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GENERATOR REPAIRS

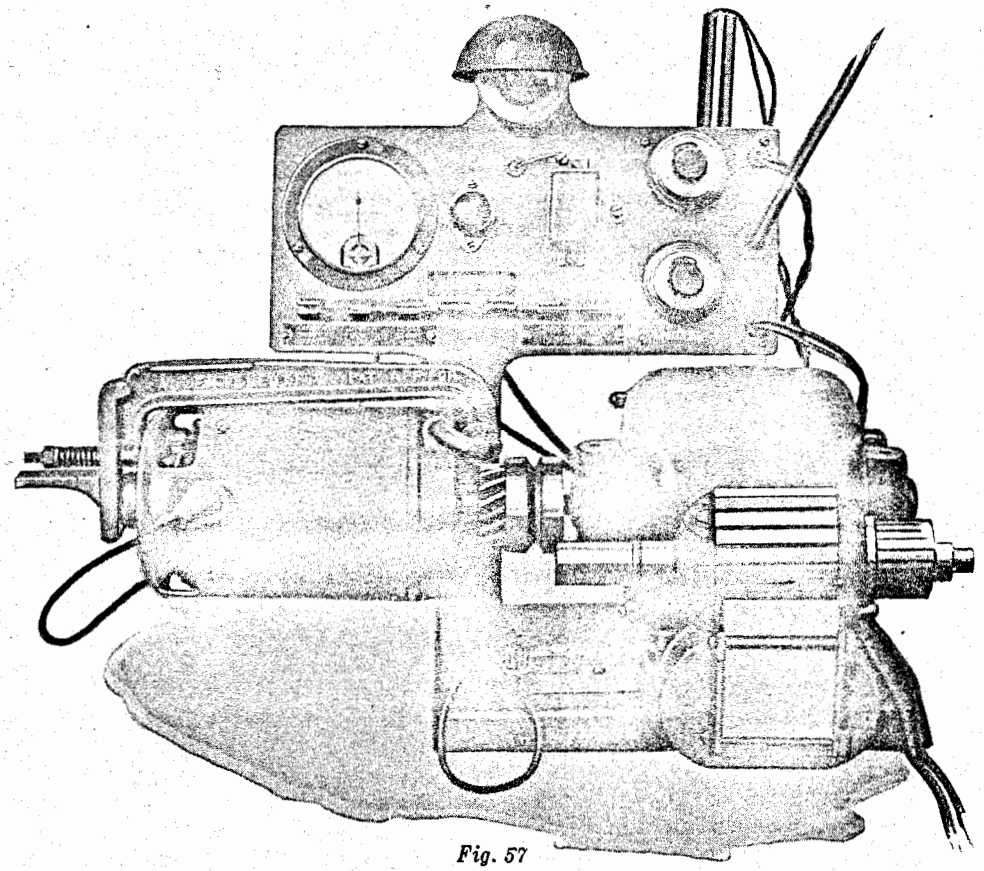

Fig. 57

GENERATOR TEST STAND

Before attempting to dismantle a defective generator it is advisable to make a thorough diagnosis of the trouble. Most troubles can be determined without completely dismantling the generator and many of them can be repaired by making necessary adjustments and thoroughly cleaning. Such troubles as broken brush pigtail, brushes stuck in holder, brushes too short, brush springs broken,—dirty commutator or loose field terminals can be found and repaired as above, and it is a good plan to always look for these before attempting to make further check.

There are a number of mechanical troubles which would prevent the generator from functioning, such as broken bearings, loose pinion, loose pole pieces or bent shaft. However, these are usually easy to find and remedy.

In this present article we will deal mostly with electrical troubles as these constitute the majority of defects and are, in most cases, more difficult to locate.

Inspection

When you have a defective generator first clean the commutator, check the generator for loose connections as explained above and place assembly on test stand Fig. 57. Fasten in place by clamp "A" Fig. 58.

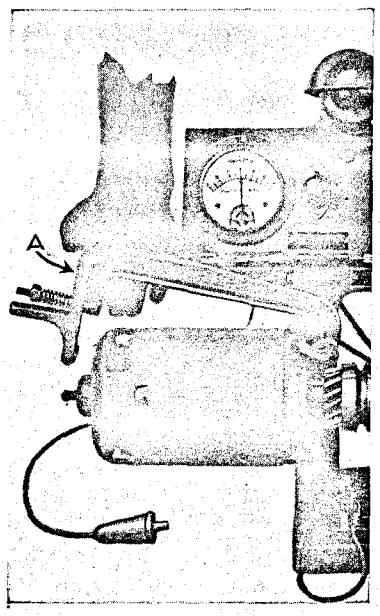

Fig. 58

Now connect battery wire "B" Fig. 57 to generator and throw knife switch "C" Fig. 57 in position shown. The current will now flow from the battery through the generator causing it to act as a motor. If the ammeter hand does not show a discharge you must have an open circuit in the generator. This open circuit might be caused by any of the above mentioned electrical troubles or a broken field wire. If the ammeter hand shows a high discharge (more than 6 Amp.) and the armature does not rotate, the trouble may be defective shaft bearings, armature rubbing on fields or a ground in the brush holder assembly or fields. If you have a ground it will be necessary in most cases to dismantle, or partially dismantle the generator. If the armature rotates and the ammeter hand remains steady at slightly over 6 Amp. you doubtless have a short-circuit in the fields or a slight ground. If the armature turns slowly or unevenly and the ammeter hand oscillates badly the trouble will be in the armature. To test the fields raise the third brush and attach connection on "B" Fig. 57 to the third brush pigtail. Now throw knife switch to left and note reading on ammeter.

Fields in good condition wi[illegible] 2 Amp. reading. If no reading at al[illegible] nown the fields must have an open circuit. If a reading of over 2 Amps. is shown you have an indication of a short circuit or ground.

Making Repairs

If upon making inspection you find one or more of the above mentioned troubles existing and you decide the generator must be dismantled, proceed as follows: Place the gen-

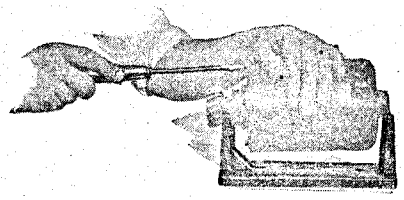

Fig. 59

erator on stand Fig. 59 and remove screws as shown. Raise brushes with brush lifters or hooks, Fig. 60 placing springs against the side of brushes to hold them in position or they will fall down on the inside of the holders as soon as the armature is removed. In this position they will be much harder to raise again.

Testing Armature.

Place Armature on Growler, See Fig. 61, and turn Growler Switch "A" in on position. This causes alternating current to flow through the Growler Winding, magnetizing the field.

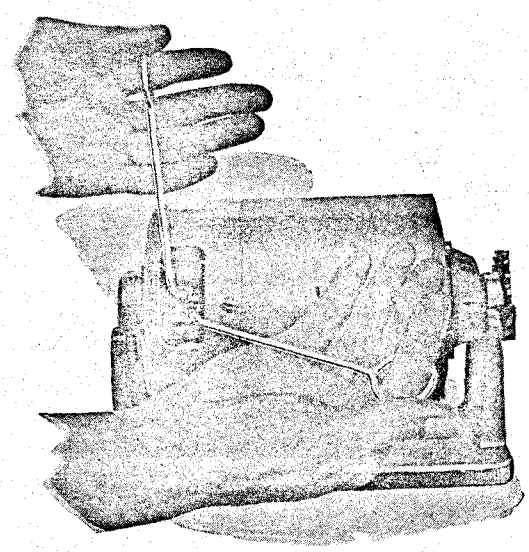

Fig. 60

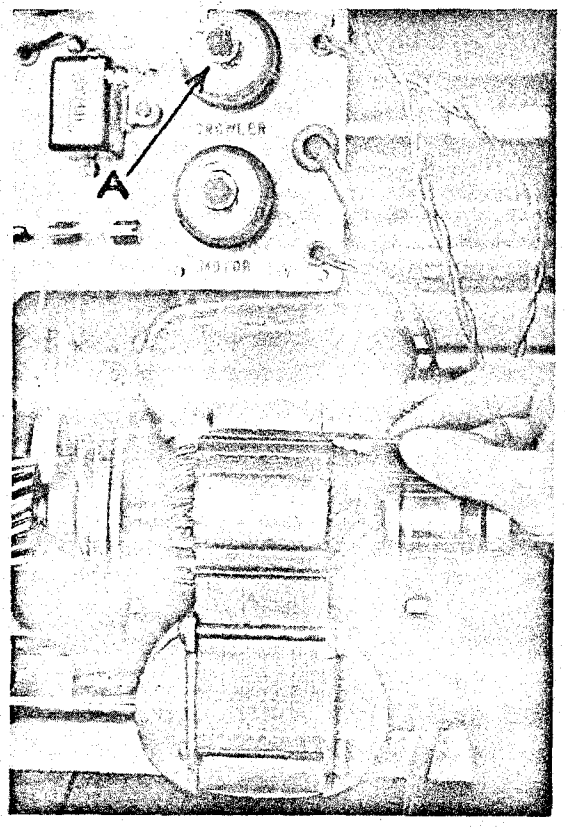

Fig. 61

A Growler must be used with alternating current. When direct current is used for operating a test stand the manufacturers of the stand shown on Page 73 have made allowances for this by adding another brush to the motor, thereby taking off alternating current from the motor armature. Whenever a Growler is used on the D. C. Test Stand the motor must be running also.

The purpose of the growler is to test the armature for short and open circuits. Its operation is based upon the principle of induction. In the armature we have 21 coils connected in series to the commutator. By placing the armature on the growler we will cause a current to flow in any one of these coils providing we have a closed circuit. When the current flows through the coil it will cause that portion of the armature surrounding the coil to become magnetized. This will attract any steel or iron object placed near it. A hacksaw blade is commonly used due to its sensitiveness and it will vibrate when held about one-eighth of an inch from the top of the armature which has a defective coil, Fig. 61. If the armature is in good condition the hacksaw blade will not be attracted to it at any position to which the armature may be turned.

Testing for Open Circuit

In making test for open circuit it is a good plan to make up a small test lamp from a six volt tail lamp bulb mounted in a socket to which are fixed two test points, Fig. 62. With the growler on, hold the test points on two adjoining segments of commutator at one time. The best position to hold these points will be just off centre at the top. In this position the lamp should light. If any two segments fail to light the lamp it is an indication that you have an open circuit in the coils to which these segments are attached.

It does not pay to spend too much time trying to repair an armature. If you cannot find the cause of the trouble by outside observation, replace it with a new one. In most

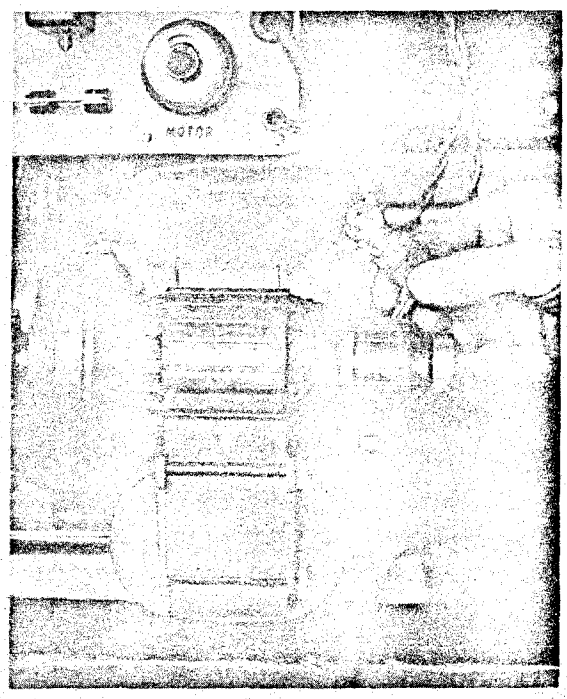

Fig. 62

cases of short-circuit, however, the trouble will be caused by carbon filling in between the commutator segments shorting same. It is a good plan to place the armature on a lathe and turn down the commutator sufficiently to true it up. Then undercut the mica slightly, using a hacksaw blade as shown in Fig. 63. It is a good plan to grind the set from the teeth on the end of the blade which you are using.

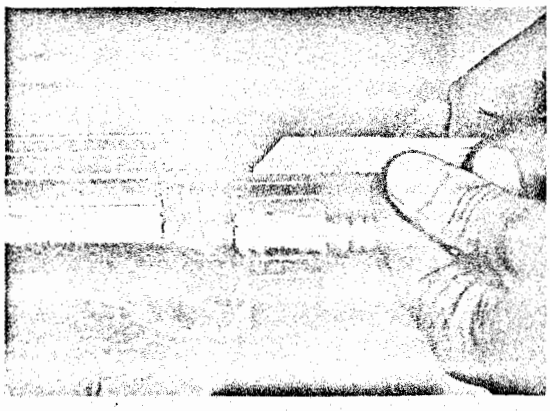

Fig. 63

Tests for Grounds

A ground in the armature is caused by some part of the winding becoming bare and making contact with the metal part of the armature or shaft. This condition is determined by the use of test points Fig. 64. Place one point anywhere on the commutator and one point on the armature or shaft. If light at top of test stand lights the armature is grounded. This test must be made with the growler switch off.

Dismantling Armature

If in making the above tests you find the armature is defective and cannot easily be repaired dismantle it by removing the pinion, bracket

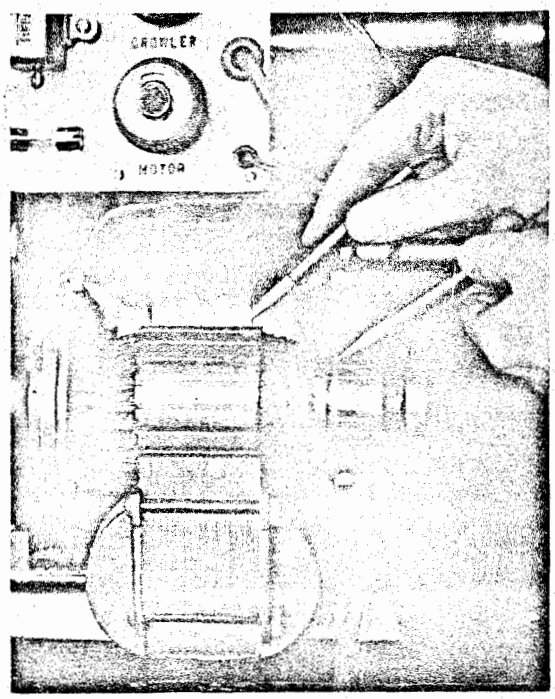

Fig. 64

and bearings. First place armature on stand Fig. 65 and remove gear pin as shown. Now pull the gear with puller Fig. 66. This is a combination puller and will pull the gear, large and small bearings by using the "C" washers shown in Figs. 67 and 68. When installing the bearings on a new armature use driver Fig. 69 with hammer or in an arbor press. The gear is also pressed on by an arbor press being sure the little half-round key is in place, after which the pin is installed and rivetted.

Testing Brush Holder Assembly

Carefully check brush holder assembly in generator head. See that all rivets are tight and that the insulation under the two brushes

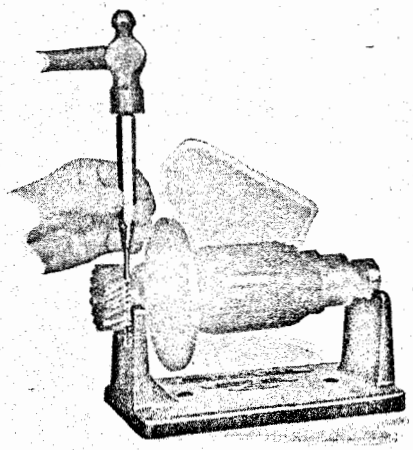

Fig. 65

is not burnt or broken. Now test for grounds using the test points Fig. 70, placing one point on the case and one point on either insulated brush holder. If these brush holders are grounded the light will light when a test point is touched to them.

The center brush holder is grounded and of course will light the lamp in any case. A ground in the brush holder assembly can be caused by carbon and when parts are thoroughly cleaned with gasoline will be in some cases O. K. If this does not remedy the trouble it will be advisable to install a new brush holder assembly.

Testing Field Coils—

Fig. 71 illustrates the open circuit test for field coils. If the lamp does not light when the test points are applied as shown, there is an open circuit in the fields. This could be caused by the connections coming unsoldered or broken between the coils or by a burned or broken wire in the fields. If you

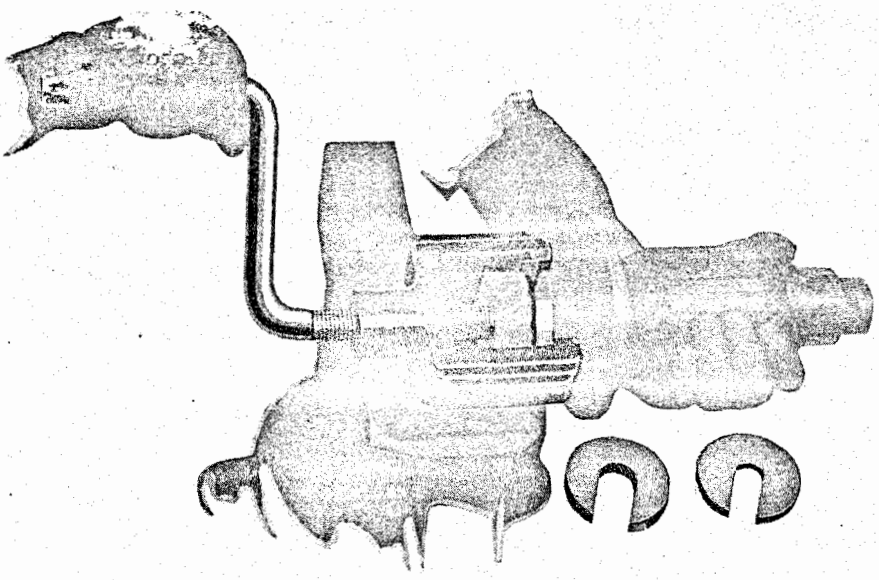

Fig. 66

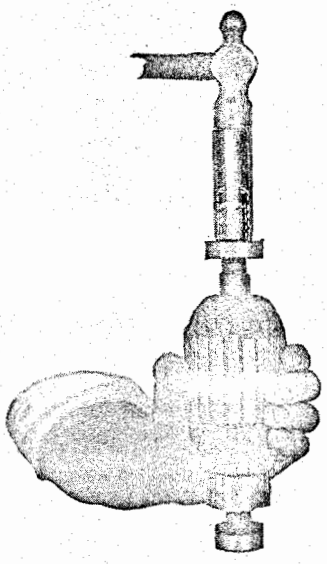

Fig. 69

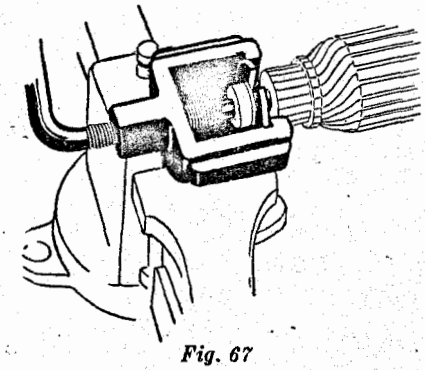

Fig. 67

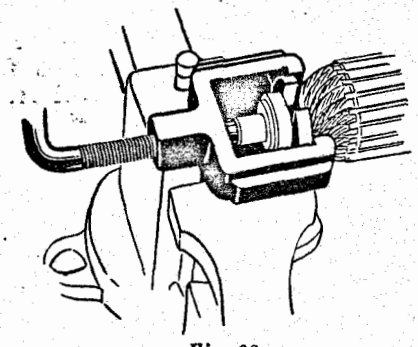

Fig. 68

cannot find the cause of the trouble by inspection, dismantle the fields from the case. If on the above test the fields show O. K., test for ground, Fig. 72. If, when making this test the lamp lights you have a grounded field.

If you cannot ascertain the cause of the ground upon inspection, the fields must be dismantled from the case as follows: Place assembly in vise and loosen pole screws with vise screw driver, Fig. 73.

As soon as screws are all loosened remove with hand screw driver. Remove pole pieces and fields intact, thoroughly washing all parts. When making your inspection, carefully examine each field for bare spots where the current might leak through to the pole pieces or case, also test each coil separately with test points for an open circuit.

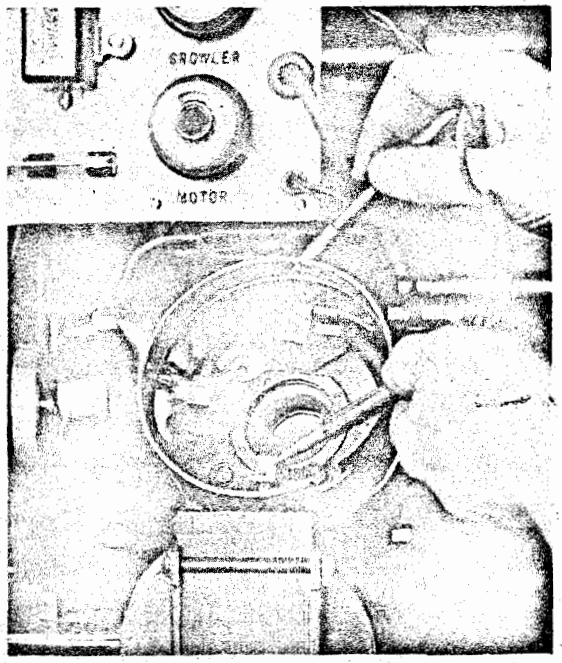

Fig. 70

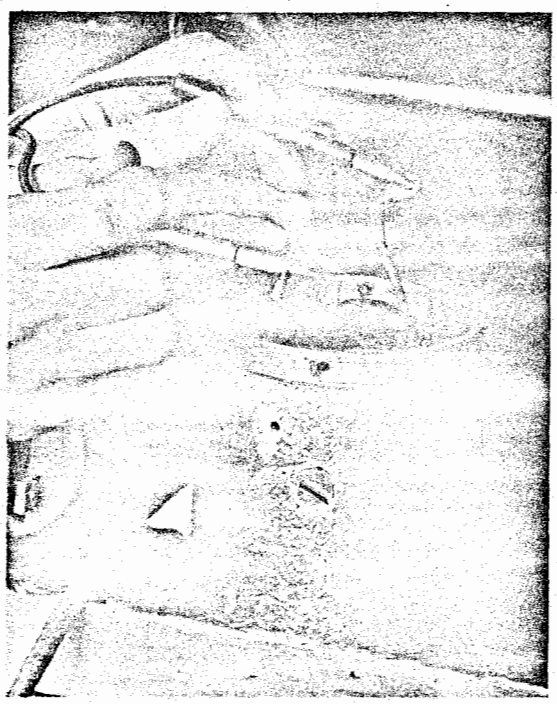

Fig. 71

If you find one or more of the coils defective, replace with new, being sure however, that

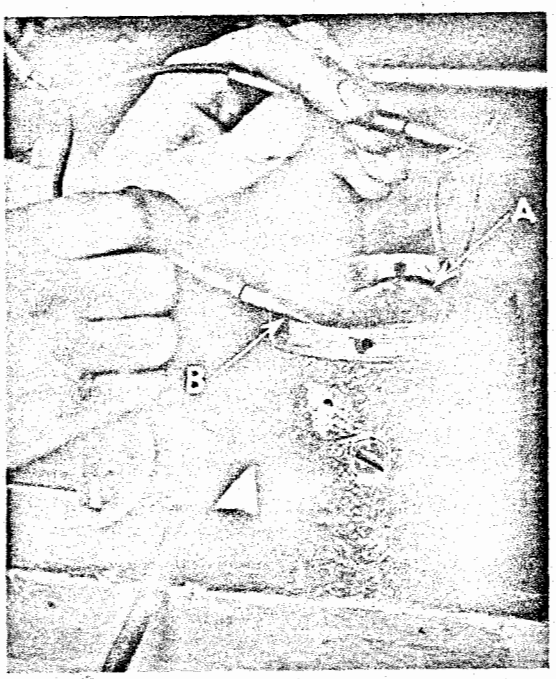

Fig. 72

the new coil is of the same polarity as the one removed. This can be determined by attaching a battery to the coils and making the test with a compass. When the coils are all laid out on the bench in a row, they should show an alternate reading on the compass; in other words, if you install two coils of the same polarity side by side, the generator will not function when assembled again. When assembling coils in place again, be sure they are placed properly—See Fig. 72—having the 2 lead wires "A" assembled so that they will be in first position to left of terminal slot "B".

Fig. 73

When you have drawn up pole piece screws as tight as possible with hand screw driver, place assembly over expander, Fig. 74, and tighten expander nut as shown. Now place assembly with expander in place in vise and finish tightening screws with vise screw driver, Fig.

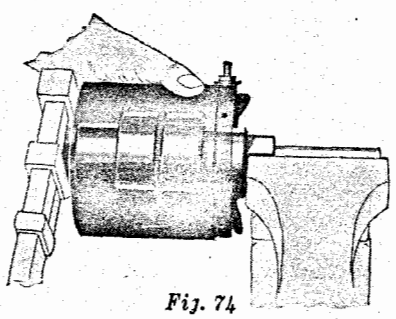

Fig. 74

75. When you have thoroughly tightened the four screws, it is a good plan to determine if you have sufficient clearance for the armature. This is determined by the pole piece gauge, Fig. 76. If this gauge will not go through the fields, place expander in fields and

tighten h . gain also re-tighten pole screws; when the field screws are properly tightened, fasten them with centre punch as shown in Fig. 81.

Pulling Outer Ball Races—

In some cases a ball bearing will break leaving the outer race in the head. It is al-

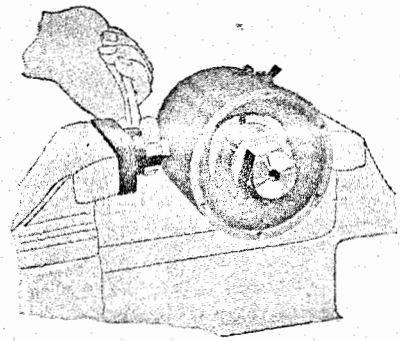

Fig. 75

most impossible to remove this race if it is tight, without mutilating the head, unless a proper puller is used. The puller shown in Fig. 78 will remove this quickly.

Pulling Ball Bearing Assembly—

If when removing the armature from the generator the ball bearing assembly remains in

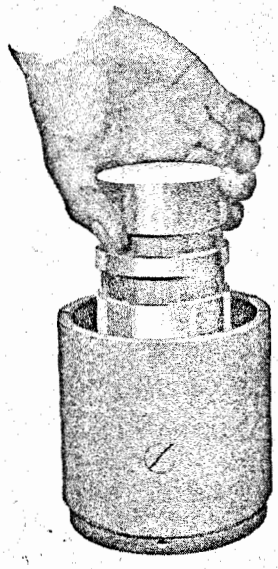

Fig. 76

the head, it can be quickly removed by the puller, shown in Fig. 79. A special bent wire is furnished with this puller to keep the split end of puller from coming together when bearing is being pulled.

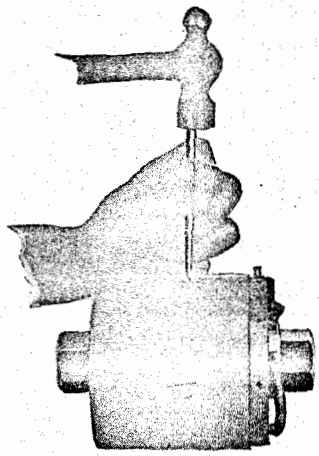

Fig. 77

Sanding Brushes—

Whenever new brushes are installed, they should be shaped to fit the commutator with a sander. It is also a good plan to give the old brushes a few turns to remove the glazed surface. (See Fig. 80). The brushes are placed on sand paper with the springs in place and a few turns will be sufficient.

Assembling Generator—

First assemble the rear bracket and brush holder assembly on the housing. Connect field leads to the proper brush holders with brush pigtails. Insert armature with bear-

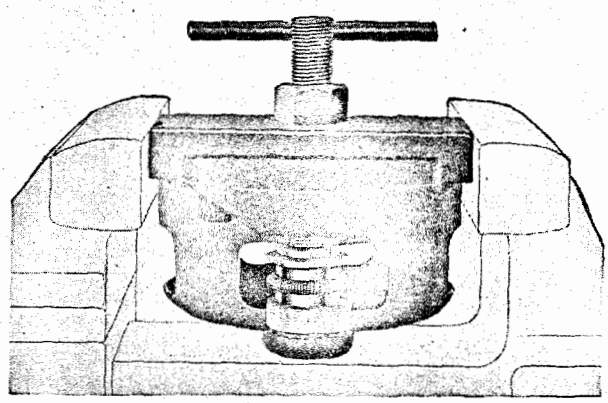

Fig. 78

ings and bracket assembly. Care must be exercised to fasten bracket in proper place. See Fig. 81 with machine portion "A" as shown. Now loosen the four brush holder screws, Fig. 82. Lower the two large brushes against commutator with springs in place and locate generator against test stand for a

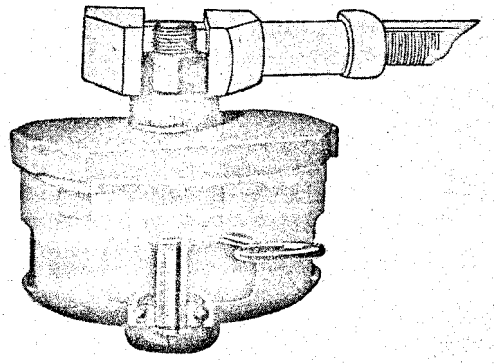

Fig. 79

ground contact. Place test stand terminal on generator terminal and throw knife switch to left. If the armature rotates the brush holder

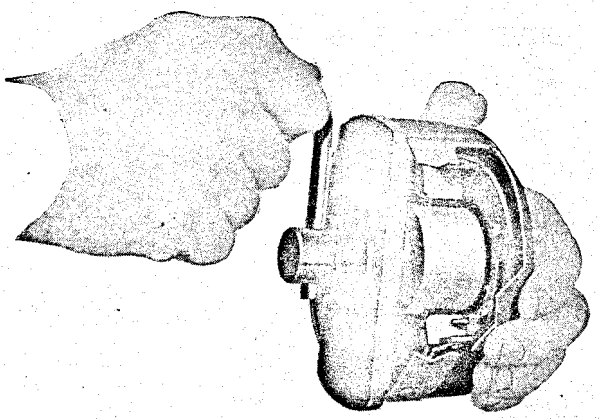

Fig. 80

assembly is not positioned right. Move brush holder assembly until armature ceases to rotate. At this point the brushes will be set for neutral and the four screws may be

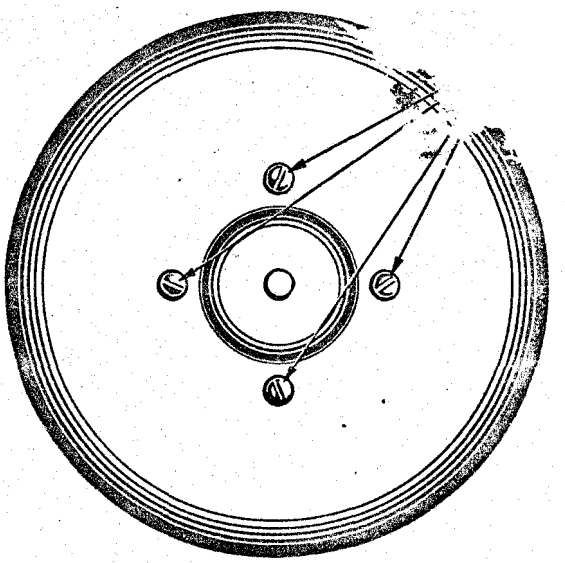

Fig. 82

tightened again. Place generator in test stand as shown in Fig. 57. Connect terminal and throw the knife switch to the right. Start motor by turning switch, pull knife switch in outward position and adjust third brush as shown in Fig. 83 to a position which will show a 10-12 Amp. reading on Ammeter. Allow the generator to run for about half an hour in making this test.

If the generator does not show a charge, it will doubtless be caused through poor workmanship on the part of the mechanic and will have to be completely checked again as shown until the trouble is found.

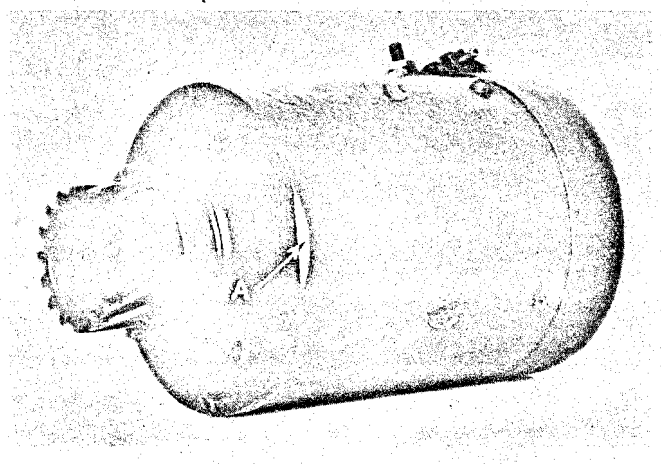

Fig. 81

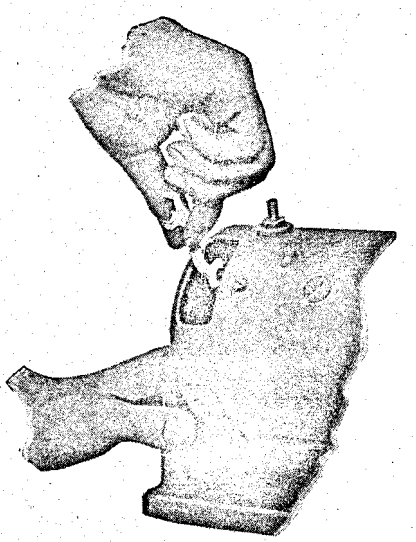

Fig. 83