. In. Engine Standard Equipment	AV-1 With 170 Cu. In. Engine Special Equipment	AV-1 With 225 Cu. In. Engine AP-1, AP-2, AR-1 AV-2, AR-2 With 225 Cu. In., 273 Cu. In. or 318 Cu. In. Engines Standard Equipment
Capacity (Ampere Hours)	38	48	48
Voltage	12	12	12
Number of Plates Per Cell	7	9	9
Ground Terminal	Negative	Negative	Negative
Model Identification Number	20-HB-38	24-MB-48	24-MB-48

Model Usage	AR-2 With 361 Cu. In. Engine Standard Equipment	AR-2, AP-2 With 383 Cu. In. Engine With 413 Cu. In. Engine AP-2, AR-2 With 426 Cu. In. Engine Standard Equipment	AV-1 With 170 or 225 Cu. In. Engine AR-1, AP-1 With 225 Cu. In. Engine AV-2, AR-2 With 273 Cu. In. Engine AR-2, AP-2 With 318 Cu. In. Engine AR-2 With 361 Cu. In. Engine
Capacity (Ampere Hours)	59	70	70
Voltage	12	12	12
Number of Plates Per Cell	11	13	11
Ground Terminal	Negative	Negative	Negative
Model Identification Number	24-MB-59	27-MB-70	24-MB-70R

STARTING MOTOR

(Reduction Gear Type)

(All Models Except Models Equipped With the 170 Cu. In. Engine)

Starting Motor Identification Number	2095150
Make	Chrysler Built
Voltage	12
No. of Fields	4 (3 Series, 1 Shunt)
No. of Poles	4
Brushes	4
Spring Tension	32 to 36 Ounces
Drive	Overrunning Clutch
End Play	.010"-.045"
Free-Running Test	
Voltage	11
Amperage Draw Maximum	90
Speed RPM	1925 to 2400
Lock-Resistance Test	
Voltage	4
Amperage Draw	400 to 450
Solenoid Switch	
Pull-In Coil	14.4-16.0 Amps. @ 6.0 Volts
Hold-In Coil	11.5-12.6 Amps. @ 6.0 Volts

(Reduction Gear Type)

(All Models Equipped With the 170 Cu. In. Engine)

Starting Motor Identification Number	2098500
Make	Chrysler Built
Voltage	12
No. of Fields	4 (4 Series)
No. of Poles	4
Brushes	4
Spring Tension	32 to 36 Ounces
Drive	Overrunning Clutch
End Play	.010"-.045"
Free-Running Test	
Voltage	11
Amperage Draw Maximum	90
Speed RPM	2950
Lock-Resistance Test	
Voltage	4
Amperage Draw	340 to 420
Solenoid Switch	
Pull-In Coil	14.4-16.0 Amps. @ 6.0 Volts
Hold-In Coil	11.5-12.6 Amps. @ 6.0 Volts

STARTING MOTOR—(Continued)

(Direct Drive)

(Taxi With 11 Inch Clutch and 225 Cu. In. Engine)

Starting Motor Identification Number	1889100
Make	Chrysler Built
Voltage	12
No. of Fields	4 (4 Series)
No. of Poles	4
Brushes	4
Spring Tension	32 to 36 Ounces
Drive	Solenoid Shift Overrunning Clutch
End Play	.005" Minimum
Free-Running Test	
Voltage	11
Amperage Draw	78 Amps. Maximum
Minimum Speed rpm	3800 rpm
Stall Torque Test	
Foot-Pounds	8.5
Voltage	4
Solenoid Switch	
Pull-In Coil	20.0 to 22.2 Amps. @ 6.0 Volts
Hold-In Coil	11.2 to 12.4 Amps. @ 6.0 Volts

ALTERNATOR AND VOLTAGE REGULATOR

ALTERNATOR

ALTERNATORS	
Rotation	Clockwise at Drive End
Voltage	12 Volt System
Current Output	Design Controlled
Voltage Output	Limited by Voltage Regulator
Brushes (Field)	2
Condenser Capacity	.50 Microfarad or minus 20%
Field Current Draw—	
Rotating Rotor by Hand @ 12 Volts	2.38 to 2.75 Maximum amperes
Current Output—	
Standard AV-1, With 170 or 225 Cu. In. Engine	26 plus or minus 3 amperes*
Standard All Others	34.5 plus or minus 3 amperes*
Special Equipment, Heavy Duty and/or Air Conditioning	39 plus or minus 3 amperes*

*Plus or minus three ampere tolerance is provided to allow for temperature variation. Current output is measured at 1250 engine RPM and 15 volts. Voltage is controlled by variable load (carbon pile) across the battery.

ALTERNATOR VOLTAGE REGULATOR

Alternator Voltage Regulator Identification Number	2098300
Volts	12
Ground Polarity	Negative

ALTERNATOR VOLTAGE REGULATOR—(Continued)

Point Gap	.014 inch plus or minus .002 inch
Air Gap	.048 to .052 inch nominal setting**

**Measure gap with gauge back of stop. Contacts closed with .052 inch gauge installed. Contacts open with .048 inch gauge installed.

Temperature in Degrees	47°F.	70°F.	93°F.	117°F.	140°F.	163°F.
Voltage Setting:						
Minimum Setting	13.7 to	13.6 to	13.5 to	13.4 to	13.3 to	13.2 to
Maximum Setting	14.6	14.5	14.4	14.3	14.2	14.1

IGNITION SYSTEM

VEHICLE MODEL APPLICATION	AV1 (Manual Transmission)	AV1 (Automatic Transmission)
Engine Displacement	170 Cu. In.	170 Cu. In.
Distributor Identification No.—Chrysler Built	2444255	2444256
Advance—Automatic (Distributor Degrees at Distributor RPM)	0° @ 375 to 525 0° to 2.5° @ 525 8° to 10° @ 1010 12.5° to 14.5° @ 2200	0° @ 325 to 475 0° to 7° @ 475 6° to 8° @ 600 12.5° to 14.5° @ 2200
Advance—Vacuum (Distributor Degrees at Inches of Mercury)	0° @ 5" to 7.1" 4° to 7° @ 9.2" 8.5° to 11.5° @ 12"	0° @ 5" to 7.1" 3° to 6° @ 8.5" 6° to 8.5° @ 10"
Breaker Point Gap	.017" to .023"	
Dwell Angle	40° to 45°	
Breaker Arm Spring Tension	17 to 20 oz.	
Condenser Capacity	.25 to .285 mfd.	
Shaft Side Play (New or Rebuilt)	.000" to .003"*	
Shaft End Play (After Assembly)	.003" to .017"	
Rotation	Clockwise	
Timing	2½° BTC	
Spark Plug Type	N14Y-Champion or P-6-6P Mopar	
Size	14MM-¾" Reach	
Gap	.035"	
Firing Order	1-5-3-6-2-4	
Coil	Chrysler—Prestolite	Chrysler—Essex
Identification Number	2444242	2444241
Primary Resistance @ 70-80°F.	1.65 to 1.79 ohms	1.4 to 1.55 ohms
Secondary Resistance @ 70-80°F.	94 to 11700 ohms	9200 to 10600 ohms
Ballast Resistor—Identification No.—Chrysler Built	2095501	
Resistance @ 70-80°F.	0.5-0.6 ohms	
Current Draw (Coil and ballast resistor in the circuit) Engine Stopped	3.0 Amperes	
Engine Idling	1.9 Amperes	

*Service wear tolerance should not exceed .006 inch.

IGNITION SYSTEM—(Continued)

VEHICLE MODEL APPLICATION	AP1, AR1, AV1 Manual Transmission	AP1, AR1, AV1 Automatic Transmission
Engine Displacement	225 Cu. In.	225 Cu. In.
Identification Number—Chrysler Built	2444907	2444648
Advance—Automatic (Distributor Degrees at Distributor RPM)	0° @ 325 to 475 0° to 2.5° @ 475 7.5° to 9.5° @ 960 10.5° to 12.5° @ 2200	0° @ 325 to 475 0° to 2.5° @ 475 7.5° to 9.5° @ 960 10.5° to 12.5° @ 2200
Advance—Vacuum (Distributor Degrees at Inches of Mercury)	0° @ 6.9" to 9.1" 3° to 5° @ 12.5" 5.25° to 7.5° @ 15"	0° @ 4.9" to 7.1" 3° to 5° @ 10.5" 5.25° to 7.5° @ 13"
Breaker Point Gap	.017" to .023"	
Dwell Angle	40° to 45°	
Breaker Arm Spring Tension	17 to 20 oz.	
Condenser Capacity	.25 to .285 mfd.	
Shaft Side Play (New or Rebuilt)	.000" to .003"*	
Shaft End Play (After Assembly)	.003" to .017"	
Rotation	Clockwise	
Timing	2½° BTC	
Spark Plug Type	N14Y-Champion or P-6-6P MOPAR	
Size	14MM-¾ Reach	
Gap	.035"	
Firing Order	1-5-3-6-2-4	
Coil	Chrysler—Prestolite	Chrysler—Essex
Identification Number	2444242	2444241
Primary Resistance @ 70-80°F.	1.65 to 1.79 ohms	1.4 to 1.55 ohms
Secondary Resistance @ 70-80°F.	9400 to 11700 ohms	9200 to 10600 ohms
Ballast Resistor—Identification No.—Chrysler Built	2095501	
Resistance @ 70-80°F.	0.5 to 0.6 ohms	
Current Draw (Coil and ballast resistor in the circuit) Engine Stopped	3.0 Amperes	
Engine Idling	1.9 Amperes	

*Service wear tolerance should not exceed .006 inch.

VEHICLE MODEL APPLICATION	AR2, AV2 (Manual Transmission 2-Barrel Carburetor)	AR2, AV2 (Automatic Transmission 2-Barrel Carburetor)	AR2, AV2 (Manual or Automatic Trans. 4-Barrel Carburetor)
Engine Displacement	273 Cu. In.	273 Cu. In.	273 Cu. In.
Distributor Identification No.—Chrysler Built	2444794	2444795	2444853
Prestolite			1BS-4013
Advance—Automatic Distributor Degrees at Distributor RPM	0° @ 300 to 450 0° to 2.5° @ 450 7.5° to 9.5° @ 870 10.5° to 12.5° @ 1750	0° @ 325 to 475 0° to 2° @ 475 5° to 7° @ 830 8° to 10° @ 1750	0° @ 325 to 475 0° to 2° @ 475 4° to 6° @ 750 8° to 10° @ 2300
Advance—Vacuum (Distributor Degrees at Inches of Mercury)	0° @ 7" to 9" 6° to 9° @ 12" 10.5° to 13.5° @ 15"	0° @ 7" to 9" 6° to 9° @ 12" 10.5° to 13.5° @ 15"	0° @ 7" to 9" 4° to 7° @ 11" 8.5° to 11.5° @ 13.5"
Breaker Point Gap	.014" to .019"	.014" to .019"	.014" to .019"
Dwell Angle	28° to 33°	28° to 33°	one set points 27° to 31° both sets points 36° to 40°

IGNITION SYSTEM—(Continued)

VEHICLE MODEL APPLICATION	AR2, AV2 (Automatic Transmission 2-Barrel Carburetor)	AR-2, AV2 (Manual Transmission 2-Barrel Carburetor)	AR2, AV2 (Manual or Automatic Trans. 4-Barrel Carburetor)
Breaker Arm Spring Tension	17 to 20 oz.	17 to 20 oz.	17 to 21.5 oz.
Condenser Capacity	.25 to .285 mfd.	.25 to .285 mfd.	.25 to .285 mfd.
Shaft Side Play (New or Rebuilt)	.000" to .003"	.000" to .003"*	.000" to .003"*
Shaft End Play (After Assembly)	.003" to .017"	.003" to .017"	.003" to .010"
Rotation	Clockwise	Clockwise	Clockwise
Timing	5° BTC	10° BTC	10° BTC
Spark Plug Type	N14Y Champion or P-6-6-P Mopar	N14Y Champion or P-6-6-P Mopar	N14Y Champion P-6-6-P Mopar
Size	14MM-¾" Reach	14MM-¾" Reach	14MM-¾" Reach
Gap	.035"	.035"	.035"
Firing Order	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2
Coil	Chrysler—Prestolite		Chrysler—Essex
Identification Number	2444242		2444241
Primary Resistance @ 70-80°F.	1.65 to 1.79 ohms		1.41 to 1.55 ohms
Secondary Resistance @ 70-80°F.	9400 to 11700 ohms		9200 to 10600 ohms
Ballast Resistor—Identification No.—Chrysler Built		2095501	
Resistance @ 70-80°F.		0.5 to 0.6 ohms	
Current Draw (Coil and Ballast resistor in the circuit) Engine Stopped		3.0 Amperes	
Engine Idling		1.9 Amperes	

*Service wear tolerance should not exceed .006 inch.

VEHICLE MODEL APPLICATION	AP2, AR2 (With Manual Transmission and 2-Barrel Carburetor)	AP2, AR2 (With Automatic Transmission and 2-Barrel Carburetor)
Engine Displacement	318 Cu. In.	318 Cu. In.
Distributor Identification No.—Chrysler Built	2444258	2444259
Advance—Automatic Distributor		
Degrees at Distributor RPM	0° @ 320 to 480	0° @ 330 to 570
	0° to 2° @ 480	0° to 2° @ 570
	4.5° to 6.5° @ 850	2° to 4° @ 800
	10.5° to 12.5° @ 2300	8° to 10° @ 2300
Advance—Vacuum (Distributor		
Degrees at Inches of Mercury)	0° @ 8" to 10"	0° @ 8" to 10"
	5° to 8° @ 13"	5° to 8° @ 13"
	9° to 12° @ 16"	9° to 12° @ 16"
Breaker Point Gap	.014" to .019"	.014" to .019"
Dwell Angle	28° to 33°	28° to 33°
Breaker Arm Spring Tension	17 to 20 oz.	17 to 20 oz.
Condenser Capacity	.25 to .285 mfd.	.25 to .285 mfd.
Shaft Side Play (New or Rebuilt)	.000" to .003"*	.000" to .003"*
Shaft End Play (After Assembly)	.003" to .017"	.003" to .017"
Rotation	Clockwise	Clockwise
Timing	5° BTC	10° BTC
Spark Plug Type	J14Y-Champion or P-3-6P Mopar	J14Y-Champion or P-3-6P Mopar
Size	14MM-⅜" Reach	14MM-⅜" Reach
Gap	.035"	.035"
Firing Order	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2
Coil	Chrysler—Prestolite	Chrysler—Essex
Identification Number	2444242	2444241
Primary Resistance @ 70-80°F.	1.65 to 1.79 ohms	1.41 to 1.55 ohms
Secondary Resistance @ 70-80°F.	9400 to 11700 ohms	9200 to 10600 ohms

IGNITION SYSTEM—(Continued)

VEHICLE MODEL APPLICATION	AP2, AR2 (With Manual Transmission and 2-Barrel Carburetor)	AP2, AR2 (With Automatic Transmission and 2-Barrel Carburetor)
Ballast Resistor—Indentification No.—Chrysler Built	2095501	
Resistance @ 70-80°F.	0.5-0.6 ohms	
Current Draw (Coil and ballast resistor in the circuit) Engine Stopped	3.0 Amperes	
Engine Idling	1.9 Amperes	

*Service wear tolerance should not exceed .006 inch.

VEHICLE MODEL APPLICATION	AR2 361 Cu. In. Engine 2-Barrel Carb. / AP2 383 Cu. In. Engine 2-Barrel Carb.
Engine Displacement	361 or 383 Cu. In.
Distributor Identification No.—Chrysler Built	2444676
Advance—Automatic Distributor Degrees at Distributor RPM (PF 1046)	0° @ 250 to 450 0° to 2° @ 450 2.5° to 4.5° @ 700 10.5° to 12.5° @ 2150
Advance—Vacuum (Distributor Degrees at Inches of Mercury) (PF 4217)	0° @ 4.5" to 8" 6° to 9° @ 12" 9° to 12° @ 14.4"
Breaker Point Gap	.014" to .019"
Dwell Angle	28° to 32°
Breaker Arm Spring Tension	17 to 20 oz.
Condenser Capacity	.25 to .285 mfd.
Shaft Side Play (New or Rebuilt)	.000" to .003"*
Shaft End Play (After Assembly)	.003" to .017"
Rotation	Counter-Clockwise
Timing	10° BTC
Spark Plug Type	J14Y-Champion or P-3-6P MOPAR
Size	14MM-⅜" Reach
Gap	.035"
Firing Order	1-8-4-3-6-5-7-2

Coil	Chrysler—Prestolite	Chrysler—Essex
Identification Number	2444242	2444241
Primary Resistance @ 70-80°F.	1.65 to 1.79 ohms	1.41 to 1.55 ohms
Secondary Resistance @ 70-80°F.	9400 to 11700 ohms	9200 to 10600 ohms

Ballast Resistor—Identification No.—Chrysler Built	2095501
Resistor @ 70-80°F.	0.5 to 0.6 ohms
Current Draw (Coil and ballast resistor in the circuit) Engine Stopped	3.0 Amperes
Engine Idling	1.9 Amperes

*Service wear tolerance should not exceed .006 inch.

VEHICLE MODEL APPLICATION	AP2, AR2 426 Cu. In. Engine 4-Barrel Carb. Hi Performance
Distributor Identification No.—Chrysler	2444684
Prestolite	1BS-4006 L

IGNITION SYSTEM—(Continued)

VEHICLE MODEL APPLICATION	AP2, AR2 426 Cu. In. Engine 4-Barrel Carb. Hi Performance	
Advance—Automatic Distributor		
Degrees at Distributor RPM	0° @ 260 to 540	
	0° to 2° @ 540	
	3.5° to 5.5° @ 1050	
	7° to 9° @ 2400	
Advance—Vacuum (Distributor		
Degrees at Inches of Mercury)	0° @ 6" to 9"	
	4.5° to 7.5° @ 12"	
	7.5° to 10.5° @ 14.3"	
Breaker Point Gap	.014" to .019"	
Dwell Angle	One Set Points 27° to 31°	
	Both Sets Points 36° to 40°	
Breaker Arm Spring Tension	17 to 21.5 oz.	
Cendenser Capacity	.25 to .285 mfd.	
Shaft Side Play (New or Rebuilt)	.000" to .003"*	
Shaft End Play (After Assembly)	.003" to .010"	
Rotation	Counter-Clockwise	
Timing	10° BTC	
Spark Plug Type	J10Y-Champion or P-3-3P MOPAR	
Size	14MM-⅜" Reach	
Gap	.035"	
Firing Order	1-8-4-3-6-5-7-2	
Coil	Chrysler—Prestolite	Chrysler—Essex
Identification Number	2444242	2444241
Primary Resistance @ 70-80°F.	1.65 to 1.79 ohms	1.41 to 1.55 ohms
Secondary Resistance @ 70-80°F.	9400 to 11700 ohms	9200 to 10600 ohms
Ballast Resistor—Identification No.—Chrysler Built	2095501	
Resistance @ 70-80°F.	0.5 to 0.6 ohms	
Current Draw (Coil and ballast resistor		
in the circuit) Engine Stopped	3.0 Amperes	
Engine Idling	1.9 Amperes	

*Service wear tolerance should not exceed .006 inch.

ENGINE—(Continued)

8-CYLINDER ENGINES

	FURY	V-800	Commando	Commando	Commando
ENGINE	"273"	"318"	"361"	"383"	"426"
Type	90° V	90° V	90° V	90° V	90° V
Number of Cylinders	8	8	8	8	8
Bore	3.625"	3.91"	4.125"	4.25"	4.25"
Stroke	3.31"	3.31"	3.375"	3.375"	3.750"
Piston Displacement	273 cu. in.	318 cu. in.	361 cu. in.	383 cu. in.	426 cu. in.
Compression Ratio	9.0 to 1* 10.3 to 1**	9.0 to 1	9.0 to 1	10.0 to 1** 9.2 to 1*	10.3 to 1
Compression Pressure with engine warm spark plugs removed—wide open throttle	120-150 psi* 130-165 psi**	125-155 psi.	125-155 psi	125-155 psi* 130-165 psi**	130-165 psi
Maximum variation between cylinders (any one Engine)	20 psi* 25 psi*	25 psi	20 psi	20 psi* 25 psi**	25 psi
Firing Order	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2
Basic Timing	10° B.T.D.C. 5° B.T.D.C.	10° B.T.D.C. 5° B.T.D.C.	10° B.T.D.C. 10° B.T.D.C.	10° B.T.D.C. 10° B.T.D.C.	10° B.T.D.C. 10° B.T.D.C.
CYLINDER NUMBERING (front to rear)					
Left Bank	1-3-5-7	1-3-5-7	1-3-5-7	1-3-5-7	1-3-4-7
Right Bank	2-4-6-8	2-4-6-8	2-4-6-8	2-4-6-8	2-4-6-8
CYLINDER BLOCK					
Cylinder Bore (standard)	3.625"-3.6270"	3.910"-3-912"	4.1245"-4.1265"	4.2495"-4.2515"	4.2495"-4.2515"
Cylinder Bore Out-of-Round (Max. allowable before reconditioning)	.005"	.005"	.005"	.005"	.005"
Cylinder Bore Taper (Max. allowable before reconditioning)	.010"	.010"	.010"	.010"	.010"
Reconditioning Working Limits (for taper and out-of-round)	.001"	.001"	.001"	.001"	.001"
Maximum Allowable Oversize (cylinder bore)	.040"	.040"	.040"	.040"	.040"
Tappet Bore Diameter	.9050"-9058"	.9050"-.9058"	.9050"-.9058"	.9050"-.9058"	.9050"-.9058"
Distributor Lower Drive Shaft Bushings (press fit in block)	.0005"-.0040"	.0005"-.0040"	.0005"-.0040"	.0005"-.0040"	.0005"-.0040"
Ream to	.4865"-.4880"	.4865"-.4880"	.4865"-.4880"	.4865"-.4880"	.4865"-.4880"
Shaft to Bushing Clearance	.0007"-.0027"	.0007"-.0027"	.0007"-.0027"	.0007"-.0027"	.0007"-.0027"
PISTONS					
Type Material	Autothermic Alloy Tin Coated	Aluminum—Alloy Tin Coated	Autothermic W/Steel Struts	Autothermic W/Steel Struts	Autothermic W/Steel Struts
Clearance in Bore (with .0015 x ½" feeler stock)	5-10 lbs. Pull	5-10 lbs. Pull	Method Not Used	Method Not Used	Method Not Used
Land Clearance (diametral)	.029"-.034"	.029"-.034"	.032".038"	.032"-.038"	.032"-.038"

ENGINE—(Continued)

	"273"	"318"	"361"	"383"	"426"
PISTONS—Continued					
Clearance at Top of Skirt	.0005"-.0015"	.0005"-.0015"	.0005"-.0015"	.0005"-.0015"	.0005"-.0015"
Weight (Std. through .040" oversize)	530 GMS.* 569 GMS.**	592 gms.	717 gms.	770 gms.	770 gms.
Piston Length (overall)	3.19"	3.21"	3.81"	3.84"	3.84"
Ring Groove Depth					
No. 1	.189"	.205"	.214"	.220"	.220"
No. 2	.189"	.205"	.214"	.220"	.220"
No. 3	.187"	.198"	.203"	.208"	.208"
Pistons for Service	Std. .005", .020", .040" Oversize	Std. .005", .020", .040" Oversize	Std. .005", .020", .040" Oversize	Std. .005", .020", .040" Oversize	Std. .005", .020", .040" Oversize
PISTON PINS					
Type	Full Floating	Full Floating	Press Fit in Rod	Press Fit in Rod	Press Fit in Rod
Diameter	.9841"-.9843"	.9842"	1.0935"-1.0937"	1.0935"-1.0937"	1.0935"-1.0937"
Length	2.810"-2.826"	2.995"	3.555"-3.575"	3.555"-3.575"	3.555"-3.575"
Clearance in Piston (Light Thumb Push @ 70°F.)	.0000"-.0005"	.0000"-.0005"	.00045"-.00075"	.00045"-.00075"	.00045"-.00075"
End Play	.004"-.026"	.004"-.026"			
Clearance in Rod	.0000"-.0005"	.0000"-.0005"			
Interference in Rod			.0007"-.0012"	.0007"-.0012"	.0007"-.0012"
Pins for Service	Std. .003", .008" Oversize	Std. .003", .008" Oversize	Standard Only	Standard Only	Standard Only
PISTON RINGS					
Number of Rings per Piston	3	3	3	3	3
Compression	2	2	2	2	2
Oil with Expander	1	1	1	1	1
Piston Ring Gaps	.010"-.020"	.010"-.020"	.013"-.025"	.013"-.025"	.013"-.025"
Compression (Steel Rails)	.015"-.055				
Ring Side Clearance—Top	.0015"-.0030"	.0015"-.0030"	.0015"-.0030"	.0015"-.0030"	.0015"-.0030"
Intermediate	.0015"-.0030"	.0015"-.0030"	.0015"-.0030"	.0015"-.0030"	.0015"-.0030"
Oil (service ring)	.009" Maximum	.009" Maximum	.009" Maximum	.009" Maximum	.009" Maximum
Width of Rings (Compression)	.0775"-.0780"	.0775"-.0780"	.077"-.078"	.077"-.078"	.077"-.078"
(Oil) Steel Rails	.025"	.025"	.025"	.025"	.025"
CONNECTING RODS					
Length (Center to Center)	6.123"	6.123"	6.356"-6.360"	6.356"-6.360"	6.766"-6.770"
Weight (less bearing shells)	726 gms.	726 gms.	812 ± 4 gms.	812 ± 4 gms.	846 ± 4 gms.
Side Clearance (two rods)	.006"-.014"	.006"-.014"	.009"-.017"	.009"-.017"	.009"-.017"
Piston Pin Bore Diameter	1.027"-1.039"	1.027"-1.039"	1.0925"-1.0829"	1.0925"-1.0928"	1.0925"-1.0928"

*With 2 BBl. Carb.
**With 4 BBl. Carb.

ENGINE—(Continued)

		"273"	"318"	"361"	"383"	"426"
CONNECTING ROD BUSHING						
Type		Steel Backed Bronze	Steel Backed Bronze	None	None	None
CONNECTING ROD BEARINGS (Type)		Steel Backed Grid Type	Steel Backed Grid Type	Steel Backed Babbitt	Steel Backed Babbitt	Steel Backed Babbitt
Diameter and Width		2.126" x .842"	2.126" x .842"	2.376"-.927"	2.376" x .927"	2.376" x .927"
Clearance desired		.0005"-.0015"	.0005"-.0015"	.0005"-.0015"	.0005"-.0015"	.0005"-.0015"
Maximum Allowable		.0025"	.0025"	.0025"	.0025"	.0025"
Bearings for Service		Std., .001", .002", .003", .010", .012"	Std., .001", .002", .003", .010", .012"	Std., .001", .002", .003", .010", .012"	Std., .001",.002", .003",.010",.012"	Std., .001", .002", .003", .010", .012"
CRANKSHAFT						
Type		Fully Counter-Balanced	Fully Counter-Balanced	Fully Counter-Balanced	Fully Counter-Balanced	Fully Counter-Balanced
Bearings		Steel Backed Babbitt	Steel Backed Babbitt	Steel Backed Babbitt	Steel Backed Babbitt	Steel Backed Babbitt
Thrust Taken By		No. 3 Main Bearing	No. 3 Main Bearing	No. 3 Main Bearing	No. 3 Main Bearing	No. 3 Main Bearing
End Play		.002"-.007"	.002"-.007"	.002"-.007"	.002"-.007"	.002"-.007"
Maximum Allowable		.010"	.010"	.010"	.010"	.010"
Diametral Clearance Desired		.0005"-.0015"	.0005"-.0015"	.0005"-.0015"	.0005"-.0015"	.0005"-.0015"
Diametrical Clearance Allowed		.0025"	.0025"	.0025"	.0025"	.0025"
Finish at Rear Oil Seal Surface		Diagonal Knurling	Diagonal Knurling	Diagonal Knurling	Diagonal Knurling	Diagonal Knurling
MAIN BEARING JOURNALS						
Diameter		2.4995"-2.5005"	2.4995"-2.5005"	2.6245"-2.6255"	2.6245"-2.6255"	2.7495"-2.7505"
Maximum Allowable Out-of-Round and/or Taper		.001"	.001"	.001"	.001"	.001"
Bearings for Service Available in Standard and the following undersizes		.001", .002", .003", .010", .012"	.001", .002", .003", .010", .012"	.001", .002", .003", .010", .012"	.001", .002", .003", .010", .012"	.001", .002", .003", .010", .012"
CONNECTING ROD JOURNALS						
Diameter		2.124"-2.125"	2.124"-2.125"	2.375"-2.375"	2.374"-2.375"	2.374"-2.375"
Maximum Allowable Out-of-Round and/or Taper		.001"	.001"	.001"	.001"	.001"
CAMSHAFT						
Drive		Chain	Chain	Chain	Chain	Chain
Bearings		Steel Backed Babbitt	Steel Backed Babbitt	Steel Backed Babbitt	Steel Backed Babbitt	Steel Backed Babbitt
Number		5	5	5	5	5
Diametral Clearance		.001"-.003"	.001"-.003"	.001"-.003"	.001"-.003"	.001"-.003"
Maximum Allowable before Reconditioning		.005"	.005"	.005"	.005"	.005"
Thrust Taken By		Thrust Plate	Thrust Plate	Cylinder Block	Cylinder Block	Cylinder Block
End Play		.002"-.006"	.002"-.006"	—	—	—
Maximum Allowable		.010"	.010"	—	—	—
CAMSHAFT JOURNALS						
Diameter	No. 1	1.998"-1.999"	1.998"-1.999"	1.998"-1.999"	1.998"-1.999"	1.998"-1.999"
	No. 2	1.982"-1.983"	1.982"-1.983"	1.982"-1.983"	1.982"-1.983"	1.982"-1.983"
	No. 3	1.967"-1.968"	1.967"-1.968"	1.967"-1.968"	1.967"-1.968"	1.967"-1.968"
	No. 4	1.951"-1.952"	1.951"-1.952"	1.951"-1.952"	1.951"-1.952"	1.951"-1.952"
	No. 5	1.5605"-1.5615"	1.5605"-1.5615"	1.748"-1.749"	1.748"-1.749"	1.748"-1.749"

ENGINE—(Continued)

		"273"		"318"	"361"	"383"		"426"
CAMSHAFT BEARINGS								
Diameter	No. 1	2.000"-2.001"		2.000"-2.001"	2.000"-2.001"	2.000"-2.001"		2.000"-2.001"
	No. 2	1.984"-1.985"		1.984"-1.985"	1.984"-1.984"	1.984"-1.984"		1.984"-1.984"
	No. 3	1.969"-1.970"		1.969"-1.970"	1.969"-1.970"	1.969"-1.970"		1.969"-1.970"
	No. 4	1.953"-1.954"		1.953"-1.954"	1.953"-1.954"	1.953"-1.954"		1.953"-1.954"
	No. 5	1.5625"-1.5635"		1.5625"-1.5635"	1.750"-1.751"	1.750"-1.751"		1.750"-1.751"
VALVE TIMING		2 BBl. Carb.	4 BBl. Carb.	2 BBl. Carb.	2 BBl. Carb.	2 BBl. Carb.	4 BBl. Carb.	4 BBl. Carb.
Intake Opens (BTC)		14°	14°	19°	13°	13°	24°	24°
Intake Closes (ABC)		46°	54°	45°	59°	59°	64°	64°
Exhaust Opens (BBC)		58°	56°	59°	59°	59°	64°	64°
Exhaust Closes (ATC)		2°	12°	1°	13°	13°	24°	24°
Valve Overlap		16°	26°	20°	26°	26°	48°	48°
Intake Valve Duration		240°	248°	244°	252°	252°	268°	268°
Exhaust Valve Duration		240°	248°	240°	252°	252°	268°	268°
TIMING CHAIN								
Number of Links		68		68	50	50		50
Pitch		.375"		.375"	.50"	.50"		.50"
Width		.625"		.625"	.88"	.88"		.88"
TAPPETS								
Type		Mechanical		Mechanical	Hydraulic	Hydraulic		Hydraulic
Body Diameter		.9040"-.9045"		.9040"-.9045"	.9040"-.9045"	.9040"-.9045"		.9040"-.9045"
Clearance in Block		.0005"-.0015"		.0005"-.0015"	.0005"-.0015"	.0005"-.0015"		.0005"-.0015"
Service Tappets Available		Std., .001", .008", .030"		Std., .001", .008", .030"	Std., .001", .008", .030"	Std., .001", .008", .030"		Std., .001", .008", .030"
Operating Clearance (Hot)		.013" Intake		.013" Intake	—	—		—
Clearance Between Valve Stem and Rocker Arm		.021" Exhaust		.021" Exhaust	—	—		—
Pad (Dry Lash)		—		—	.060"-.210"	.060"-210"		.060"-.210"
CYLINDER HEAD								
Valve Seat Run-Out (Maximum)		.002"		.002"	.002"	.002"		.002"
Intake Valve Seat Angle		45°		45°	45°	45°		45°
Seat Width (finish)		.060"-.085"		.060"-.085"	.060"-.085"	.060"-.085"		.060"-.085"
Exhaust Valve Seat Angle		45°		45°	45°	45°		45°
Seat Width (finish)		.040"-.060"		.040"-.060"	.040"-.060"	.040"-.060"		.040"-.060"
Cylinder Head Gasket (Thickness compressed)		.028"		.028"	.022"	.022"		.022"
VALVE GUIDES								
Type		Cast in Head		Cast in Head	Cast in Head	Cast in Head		Cast in Head
Guide Bore Diameter		.374"-.375" Std.		.374"-.375" Std.	.374"-.375" Std.	.374"-.375" Std.		.374"-.375" Std.
VALVES—(INTAKE)								
Head Diameter		1.780"		1.844"	2.08"	2.08"		2.08"
Length (to center of valve face)		5.00"		4.59"	4.87"	4.87"		4.87"
Stem Diameter (Standard)		.372"-.373"		.372"-.373"	.372"-.373"	.372"-373"		.372"-.373"

ENGINE—(Continued)

	"273"	"318"	"361"	"383"	"426"
VALVES—(INTAKE)—Continued					
Stem to Guide Clearance	.001"-.003"	.001"-.003"	.001"-.003"	.001"-.003"	.001"-.003"
Maximum Allowable	.016"***	.016"	.016"***	.016"***	.016"***
Face Angle	45°	45°	45°	45°	45°
Valve for Service	Std., .005", .015", .030" Oversize Stem Diam.	Std., .005", .015", .030" Oversize Stem Diam.	Std., .005", .015", .030" Oversize Stem Diam.	Std., .005", .015", .030" Oversize Stem Diam.	Std., .005", .015", .030" Oversize Stem Diam.
Lift (Zero Lash)	.395"* .415"	.397"	.392" 2 BBl. .430" 4 BBl.	.430"	.430"
VALVES—(EXHAUST)					
Head Diameter	1.563"	1.563"	1.60"	1.60"	1.60"
Length to (center of valve face)	4.45"	4.53"	4.87"	4.87"	4.87"
Stem Diameter (Standard)	.3715"	.3715"	.371"-.372"	.371"-372"	.371"-.372"
Stem to Guide Clearance	.002"-.004"	.002"-.004"	.002"-.004"	.002"-.004"	.02"-.004"
Maximum Allowable	.018***		.018"***	.018"***	.018"***
Face Angle	45°	45°	45°	45°	45°
Valve for Service	Std., .005", .015", .030" Oversize Stem Diam.	Std., .005", .015", .030" Oversize Stem Diam.	Std., .005", .015", .030" Oversize Stem Diam.	Std., .005", .015", .030" Oversize Stem Diam.	Std., .005", .015", .030" Oversize Stem Diam.
Lift (Zero Lash)	.405"* .425**	.403"	.390" 2 BBl. .430" 4 BBl.	.430"	.430"
VALVE SPRINGS					
Number	16	16	16	16	16
Free Length	1.92"* 2.00"**	1.92"	2.34"	2.34" Exhaust 2.21" Intake** 2.34" Intake*	2.34" Exhaust 2.21" Intake** 2.34" Intake*
Load when Compressed to (valve closed)	49-57 lbs. @ $1^{11}/_{16}$"* 78-88 lbs. @ $1^{11}/_{16}$"**	49-57 lbs. @ $1^{11}/_{16}$"	95-105 lbs. @ $1^{55}/_{64}$"	95-105 @ $1^{55}/_{64}$"	95-105 @ $1^{55}/_{64}$"
Load when Compressed to (valve closed)	137-150 lbs. @ $1^{5}/_{16}$"* 170-184 lbs. @ $1^{5}/_{16}$"**	137-15 lbs. @ $1^{5}/_{16}$"	187-203 lbs. @ $^{15}/_{32}$"	187-203 @ $1^{15}/_{32}$"	187-203 @ $1^{15}/_{32}$"
Surge Damper	None	None	None	Intake Only	Intake Only
Valve Springs I.D.	1.00" 1.010"-1.030"**	1.00"	1.010"-1.030"	1.070"-1.090" Intake** 1.010"-1.030" Exhaust 1.010"-1.030" Intake*	1.070"-1.090" Intake** 1.010"-1.030" Exhaust 1.010"-1.030" Intake*
Maximum Allowable Out of Plumb	$^{1}/_{16}$"	$^{1}/_{16}$"	$^{1}/_{16}$"	$^{1}/_{16}$"	$^{1}/_{16}$"
Valve Spring Installed Height (spring seat to retainer)	$1^{5}/_{8}$"-$1^{11}/_{16}$"	$1^{5}/_{8}$"-$1^{11}/_{16}$"	$1^{53}/_{64}$"-$1^{57}/_{64}$"	$1^{53}/_{64}$"-$1^{57}/_{64}$"	$1^{53}/_{64}$"-$1^{57}/_{64}$"
Use $^{1}/_{16}$" Spacer to Reduce Spring Height when Over Specifications					
ROCKER SHAFT ASSEMBLY					
Clearance Between Rocker Arm and Shaft	.001"-.003"	.001"-.003"	—	—	—
Clearance Between Rocker Arm and Bracket	—	.001"-.0045"	—	—	—

*With 2 BBl. Carb. **With 4 BBl. Carb. ***With tools C-3973 & C-3339 using wobble method

ENGINE—(Continued)

	"273"	"318"	"361"	"383"	"426"
ENGINE LUBRICATION					
Pump Type	Rotary Full Pressure	Rotary Full Pressure	Rotary Full Pressure	Rotary Full Pressure	Rotary Full Pressure
Capacity (qts.)	4***	4***	4***	4***	4***
Pump Drive	Camshaft	Camshaft	Camshaft	Camshaft	Camshaft
Minimum Pump Pressure @ 500 R.P.M.	20 PSI	20 PSI	20 PSI	20 PSI	20 PSI
Operating Pressure at 1000 R.P.M.	45-65 lbs.	45-65 lbs.	45-65 lbs.	45-65 lbs.	45-65 lbs.
Pressure Drop Resulting from Clogged Filter	7-9 lbs.	7-9 lbs.	7-9 lbs.	7-9 lbs.	7-9 lbs.
Oil Filter Type	Full-Flow	Full-Flow	Full-Flow	Full-Flow	Full-Flow

***When Filter Element is Replaced Add 1 Quart.

OIL PUMP—INSPECTION LIMITS FOR REPLACEMENT

	273 and 318 Cu. In. Engines	361, 383 and 426 Cu. In. Engines
Oil Pump Cover	.0015 inch or more	.0015 inch or more
Outer Rotor Length	.825 inch or less	.943 inch or less
Outer Rotor Diameter	2.469 inch or less	2.469 inch or less
Inner Rotor Length	.825 inch or less	.942 inch or less
Clearance Over Rotors—Outer	.004 inch or more	.004 inch or more
Inner	.004 inch or more	.005 inch or more
Outer Rotor Clearance	.012 inch or more	.012 inch or more
Tip Clearance Between Rotors	.010 inch or more	.010 inch or more

ENGINE—(Continued)

OVERSIZE AND UNDERSIZE

ENGINE COMPONENT MARKINGS

Engine Displacement	Condition	Identification	Location of Identification
273 cu. in. 318 cu. in.	.001" U/S Crankshaft	Maltese Cross M-2-3 etc. (indicating No. 2 & 3 main bearing journal) and/or R-1-4 etc. (indicating No. 1 & 4 connecting rod journal)	Following engine serial number Crankshaft counterweight
	.010" U/S Crankshaft	B M (indicates .010" U/S all main journals) and/or R (indicating .010" U/S all rod journals)	Following engine serial number Crankshaft counterweight
	.020" O/S Cylinder Bores	A	Following engine serial number
361 cu. in. 383 cu. in. 426 cu. in.	.001" U/S Crankshaft	Maltese Cross M-2-3 etc. (indicating No. 2 & 3 main bearing journal) and/or R-1-4 etc. (indicating No. 1 & 4 connecting rod journals)	Top pad—Front of engine Crankshaft counterweight
	.010" U/S Crankshaft	Maltese Cross and X M-10 (indicates .010" U/S all main journals) and/or R-10 (indicates .010" U/S all rod journals)	Top pad—Front of engine Crankshaft counterweight
	.020" O/S Cylinder Bores	A	Top pad—Front of engine
	.008" O/S Tappets	◆	Top pad—Front of engine
	.005" O/S Valve Stems	O.S.	Single bolt boss on end of the head

FUEL SYSTEM

HOLLEY MODEL NO. 1920 SERIES CARBURETORS

	Manual Trans.	Automatic Trans.	Manual Trans.	Automatic Trans.	Manual Trans.	Automatic Trans.
TYPE	Single Throat Down Draft					
MODEL	Holley—#1920					
	R-3053A	R-3054A	R-3057A	R-3058A	R-3059A	R-3060A
With Air Conditioning	R-3149A	R-3150A	R-3151A	R-3152A	—	—
ENGINE DISPLACEMENT (Cu. In.)	170	170	225 H.P.	225 H.P.	225	225
Bore	$1^{9}/_{16}$"	$1^{11}/_{16}$"	$1^{11}/_{16}$"	$1^{11}/_{16}$"	$1^{11}/_{16}$"	$1^{11}/_{16}$"
Venturi	$1^{1}/_{4}$"	$1^{5}/_{16}$"	$1^{5}/_{16}$"	$1^{5}/_{16}$"	$1^{5}/_{16}$"	$1^{5}/_{16}$"
Main Metering Jet						
Standard	53	56	58	56	58	56
One Step Lean	51	54	56	54	56	54
2 Steps Lean	49	52	54	52	54	52
ADJUSTMENTS						
Float Setting	Use Gauge		Use Gauge		Use Gauge	
Fuel Level Height (Wet)	$^{27}/_{32}$"	$^{27}/_{32}$"	$^{27}/_{32}$"	$^{27}/_{32}$"	$^{27}/_{32}$"	$^{27}/_{32}$"
Vacuum Kick (Drill Size)	#32	$^{3}/_{32}$"	#32	#46	#32	#46
Cam Position Adjustment (Drill Size)	$^{5}/_{64}$"	$^{5}/_{64}$"	$^{5}/_{64}$"	$^{5}/_{64}$"	$^{5}/_{64}$"	$^{5}/_{64}$"
Choke Unloader (See Fast Idle Cam Pos. Adj.)	—	—	—	—	—	—
Bowl Vent Valve	$^{1}/_{16}$"	$^{1}/_{16}$"	$^{1}/_{16}$"	$^{1}/_{16}$"	$^{1}/_{16}$"	$^{1}/_{16}$"
Idle Mixture Screw (turns open) Approx.	1	1	1	1	1	1
Idle Speed (Curb Idle rpm)**	550	550	550	550	550	550
Fast Idle Speed (Engine Hot and Screw on Slowest Step of Cam, rpm)						
Manual Trans.	700*	—	700*	—	700*	—
Automatic Trans.	—	700*	—	700*	—	700*
CHOKE						
Control	Thermostatic Coil Spring					
Type	Well	Well	Well	Well	Well	Well
Setting	2 Notches Rich		2 Notches Rich		2 Notches Rich	

*After Approx. 500 Miles (If Necessary)

**With Headlights ON and Air Conditioning ON (if so equipped)

FUEL SYSTEM—(Continued)

BBS SERIES CARBURETORS

	Manual Trans.	Auto. Trans.	Manual Trans.	Auto. Trans.	Manual Trans. High Perf.	Auto. Trans. High Perf.	Taxi
TYPE			Ball and Ball Single Throat				
MODEL	BBS-3833S BBS-3835S*	BBS-3834S BBS-3836S*	BBS-3839S —	— BBS-3840S	BBS-3837S BBS-3839S*	BBS-3838S BBS-3840S*	BBS-3841S BBS-3841S
ENGINE DISPLACEMENT (Cu. In.)	170	170	225	225	225	225	170/225
Bore	$1^{9}/_{16}$"	$1^{11}/_{16}$"	$1^{11}/_{16}$"	$1^{11}/_{16}$"	$1^{11}/_{16}$"	$1^{11}/_{16}$"	$1^{9}/_{16}$"
Venturi	$1^{1}/_{4}$"	$1^{11}/_{32}$"	$1^{11}/_{32}$"	$1^{11}/_{32}$"	$1^{11}/_{32}$"	$1^{11}/_{32}$"	$1^{1}/_{4}$"
Main Metering Jet							
Standard	#120-267S	#120-263S	#120-263S	#120-263S	#120-263S	#120-263S	#120-209S
One Step Lean	#120-264S	#120-267S	#120-267S	#120-267S	#120-267S	#120-267S	#120-211S
Two Steps Lean	#120-265S	#120-268S	#120-268S	#120-268S	#120-268S	#120-268S	#120-210S
Step-Up Wire (Standard)	75-1593	75-1592	75-159	75-1592	75-159	75-1592	75-1208
Diameter	(.026")	(.028")	(.022")	(.028")	(.022")	(.028")	(.023")
ADJUSTMENTS							
Float Setting	$^{1}/_{4}$"	$^{1}/_{4}$"	$^{1}/_{4}$"	$^{1}/_{4}$"	$^{1}/_{4}$"	$^{1}/_{4}$"	$^{9}/_{32}$"
Choke Unloader	$^{3}/_{16}$"	$^{3}/_{16}$"	$^{3}/_{16}$"	$^{3}/_{16}$"	$^{3}/_{16}$"	$^{3}/_{16}$"	$^{3}/_{16}$"
Fast Idle Cam Position	$^{5}/_{64}$"	$^{5}/_{64}$"	$^{5}/_{64}$"	$^{5}/_{64}$"	$^{5}/_{64}$"	$^{5}/_{64}$"	$^{5}/_{64}$"
Vacuum Kick (drill size)	$^{5}/_{32}$"	#41	$^{1}/_{8}$"	#41	$^{1}/_{8}$"	#41	$^{5}/_{32}$"
Bowl Vent Valve Setting (from under side of valve to air horn)	.060"	.060"	.060"	.060"	.060"	.060"	.060"
Idle Mixture Screw (turns open)	1	1	1	1	1	1	1
Idle Speed R.P.M. (curb idle)**	550	550	550	550	550	550	550
Fast Idle Speed (r.p.m.)	700†	700†	700†	700†	700†	700†	700†
CHOKE							
Control			Thermostatic Coil Spring				
Type	Well		Well		Well		Well
Setting	2 Notches Rich		2 Notches Rich		2 Notches Rich		2 Notches Rich

*When equipped with Air Conditioning
**With Headlights ON and Air Conditioning ON (if so equipped)
†After Approx. 500 Miles (If Necessary)

32 SPECIFICATIONS

FUEL SYSTEM—(Continued)

BBD SERIES CARBURETORS

CARBURETOR				
Type	Ball and Ball Dual Downdraft		Ball and Ball Dual Downdraft	
Model	273 Cu. In. Engine		318 Cu. In. Engine	
Manual Transmission	BBD-3843S	—	BBD-3847S	—
Automatic Transmission	—	BBD-3844S	—	BBD-3848S
Bore	$1^{7}/_{16}$"	$1^{7}/_{16}$"	$1^{7}/_{16}$"	$1^{7}/_{16}$"
Venturi	$1^{1}/_{16}$"	$1^{1}/_{16}$"	$1^{3}/_{16}$"	$1^{3}/_{16}$"
Main Metering Jet				
Standard	#120-294S	#120-294S	#120-299S	#120-299S
One Step Lean	#120-297S	#120-297S	#120-300S	#120-300S
Two Steps Lean	#120-298S	#120-298S	#120-301S	#120-301S
Step-Up Wire	75-1642	75-1645	75-1645	75-1641
Diameters (2 stage)	.025 x .022"	.026 x .022"	.026 x .022"	.028 x .025"
ADJUSTMENTS				
Float Setting (at center of floats)	¼"	¼"	¼"	¼"
Bowl Vent Valve (throttle closed)	$^{1}/_{16}$"	$^{1}/_{16}$"	$^{1}/_{16}$"	$^{1}/_{16}$"
Choke Unloader	¼"	¼"	¼"	¼"
Idle Mixture Screws (turns open)	1	1	1	1
Idle Speed R.P.M. (curb idle)	500	500	500	500
(Air Conditioning ON)	500	500	500	500
Vacuum Kick Adjustment (Drill Size)	#16	#30	#16	#25
Fast Idle Cam Position	$^{7}/_{64}$"	$^{7}/_{64}$"	$^{7}/_{64}$"	$^{7}/_{64}$"
Fast Idle Speed R.P.M.	700*	700*	700*	700*
CHOKE				
Control	Thermostatic Coil Spring		Thermostatic Coil Spring	
Type	Well	Well	Well	Well
Setting	On Index	On Index	On Index	On Index

CARBURETOR	Manual Transmission	Automatic Transmission
Type	Dual Throat Downdraft	Dual Throat Downdraft
Model	BBD-3849S	BBD-3850S
Engine Displacement (cu. in.)	361-383	361-383
Bore	$1^{9}/_{16}$"	$1^{9}/_{16}$"
Venturi	$1^{5}/_{16}$"	$1^{5}/_{16}$"
Main Metering Jet		
Standard	120-304S	120-304S
One Step Lean	120-296S	120-296S
Two Steps Lean	120-302S	120-302S
One Step Rich	120-306S	120-306S
Step-Up Wire (Standard)	75-1651	75-1652
Diameter (2 Stage)	.033 x .027"	.035 x .027"
ADJUSTMENTS		
Accelerator Pump Setting	1" ± $^{1}/_{64}$"	1" ± $^{1}/_{64}$"
Float Setting (at Center of Floats)	$^{5}/_{16}$"	$^{5}/_{16}$"
Vacuum Kick Adjustment (drill size)	#11	#22
Fast Idle Cam Position Adjustment (drill size)	#35	#35
Bowl Vent Valve (at curb idle)	$^{1}/_{16}$"	$^{1}/_{16}$"
Choke Unloader	¼"	¼"
Idle Mixture Screws (Turns Open)	¾"	¾"

FUEL SYSTEM—(Continued)

	Manual Transmission	Automatic Transmission
CARBURETOR		
Type	Dual Throat Downdraft	Dual Throat Downdraft
Model	BBD-3849S	BBD-3850S
Idle Speed RPM (Curb Idle)	500	500
(Air Conditioning ON)	500	500
Fast Idle Speed RPM	600*	700*
CHOKE		
Type	Well	Well
Control	Thermostatic Coil Spring	Thermostatic Coil Spring
Setting	2 Notches Rich	2 Notches Rich

*After Approv. 500 Miles (If Necessary)

STROMBERG WW3 SERIES CARBURETORS

CARBURETOR				
Type	Dual Throat Downdraft			
Engine Displacement (Cu. In.)	273		318	
Model				
Manual Transmission	WW3-248	—	WW3-250	—
Automatic Transmission	—	WW3-249	—	WW3-251
Bore	$1^{7}/_{16}$"	$1^{7}/_{16}$"	$1^{7}/_{16}$"	$1^{7}/_{16}$"
Venturi	1⅛"	1⅛"	$1^{3}/_{16}$"	$1^{3}/_{16}$"
Main Metering Jet				
Standard (388539)*	.053"	.052"	.055"	.054"
1 Size Lean (388539)*	.051"	.050"	.053"	.052"
2 Sizes Lean (388539)*	.049"	.048"	.051"	.050"
Power Jet (2 Stage)	.028 x .052"	.028 x .055"	.028 x .047"	.031 x .055"
ADJUSTMENTS				
Idle Mixture Screws (turns open)	1¼	1¼	1¼	1¼
Idle Speed (curb idle)	500	500	500	500
(Air Conditioning ON)	500	500	500	500
Fast Idle Speed	700*	700*	700*	700*
Fast Idle Cam Position	$^{9}/_{64}$"	$^{9}/_{64}$"	$^{9}/_{64}$"	$^{9}/_{64}$"
Bowl Vent (closed throttle)	$^{5}/_{64}$"	$^{5}/_{64}$"	$^{5}/_{64}$"	$^{5}/_{64}$"
Vacuum Kick	$^{17}/_{64}$"	#4	$^{17}/_{64}$"	$^{15}/_{64}$"
Float Setting	$^{7}/_{32}$"	$^{7}/_{32}$"	$^{7}/_{32}$"	$^{7}/_{32}$"
Choke Unloader	$^{5}/_{16}$"	$^{5}/_{16}$"	$^{5}/_{16}$"	$^{5}/_{16}$"
CHOKE				
Control	Thermostatic Coil Spring			
Type	Well	Well	Well	Well
Setting	On Index	On Index	On Index	On Index

*After Approx. 500 Miles (If Necessary)

FUEL SYSTEM—(Continued)

STROMBERG WWC3 SERIES CARBURETORS

CARBURETOR	Manual Transmission	Automatic Transmission
Type	Dual Throat Downdraft	Dual Throat Downdraft
Model	WWC3-254	WWC3-255
Engine Displacement (cu. in.)	361-383	361-383
Bore	$1^{9}/_{16}$"	$1^{9}/_{16}$"
Venturi	$1^{5}/_{16}$"	$1^{5}/_{16}$"
Main Metering Jet (Standard)..(#389323)	.068"	.067"
(One Step Lean) (#389323)	.066"	.065"
(Two Steps Lean) (#389323)	.064"	.063"
Power Jet	.045 x .075"	.040 x .075"
ADJUSTMENTS		
Idle Mixture (Both Screws)	1½ Turns Open	1½ Turns Open
Idle Speed (rpm)	500	500
(with Air Conditioning ON)	500	500
Fast Idle Speed (rpm)	700*	700*
Fast Idle Cam Position Adjustment (drill size)	#41	#41
Accelerator Pump Travel (throttle fully closed)	$^{11}/_{32}$"	$^{7}/_{16}$"
Bowl Vent Valve (throttle at curb idle)	$^{1}/_{16}$"-$^{3}/_{32}$"	$^{1}/_{16}$"-$^{3}/_{32}$"
Vacuum Kick (drill size)	#17	#35
Float Setting	$^{5}/_{32}$"	$^{5}/_{32}$"
Unloader Adjustment (wide open kick)	$^{15}/_{64}$"	$^{15}/_{64}$"
CHOKE		
Type	Well Type	Well Type
Control	Thermostatic Coil Spring	Thermostatic Coil Spring
Setting	1 Notch Rich	1 Notch Rich

* After Approx. 500 Miles (If Necessary)

FUEL SYSTEM—(Continued)

AFB SERIES CARBURETORS

CARBURETOR	Manual Transmission	Automatic Transmission	Manual Transmission	Automatic Transmission	Manual Transmission	Automatic Transmission
Type			4 Barrel Downdraft			
Model	AFB-3853S	AFB-3854S	AFB-3855S	AFB-3856S	AFB-3859S	AFB-3860S
Engine Displacement (Cu. In.)	273	273	383	383	383, 413, 426	383, 413, 426
Car Model					High Performance	
THROTTLE BORE						
Primary	1 7/16"	1 7/16"	1 7/16"	1 7/16"	1 7/16"	1 7/16"
Secondary	1 9/16"	1 9/16"	1 9/16"	1 9/16"	1 9/16"	1 9/16"
MAIN VENTURI						
Primary	1 1/16"	1 1/16"	1 3/16"	1 3/16"	1 3/16"	1 3/16"
Secondary	1¼"	1¼"	1 5/16"	1 5/16"	1 5/16"	1 5/16"
MAIN JET						
Primary	.089"	.089"	.089"	.089"	.089"	.089"
Secondary	.073"	.073"	.067"	.065"	.0689"	.0689"
LOW SPEED JET						
Primary	#65-.035"	#65-.035"	#65-.035"	#65-.035"	#65-.035"	#65-.035"
STEP-UP ROD (2 Stage)						
Standard	16-367	16-176	16-217	16-165	16-217	16-217
1 Size Lean	16-369	16-371	16-165	16-160	16-165	16-165
2 Sizes Lean	16-370	16-372	16-159	16-173	16-159	16-159
ADJUSTMENTS						
Accelerator Pump (top of plunger to air horn)	7/16"	7/16"	7/16"	7/16"	7/16"	7/16"
Fast Idle Cam Position (drill size)	#50	#50	#50	#50	#50	#50
Choke Unloader	7/32"	7/32"	3/8"	3/8"	3/8"	3/8"
Vacuum Kick (drill size)	1/8"	#42	1/8"	#35	1/8"	#35
Fast Idle Speed (r.p.m.)	625*	700*	700*	700*	700*	700*
Idle Speed (r.p.m.)	600	600	500	500	550	550
(with air conditioning ON)	600	600	500	500	550	550
Secondary Throttle Lever Adjustment	21/64"	21/64"	21/64"	21/64"	21/64"	21/64"
Secondary Throttle Lockout Adjustment	.020"	.020"	.020"	.020"	.020"	.020"
Float Setting	7/32"	7/32"	7/32"	7/32"	7/32"	7/32"
Float Drop	¾"	¾"	¾"	¾"	¾"	¾"
Idle Mixture (both screws open)	1-2 Turns	1-2 Turns	1-2 Turns	1-2 Turns	1-2 Turns	1-2 Turns
CHOKE						
Control	Well	Well	Well	Well	Well	Well
Type	Coil Spring	Coil Spring	Coil Spring	Coil Spring	Coil Spring	Coil Spring
Setting	On Index	On Index	2 Notches Rich	2 Notches Rich	On Index	On Index

*After Approx. 500 Miles (If Necessary)

FUEL SYSTEM—(Continued)

FUEL PUMP

FUEL PUMP	6	V-8	V-8
ENGINE DISPLACEMENT	170 Cu. In.	273 Cu. In.	
	225 Cu. In.	318 Cu. In.	361, 383, 426 Cu. In.
Make	Carter	Carter	Carter
Model	MS-3674S	MS-3673S	MS-3672S
Type	Diaphragm	Diaphragm	Diaphragm
Number of Valves	2	2	2
Driven by	Camshaft	Camshaft	Camshaft
Pump Pressure (pounds)	3½ to 5	5 to 7	3½ to 5

TIGHTENING REFERENCE

[redacted]

	FOOT POUNDS	INCH POUNDS
[redacted]		

GROUP 7—COOLING SYSTEM

Water Pump Bolts	30
Fan Attaching Bolts	15-18
Thermostat Housing Bolts	30

	Torque Foot-Pounds	Thread Size
273-318 CUBIC INCH ENGINES		
Connecting Rod Nut—Plain	45	3/8-24
Cylinder Head Bolt	85	1/2-13
Main Bearing Cap	85	1/2-13
Camshaft Nut	125	
Camshaft Lockbolt	35	
Camshaft Thrust Plate 273 Cubic Inch	210 in.-lbs.	5/16-18
318 Cubic Inch	15	5/16-18
Chain Case Cover (Cast)	30	3/8-16

273-318 CUBIC INCH ENGINES—(Continued)

	Torque Foot-Pounds	Thread Size
Clutch Housing Bolt	30	3/8-16
Clutch Housing Vent Hole	100 in.-lbs.	1/4-20
Clutch Housing Pan Drain Plug	35	
Crankshaft Bolt	135	3/4-16
Cylinder Head Cover	36 in.-lbs.	
Engine Front Mounting		
To Engine Bosses	45	
To Frame	85	
To Frame Bracket Stud	20	
Engine Rear Mounting		
To Transmission	35	
To Frame	35	
Flywheel Housing to Cylinder Block	50	
Flywheel Housing Cover	100 in.-lbs.	1/4-20
Intake Manifold 273 Cubic Inch	270 in.-lbs.	3/8-16
318 Cubic Inch	40	3/8-16
Oil Level Indicator Tube Bracket	130 in.-lbs.	1/4-28
Oil Pan Drain Plug	20	1/2-20
Oil Pan Bolt	15	5/16-18
Oil Pump Cover Bolt	15	1/4-20
Oil Pump Attaching Bolt	35	3/8-16
Oil Filler Tube	30	
Rocker Shaft Bracket Bolt	15	5/16-18
Spark Plug	30	14mm
Vibration Damper Bolt	200 in.-lbs.	5/16-24

GROUP 11—EXHAUST SYSTEM

	6-Cylinder		8-Cylinder	
	Ft. Lbs.	In. Lbs.	Ft. Lbs.	In. Lbs.
Exhaust Manifold Brace Bolt Nut			30	
Exhaust Manifold to Cylinder Head Stud Nuts				
(All except 273 Cu. In. Engine)	10		30	
273 Cu. In. Engine			15	
Exhaust Pipe Ball Joint Screws			35	
Exhaust Pipe Clamp Nuts		100		100
Exhaust Pipe Flange Bolt Nuts	35		35	
Hanger Clamp Screws		95		95
Heat Control Valve Counterweight Clamp				
Bolt Nut		50		50
Intake Manifold to Cylinder Head Screws	10			
273 Cu. In. Engine				270
318 Cu. In. Engine			35	
Intake to Exhaust Manifold Screws	15			
Rear Muffler Support Screw		100		100
Tailpipe to Underbody Hanger Screw		200		200