SECTION A–4
ISSUE 2, SEPTEMBER 1963
Supersedes Issue 1, August 1959
and also Section A–1, Part B, Pages 6 and 7

LUCAS

Quality

EQUIPMENT

WORKSHOP INSTRUCTIONS

GENERATORS

MODELS C40-1, C40, C40R, C40Q, C40A, C40AQ, C40L, C40LQ, C40LA and C42

JOSEPH LUCAS LTD · BIRMINGHAM 19 · ENGLAND

D/863/D Printed in England

GENERATORS

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1. GENERAL

(*a*) ADDITIONAL MODELS

Since section A-4 was first issued in August 1959 a number of additions have been made to the C40 range of generators. A further machine—model C42—has also been introduced. Whilst constructionally similar to the C40, the C42 is of slightly larger diameter and has a commensurately higher maximum output. As usual, minor differences occur between machines having the same model designation but differing Part Numbers. These differences concern such features as terminal types and their radial positioning on the commutator end bracket, earth polarity, finish and whether the commutator end bracket has a bush or a ball race bearing, etc. The 'output' and 'field' terminals ('D' and 'F') of C40 and C42 generators are normally situated on the commutator end bracket although certain (otherwise standard) machines have their terminals mounted on the yoke, when the suffix letter 'Q' is added to the model designation (e.g. C40Q, C40LQ, etc.).

(*b*) DESCRIPTIONS

The present range of C40 and C42 generators is listed overleaf, together with the salient features of each machine.

Note: Any of these machines may be produced in 'Q' form, i.e. with the terminals on the yoke.

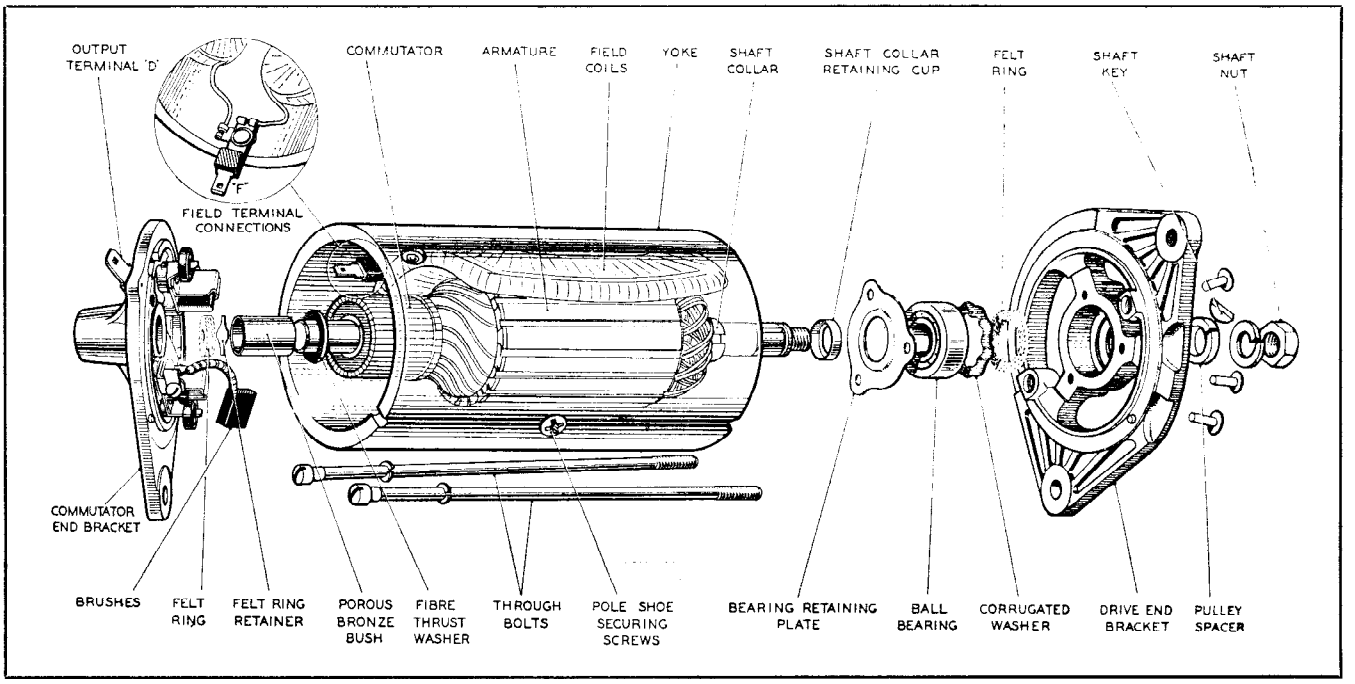

Fig. 1
Typical generator, dismantled

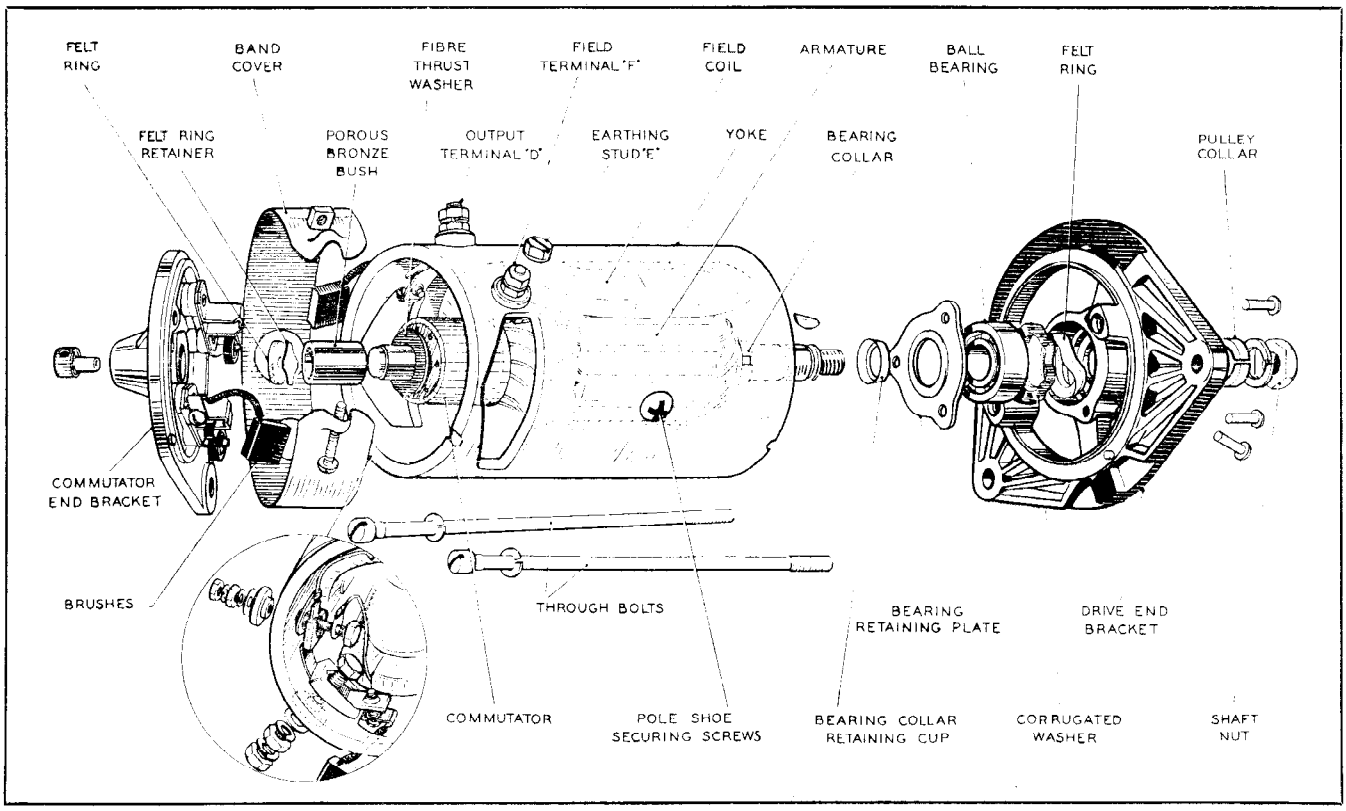

Fig. 2
Generator, model C40LQ, with windowed yoke, oiler and alternative drive end bracket assemblies — see also Fig. 2a

C40-1 Extruded yoke construction, ventilated, two-pole, two-brush machine having a maximum continuous output of 22 amperes when used with a 5" (127 mm.) dia. fan and a current-voltage control box.

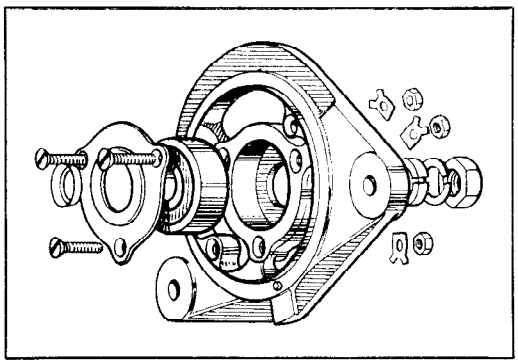

Fig. 2a
Alternative drive end bracket assembly

C40 Wrapped and welded yoke version of model C40-1.

C40A As model C40 in construction but non-ventilated. Fitted to vehicles which operate under exposed service conditions. Continuously rated at 11 amperes.

C40R As model C40 but constructed for racing and rally purposes by having one or more of the special constructional features listed in section A-1, Part B, Page 5 of this Manual. Continuously rated at 22 amperes.

C40L As model C40 in diameter and general construction but slightly longer in yoke length. Continuously rated at 25 amperes.

C40LA As model C40L but non-ventilated. Continuously rated at 13 amperes.

C42 Larger in diameter than the C40 range but otherwise constructionally similar. Standard version continuously rated at 30 amperes.

(c) CAUSES OF GENERATOR FAILURE

Generator failure is often traceable to external causes and the mere replacing of an overheated or burned out machine is, in itself, insufficient. At such times the following checks should be made to locate the original defect and to ensure that the trouble does not recur.

(*i*) Check control box earth.

(*ii*) Check control box settings.

(*iii*) Check that the 'D' and 'F' cables are correctly connected at the generator and control box.

(*iv*) Check for short circuit between 'D' and 'F' cables.

(*v*) Check main charging cables from battery to control box, rectifying any bad connections, etc.

(*vi*) Check the battery condition as shorted cells may, with compensated voltage control, overload the generator, causing it to overheat. If the battery is merely "flat" due to the generator having failed, it must be re-charged from an external source until the specific gravity of the electrolyte is at least 1.200.

2. ROUTINE MAINTENANCE

(*a*) LUBRICATION

(*i*) All models C40 and C42 generators are fitted with a ball race bearing in the drive end bracket. This bearing is packed with lubricant on production and requires no periodic attention. On certain of these machines a ball-race bearing is also fitted in the commutator end bracket, when the same applies. When a porous bearing bush is fitted in the commutator end bracket this must be periodically lubricated as follows :—

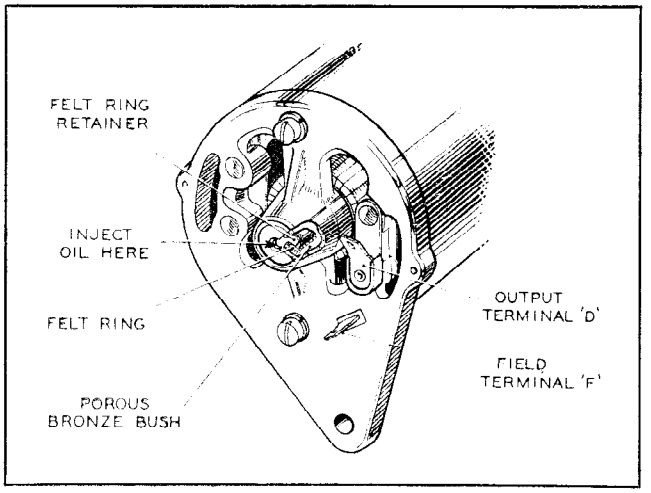

Fig. 3
Typical commutator end bracket showing details of bearing lubrication

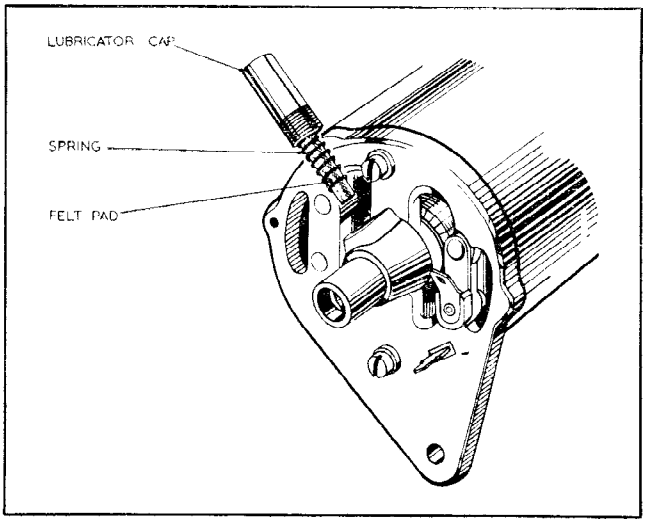

Fig. 4
Commutator end bracket with screw type oiler and provision for a tachometer drive

Every 6 months, or 6,000 miles (road vehicles) or 700 running hours (tractors and stationary engines), whichever occurs first, inject a few drops of clean high quality S.A.E.30 engine oil into the hole (usually marked 'Oil') in the commutator end bearing bush housing.

(*ii*) When a tachometer drive take-off is incorporated in the machine, a tube-type lubricator is screwed into the side of the commutator-end bearing housing. To replenish, unscrew the lubricator, lift out the felt pad and spring, and about half fill the lubricator cap with high melting point (H.M.P.) grease. Refit the spring, felt pad and lubricator.

(*b*) INSPECTION OF BRUSHGEAR

At every fourth lubrication period the generator should be removed from the engine and the brushgear examined by a competent automobile electrician. See para. 4(c).

(*c*) BELT ADJUSTMENT

Occasionally inspect the driving belt and, if necessary, adjust to take up any undue slackness by turning the generator in its mounting. Avoid overtightening the belt. See that the machine is properly aligned otherwise undue strain will be thrown on the generator bearings.

3. PERFORMANCE DATA

Model	Nominal Voltage	Cutting-in Speed (r.p.m., max.)	At Gen. Volts	Max. Continuous Output (amp.)	At r.p.m. (max.)	At Gen. Volts	On Resistance Load (ohms)	Field Resistance (ohms)	Brush Spring Pressures	Replace Brushes at
C40–1 C40 C40R* C40Q	12	1450	13.0	22	2250	13.5	0.61	6.0	30–13 oz. (850–370 g.)	$\frac{9}{32}$" (7.14 mm.)
C40A C40AQ	12	1100	13.0	11	1700	13.5	1.23	6.0	30–13 oz. (850–370 g.)	$\frac{9}{32}$" (7.14 mm.)
C40L C40LQ*	12	1350	13.0	25	2275	13.5	0.54	5.9	30–13 oz. (850–370 g.)	$\frac{9}{32}$" (7.14 mm.)
C40LA	12	1320	13.0	13	1740	13.5	1.04	5.9	30–13 oz. (850–370 g.)	$\frac{9}{32}$" (7.14 mm.)
C42*	12	1360	13.0	30	2330	13.5	0.45	4.5	33–16 oz. (940–450 g.)	$\frac{1}{4}$" (6.35 mm.)

*See Section A–1 Part A for Part Nos. and performance details of non-standard machines.

4. SERVICING

(*a*) TESTING THE GENERATOR IN POSITION

In the event of a fault developing in the charging circuit the generator should be checked as follows without removing it from the vehicle.

(*i*) Inspect the driving belt and adjust as necessary.

(*ii*) Check the generator terminal connections : The larger terminal ('D') carries the main generator output, the smaller terminal ('F') the field current. 'Q' type generators usually have terminals of similar size when the yoke is stamped 'D' and 'F' accordingly.

(*iii*) Disconnect the generator and link the two terminals with a short length of bare wire.

(*iv*) Start the engine and allow it to run at idling speed.

(*v*) Clip the appropriate lead of a moving-coil type 0-20 voltmeter 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 and do not race the engine in an attempt to increase the voltage. If the voltage does not rise rapidly and without fluctuation the unit must be dismantled for detailed examination, see para. 4(b). Excessive sparking at the commutator in the above test indicates a defective armature which must be replaced.

Note 1: If a radio suppression capacitor is fitted between the output terminal and earth, disconnect this capacitor and re-test the generator before dismantling. If a normal reading is now shown on the voltmeter the capacitor is defective and must be replaced.

Note 2: Some special purpose vehicles employ generators having the return current path insulated from the frame of the machine and, instead, brought out via a cable to a further terminal. These insulated-return machines can be tested in the same manner as the conventional 'earth-return' generator described above except that all references to 'earth' refer, in this instance, to the extra terminal.

If the generator is in good order remove the wire link and restore the original connections.

(*b*) TO DISMANTLE

(*i*) Take off the driving pulley.

(*ii*) Unscrew and withdraw the two through bolts. Generator model C42 is fitted with through bolts of non-magnetic material which must not, on any account, be replaced with ferrous bolts.

(*iii*) Withdraw the commutator end bracket from the yoke. With 'insulated-return' generator first disconnect the field coil cable connection to the brush box terminal.

(*iv*) Lift the driving end bracket and armature assembly from the yoke. Take care not to lose the fibre thrust washer (when fitted) from the commutator end of the armature shaft.

(*v*) 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 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, having first removed the shaft key.

(c) BRUSHGEAR (*Checking with yoke removed*)

(*i*) Lift the brushes up into the brush boxes and secure them in that position by positioning the brush springs at the sides of the brushes.

(*ii*) Fit the commutator end bracket over the commutator and release the brushes.

(*iii*) Hold back each of the brush springs and slide the brush upwards in its box by pulling gently on the 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 refit brushes in their original positions. Brushes worn to, or approaching, the minimum permissible brush length (see Para. 3) must be renewed. When changing brushes use only replacements **of the type originally fitted.** Certain generators are fitted with brushes of special grade carbon and the performances of these units can be adversely affected when brushes of a type other than the original are fitted.

(*iv*) Measure brush spring pressures using a spring balance held radially to the commutator, and compare the reading with the values shown in Para. 3. Of the two figures given, the higher indicates the maximum spring pressure permissible on a new brush, the lower the minimum pressure on a fully worn brush. Replace springs that are obviously defective.

(d) COMMUTATOR

(*i*) A commutator in good condition will be smooth and free from pits and burned spots. Two types of commutator, the moulded and the fabricated, are being currently produced. Moulded commutators can be recognized by the exposed end being quite smooth, unlike that of the fabricated commutator from which a metal roll-over and an insulating cone protrude (see Fig. 5).

(*ii*) A moulded commutator can be re-skimmed during service but care must be exercised to ensure that the finished diameter is not less than 1.450" (36.83 mm.). The process of re-skimming consists of rough turning (if necessary) followed by diamond turning. Whether or not rough turning is carried out depends upon the severity and unevenness of the wear which has taken place. A moulded commutator requires no undercutting in service, the production undercut being of sufficient depth to obviate any further need for this. The insulation slots must, however, be kept clear of copper and carbon residue.

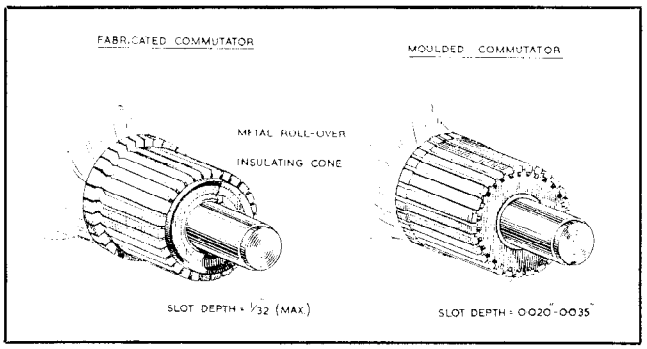

Fig. 5
Comparison of fabricated and moulded commutators

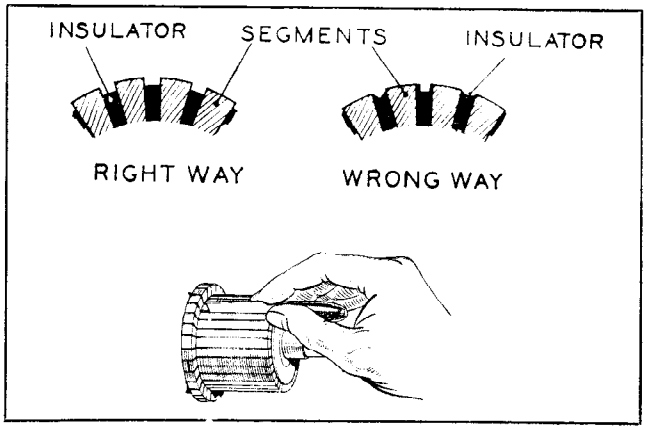

Fig. 6
Undercutting a fabricated commutator

(*iii*) To remedy a worn fabricated commutator, undercut the insulators between the segments to a depth of $\frac{1}{32}$" (0.8 mm.) using a hacksaw blade ground to the thickness of the insulator, then 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.

(e) ARMATURE

Indication of an open-circuited armature winding will be given by burnt commutator segments. If armature testing facilities are not available, an armature can be checked by substitution. To separate the armature shaft from the drive end bracket, press the shaft out of the drive end bracket bearing. When fitting the new armature, support the inner journal of the ball bearing, using a mild steel tube of suitable diameter, whilst pressing the armature shaft firmly home.

(f) FIELD COILS

(*i*) Measure the resistance of the field coils, without removing them from the generator yoke, by means of an ohm meter connected between the field terminal and the yoke ('earth-return' machines) or between the field terminal and the field coil cable normally connected to the brush box terminal ('insulated-return' machines). Field resistance values are given in Para. 3.

(*ii*) If an ohm meter is not available, connect a 12-volt d.c. supply between the same two points with an ammeter in series. The normal ammeter reading is approximately 2 amperes (5.9 or 6.0 ohm fields) or 2½—3 amperes (4.5 ohm fields). Zero reading on the ammeter or an "infinity" ohm meter reading indicates an open circuit in the field winding.

(*iii*) If the current reading is much above (or the ohm meter reading much below) the normal, it is an indication that the insulation of one of the field coils has broken down.

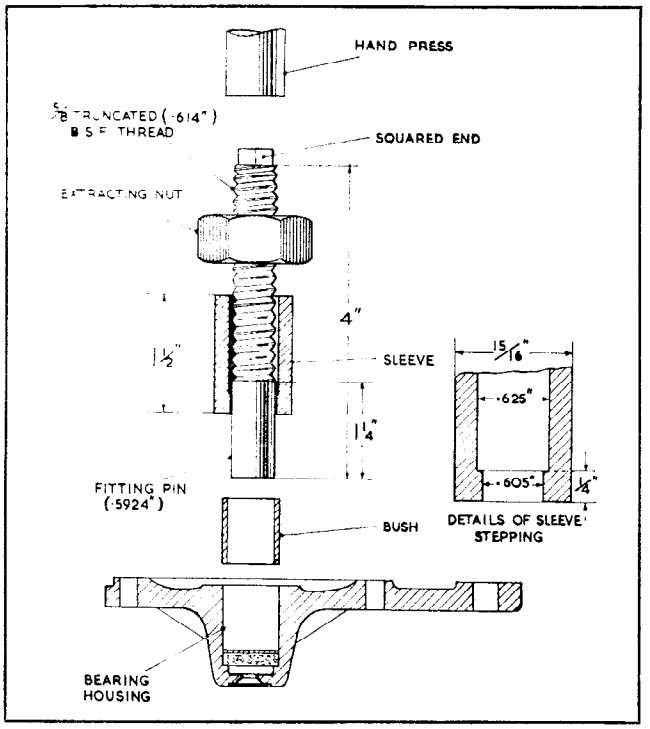

Fig. 7
Method of fitting porous bronze bush in commutator end bracket

(*iv*) In either event the field coils must be replaced, unless a spare generator is available.

(*v*) Replacement field coils for generators having Lucar terminals on the commutator end bracket are provided complete with a field terminal assembly attached, which only requires riveting to the yoke — no soldering being necessary.

(*vi*) Some 'Q' type generators have captive nuts — the outer end of the stud type field terminal being pinched or gimped. When replacing field coils on these dynamos, it is necessary to file away the gimping to permit removal of the nuts, etc. Replacement field coils for all 'Q' type generators carry eyelets for assembling to the original stud type terminal. Alternatively, the coil ends can be soldered to the original eyelets without disturbing the terminals.

(*vii*) When replacing field coils, note that an insulation piece is provided to prevent the junction of the coils from contacting the yoke.

(*viii*) The yoke and pole shoes should be marked to facilitate refitting of the latter in their original positions.

(*ix*) A wheel-operated screwdriver, as shown in Fig. 8, must be used to ensure that pole shoe retaining screws are securely tightened.

(*x*) Take care to ensure that the taping of the field coils does not get trapped between the mating surfaces of the pole shoes and yoke — otherwise the magnetic circuit will be impaired and the electrical performance will suffer.

(g) BEARINGS

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

(*i*) To replace a bearing bush in the commutator end bracket, proceed as follows:—

Remove the old bearing bush from the end bracket. The bearing can be withdrawn with a suitable extractor or by screwing a ⅝" tap into the bush for a few turns and pulling out the bush with the tap. Screw the tap squarely into the bush to avoid damaging the bracket.

Withdraw and clean the felt ring retainer and felt ring.

Insert the felt ring and felt ring retainer in the bearing housing, then press the new bearing bush into the end bracket, using a self-extracting tool of the type and in the manner shown in Fig. 4—the fitting pin or mandrel portion being of 0.5924" (15.05 mm.) diameter and highly polished. To withdraw the pin after

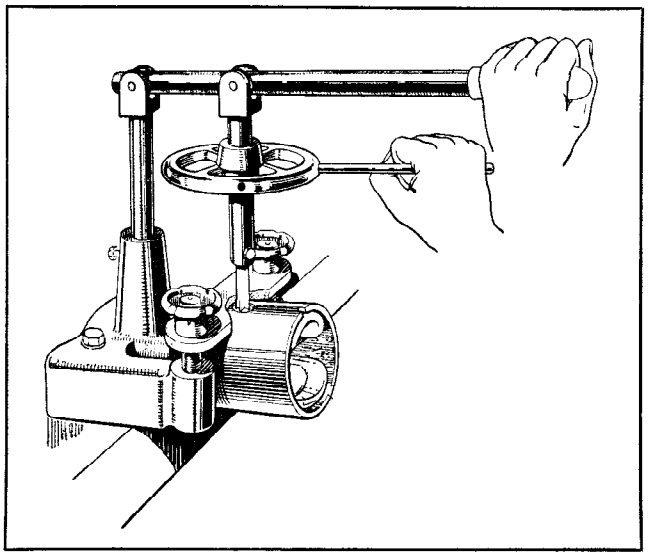

Fig. 8
Tightening pole shoe retaining screws using a wheel-operated screwdriver

pressing the bush fully home, turn the nut against the sleeve while gripping the squared end of the fitting pin.

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 a good grade S.A.E.30 engine oil ; this will allow the pores of the bush to be filled with lubricant.

When, instead of a bearing bush, a ball bearing is fitted in the commutator end bracket, this can be removed using a suitable extractor.

(*ii*) The ball bearing at the driving end is replaced as follows:—

Drill out the rivets (or withdraw the screws) which secure the bearing retaining plate to the end bracket and remove the plate.

Press the bearing out of the end bracket.

Remove and clean the corrugated washer and felt ring when fitted.

Before fitting the replacement bearing, see that it is clean and pack it with high melting point grease, such as Energrease RBB3.

Place the felt ring and corrugated washer in the bearing housing in the end bracket.

Locate the bearing in the housing and press it home.

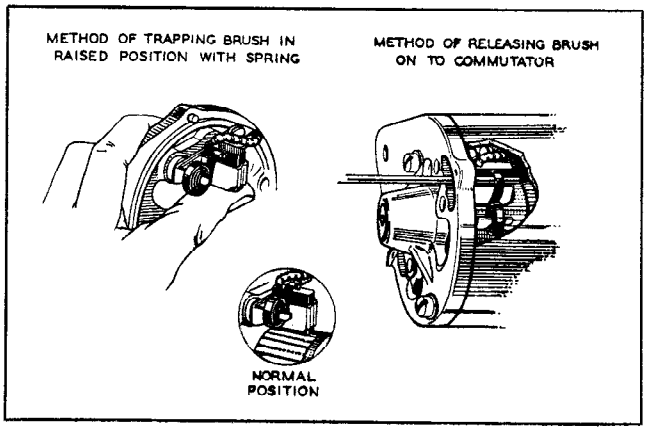

Fig. 9

Method of refitting commutator end bracket to windowless yoke, ventilated generator

Fit the bearing retaining plate. Insert the new rivets (or existing screws) from the pulley side of the D.E. bracket and open the rivets over the plate by means of a punch to secure the plate rigidly in position.

(*h*) TO REASSEMBLE

Reassembly of the generator is the reversal of the dismantling procedure. When a bearing bush is fitted in the commutator end bracket it should be lubricated following reassembly of the machine.

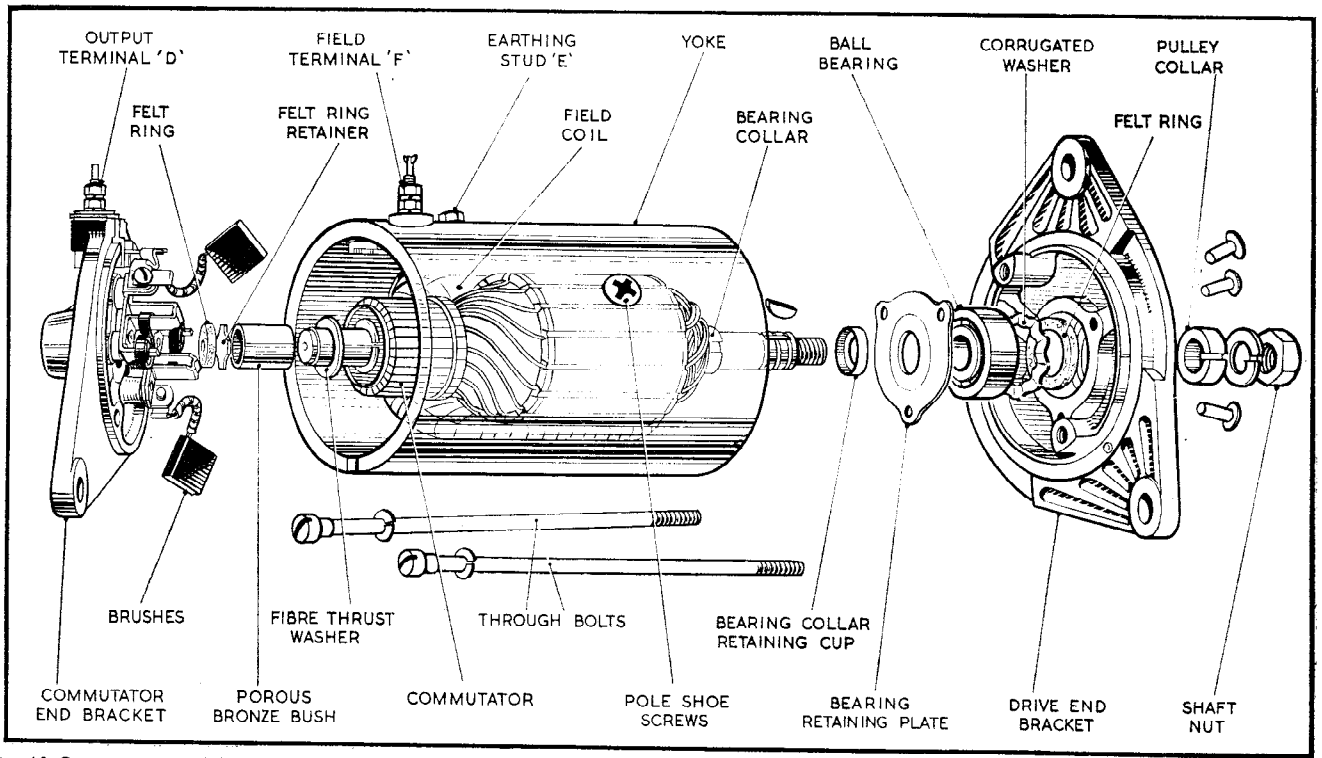

Fig. 10 Generator, model C40AQ, with output terminal radially mounted on commutator end bracket and with captive nuts on field terminal