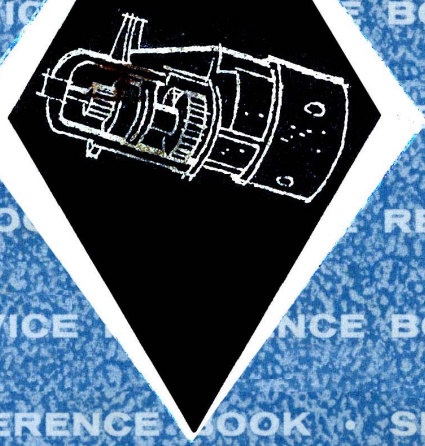
Service Reference Book

MASTER TECHNICIANS SERVICE CONFERENCE

SESSION NO. 169

ALTERNATOR and CRANKING MOTOR



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Something to think about

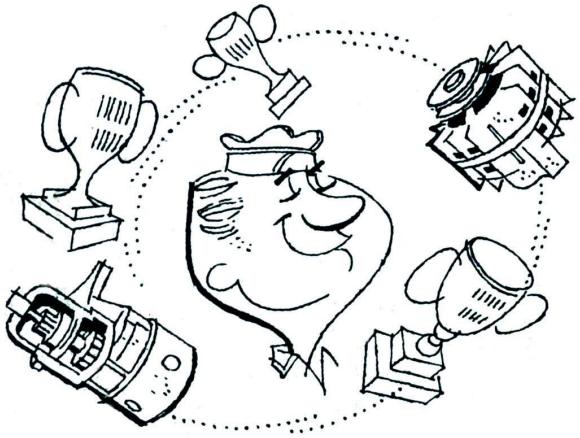
Chrysler Corporation pioneered the alternator as standard equipment a little more than two years ago and competitors are starting to follow suit. Soon there will be more than a million Chrysler-built, alternator-equipped vehicles on the road. No doubt about it, alternator service is bound to become big business . . . just as generator service did a few years back.

The new gear-reduction, Chrysler-built cranking motor is quite a feature, too. It represents a major improvement in cranking motor design. Of course, progress means change and changes call for additional service know-how. The new gear-reduction cranking motor is no exception. It's not difficult to test it and service it, but it *is* different. Don't try servicing one of these new cranking motors before you've boned up on these differences.

One of the easiest and quickest ways to qualify as a Master Technician on alternators and the new cranking motor is to familiarize yourself with the contents of this reference book. It's loaded with information on testing and servicing alternators, regulators and cranking motors. Remember, session number 169 is a sequel to session number 168. Reference book 168 covers circuit diagnosis and *on-the-car tests:* this one covers *bench tests and repairs.* Keep *both* these reference books handy.

Your sales department is capitalizing on the sales appeal of the alternator and the new cranking motor. You can make a real contribution to the over-all success of your dealership by learning how to service them. And don't ever forget:

THE SERVICE THAT SAVES THE CUSTOMER'S CAR . . . SAVES THE CUSTOMER, TOO.



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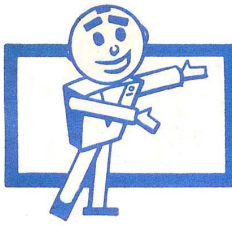


ALTERNATOR, BENCH TESTS AND INSPECTION

The charging system should be tested with the alternator and regulator installed on the car. These, "on the car", tests were covered in session number 168, Electrical Circuit Diagnosis. Testing the complete charging system helps determine whether the trouble is in the circuit, in the alternator or in the regulator. On-the-car tests also provide valuable clues to the probable cause of trouble in the unit that is not performing up to standard. Bench tests are not a substitute for on-the-car tests; they are the logical follow-up on these tests.

FIELD CIRCUIT DRAW TEST

Field current draw is easily measured on the car and provides valuable information about the condition of the internal field circuit. However, it does not replace the bench test since the test on the car is made with the rotor stationary. The bench test measures field current draw with slip rings rotating. By testing the field current draw before the alternator is disassembled, the complete internal field circuit is included in the test.

Connect a test ammeter in series between the *positive* post of a fully charged 12-volt battery and the alternator *field* terminal. Then, connect a jumper wire between the battery *negative* post and one of the alternator end shields. Some alternator end shields may be coated with an insulating material. Be sure the jumper is connected to a machined surface of the end shield.

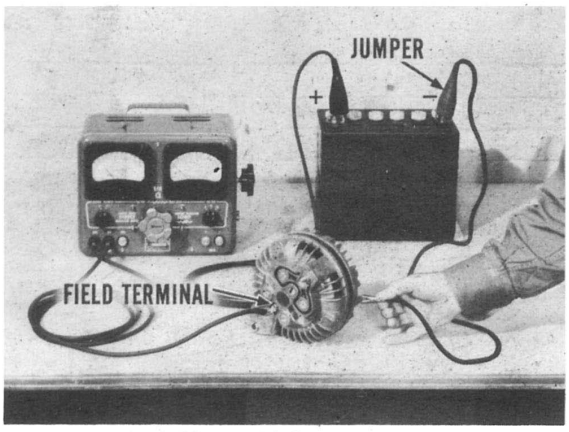


Fig. 1—Testing field current draw

Manually rotate the drive pulley and note the current draw on the ammeter. The current draw at 12 volts, with rotor turning, should not be less than 2.3 amperes or more than 2.8 amperes. If the current draw is *less* than 2.3 amperes it indicates abnormal resistance in the rotor field windings or between the brushes and the slip rings. A current draw in *excess* of 2.8 amperes indicates an internal short.

TESTING FOR AN INTERNAL GROUND

To make this test, the ground brush must be removed. Remove the retaining screw and lift the clip and brush assembly from the end shield. Touch one prod of a 110-volt test lamp to the field terminal of the alternator and the remaining prod to a machined surface of one of the end shields. The test lamp should *not* light. If the test lamp *does* light, there is an internal ground. Further tests should be made to locate it.

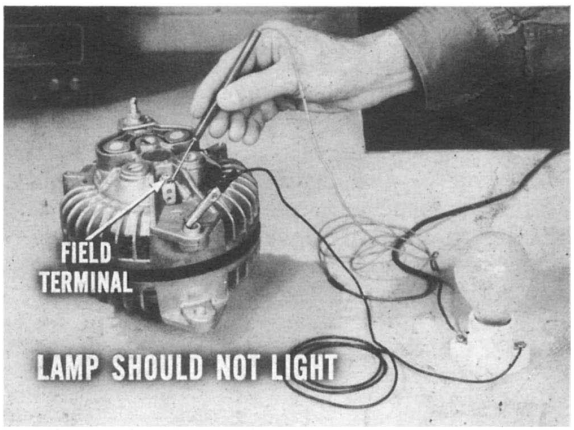


Fig. 2—Testing for internal ground

Remove the insulated brush assembly and its plastic holder. When removing the retaining screw, note that the attaching parts should disassemble in the following order: Internal tooth lockwasher, insulating washer and field

terminal. If these parts are not assembled in the proper order, a short circuit to ground may result. Carefully lift the brush and holder assembly from the end shield.

Remove the three through-bolts. To facilitate disassembly, tap the end shields at the stator joint with a plastic hammer. Use a thin-blade screwdriver to separate the stator and rectifier end shield from the drive end shield and rotor assembly. The stator is laminated and care must be taken not to burr the stator or end shield.

Hold one of the test leads of the 110-volt test lamp on one of the slip rings. Touch the remaining test prod on the end of the shaft. The lamp should *not* light. If the lamp *does* light, the rotor assembly is grounded.

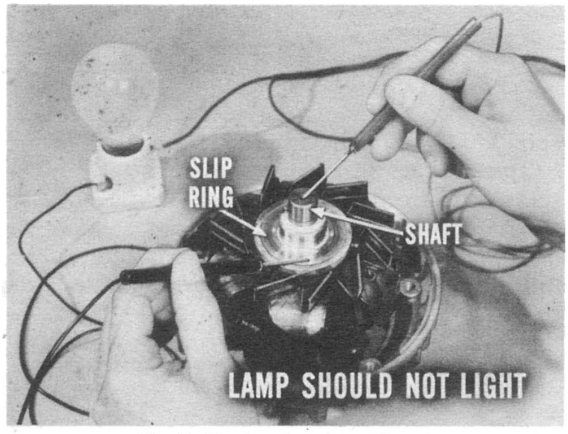


Fig. 3—Testing for shorted rotor

If the test lamp does *not* light, the short circuit was in the insulated brush assembly. Carefully inspect the plastic brush holder and the nylon insulating washer. If there is evidence of damage, the damaged part, or parts, should be replaced. The correct internal tooth lockwasher must be used. A split-type lockwasher will damage the insulating washer.

INSPECTION

Inspect the components, giving special attention to the condition of the slip rings. Look for traces of oil or grease on the rings, as well as a burned or worn condition. Light scratches can usually be removed from the slip rings by carefully sanding them with 00 sandpaper. If the slip rings are badly damaged or burned, the slip ring assembly should be replaced. Refer to the Shop Manual for this procedure.

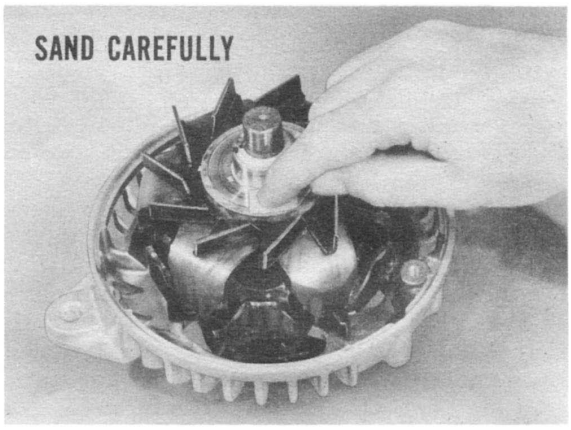


Fig. 4—Sanding slip ring

Inspect the brushes for wear and evidence of sticking in the end shield or the insulated brush holder. Early production alternators used square brushes. The round brushes now used in production and supplied through service are less likely to stick.

Inspect the rectifier connections for poor solder joints. Inspect the insulation, as well. The rectifier leads and the capacitor should be cemented to the end shield. It is important that these parts be secured to prevent vibration from breaking the leads and also to keep them out of the path of the rotor blades.

Inspect the bearing surface of the rotor shaft and test the roller bearing in the rectifier end shield for roughness. Rotate the rotor in the drive end shield to test for roughness in the drive end bearing. Rough or worn bearings should be replaced.

TESTING THE DIODE RECTIFIERS

If the alternator output was tested on the car and found to be five to seven amperes under specifications, one or more of the rectifiers may have an *open circuit*. If the output was excessively low, one of the rectifiers may be *shorted*.

Testing the rectifiers for open circuits or shorts has been simplified by the use of a new Tester C-3829. With this new tester it is no longer necessary to open the "Y" connection to test the rectifiers. This eliminates the difficult job of soldering the "Y" connection after the test.

TESTING POSITIVE RECTIFIERS

If the test is to be made on a metal bench, be sure to insulate the alternator from the bench. Plug the tester into a 110-volt outlet. Connect the alligator clip of the tester to the "Bat" terminal of the alternator. Touch the prod of the tester to the rectifiers in the heat sink. Make the test at the crimp connection nearest the rectifier.

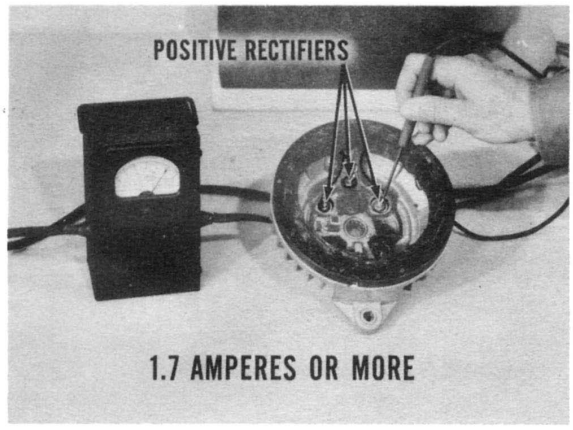


Fig. 5—Testing positive rectifiers

The meter reading for each of the rectifiers should be the same. A good rectifier will show a reading of 1.7 amperes or more. Where two rectifiers have almost identical readings, but are lower than 1.7 amperes, and the third rectifier has a zero reading, it can be assumed that the latter rectifier is *shorted*. If the lead to the shorted rectifier is cut, taking the rectifier out of the circuit, the readings on the two remaining rectifiers will go up to normal.

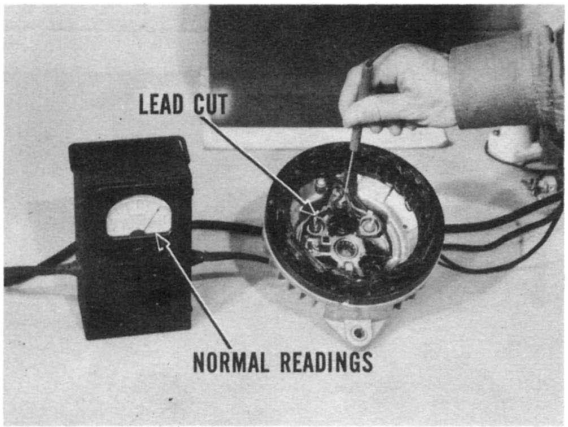


Fig. 6—Shorted rectifier removed from circuit

If two rectifiers have almost identical normal readings and the third one has a reading of one ampere or less, the rectifier with the low reading probably has an *open circuit*.

TESTING NEGATIVE RECTIFIERS

To test the negative rectifiers, which are pressed directly into the end shield, move the alligator clip from the "Bat" terminal to a machined surface on the end shield. Then, touch the test prods, in turn, to each of the three negative rectifier leads. Test specifications are the same as for positive rectifiers. However, test meter readings will be on the opposite end of the scale.

CAUTION: If all three negative diodes test low, test for a grounded stator before condemning the diodes.

Possible causes of an open or shorted rectifier are reversed battery polarity or a faulty capacitor. When a battery is installed with reverse polarity, the rectifiers are shorted by the full battery voltage impressed on them. A faulty capacitor cannot control the voltage surges through the circuit. This can damage the rectifiers.

TESTING THE ALTERNATOR CAPACITOR

If you find an open or shorted rectifier, the capacitor must be tested before installing new rectifiers. The capacitor is connected across the charging circuit to protect the rectifiers by suppressing transient peak voltages. On some early production alternators, the capacitor is mounted externally. On later models it is mounted inside the rectifier end shield. One end of the internally mounted capacitor is soldered to the inner end of the "Bat" terminal screw. The ground lead is attached to the end shield by a ground screw.

Fig. 7—Testing alternator capacitor

To test the capacitor, first remove the ground screw and move the ground lead away from the end shield. Connect one lead of a condenser tester to the disconnected capacitor lead. Connect the remaining tester lead to the "Bat" terminal on the end shield.

CAUTION: Do not allow the test clips to come in contact with the end shield or the rectifier lead while the test is being made as this may short out the rectifiers.

The minimum reading for the internally mounted capacitor is .158 microfarad. The minimum reading for the externally mounted capacitor is .5 microfarad. A capacitor that does not test within these specifications should be replaced.

TESTING STATOR FOR GROUND

The stator coils are insulated from the stator core. A break in the insulation, allowing the bare wire to touch the core would short-circuit the stator to ground and result in no output and burned windings.

To test the stator for a ground, the rectifier end shield must be separated from the stator. Lift the stator away from the end shield and insulate the two parts from each other with one-half-inch wooden blocks, being careful not to break the coil leads to the rectifiers.

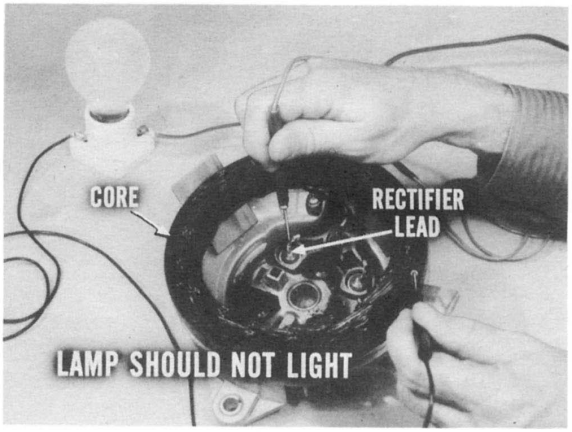
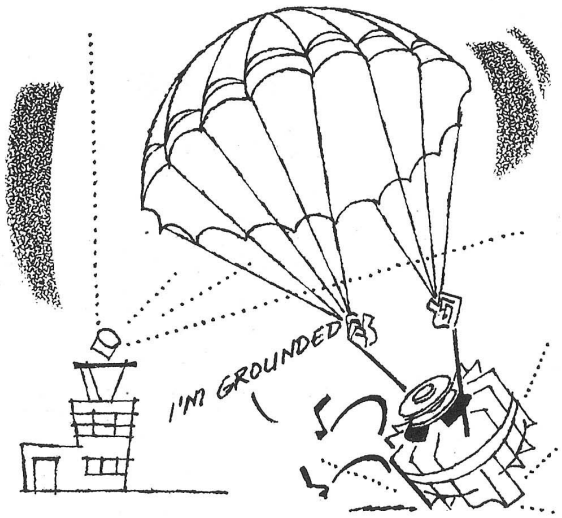
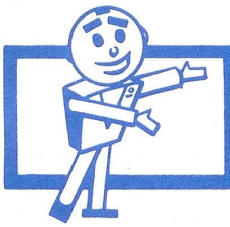


Fig. 8—Testing stator coils for ground

Plug the 110-volt test lamp into an outlet. Touch one test prod to the core and the other prod to one of the rectifier leads, making certain that there is a good electrical connection at both prods. The lamp should *not* light. If the lamp does light, it is an indication that the coil windings are grounded to the core and the stator must be replaced.





ALTERNATOR, REPAIR AND ASSEMBLY

The best way to avoid comebacks on alternator service jobs is to test carefully, then, *use the proper tools when making repairs.* It is impossible to overemphasize the importance of using the recommended tools for removing and installing rectifiers. And, you must use a *press* to remove and install rectifiers.

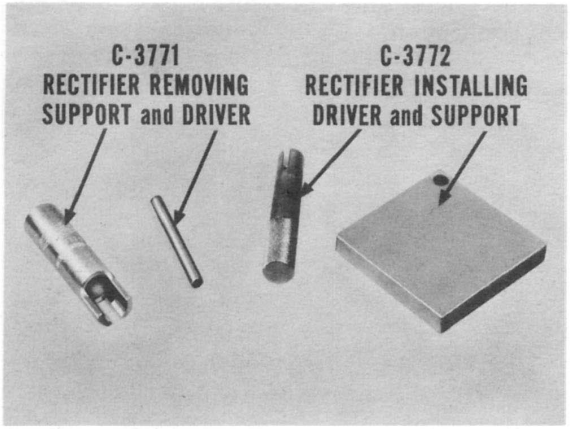


Fig. 9—Rectifier removing and installing tools

CAUTION: Do not drive rectifiers out of or into the end shield or heat sink. This will certainly damage the rectifiers and may damage or crack the castings.

RECTIFIER REMOVAL

Cut the connector of the rectifier just above the crimp connection on the lead. This will leave enough of the connector remaining to insure a good mechanical connection when soldering the lead to the new rectifier lead. If all rectifiers are to be replaced, the operation can be done more conveniently by cutting the connectors from the rectifier leads and removing the stator from the end shield.

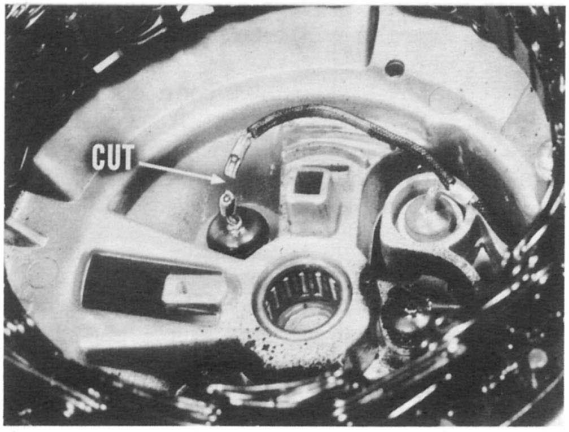


Fig. 10—Cut lead above crimp connection

Place the end shield on Support C-3771. This support is cut away and slotted to fit over the leads and around the bosses in the shield. Be sure the bore of the support completely surrounds the rectifier. *Press* the rectifier out, using Driver SP-3380, or a short length of rod which is slightly smaller in diameter than the rectifier.

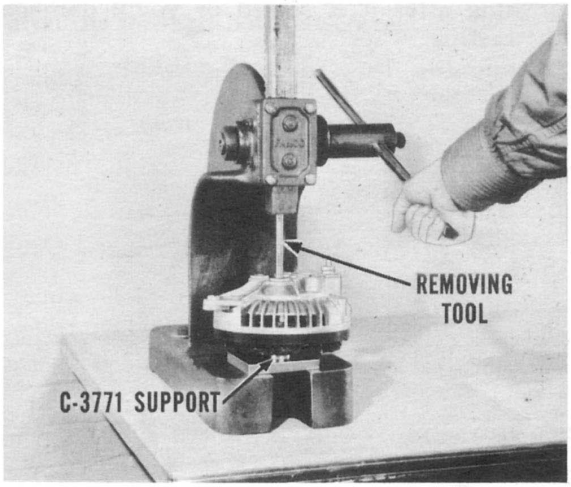


Fig. 11—Press rectifier from end shield

TIP: Weld the support tool, C-3771, to a piece of half-inch steel plate. This will prevent the support tool from tipping or shifting during the removal operation.

SERVICE REPLACEMENT RECTIFIERS

Rectifiers are identified by red and black markings on the outer end of shell. Red markings indicate positive rectifiers and these should be installed in the heat sink. Black markings identify the negative rectifiers and these should be installed in the end shield.

Use only rectifiers obtained from your MoPar parts source. These service replacement rectifiers are slightly oversize to assure a tight fit in the end shield or heat sink. Be sure and use the new Heavy-Duty rectifiers when servicing 40-ampere alternators.

The heavy-duty rectifiers are available for servicing the 40-amp. alternator assemblies under the following numbers:

Negative Diode Rectifier—Part No. 2098292
Positive Diode Rectifier—Part No. 2098293

These part numbers were reversed in the 1962 MoPar Passenger Car Parts List published in September, 1961. The next revision will include a correction.

Rectifier Installation. Support the end shield on Support Plate SP-3377. Start the rectifier straight in its bore and press it into place with Installer C-3772. Press the rectifier into its bore until it is fully seated. Do not continue pressing after it is seated or you'll damage the casting.

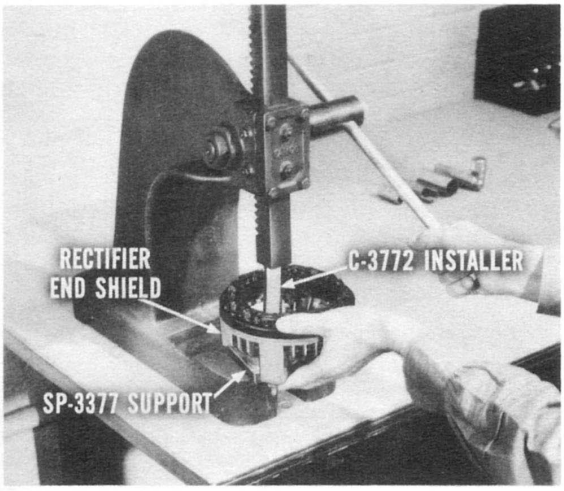


Fig. 12—Installing rectifier in end shield

NOTE: Early production of Installing Tool C-3772 had a ⅜-inch bore. This bore was later increased in size to .515-inch to accommodate the larger rectifiers used in 1961 and 1962. Be sure only the tool with the larger bore is used, otherwise the shell of the rectifier will be damaged. The inside diameter of the early tools can be increased by boring on a lathe. Tool C-3772 with the .515-inch bore can be used to service all alternators.

SOLDERING RECTIFIER LEADS

After the rectifier has been installed, it must be soldered to the stator winding connector. The degree of success obtained from the replacement of rectifiers depends on a good solder job.

Before soldering, clean the rectifier lead and stator lead connector. A small amount of foreign matter on either part will prevent the solder from making a good connection. Then, hook or loop around the connector and secure it with pliers. This will assure a good mechanical connection.

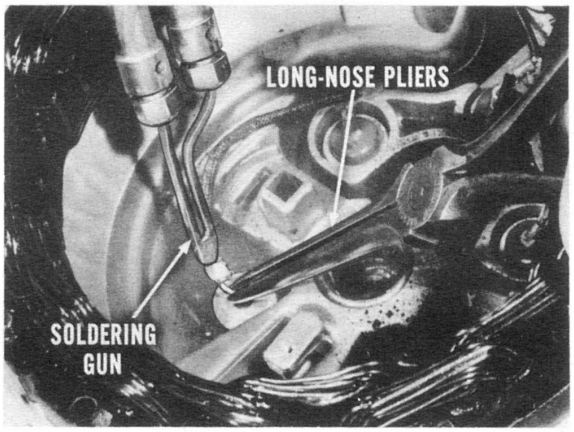
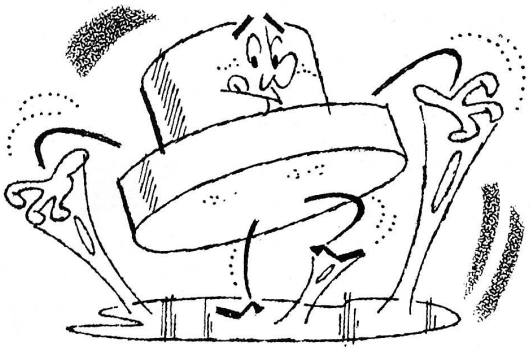


Fig. 13—Soldering rectifier lead

Use 60-40 resin-core solder. Do not, under any circumstances, use acid-core solder as this may result in a short and will cause corrosion. Hold the rectifier lead with a pair of long-nose pliers just below the connection while soldering to absorb heat and prevent damage to the rectifier. Be sure the rectifier lead and connector are hot enough to flow the solder into the connection. A good solder connection has a smooth, bright appearance. A poor solder connection has a dull, grain-like appearance. Don't remove the pliers from the lead until the connection cools off.

CEMENT RECTIFIER LEADS

After soldering, push the stator leads down into the slots that are cast in the end shield and cement them in place with MoPar Alternator Cement, Part No. 2299314. This is a special high-temperature cement. Cement the leads in place to prevent possible interference



with the rotor blades. Be sure all wires and leads are positioned out of the path of the rotor. If the negative rectifier immediately below the heat sink is replaced, coat the exposed lead and solder joint with Alternator Cement to prevent corrosion.

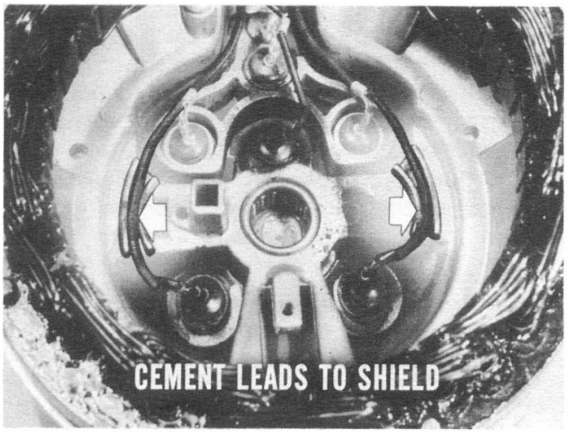


Fig. 14—Cement leads to end shield

If a new capacitor has been installed, be sure it is cemented to the end shield to prevent vibration which could break the lead wires.

TEST THE NEW RECTIFIERS

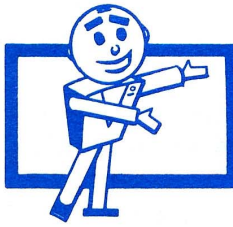
Before reassembling the alternator, test the newly installed rectifier, or rectifiers, with Tester C-3829. This will serve as a check on the efficiency of your work.

ASSEMBLING THE ALTERNATOR

Assemble the rotor, stator and end shields, before installing the brushes. Carefully line up the bolt holes in the end shields and the stator core to prevent damaging the threads in the rectifier end shield when the through-bolts are installed.

Do not overtighten the through-bolts. The laminated stator core should seat in the counterbore of the end shields. A small gap between the end shields and the stator core is normal after the through-bolts are correctly tightened.

Then, install the brushes. When installing the insulated brush holder assembly, assemble the attaching parts in this order: field terminal, insulating washer, internal-tooth lockwasher and screw. If these parts are not assembled in the proper order, a short circuit to ground may occur. If the original internal-tooth lockwasher is misplaced, do not use a split lockwasher as this may break the insulating washer. Use an original-type internal-tooth lockwasher.



VOLTAGE REGULATOR, ADJUSTMENTS AND REPAIR

A final test of voltage regulator operation must be made with the regulator installed on the car. The voltage regulator tests are covered in the service manual. They are also covered in Reference Book number 168. If the regulator voltage setting cannot be adjusted to specifications by bending the lower spring hanger, the regulator must be removed for bench test and repair.

AIR GAP ADJUSTMENT

A 12-volt test lamp provides the most accurate means of measuring the air gap between the

underside of the armature and the top of the core. Connect one lead of the test lamp to the positive post of a 12-volt battery.

Connect the remaining lead to the regulator "IGN" terminal. Next, connect a jumper wire from the negative post of the battery to the regulator "FIELD" terminal.

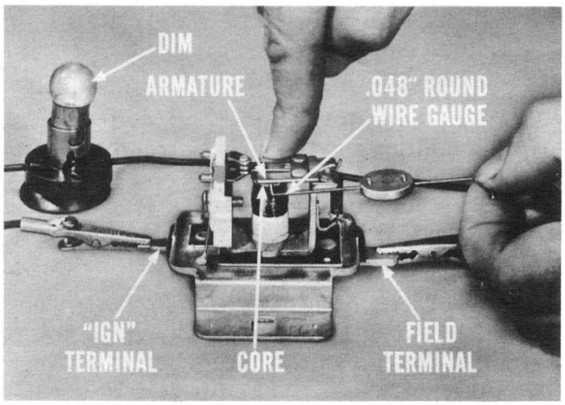


Fig. 15—Measuring air gap

Insert a .048-inch round wire gauge between the armature and the core on the hinge side of the armature stop. Then press the armature, not the contact reed, down against the gauge. The test lamp should dim.

Next, remove the .048-inch gauge and install a .052-inch gauge in its place. Again press the armature down. With the larger gauge inserted, the contacts remain closed and the test lamp should *not* dim. If the test does not show the results prescribed, the air gap is incorrect and must be adjusted.

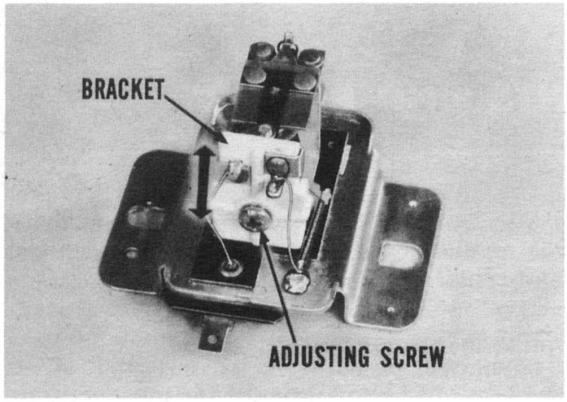


Fig. 16—Adjusting air gap

Loosen the adjustable bracket retaining screw. Raise or lower the contact bracket, as required, to adjust the air gap to specifications. Then, tighten the retaining screw.

CONTACT CLEARANCE ADJUSTMENT

The space between the upper and lower contacts is pre-set at the time of assembly. The clearance between the movable contact and the lower contact should be .015-inch plus or minus .001-inch. Even though the air gap is re-adjusted, the contact clearance should remain the same.

In the event that the clearance is incorrect, it can be reset to the specified clearance by bending the lower contact bracket.

FIELD CIRCUIT FUSES

The field circuit is protected by two fuses in the form of soft steel fusible wires in the regulator. One of the fuses is connected between the upper contact and the "IGN" terminal. The other fuse is connected between the lower contact and the regulator base. The fuses are soldered at their lower ends and are wound around the contact brackets at their upper ends.

NOTE: Practically all burned fuses are caused by unintentionally shorting the field wire at the regulator or alternator.

Fuses that are burned out can be replaced by installing a new length of fuse wire. Replacement fuse wire is available through your Mo-Par parts source in 24-inch lengths under Part No. 2275242. There is sufficient wire to replace several fuses.

TO REPLACE A FUSE

First, cut the fuse wire off above the solder connection at the bottom and unwind it at the top.

CAUTION: Do not attempt to unsolder the remaining section of the old fuse as the fine wire from the voltage coil may be damaged.

Tin the end of the new fuse wire. Then, hold the tinned end of the wire in contact with the solder at the base of the regulator and the old piece of fuse wire that remains. Flow a drop of solder on these parts. Do not move the fuse wire before the solder has cooled and set.

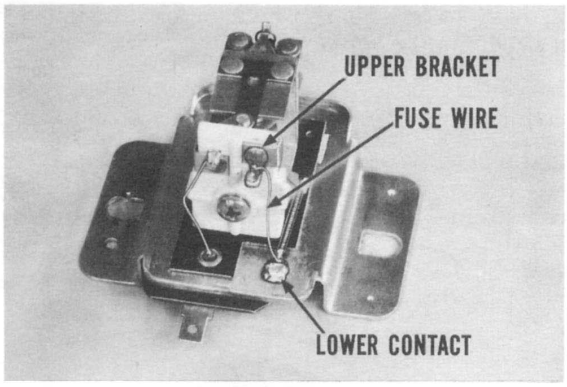


Fig. 17—Installing new fuse wire

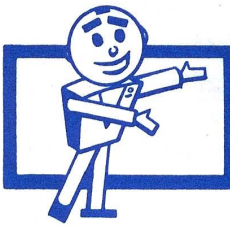
Next, pull the new fuse wire up enough to remove the slack and wind it around the bracket at the top. Solder the coiled wire to the bracket and cut off the surplus fuse wire. Although the original fuse wire was not soldered to the bracket, soldering it will ensure a good connection.

CAUTION: In cases where a later type regulator with fuses is used to replace one of the older model regulators, the fuse in the field wiring should be removed and the wires connected together and soldered. An early model regulator must not be used with the 1962 alternator.

REGULATOR VOLTAGE ADJUSTMENT

A regulator that has been removed for bench tests and adjustment must be connected into the car's charging system and retested to make certain the voltage setting is within specifications. Voltage regulator tests are covered in Reference Book number 168 as well as in the current service manuals. Complete test and adjustment instructions will not be repeated here. However, the following suggestions and cautions are worth repeating:

- It is permissible to use a jumper wire to ground the base of the regulator when testing and adjusting in lieu of reinstalling the regulator each time an adjustment is made.
- Before each adjustment of the lower spring hanger, turn the ignition off. This will demagnetize the field and prevent accidental shorting of the field circuit.
- The regulator cover must be in place when testing the regulator voltage setting.
- When testing, the regulator must be held or placed at the same angle as when installed on the car.
- Do not accidentally ground the regulator terminals or resistance elements.



CRANKING MOTOR, DISASSEMBLY AND TESTS

The Chrysler-built, gear reduction cranking motor is an entirely new design. It has many new features which affect servicing and bench testing. Complete disassembly and assembly instructions are included in the 1962 Service Manuals. Follow these instructions to avoid damaging the cranking motor.

The information in this Reference Book does not replace the Service Manuals.It does cover important service highlights and precautions that *must* be observed when testing and repairing the new cranking motor. It provides an easy way to get acquainted with the new testing and servicing procedures.

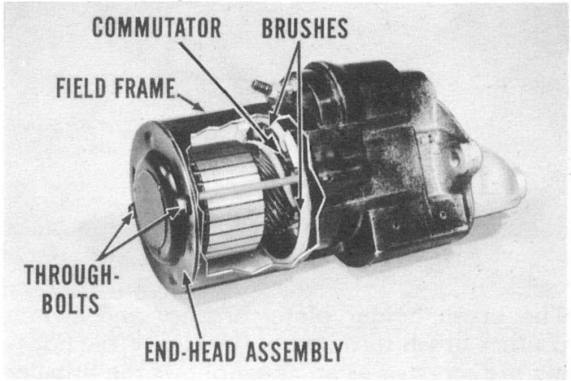


Fig. 18—Gear-reduction-type cranking motor

DISASSEMBLING THE CRANKING MOTOR

A bench vise, when provided with soft jaws, can be used as a motor-holding fixture. The aluminum motor housing should never be clamped in a vise. Clamping will damage the housing.

The motor end head assembly is attached to the field frame by two through-bolts which thread into the aluminum housing. Remove the two bolts, then the end head, to permit removal of the armature from the field coil frame. When removing the armature, save the steel washer and the fibre washer on the outer end of the armature and the fibre washer at commutator end. These washers must be re-assembled in their correct locations.

Before removing the field frame, disconnect the brush and coil leads as follows:

- Carefully lift the field frame up about one inch and place one-inch-thick wooden blocks between the frame and the brush plate, 180 degrees apart.
- Unsolder and remove the shunt coil lead from the switch contact and brush terminal post.
- Remove the series field-to-brush attaching screw.
- Lift the field frame assembly from the housing.

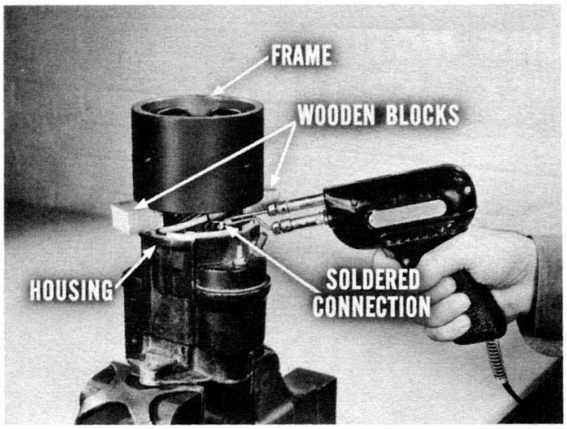
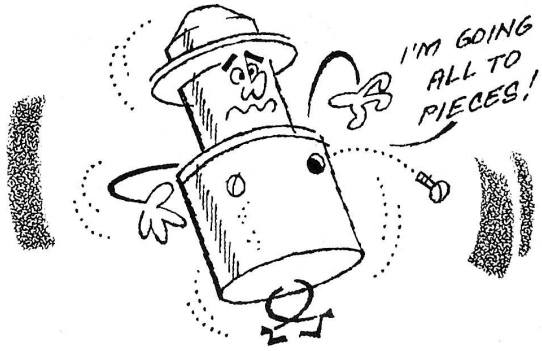


Fig. 19—Unsolder shunt coil lead

The brush holder plate, brushes and switch contact brush terminal in the end of the housing are serviced as an assembly. If the brushes are worn to one-half their normal length, that is, down to one-quarter inch, or are oil-soaked, they should be replaced.



REMOVING THE BRUSH HOLDER PLATE

Remove the brush holder and solenoid cover and the solenoid coil from the housing by removing the screw from the plate. Carefully lift the brush holder plate to prevent damage to the solenoid coil and remove the assembly from the housing.

If it is necessary to separate the brush holder plate from the solenoid, unsolder and remove the solenoid coil lead from the brush terminal post.

CAUTION: Before separating the solenoid coil from the brush holder plate, be sure to straighten the solenoid coil lead.

INSPECT THE SWITCH CONTACTS

Next, inspect the switch contacts. The solenoid disc contact and the battery terminal post switch contact are serviced separately.

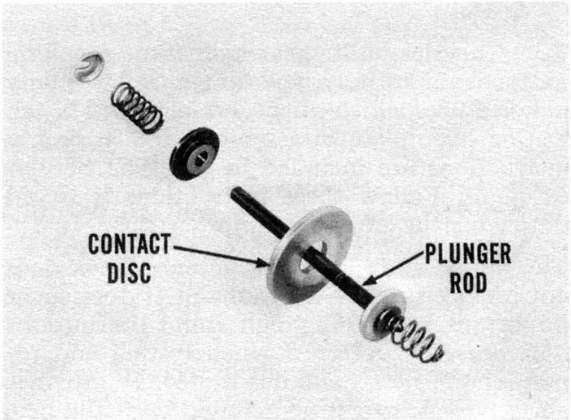


Fig. 20—Inspect solenoid contact disc

If the contact disc is slightly burned, remove it from the rod and turn it over. This may be done by removing the inner spring seat and spring at the rear of the contact.

The brush terminal post and switch contact are not serviced separately since they are riveted together through the plastic brush holder plate.

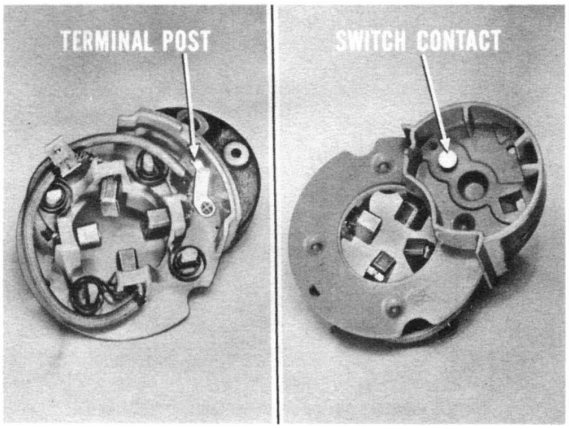


Fig. 21—Brush holder plate and terminal assembly

If the contact becomes loose or burned, the brush holder plate and terminal should be replaced as an assembly. It cannot be tightened, as any attempt to do so may crack the plastic plate.

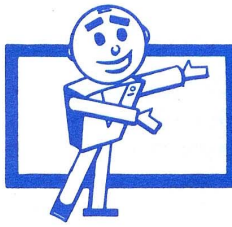
TESTING THE ARMATURE

The armature may be tested for a short circuit, using a growler and a thin steel blade, such as a hack-saw blade. This test is performed in the same manner as prescribed for all armatures. To test the armature for a ground, use a 110-volt test lamp.

TESTING FIELD COILS

The field coils may be tested for a ground using a 110-volt test lamp. The ground rivet, however, should be removed before making the test.

When installing a new ground rivet, install the rivet with the head on the *inside*. Then, support the rivet and coil frame on a pipe or drift and peen the outer end. This will assure a tight ground connection.



CRANKING MOTOR, REPAIR AND ASSEMBLY

Only those steps which require special attention will be included in this Reference Book. Other details may be obtained from the Shop Manual.

SOLENOID HOLD-IN WINDING GROUND CIRCUIT

The solenoid hold-in winding ground circuit is through the solenoid core, the sleeve, the two retainers, the pinion and gear housing and through the engine and ground strap to the battery. To minimize a voltage drop through these parts, it is important that all surfaces be clean and free from corrosion, and assembled properly.

The compression-type retainer requires a preset to provide compression to hold these parts tightly together at the time of assembly. This is provided through the tangs on the retainer. At assembly, compress the tangs sufficiently to hold the stack-up of parts tightly together. If any parts of this assembly are replaced, the compression-type retainer must also be replaced.

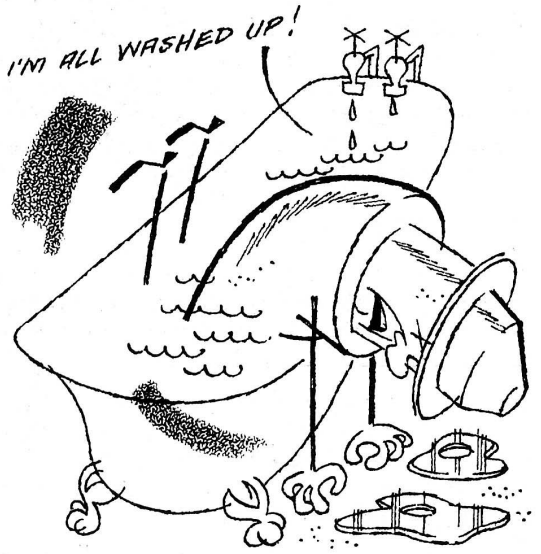
REPLACING HOUSING BEARINGS

The bearings in the pinion and gear housing are normally serviced as an assembly with the housing. The bearings, however, may be replaced separately, providing Tool Kit C-3883 is used to install and burnish them.

CLEANING PARTS

Certain precautions are necessary when cleaning and inspecting parts prior to testing or examination. Never, under *any* circumstances, clean the field frame and coil assembly, arma-

ture or the drive clutch assembly by dipping in cleaning solutions. The insulation on the field coils and armature may be damaged by the immersion. The lubricant in the drive clutch will be diluted and washed out if dipped in cleaning solution.



Parts can be satisfactorily cleaned by wiping with a clean cloth. The flat area in the bottom of the solenoid well, where the retainer contacts the housing, should be polished with crocus cloth.

ASSEMBLY INSTRUCTIONS

Start the reassembling operation by first lubricating between the plates of the shift lever sparingly with engine oil. Proceed with the assembly of the shift lever in the housing. When assembling the shift lever split pin, be sure and use an *approved* service pin. *Do not use an ordinary cotter pin.* Lubricate the pin and make sure it does not bind against the housing. Both the pin and the lever must work freely in the housing.

Also, place a drop of engine oil in both the pinion shaft bearings and insert the pinion shaft into the housing just far enough to position the brake washer and driven gear on the shaft. Make sure that no oil gets on the brake washer.

When installing the pinion shaft retaining ring, use a pair of Truarc pliers to spread the ring as it is moved across the shaft. Do not force the ring across the end of the shaft as this may raise burrs which can damage the shaft bearing.

The proper operation of the cranking motor after being serviced depends to a large measure on the care taken when assembling the solenoid assembly.

Both sides of the retainer and the retainer washer should be polished with crocus cloth.

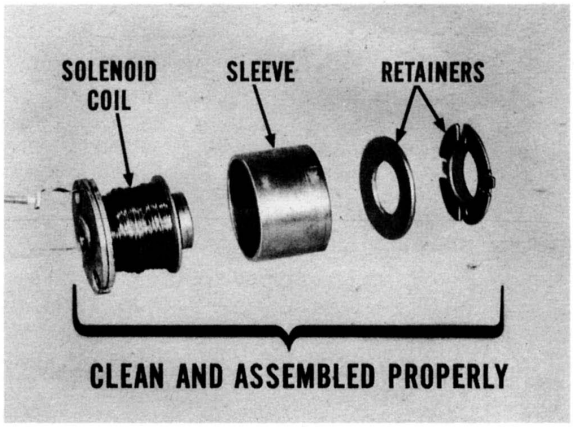


Fig. 22—Contact surfaces must be clean

The inner face of the large-diameter solenoid coil support washer and both ends of the solenoid coil sleeve should also be polished with crocus cloth. These surfaces must be clean to provide a good electrical ground circuit for the solenoid hold-in winding. These parts are held together by compression only.

Install the solenoid assembly and the plastic brush holder plate and secure the plate with the screw.

If a new compression-type retainer was installed on the solenoid coil assembly, it will also be necessary to preset compression in the retainer tangs. To do this, position the field frame and end head on the housing and install two through-bolts. Then, tighten the bolts evenly to apply tension on the retainer tangs. Remove the end head and field frame and retighten the brush holder plate screw.

Wrap the solenoid coil wire around the brush lead and switch contact terminal post and solder the lead to the post with *resin-core* solder.

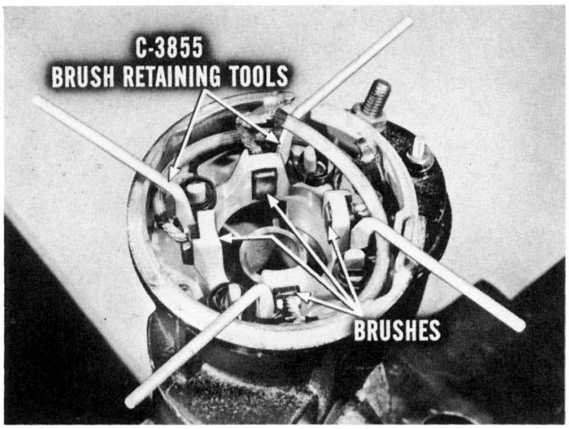


Fig. 23—Brush retaining tools installed

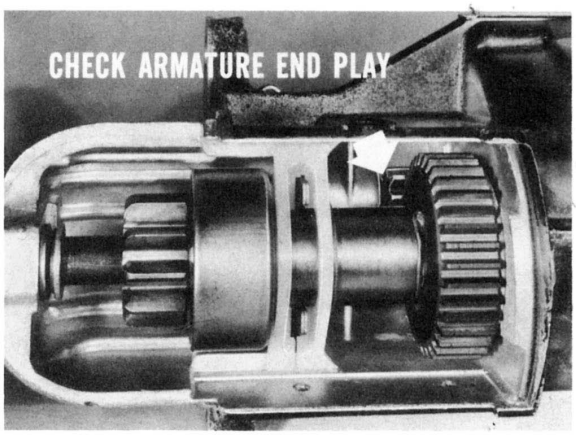


Fig. 24—Checking armature end play

Install the four Brush Retaining Tools C-3855 to hold the brushes back so they will not interfere with the armature as it is installed.

Set the field frame in position on the housing with two one-inch wooden blocks positioned 180 degrees apart between the housing and frame. Wind the shunt coil lead around the terminal post and solder it with *resin-core* solder. It is important that a good solder connection be made.

Next, secure the brush lead terminal to the series field coil lead with the attaching screw.

Lower the armature carefully into the housing to avoid burring the driven gear teeth. Mesh the two gears. Then, remove the four Brush Retaining Tools C-3855 and the wooden blocks.

End play in the armature shaft is adjusted by the fibre washer installed on the shaft. This washer is available in three thicknesses. Identification of the washers is as follows:

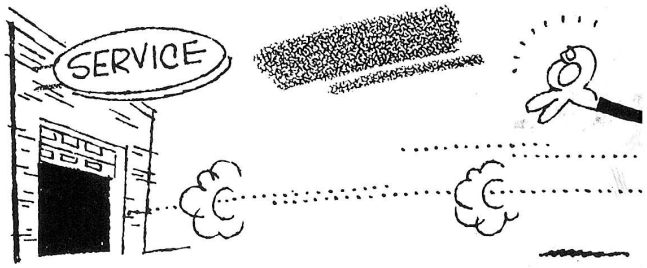
.020″ ± .003″ grey fibre
.031″ ± .003″ black fibre
.045″ ± .0045″ brown fibre

Normal armature shaft end play is .010″ to .035″ and is measured with a feeler gauge between the housing and end of the armature gear teeth.

Generally, unless the original fibre washer is lost or damaged, it should not be necessary to replace this washer. However, if a new washer is required, install one of the proper thickness to provide the specified end play. The fibre washer must be installed next to the armature and the steel washer next to the end head.

Lubricate the driven gear with SAE 30 engine oil and rotate the gear to ensure a film of oil on the armature shaft drive gear and driven gear teeth.

Before installing the cranking motor on the engine, perform a free-running test. When installing the motor, be sure to install the seal between the cranking motor and the engine.



REVIEW QUESTIONS ARE NOW PRINTED ON THE BACK OF THE MEETING GUIDE.

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