GROUP E ELECTRICAL SYSTEM

Description of the electrical system

(see wiring diagram on page 61)

The electrical equipment consists of the following components:

A) Components fitted to engine

1. Noris dynamo starter, on front extension of crankshaft with two separate field coil assemblies (for starter and dynamo) and blower wheel with cam ring and automatic advance unit. The contact breaker sits on dynamo front plate, easily accessible for adjustment through holes in blower wheel. The whole assembly is fitted to the timing case cover by means of 4 screws and protected by a front-end cover upon the blower wheel.

   The connections for starter and dynamo pass through a rubber-garnished lateral opening in the blower wheel housing. The various leads are assembled in one wiring harness and identified by the following colours:

   a) blue lead 91[+]): From positive carbon brush of dynamo to cable connector unit II/2.

   b) black-red lead 92: From dynamo field coil assembly to cable connector unit II/3.

   c) black lead 93: From contact breaker to terminal 1 of ignition coil.

   d) The green lead 90 does not come out of the dynamo starter, but runs directly from cable connector unit II/1 to terminal 15 of ignition coil.

   To the dynamo starter pertains the cut-out and regulator unit with starter relay, which is - for the sake of protection - situated behind the battery inside the vehicle. Voltage regulator (same type as used for motorcycle) and cut-out relay are mounted upon a common base plate and protected by a sheet-metal cover. The field resistor is fitted to the bottom side of the base plate, that features five terminals:

   Terminal A for main lead to starter

   Terminal 51/30 for cable to positive terminal of battery

   Terminal 50 to terminal 50 of starter switch in instrument panel

   Terminal 61/D+ for connection of lead 4 to cable connector unit I/11 and

   Lead 18 to cable connector unit II/2

   Terminal DF for connection of lead 19 to cable connector unit II/3.

   The electrical load of starter is:

   a) start, about 90 Amps

   b) finish, about 35 to 40 Amps.

   The dynamo (generator) has a rated output of 90 Amps and it may be run with a maximum of 130 Amps.
   To adjust the voltage regulator of generator observe the following values:
   Slow-running tension:
   14.4 to 14.8 Volts,
   tension with rated output of
   90 Watts: 12.5 to 13 Volts.
   Make certain that the earth (ground) connection of regulator is always in proper condition.

2. Noris ignition coil with condenser, fixed to timing case cover by means of a bracket. For connections see point 1.

   Setting timing:
   This job requires a 12V test lamp, a breaker point gauge 0.4 mm and a screwdriver.

   The adjustment is made according to M 30.

B) Components fitted to chassis frame

1. Noris electrical horn, mounted beneath the bumper before front wheel and connected by leads 30 and 31 to cable connector units I/1 and I/2, respectively.

[+]) The lead numbers correspond with the cable designations in annexed wiring diagram.

2. Stop light switch is fitted to master cylinder of brake system and connected by leads 12 and 13 to connector units II/1 and II/4 respectively.

C) Components fitted to body

1. Battery 6 V/31 Amp. hours, is located beneath the seat. Behind it is the cut-out and regulator unit, as already mentioned under A. As usual it has shunt connection to dynamo and is linked with the current consuming units via regulator terminal 51/30 and lead 2 to connector unit I/13.

2. The instrument panel as main switching board contains:

a) the ignition and starter switch with terminals 30, 50, and 15/54. Terminal 30 is connected by lead 62 to cable connector unit I/13 and then by cable 2 to battery and generator. Rotation of ignition key connects terminals 15/54 and 50 to terminal 30.

Switch positions: First stop: Ignition and daytime consumers; pushing-in the key and further rotation operates the starter through the starter relay.

b) Six-pole fuse box with fuses 1 to 6.

The following consumers are connected:

To fuse 1: Long beam light of left-hand headlamp.

To fuse 2: Long beam light of right-hand headlamp and headlamp main beam control light.

To fuse 3: Dipped beam light for both headlamps.

To fuse 4: Tail lamp left and parking light of both headlamps.

To fuse 5: Tail lamp right and speedometer light.

To fuse 6: Electric horn, screen wiper motor, directional flasher and stop light switch.

c) Lighting switch with terminals 30, 56 and 58. Terminal 30 is connected by lead 71 to terminal 30 of ignition and starter switch. Clockwise rotation of knob to first stop switches on parking and license plate lights and the tail lights, turning to second stop cuts-in the headlamps.

d) Directional flasher with terminals 15, 54 and K. With ignition being switched-on the terminals 54 and 15 receive electrical load via fuse 6 and lead 76. Terminal 54 is connected by lead 78 to identical terminal of directional flasher on steering column guide. From terminal K the lead 77 is taken to direction indicator control light. Lead 63 (general earth (ground) lead) is attached by a lid clip beneath the directional flasher.

e) The two-pole ignition control light is connected with one pole to terminal 15/54 of ignition and starter switch, via lead 79, and with the other pole to cable connector unit I/11, via lead 60, and then by lead 4 to terminal 61/D+ of cut-out and regulator unit.

f) The direction indicator control light is connected by positive pole to terminal K of directional flasher, via lead 77. The lamp nacelle has earth (ground) connection.

g) The headlamp main beam control light is connected by positive pole to fuse 2, via lead 80, and then by lead 73 to terminal 56a of headlamp dipper switch. The nacelle has earth (ground) connection. All three lights beforementioned are equipped with a 12V/2W lamp.

h) The speedometer with flexible drive shaft. Speedometer light is connected by lead 82 to fuse 5.

3. The electrical components fitted to steering column guide:

a) The horn blowing slide contact is connected by lead

56 to connector unit I/2, and then by lead 31 to negative pole of electric hole. The steering column carries an insulated contact ring, upon which slides the contact carbon. The contact ring is connected by a cable to the horn button on steering wheel and by pushing same the earth (ground) connection is obtained.

b) The headlamp dipper switch with terminals 56, 56a and 56b is located on the left-hand side of steering column guide. Terminal 56 is connected by lead 72 to terminal 56 of lighting switch, terminal 56a by lead 73 to fuse 1 and 2 (headlamp long beam lights) and terminal 56b by lead 74 to fuse 3 (headlamp dipped beam lights).

c) The directional signal switch with terminals 54, L, R is fitted to the right-hand side of steering column guide. Terminal 54 is connected to identical terminal of directional flasher, whereas from terminal 1 ble connector unit I/8 and le connector unit I/8 and then by lead 7 to positive pole to left-hand directional signal light. Terminal R is connected by lead 58 to cable connector unit I/9 and then by lead 6 to positive pole of right-hand directional signal light.

4. The headlamps are situated upon the front wheel mudguards, right and left. To the left-hand headlamp lead the cables 32 (dipped beam light), 33 (long beam light), 34 (parking light) and 35 (earth = ground connection). The leads 10 (dipped beam light), 11 (long beam light), 16 (parking light), 17 (earth/ground) are connected to right-hand headlamp. Each headlamp contains a 12V/25/25 W Bilux lamp for long and dipped beam lights and a 12 V/2 W parking lamp.

5. The stop and license plate light is fixed in the center at rear on air intake unit above the license plate. It features two festoon-type bulbs: a 12V/15W lamp for the stop light and a 12V/3W lamp for illumination of license plate. From cable connector unit II/4 the lead 45 is taken to positive pole of stop light. The festoon bulb for license plate illumination has shunt connection and receives current from right-hand tail lamp via lead 44. The earth (ground) connection for all these lamps is also taken from the right-hand tail lamp.

6. The tail lamps are recessed in the corners of rear panel, just above the bumper. Each tail lamp unit contains a festoon-type bulb 12 V/5 W. From connector unit II/6 the lead 43 is taken to the positive terminal of right-hand tail lamp. The earth (ground) terminal is connected by lead 40 to cable connector unit II/7. From cable connector unit II/5 runs the lead 46 to the positive terminal of left-hand lamp, whereas the earth (ground) terminal is connected by lead 42 to earth lead 41 in stop and license plate light, to which it (lead 41) comes from the right-hand tail lamp.

7. The two directional signal lights are fixed to side panel, right and left, each of them being fitted with a 12V/15W festoon-type bulb. The left-hand lamp receives current via lead 7 and cable connector unit I/8 whereas the earth (ground) lead is connected by lead 14 to connector unit I/14.
The right-hand lamp receives current via lead 6 and connector unit I/9. The earth terminal is connected by lead 15 to connector unit II/7.

8. The windscreen wiper motor is fitted to inner side of door at the right of instrument panel, The wiper motor's positive terminal is connected by lead 81 to fuse 6. The switch is located upon the wiper motor.

9. Except the connections in instrument panel all leads are arranged in several wiring assemblies as follows:

a) Wiring assembly from instrument panel to cable connector unit I.

b) Wiring assembly (central harness) links connector unit I with connector unit II and provides connection to right-hand headlamp and right-hand directional signal light.

c) Wiring assembly (left branch) links left-hand headlamp and horn with connector unit I.

d) Wiring assembly (rear branch) links cable connector unit II with the lamps on vehicle rear end.

e) Wiring assembly to steering column links the terminals of switches fitted to steering column guide with the corresponding instruments in the facia panel.

f) Wiring assembly from dynamo starter links cable connector unit II with dynamo starter and ignition coil.

10. Elastic connector bar. Two 7-pole connector bars, fitted in line on the left-hand front wheel housing, form the cable connector unit I. A 7-pole connector bar, inside the right-hand bottom corner of body rear panel, constitutes the cable connector unit II.

Note: The removal of the body requires disconnection of the following leads:

a) All leads linking cable connector unit II with dynamo starter and ignition coil. Remove the seat for this purpose.

b) The leads to the stop light switch.

c) The leads to electric horn.

Wiring diagram Isetta

BLK Blinker-Kontrolle
Direction indicator control light

FLK Fernlicht-Kontrolle
Headlamp control light

TB Tacho-Beleuchtung
Speedometer light

LK Lade-Kontrolle
Ignition control light

SK Schleifkontakt
Slide contact

SD Signaldrücker
Horn button

Scheinwerfer rechts
Headlamp (right)

Scheinwerfer links
Headlamp (left)

Sicherungsdose
Fuse box

Scheibenwischer
Wiper motor

Horn
Horn

Zündanlaß-Schalter
Ignition and starter switch

Lichtschalter
Lighting switch

Blinkgeber
Directional flasher

Blinkerschalter
Directional signal switch

Abblendschalter
Headlamp dipper switch

Kabelverbind.-Klemme I
Cable connector unit No. I

Blinkleuchte rechts
Directional signal light (right)

Blinkleuchte links
Directional signal light (left)

Kabelverbindungsklemme II
Cable connector unit No. II

Batterie
Battery

Bremslichtschalter
Stop lamp switch

Reglerschalter
Regulator & cut-out

Lichtanlasser
Dynamo starter

Zündspule
Ignition coil

Schlußlicht rechts
Tail light (right)

Schlußlicht links
Tail light (left)

Brems-Kennzeichenleuchte
Stop & License plate light

E 5 Replacing contact breaker points

Fig. 1 — Tools: Screwdriver 6 mm, socket spanner 17/22 mm, puller screw for blower wheel No. 527, scriber, 1 set of contact spanners.

Fig. 2

1. Remove blower wheel housing (screwdriver 6 mm)
2. Remove dynamo front end cap. (screwdriver 6mm)
3. Unscrew blower wheel screw. (socket spanner 17 mm)
4. Remove blower wheel by means of puller screw No. 527. (puller screw No. 527, socket wrench 22 mm)

Fig. 3

5. Slacken screw securing contact breaker lead. (open ended spanner 5.5 mm)

Fig. 4

Caution: Spring for breaker arm is slotted, so that this screw must not be removed entirely.

6. Remove spring lock washer retaining the breaker arm. (scriber)

Fig. 5

Caution: Hold spring lock washer with the finger to avoid jumping away.

7. Remove breaker arm.
8. Detach contact support. (screwdriver 6 mm)

To fit the new breaker points proceed in exactly the reverse order.

Caution: Before fitting the breaker arm fill the bearing bushing with Bosch grease F t 1 v 22. Upon having fitted new breaker points it is indispensable to reset the ignition timing (see M 30 Figures 81-85)

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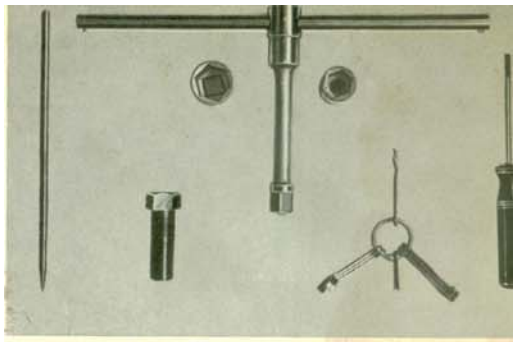

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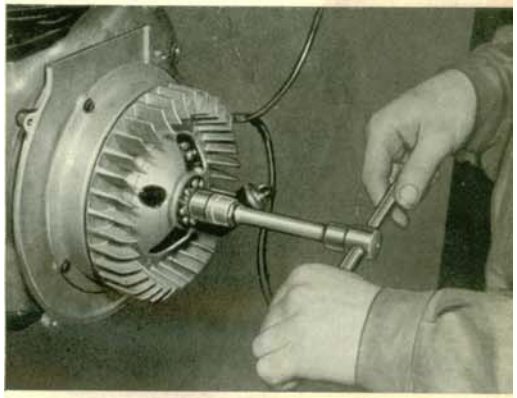

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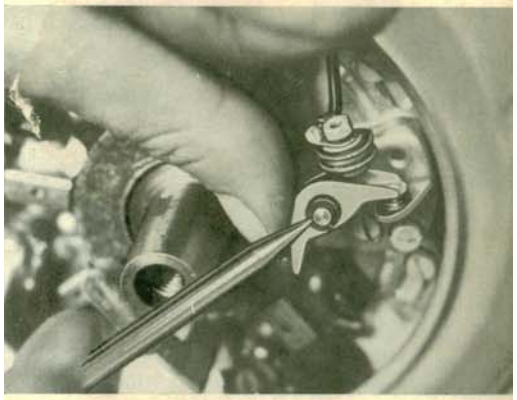

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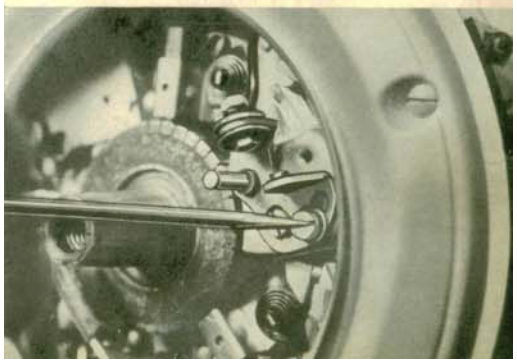

E 6 Replacing springs of automatic advance unit, and greasing the cam

Fig. 6 — Tools: Screwdriver 6 mm, socket spanner 17/22 mm, puller screw for blower wheel No. 527, scriber.

Fig. 7 — 1. Remove blower wheel housing (screwdriver 6 mm)

2. Remove dynamo front end cap (screwdriver 6mm)

3. Unscrew blower wheel fixing screw. (socket spanner 17 mm)

4. Remove blower wheel by means of puller screw. (puller screw No. 527, socket spanner)

5. Mark position of cam (coloured pencil or brass scriber)

Fig. 8 — 6. Unhook advance springs. (scriber)

7. Remove lock ring for breaker cam (screwdriver)

Fig. 9 — 8. Unhook advance springs on breaker cam.

Caution: The advance springs are calibrated and must not be modified by extending them.

Fig. 10 — Caution: The breaker cam should be greased inside before being fitted. Fill groove machined in inner side of breaker cam with lubricating grease.

The reassembly is carried out in exactly the reverse order. Fit the breaker cam into its original position, determined by the colour marks.

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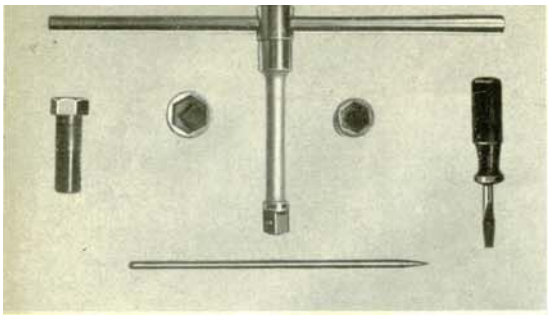

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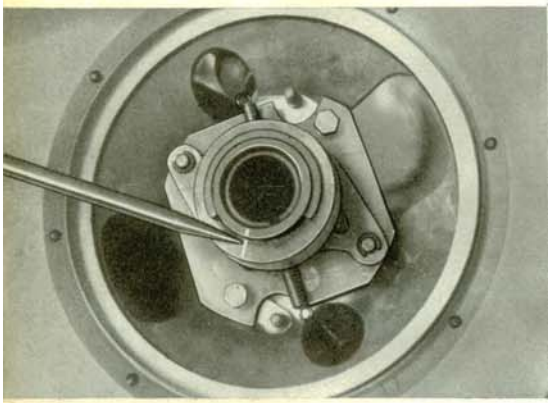

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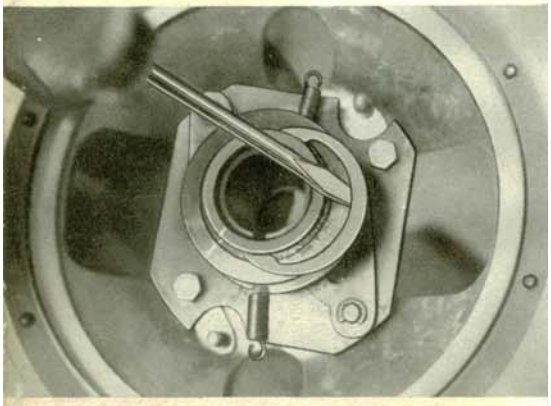

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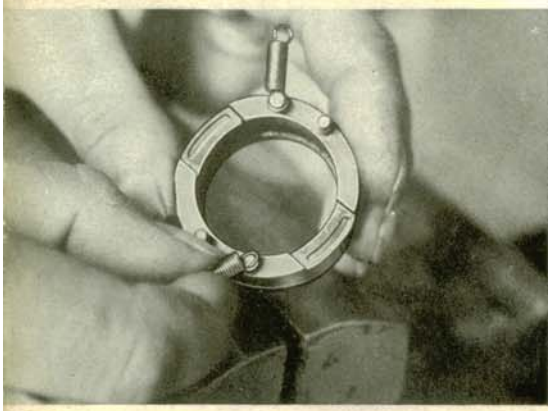

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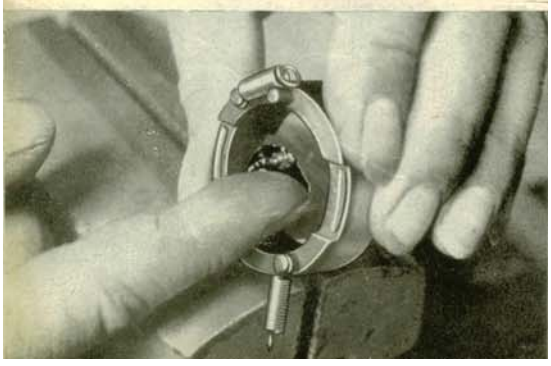

E 7 Replacing carbon brushes

Fig. 11 — Tools: Screwdriver 6mm, socket spanner 17/22 mm, puller screw for blower wheel No. 527.

Fig. 12 — For jobs 1 to 4 see E 6. Furthermore:

5. Remove sheet-metal cover from dynamo (genrator) housing. (screwdriver 6 mm)

Fig. 13 — 6. Withdraw brush springs from top of carbon brushes and release them laterally. (screwdriver)

Fig. 14 — 7. Slacken brush lead attaching screw. (screwdriver 6 mm)

Fig. 15 — 8. Lift off the carbon brushes and fit the new set.

Caution: Make certain positive and negative brush leads are not too close each to other.

The reassembly is carried out in exactly the reverse order.

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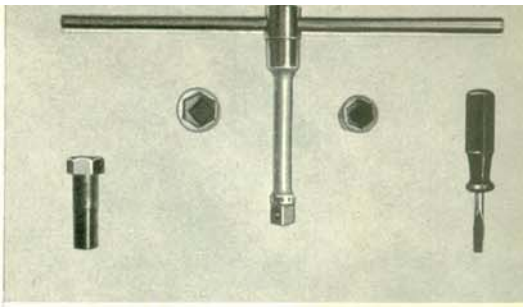

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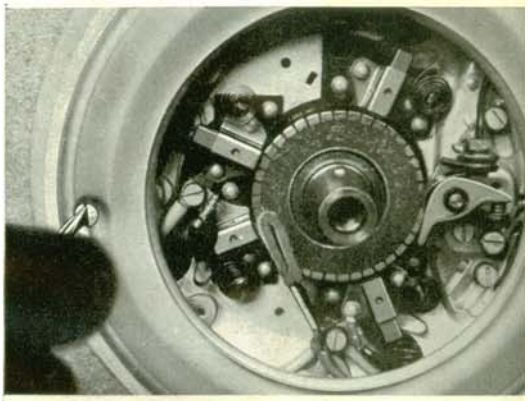

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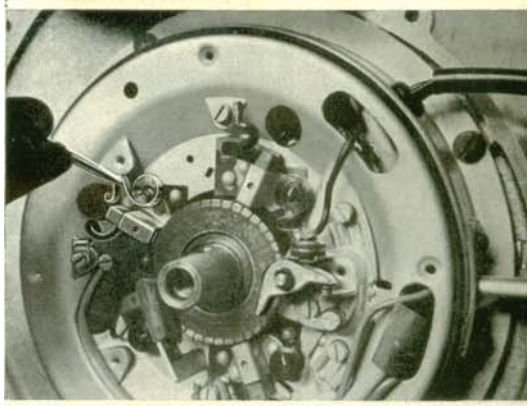

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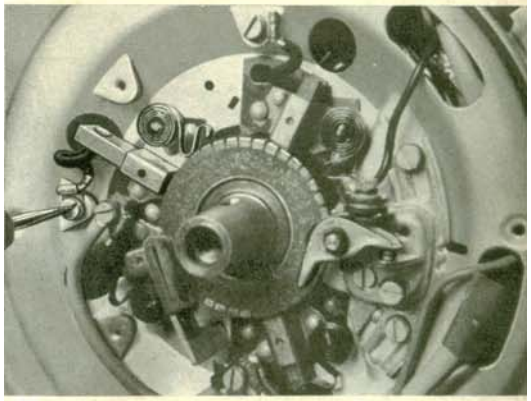

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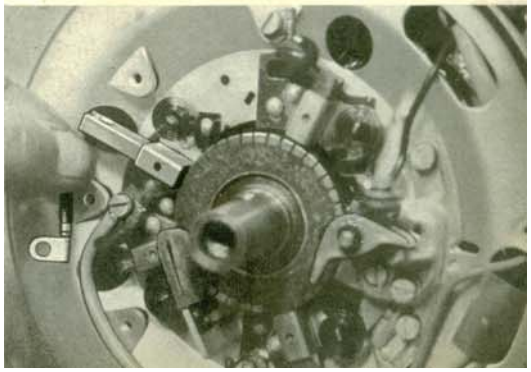


E 9 Testing carbon brushes for circuit and ground (earth)

Fig. 16 Tools: Screwdriver 6/8 mm, electric screwdriver, socket spanner 17/22 mm, puller screw for blower wheel No. 527, test lamp.

Fig. 17 Jobs 1 to 5 as outlined in E 7. Furthermore:

6. Lift off all springs from carbon brushes, withdraw the brushes. (screwdriver)

7. Disconnect leads 15 and 1 from ignition coil.

8. Disconnect battery lead from starter connection. (screwdriver)

9. Disconnect leads green, blue and black/red from cable connector unit in the vehicle and draw them out. (see Group A 1 Figure 4) (electric screwdriver)

10. Detach dynamo (generator) housing. (screwdriver 8 mm)

Fig. 18 Caution: When testing hold in mind that 2 brush holders have ground (earth) connection, 2 brush holders are insulated.

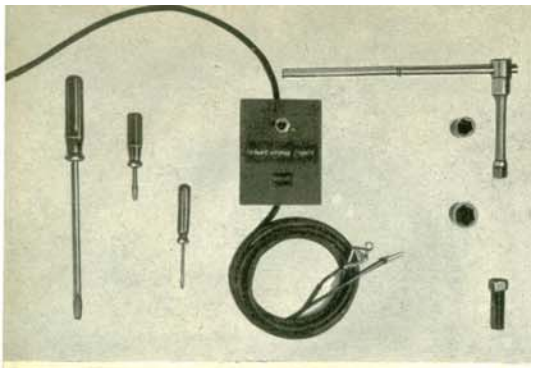
11. Disconnect positive connections from the two insulated brush holders. (screwdriver 6 mm)

Fig. 19 12. Test the grounded (earthed) brush holders (negative), by connecting one test lamp probe to the housing and the other probe to the brush holder. The test lamp must light.

Fig. 20 13. Test the insulated brush holders (positive), by connecting one test lamp probe to the housing and the other probe to the brush holder. The test lamp must not light.

The reassembly is carried out in exactly the reverse order.

16



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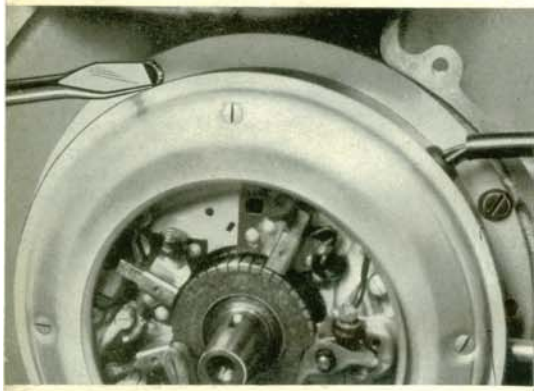

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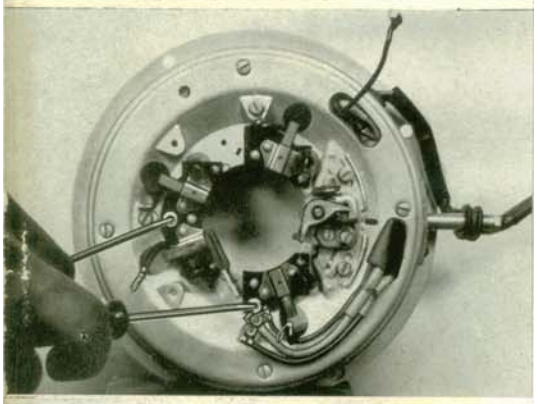

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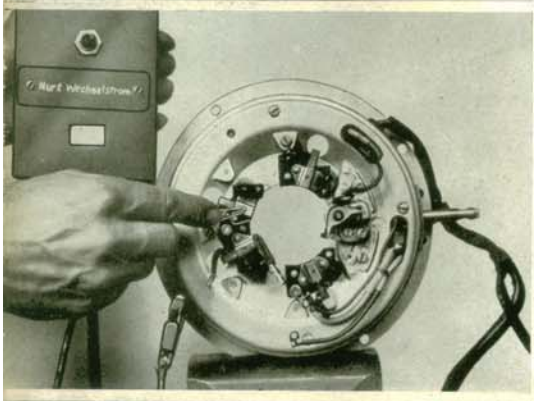

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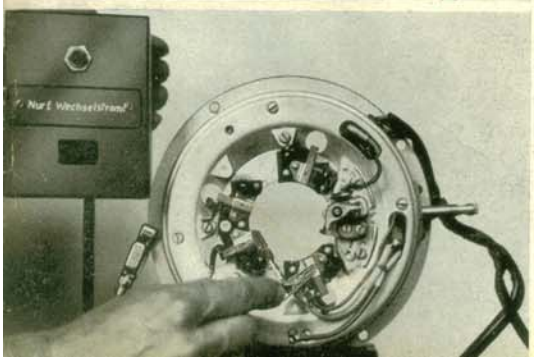
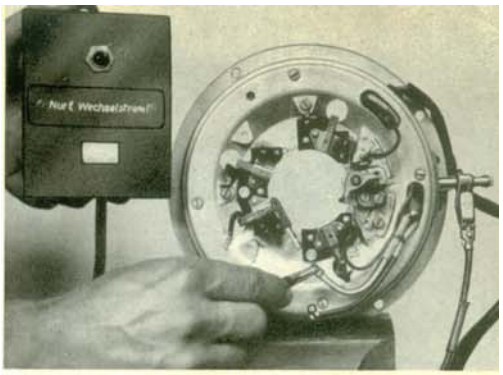


E 10 Testing field coils for circuit and ground (earth)

Tools: Same set as for E 9.

Jobs 1 to 10 as outlined in E 9. Furthermore:

Fig. 21 — 11. Disconnect field coil leads from brush holders.



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12. Test starter field coils for circuit by connecting one test lamp probe to the field coil terminal lead and the other probe to starter lead terminal stud. The test lamp must light.

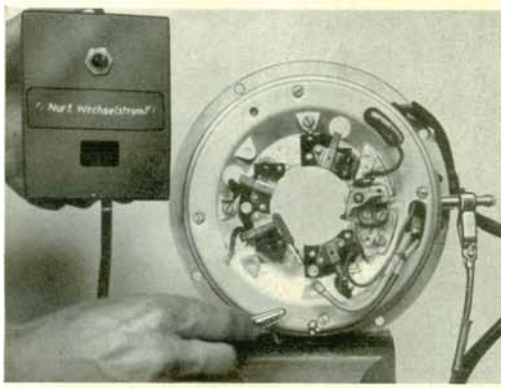

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Fig. 22 — 13. Test starter field coils for ground (earth) by connecting one test lamp probe to starter lead terminal stud and the other probe to the dynamo cover. The test lamp must not light.

23

Fig. 23 — 14. Test dynamo (generator) field coils for circuit by connecting one test lamp probe to field coil terminal lead and the other probe to brush lead of field coil. The test lamp must light.

Fig. 24 — 15. Test dynamo (generator) field coils for ground by connecting one test lamp probe to field coil terminal lead and the other probe to the dynamo cover plate. The test lamp must not light.

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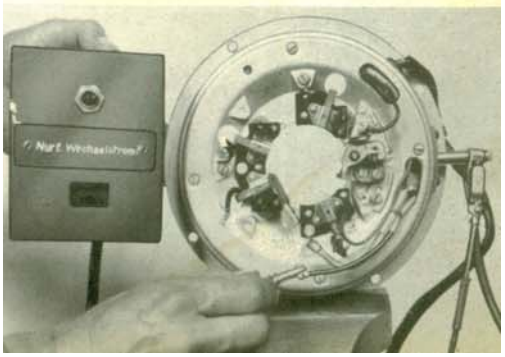
Fig. 25 — 16. Test field coils of starter and dynamo for mutual ground by connecting one test lamp probe to terminal lead of starter coil and the other probe to brush lead of dynamo coil. The test lamp must not light.



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E 12 Testing armature of Dynamo starter

Fig. 26

Tools: Screwdriver 6/8 mm, socket spanner 17/22 mm, puller screw for blower wheel No. 527, puller spindle for armature of dynamo starter No. 528, testing equipment Prüfrex for electric sets (item shown in figure is type K 15).

Fig. 27

Jobs 1 to 6 as outlined in E 9. Furthermore:

7. Detach dynamo housing. (screwdriver 8 mm)

8. Remove dynamo housing (with the aid of 2 screwdrivers applied behind the flange of dynamo housing).

9. Remove armature from crankshaft extension by means of puller spindle No. 528.

Fig. 28

10. Locate armature assembly upon the testing equipment (Prüfrex K 15)

a) Place detector magnet upon laminated iron core, switch on the equipment and rotate armature slowly.

Fig. 29

A defective armature wiring is indicated by the glowing of an incandescent glass tube on the testing equipment. (shorted armature).

b) Short-circuit the commutator by surrounding it with a wire. Check laminated iron core with the detector magnet by turning armature slowly.

Fig. 30

If somewhere is a break in the wiring the incandescent glass tube does not light.

c) Check commutator bars and armature core (shaft) with the aid of test points.

A grounded armature is indicated by a humming noise produced by the testing equipment. (grounded armature)

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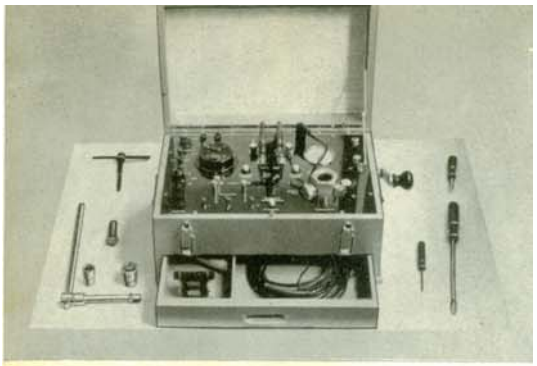

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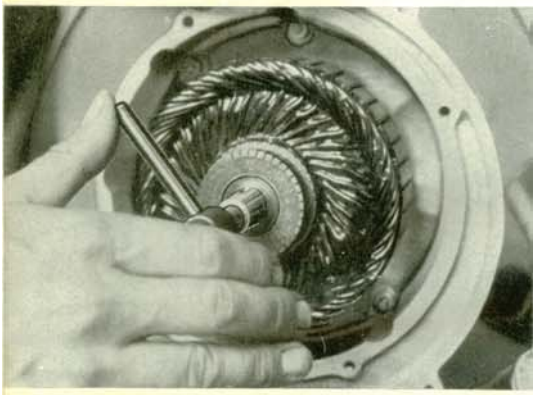

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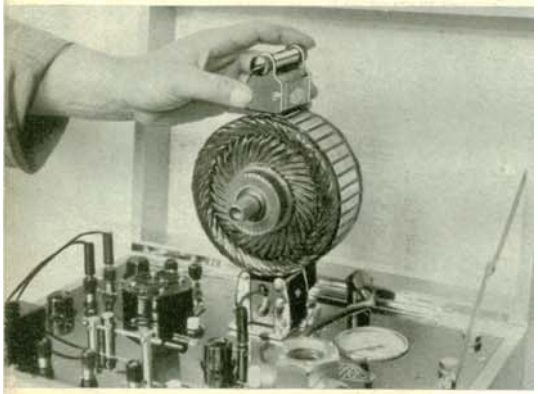

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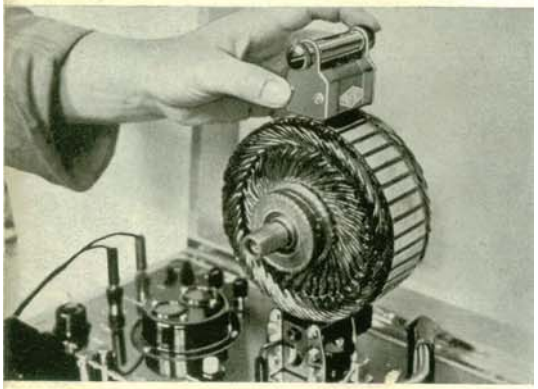

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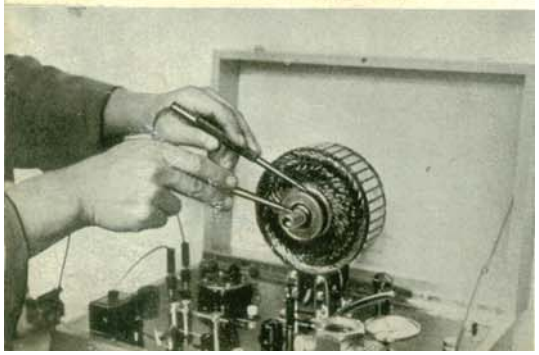

E 13 Testing ignition coil

Tools: Socket spanner 10 mm,
open ended spanner 9 mm,
Prüfrex testing equipment.

Fig. 31

1. Remove high-tension lead from ignition coil.
2. Detach connections 1 and 15 from the ignition coil. (open ended spanner 9 mm)
3. Detach ignition coil with holding bracket. (socket spanner 10 mm)

Fig. 32

4. Locate ignition coil upon the testing equipment and check it by means of spark discharge over the provided gap.

E 15 Testing condenser

Tools: Screwdriver 6 mm, open ended spanner 9 mm.

Fig. 33

1. Detach connection to ignition coil. (open ended spanner 9 mm)
2. Detach condenser from holding clip on ignition coil. (screwdriver)

Fig. 34

3. Fit condenser upon testing equipment and switch on the tester set.
4. Charge condenser.

Fig. 35

5. Discharge condenser.

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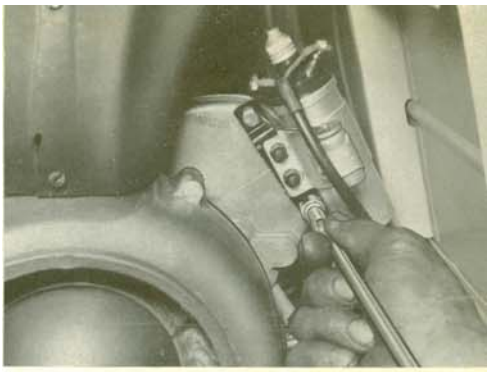

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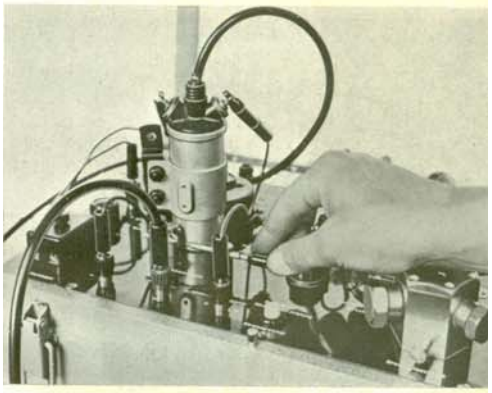

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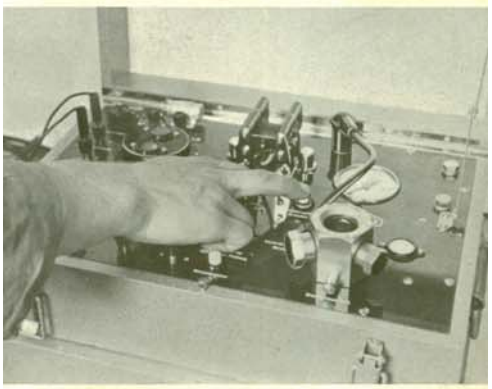

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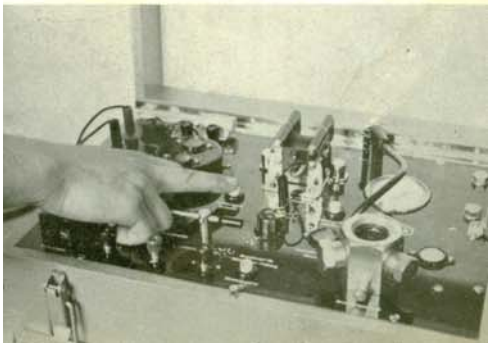


E 17 Aiming the headlamps

Fig. 36 — Tools: Screwdriver 6 mm, aiming screen or aiming device.

Fig. 37 — 1. Vertical adjustment up and down is done by uniform motion of the two adjusting screws. Turning them inwards raises the headlamp, and unscrewing lowers the beam.

Fig. 38 — 2. For horizontal adjustment to the right and the left it is mostly sufficient to turn one screw in or outwards as required, whereas for a wide adjustment range it is necessary to turn both screws in opposite direction. Having done the horizontal adjustment correct the vertical position.

E 19 Replacing a Bilux lamp

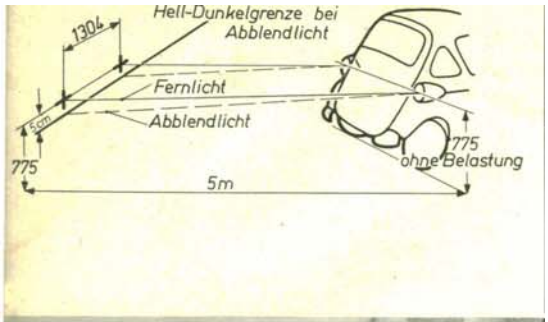
Fig. 39 — Tools: Screwdriver 6mm.

1. Loosen the headlamp by removing the screw in center of bottom and tilt headlamp upwards.

2. Remove retaining clip for lamp holder.

Fig. 40 — 3. Turn lamp out of socket.

Caution: A Bilux lamp should only be touched with a clean cloth or paper, as otherwise the sweat and oil on the hand might dim the reflector.



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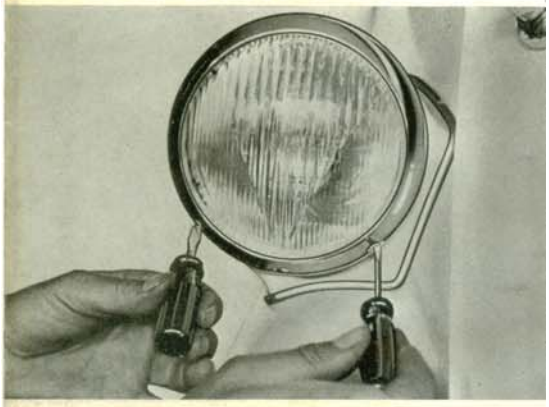

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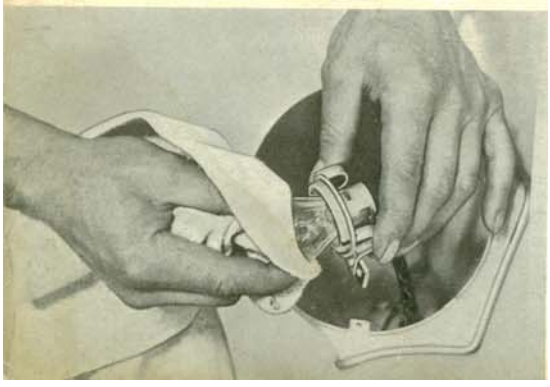

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