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# EQUIPMENT

VOLUME 2

# WORKSHOP INSTRUCTIONS

## GENERATORS

### MODELS
### C45PVS, C45PV-4, C45P, C39PV and C39P


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# GENERATORS

## MODELS C45PVS, C45PV-4, C45P, C39PV AND C39P

### 1. GENERAL

The generator is a shunt-wound two-pole two brush machine, arranged to work in conjunction with a compensated voltage control regulator unit (see SECTION F). On generators having the letter V in their model number, a fan, usually integral with the driving pulley, draws cooling air through the generator, inlet and outlet holes being provided in the end brackets of the unit. The other models, namely C45P and C39P are non-ventilated and will be found fitted to vehicles such as tractors which operate under severe service conditions.

The output of the generator is controlled by the regulator and is dependent on the state of charge of the battery and the loading of the electrical equipment in use. When the battery is in a low state of charge, the generator gives a high output, whereas if the battery is fully charged, the generator gives only sufficient output to keep the battery in good condition without any possibility of overcharging. In addition, an increase in output is given to balance the current taken by lamps and other accessories when in use. Further, a high boosting charge is given for a few minutes immediately after starting up, thus quickly restoring to the battery the energy taken from it by the electric starting motor.

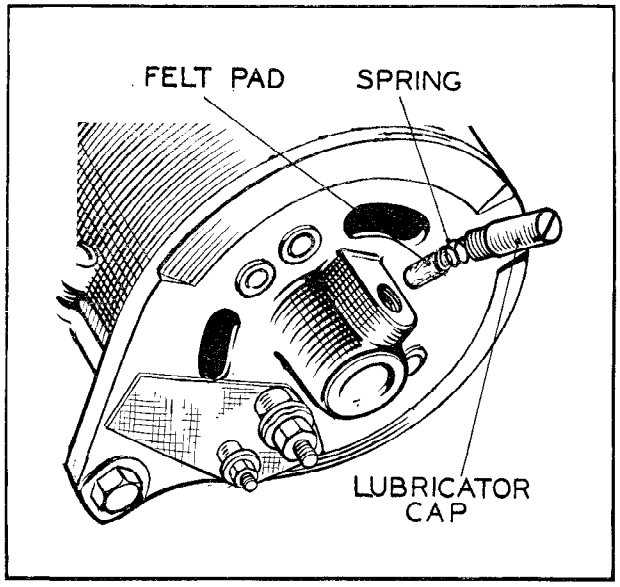



Fig. 1.
Lubrication (all models except C45PVS)

### 2. ROUTINE MAINTENANCE

#### (a) LUBRICATION

All models except C45PVS:
Every 12,000 miles, unscrew the cap of the lubricator fitted on the commutator end bracket, lift out the felt pad and spring and about half-fill the lubricator cap with high melting point grease (H.M.P. Grease).

Replace the spring and felt pad and screw the lubricator cap back into position.

No lubrication is necessary on Model C45PVS.

#### (b) INSPECTION OF BRUSHGEAR AND COMMUTATOR

At the same time, remove the metal band cover to inspect the brushgear and commutator. Check that the brushes move freely in their holders by holding back the brush springs and pulling gently on the

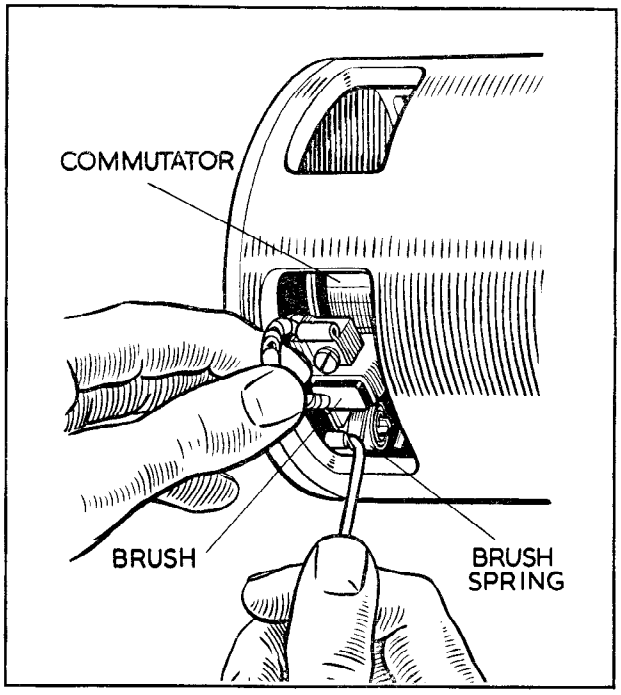



Fig. 2.
Checking brushgear

flexible connectors. If a brush is inclined to stick, remove it from its holder and clean its sides with a petrol-moistened cloth. Be careful to replace brushes in their original positions in order to retain the "bedding". Brushes which have worn so that they will not "bed" properly on the commutator must be renewed.

The commutator should be clean, free from oil or dirt and should have a polished appearance. If it is dirty, clean it by pressing a fine dry cloth against it while the engine is slowly turned over by hand. If the commutator is very dirty, moisten the cloth with petrol.

(c) BELT ADJUSTMENT

Occasionally inspect the generator driving belt and adjust, if necessary, to take up any undue slackness by turning the generator on its mounting. Care should be taken to avoid overtightening the belt, which should have sufficient tension only to drive without slipping.

See that the machine is properly aligned, otherwise undue strain will be thrown on the generator bearings.

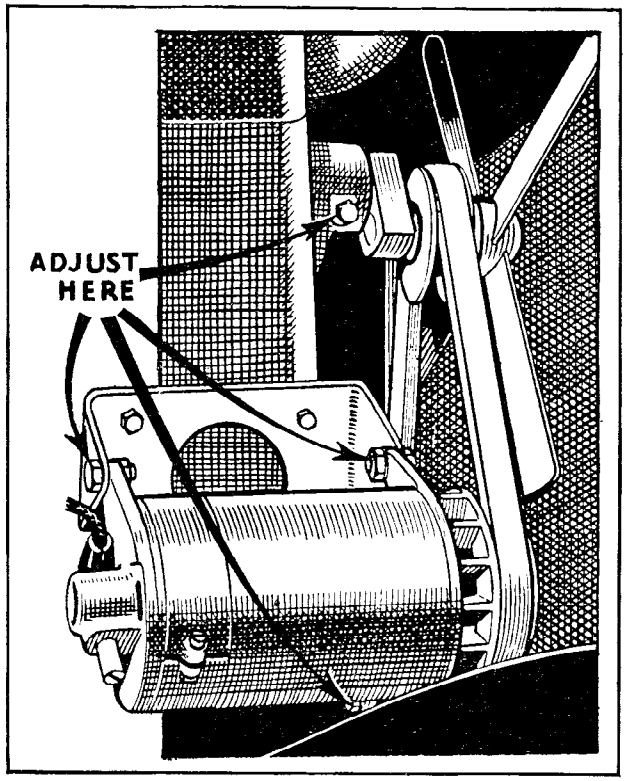



Fig. 3.
Belt adjustment

## 3. PERFORMANCE DATA

| Model | Nominal Voltage | Cutting-in Speed–r.p.m. | At Generator Volts | Max. Output—Amps. | At r.p.m. | At Generator Volts | On Resistance Load–ohms.* | Field Resistance ohms |
|---|---|---|---|---|---|---|---|---|
| C45PVS | 12 | 900—1050 | 13·0 | 20 | 1600—1800 | 13·5 | 0·67 | 6·0 |
| C45PV-4 | 12 | 900—1050 | 13·0 | 20 | 1600—1800 | 13·5 | 0·67 | 6·0 |
| C45P | 12 | 900—1050 | 13·0 | 13 | 1600—1800 | 13·5 | 1·04 | 6·0 |
| C39PV | 12 | 1050—1200 | 13·0 | 17 | 1850—2100 | 13·5 | 0·8 | 6·2 |
| C39PV | 6 | 950—1050 | 6·5 | 21 | 1850—2100 | 7 | 0·33 | 2·7 |
| C39P | 12 | 1050—1200 | 13·0 | 11 | 1850—2100 | 13·5 | 1·23 | 6·2 |
| C39P | 6 | 950—1050 | 6·5 | 14 | 1500—1700 | 7 | 0·5 | 2·7 |

* Resistance load in each case must be capable of carrying the current stated without overheating.

## 4. SERVICING

*Reference to Model* C39 *in the following instructions must be taken to cover* C39P *and* C39PV, *both 6 and 12 volt, unless otherwise stated. Similarly, Model* C45 *refers to* C45P, C45PV–4 *and* C45PVS.

(a) TESTING IN POSITION TO LOCATE FAULT IN CHARGING CIRCUIT

In the event of a fault in the charging circuit, adopt the following procedure to locate the cause of trouble.

(*i*) Inspect the driving belt and adjust if necessary (see Para 2c).

(*ii*) Check that the generator and control box are connected correctly. The generator terminal "D" must be connected to control box terminal "D" and

generator terminal "F" to control box terminal "F".

(*iii*) Switch off all lights and accessories, disconnect the cables from terminals of generator marked "D" and "F", and connect the two terminals with a short length of wire.

(*iv*) Start the engine and set to run at normal idling speed.

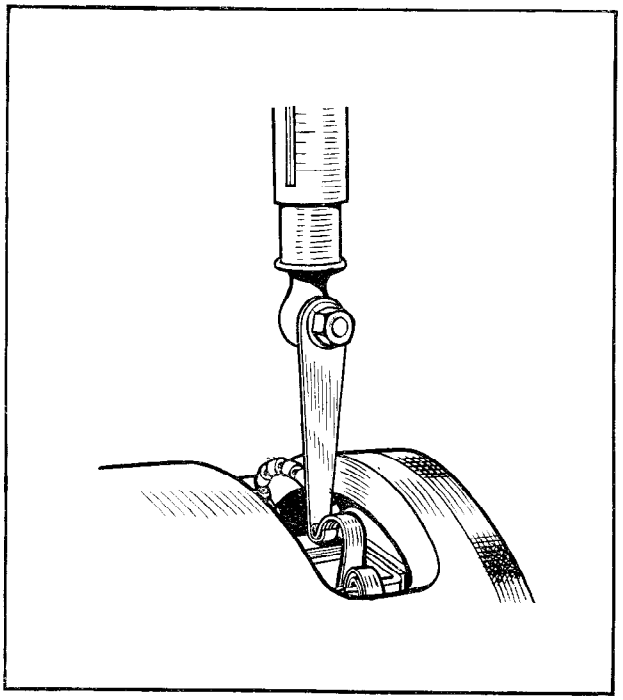


Fig. 4.
Testing brush spring tension

(*v*) Clip the negative lead of a moving coil type voltmeter, calibrated 0—20 volts, to one generator terminal and the other lead to a good earthing point on the yoke.

(*vi*) Gradually increase the engine speed, when the voltmeter reading should rise rapidly and without fluctuation. Do not allow the voltmeter reading to reach 20 volts (or 10 volts for 6 volt generators), and do not race the engine in an attempt to increase the voltage. It is sufficient to run the generator up to a speed of 1000 r.p.m.

If there is no reading, check the brushgear as described in (*vii*) below. If there is a low reading of approximately $\frac{1}{2}$—1 volt, the field winding may be at fault (see Para. 4e) If there is a reading of 4—5 volts ($1\frac{1}{2}$—$2\frac{1}{2}$ volts for 6 volt machines) the armature winding may be at fault (see Para. 4d.).

(*vii*) Remove the cover band and examine the brushes and commutator. Hold back each of the brush springs and move the brush by pulling gently on its flexible connector. If the movement is sluggish, remove the brush from its holder and ease the sides by lightly polishing on a smooth file. Always replace brushes in their original positions. If the brushes are worn so that they do not bear on the commutator, or if the brush flexible is exposed on the running face, new brushes must be fitted and bedded to the commutator.

Test the brush spring tension with a spring scale.

The tension of the springs when new is 36—44 oz. for C45 models and 22—25 oz. for C39 models. In service, it is permissible for these values to fall to 30 and 15 oz. respectively before performance may be affected. Fit new springs if the tension is low.

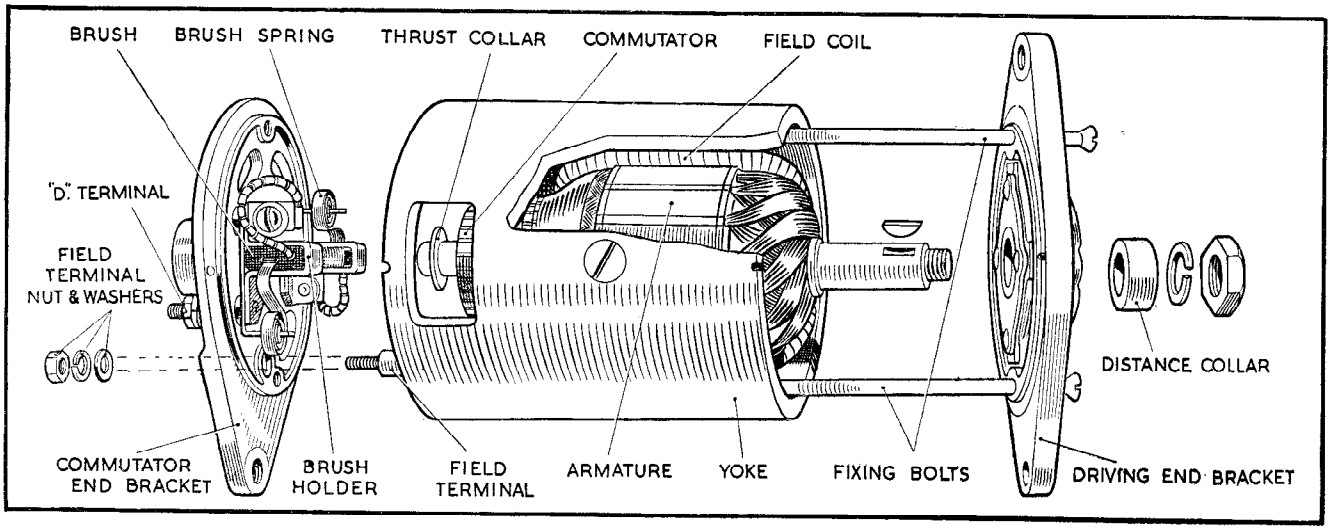



Fig. 5.
Typical generator, dismantled view

If the commutator is blackened or dirty, clean it by holding a petrol-moistened cloth against it while the engine is turned slowly by hand cranking. Re-test the generator as in (*vi*) on p.2 ; if there is still no reading on the voltmeter, there is an internal fault and the complete unit, if a spare is available, should be replaced. Otherwise the unit must be dismantled (see Para. 4b) for internal examination.

(*viii*) If the generator is in good order, remove the link from between the terminals and restore the original connections, taking care to connect generator terminal "D" to control box terminal "D", and generator terminal "F" to control box terminal "F". Proceed to test the regulator unit as described in SECTION F.

## (b) TO DISMANTLE

(*i*) Take off the driving pulley.

(*ii*) Remove the cover band, hold back the brush springs and remove the brushes from their holders.

(*iii*) Remove the nut, spring washer and flat washer from the smaller terminal (i.e. the FIELD terminal) on the commutator end bracket.

(*iv*) Unscrew and withdraw the two through bolts. In some cases locking nuts are fitted.

(*v*) The commutator end bracket can now be withdrawn from the generator yoke.

(*vi*) The driving end bracket together with the armature can now be lifted out of the yoke. Take care not to lose the spring and bearing cup from the end of the armature shaft on C45PVS generators.

(*vii*) The driving end bracket, which on removal from the yoke has withdrawn with it the armature and armature shaft ball-bearing, need not be separated from the shaft unless the bearing is suspected and requires examination, or the armature is to be replaced ; in this event the armature should be removed from the end bracket by means of a hand press.

## (c) COMMUTATOR

A commutator in good condition will be smooth and free from pits or burned spots. Clean the commutator with a petrol-moistened cloth. If this is ineffective, carefully polish with a strip of fine glass paper while rotating the armature. To remedy a badly worn commutator, mount the armature, with or without the drive end bracket, in a lathe, rotate at high speed and take a light cut with a very sharp tool. Do not remove more metal than is necessary. Polish the commutator with very fine glass paper. Undercut the insulators between the segments to a depth of 1/32″ with a hack saw blade ground down to the thickness of the insulator.

## (d) ARMATURE

The testing of the armature winding requires the use of a volt drop test and growler. If these are not available the armature should be checked by substitution. No attempt should be made to machine the armature core or to true a distorted armature shaft.

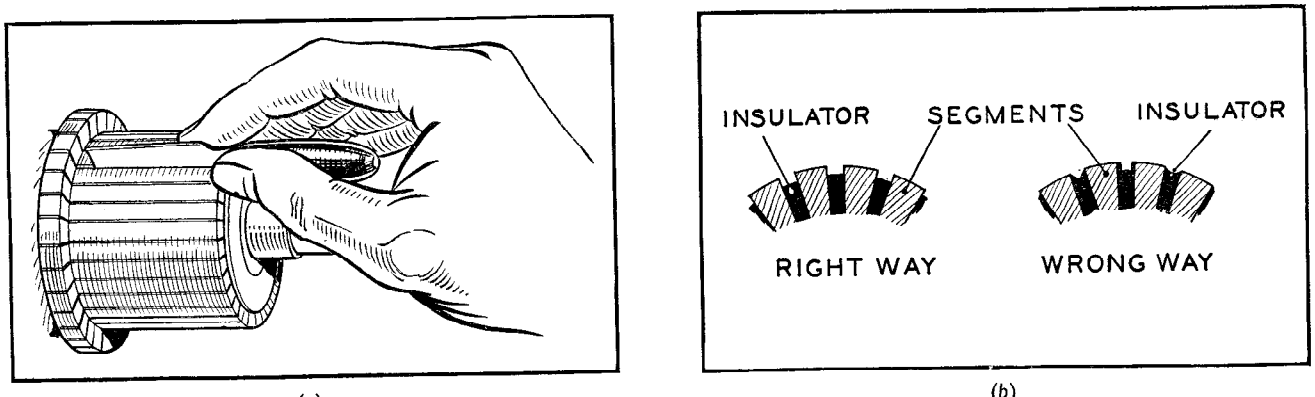
## (e) FIELD COILS

Measure the resistance of the field coils, without removing them from the generator yoke, by means of an ohm meter. These values are as follows :—

Model C39 (6 volt) : 2·7 ohms approx.

Model C39 (12 volt) : 6·2 ohms approx.

Model C45 : 6·0 ohms approx.




(*a*) (*b*)

Fig. 6.
Method of undercutting commutator insulation

If an ohm meter is not available, connect a 12 volt D.C. supply (or 6 volt in case of Model C39, 6 volt) with an ammeter in series between the field terminal and generator yoke. The ammeter reading in each case should be approximately 2 amperes. No reading on the ammeter indicates an open circuit in the field winding.

To test for earthed field coils, unsolder and isolate the end of the field winding from the earth terminal on the generator yoke and, with a mains test lamp, check between the field terminal and yoke. If the lamp lights, the field coils are earthed. In either case, unless a replacement generator is available, the field coils must be replaced. To do this, carry out the procedure outlined below, using a pole shoe expander and a wheel-operated screwdriver.

(*i*) Remove the insulation piece which is provided to prevent the junction of the field coils from contacting with the yoke.

(*ii*) Mark the yoke and pole shoes in order that they can be fitted in their original positions.

(*iii*) Unscrew the two pole shoe retaining screws by means of the wheel operated screwdriver.

(*iv*) Draw the pole shoes and coils out of the yoke and lift off the coils.

(*v*) Fit the new field coils over the pole shoes and place them in position inside the yoke. Take care to ensure that the taping of the field coils is not trapped between the pole shoes and the yoke.

(*vi*) Locate the pole shoes and field coils by lightly tightening the fixing screw.

(*vii*) Insert the pole shoe expander, open it to the fullest extent and tighten the screws.

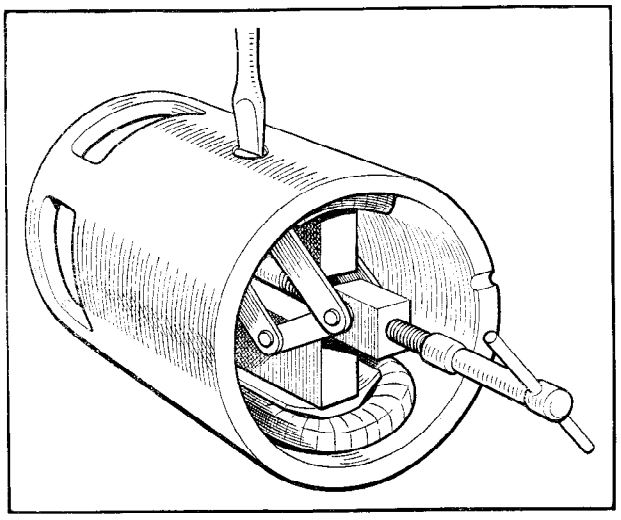


Fig. 7.
Pole shoe and field coil assembly

(*viii*) Finally tighten the screws by means of the wheel operated screwdriver and lock them by caulking.

(*ix*) Replace the insulation piece between the field coil connections and the yoke.

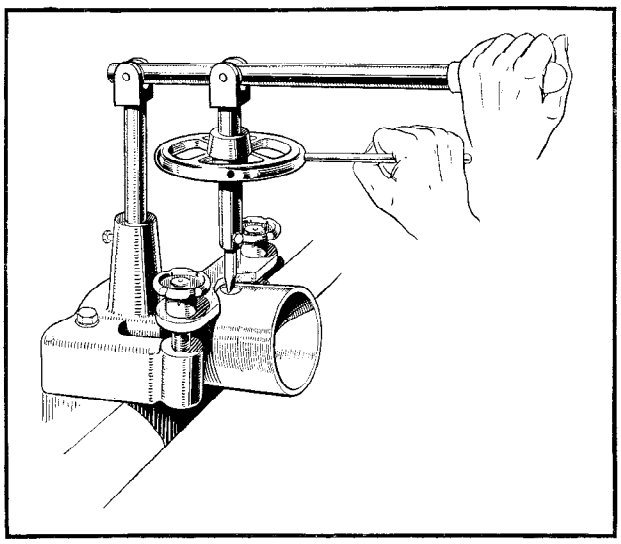


Fig. 8.
Tightening pole shoe retaining screws

(f) BEARINGS

Models C39PV, C39P, C45P and C45PV-4 are fitted with a ball bearing at the driving end and a porous bronze bearing bush at the commutator end. Model C45PVS has ball bearings at both ends.

Bearings which are worn to such an extent that they will allow side movement of the armature shaft, must be replaced.

To replace the bearing bush at the commutator end on Models C39V, C39P, C45P and C45PV-4, proceed as follows :—

(*i*) Press the bearing bush out of the commutator end bracket.

(*ii*) Press the new bearing bush into the end bracket using a shouldered, highly polished mandrel of the same diameter as the shaft which is to fit in the bearing. **Porous bronze bushes must not be opened out after fitting, or the porosity of the bush may be impaired.**

**Note:** Before fitting the new bearing bush it should be allowed to stand for 24 hours completely immersed in thin engine oil; this will allow the pores of the bush to be filled with lubricant. In cases of extreme urgency, this period may be shortened by heating the oil to 100°C. when the time of immersion may be reduced to 2 hours.

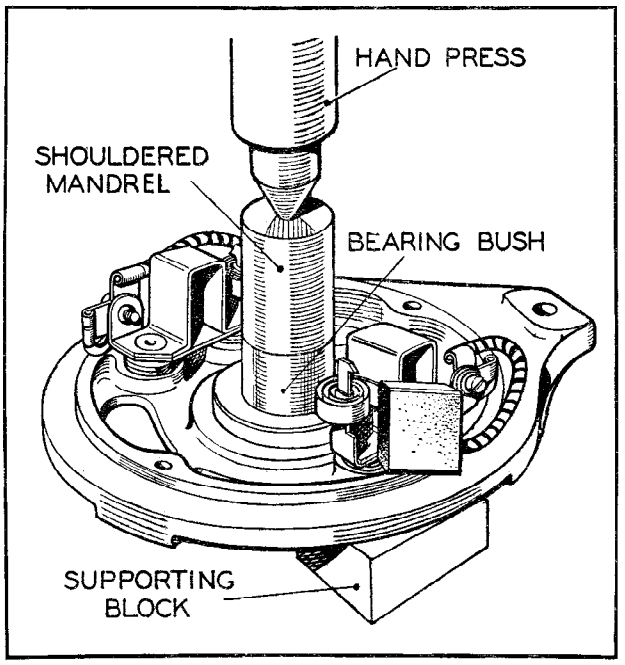



Fig. 9.
Method of fitting porous bronze bearing bush

The ball bearing at the driving end on all models is replaced as follows :—

(*i*) Knock out the rivets which secure the bearing retaining plate to the end bracket and remove the plate.

(*ii*) Press the bearing out of the end bracket and remove the corrugated washer, felt washer and oil retaining washer.

(*iii*) Before fitting the replacement bearing see that it is clean and pack it with high melting point grease.
(*iv*) Place the oil retaining washer, felt washer and corrugated washer in the bearing housing in the end bracket.

(*v*) Locate the bearing in the housing and press it home by means of a hand press.

(*vi*) Fit the bearing retaining plate. Insert the new rivets from the inside of the end bracket and open the rivets by means of a punch to secure the plate rigidly in position.

The ball bearing at the commutator end on Model C45PVS is replaced as follows :—

(*i*) Remove the four screws securing the square metal plate.

(*ii*) Press the bearing out of its housing.

(*iii*) Before fitting the replacment bearing see that it is clean and pack it with high melting point grease.

(*iv*) Locate the bearing in the housing and press it home by means of a hand press. Finally refit the metal cover plate.

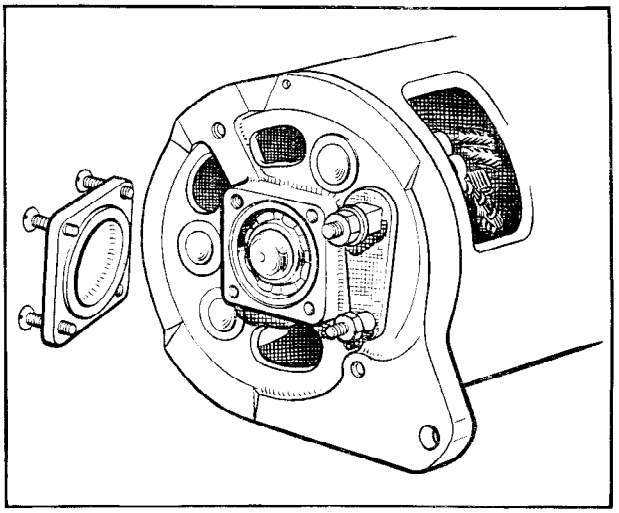


Fig. 10.
Replacement of ball bearing
(CE bracket, Model C45PVS)

## (g) REASSEMBLY

In the main the reassembly of the generator is a reversal of the operations described in Para. 4(b). Before refitting Models C39PV, C39P, C45P and C45PV-4 to the vehicle, unscrew the lubricator from the commutator end bracket, lift out the felt wick and spring and refill the cap with H.M.P. grease. Replace spring and wick and screw the lubricator in position in the end bracket.