

Electrical Equipment and Fittings

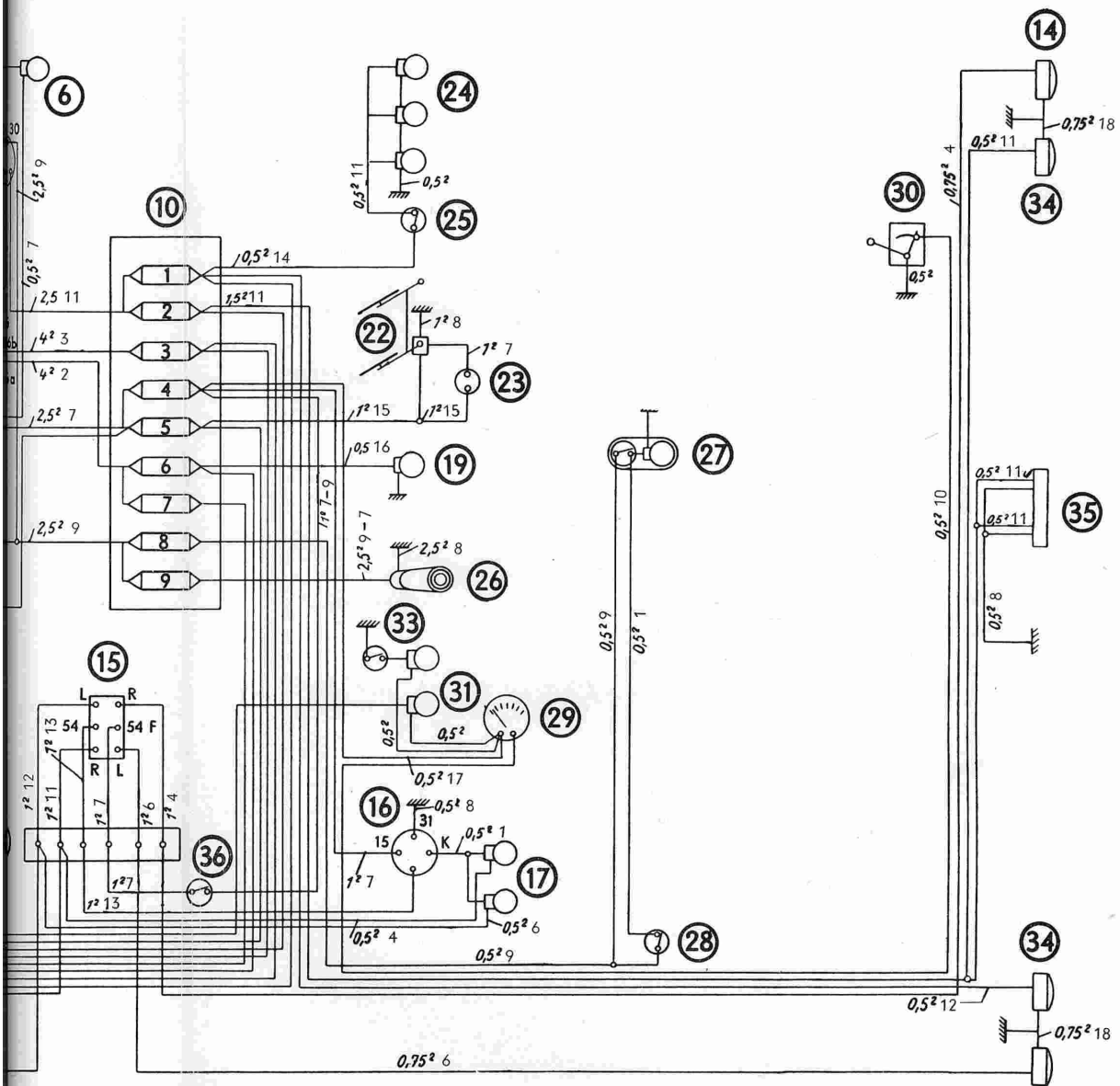
The electrical equipment fitted to Borgward "Isabella" Saloons is of the 6-volt type incorporating constant voltage controlled dynamo with voltage and current regulation (with steep-drop characteristics).

Modern testing devices, as described in the chapters "Engine" and "Wheel Measurement" are also employed for the individual procedures and should be in every well equipped Borgward Customers Service Workshop. "Bosch-Engine-Tester" as well as "Prüfreflex Device K 20" serve as an example for the chapter "Electric".

Battery: voltage and capacity	6 volt 84 Amp. /h.
Dynamo	Bosch LJ/GEF 130/6 2200 R 7, voltage regulating
Capacity	130 watt at 2200 r. p. m.
Drive	V belt driven from crankshaft
Gear ratio to crankshaft	1.805
Starter motor	Bosch EGD 0.6/6 AR 2
Gear ratio: Starter motor/ flywheel	9 : 117 = 1 : 13
Distributor	VJU 4 BR 6 ("T.S." Touring Sports: VJU 4 BR 17)
Ignition timing	Centrifugal force - vacuum
Ignition setting	In Top Dead Centre ("T.S." touring sports type: 4° after T.D.C.)
Contact breaker gap	0.4 mm or .0157"
Ignition coil	Bosch TK 6/3
Sparking plug	Bosch W 225 T 1 or Beru 225 - 14 U ("T.S." touring sports Bosch 240 - 14 U)
Electrode gap	0.6 - 0.7 mm or .0236 - .0276"
Firing order/cycle of work	1 - 3 - 4 - 2

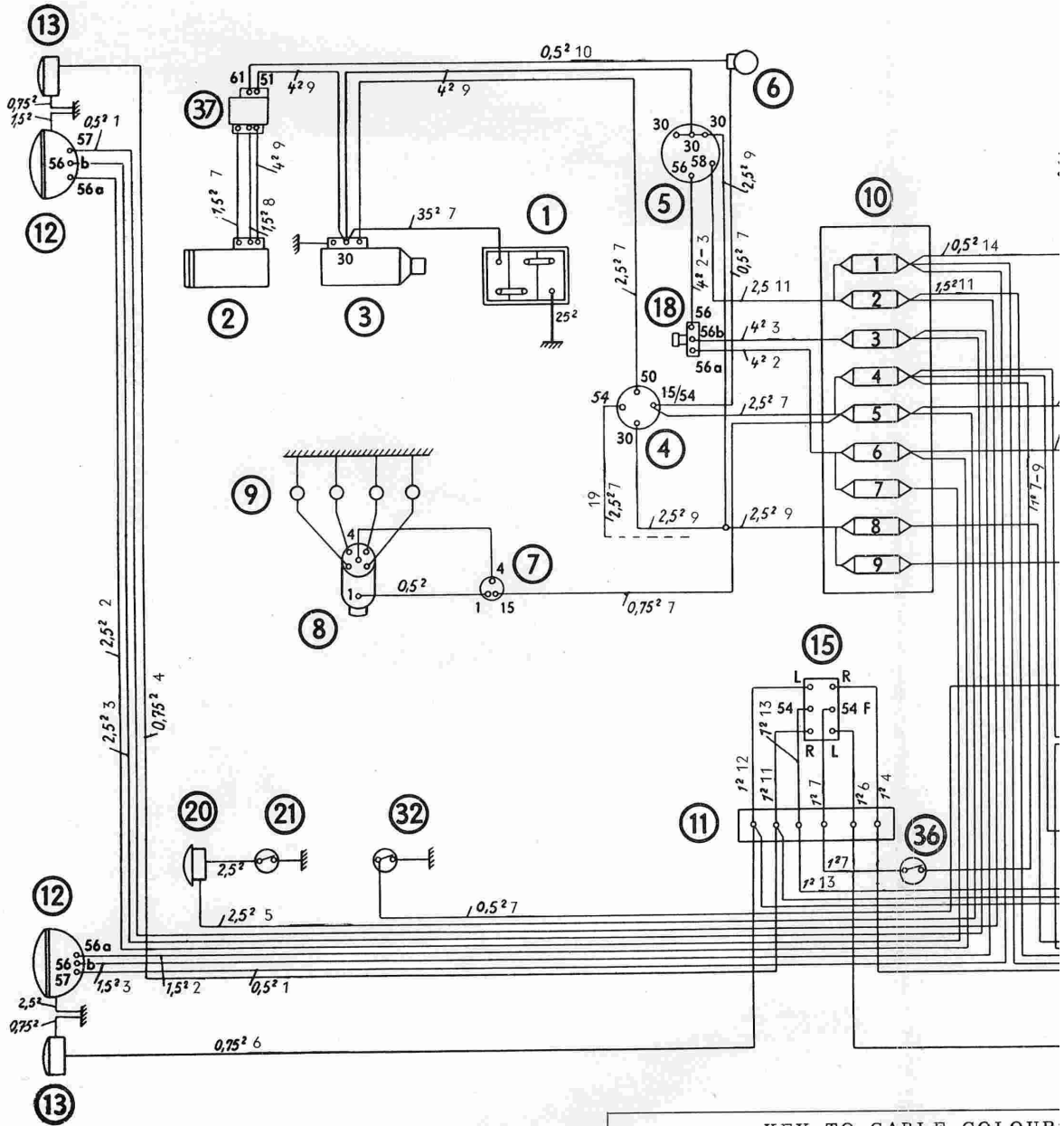
Wiring Diagram

- |                                |   |
|--------------------------------|---|
| 1 Battery                      | 27 Roof lamp with switch  |
| 2 Dynamo                       | 28 Door switch  |
| 3 Starter motor                | 29 Fuel gauge   |
| 4 Ignition starter lock        | 30 Tank unit  |
| 5 Light switch                 | 31 Oil pressure lamp  |
| 6 Charge control lamp          | 32 Oil pressure switch  |
| 7 Ignition coil                | 33 Remote control thermometer   |
| 8 Distributor                  | 34 Tail lamp  |
| 9 Sparking plugs               | 35 License plate lamp   |
| 10 Fuse box                    | 36 Stop lamp switch   |
| 11 Terminal strip              | 37 Regulator for dynamo   |
| 12 Head lamps                  |   |
| 13 Blinker lamp, front         | <u>Fuse box</u>   |
| 14 Blinker and stop lamp, rear | 1 Dashboard lamp, parking lamp and tail lamp, L. H.   |
| 15 Blinker switch              | 2 Parking lamp and tail lamp, R. H.   |
| 16 Blinker transmitter         | 3 Dipped lamps, R. H. and L. H.   |
| 17 Blinker control lamps       | 4 Blinker lamps, front and rear, tank unit, remote control thermometer, oil pressure warning lamp |
| 18 Foot dipper switch          | 5 Windscreen wiper, horn  |
| 19 High beam control lamp      | 6 High beam control lamp, High beam, L. H.  |
| 20 Horn                        | 7 High beam, R. H.  |
| 21 Switch for horn             | 8 Roof lamp, Door switch  |
| 22 Windscreen wiper            | 9 Cigarette lighter cartridge   |
| 23 Switch for windscreen wiper |   |
| 24 Dashboard lamp              |   |
| 25 Switch for dashboard lamp   |   |
| 26 Cigarette lighter cartridge |   |



**KEY TO CABLE COLOURS**

8 Brown	14 Grey and red
9 Red	15 Purple
10 Blue	16 Blue and white
11 Grey	17 Blue and black
12 Grey and black	18 Bright
13 Black and white	19 Radio connection
14 Grey and red	
15 Purple	
16 Blue and white	
17 Blue and black	
18 Bright	
19 Radio connection	



**KEY TO CABLE COLOUR.**

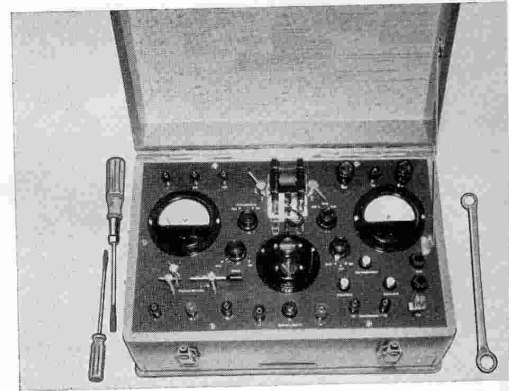
1 Green	8 Brown	14 G
2 White	9 Red	15 P
3 Yellow	10 Blue	16 B
4 Black and white	11 Grey	17 B
5 Black and yellow	12 Grey and black	
6 Black and green	13 Black and white with green	18 B
7 Black		19 R

### E 13. Dynamo overhaul

Dynamo is removed, including cleaning and testing, replace useless parts, turn commutator in lathe and take a light cut. Capacity control.

Tools: "Prüfreflex K 20" device, screwdriver 8 and 10 mm, ring spanner 19 mm.

Figure 1



1. Separate regulator from dynamo. (Screwdriver 8 mm)
2. Disconnect regulator connections. (Screwdriver 8 mm), thin cable to F = field, thick cable to positive brush connection.

**Caution:** In case of vehicles of the newer type the regulator is no longer mounted on the dynamo but is fitted separately to the wall of the body.

3. Pull off pulley. (Ring spanner 19 mm)
4. Undo dynamo. (Screwdriver 10 mm)

Figure 2

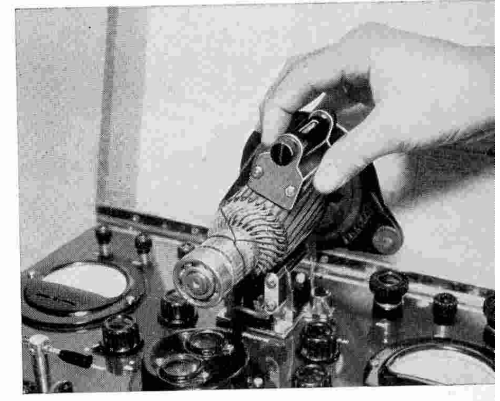
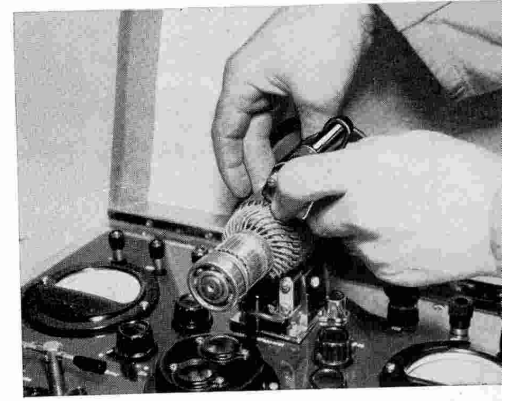
**Caution:** When removing the armature lift springs for brushes, pull up brushes and block by springs so that the brushes do not touch the ball bearing and are not smeared with grease.

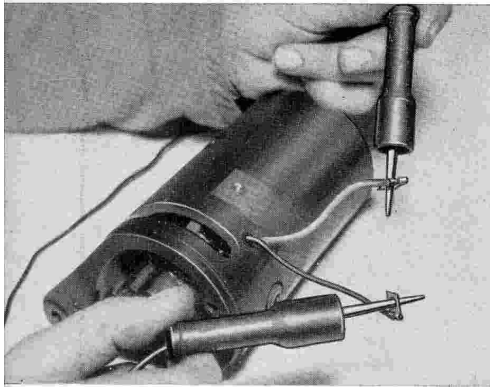
5. Place armature on testing device, connect testing device and switch on.
  - a) Defective coils. Apply searching instrument, turn armature slowly. If coils are defective, the glow lamp in the searching instruments lights up.
  - b) Wire rupture or disconnection on armature. Short circuit commutator by copper wire, armature must accomplish on its whole circumference to light the searching instrument.

Figure 3

- c) If necessary short circuit segments individually by scriber.

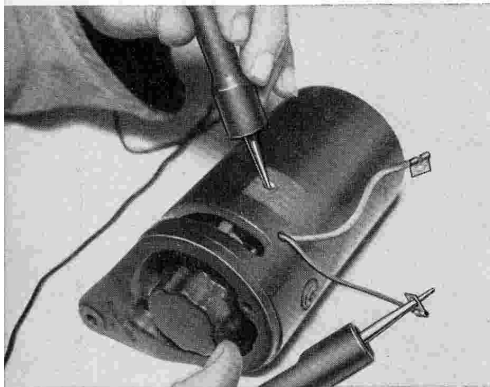
Figure 4





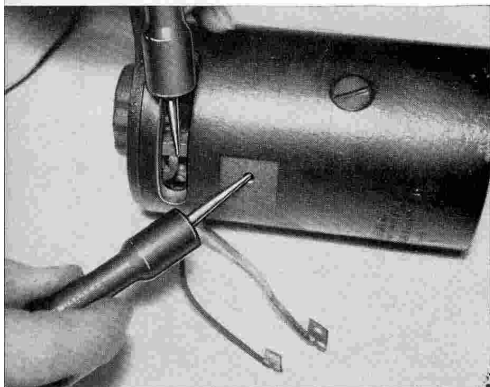
- 5
6. Check field winding.  
Control is made with a main circuit test lamp or with a glow lamp.
- a) Check field winding for travel.  
1 test point on beginning of winding,  
1 test point on end of winding,  
test lamp must light.

Figure 5



- 6
- b) Check field winding for earth.  
1 test point on beginning of winding,  
1 test point on earth,  
test lamp must not light.

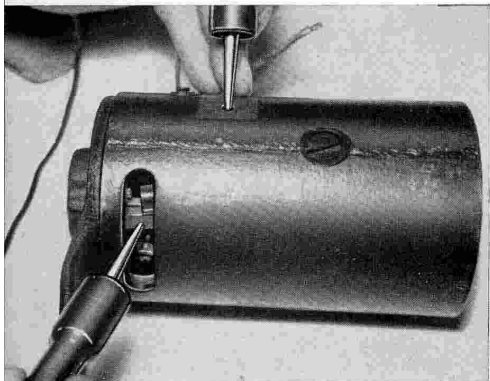
Figure 6



- 7
7. Check brush holder.
- a) + brushholder for earth short circuit,  
1 test point on brush holder,  
1 test point on earth,  
test lamp must not light.

If the test lamp glows faintly, one can try to eliminate the insulating fault (Caused by moisture) by heating (By longer duration of action of current from network with intermediate connected test lamp or with a heating furnace).

Figure 7



- 8
- b) Check - brush holder for earth short circuit.  
1 test point on brush holder,  
1 test point on earth,  
test lamp must light.

Figure 8

E 15. Checking of dynamo on the vehicle.

Tools: "Bosch Electro Tester".

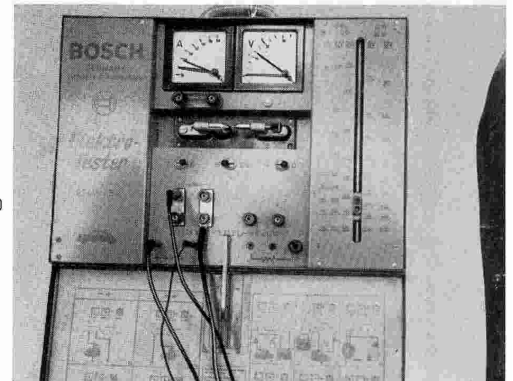
1. Regulating voltage in idling.  
Connect voltmeter connections + and - with terminal 61 and earth. Switch change over switch for voltmeter to the voltage range of the dynamo (15 or 30 volt), let engine run, raise r.p.m., observe voltmeter.

Figure 9



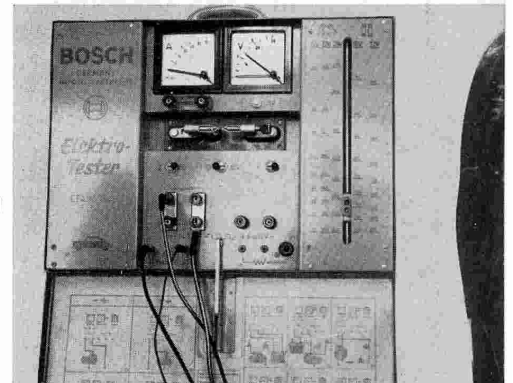
2. Cut-in tension.  
Connections of voltmeter, as described in chapter 1. Connect terminal 51 with connection + 6, earth with negative terminal. Adjust load resistance to 130. Let engine run, raise r.p.m., read cut-in tension.

Figure 10



3. Regulating tension at load.  
Connection and adjustment of the load resistance as described in chapter 2. Raise r.p.m. again until tension declines. Read off tension.
4. Starting of current regulator.  
Raise load until tension begins to drop. The amperemeter indicates now the starting of current regulator.

Figure 11



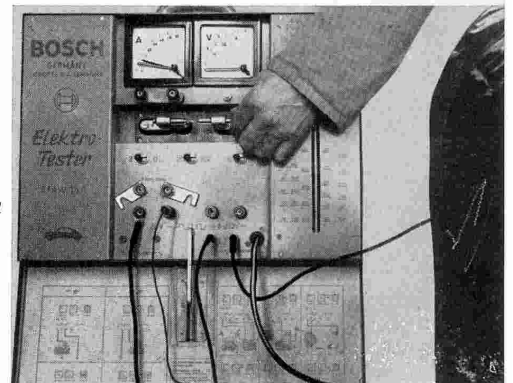
5. Return current.  
Connect terminal 51 with terminal + A, + battery with terminal - A. Open connecting bridges. Let engine run, raise r.p.m. until ammeter deflects, reduce r.p.m. slowly. The needle of the ammeter returns via 0 to a certain value and jumps then finally to 0. Lowest needle position equals amount of return current.

E 38. Test ignition coil with testing device (in vehicle)

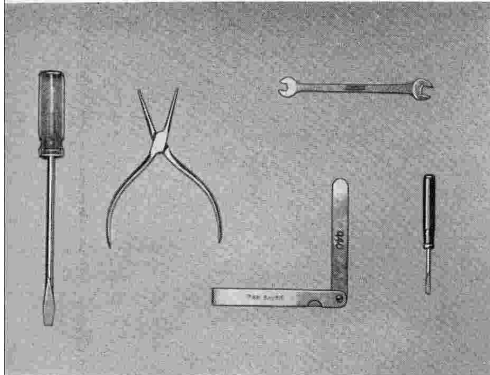
Tools: "Bosch Electro Tester"

Ignition coil control with built-in buzzer. Disconnect connection wires and cables on ignition coil. Connect ignition coil with its connection to bushes 15, 1, and 4 of the testing device. Connect battery with plunger bushes + and - V, left tumbler switch on Z, right switch on K. Adjust spark gap until slips no longer crop up. Measure spark gap. (If necessary compare with the value of a new ignition coil).

Figure 12



*Isabella*



13

**E 34. Removal and reassembly of contact breakers incl. adjustment**

**Tools:** Long nosed pliers, spanner 7 mm, screwdriver 6 and 4 mm, feeler gauge 0.4 mm or .0157".

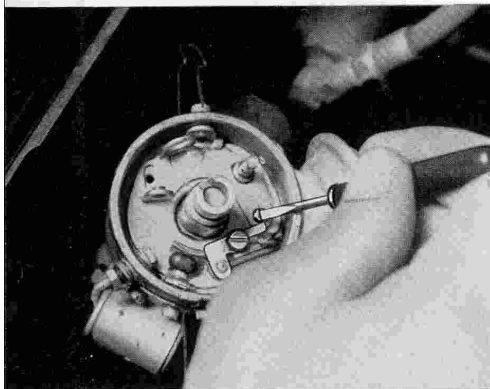
Figure 13



14

1. Remove distributor top cover, remove rotors.
2. Pull off clamping spring for moving contact. (Long nosed pliers)

Figure 14



15

3. Loosen connection primary current on distributor, undo nut for insulating pieces, lift out slotted connection (inner) for moving contact. (Spanner 7 mm).
4. Turn out fixing screw for anvil. (Large screw with screwdriver 6 mm)

Figure 15



16

5. Remove anvil.

**Caution:** The small screw is an eccentric screw and serves for the adjustment of points. (Small screwdriver). After fitting of new points the point gap is adjusted at the highest lift of the hammer to 0.4 mm or .0157" by turning of the small eccentric screw.

The anvil is fixed by the large screw in the found position. Control gap again.

Figure 16

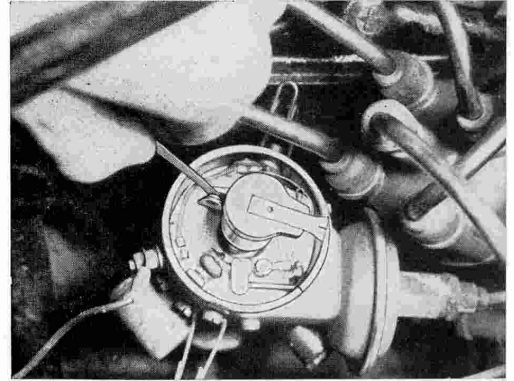


E 35. Setting the ignition timing

The ignition timing can be set with the aid of a 6-volt test lamp. This is done as follows:

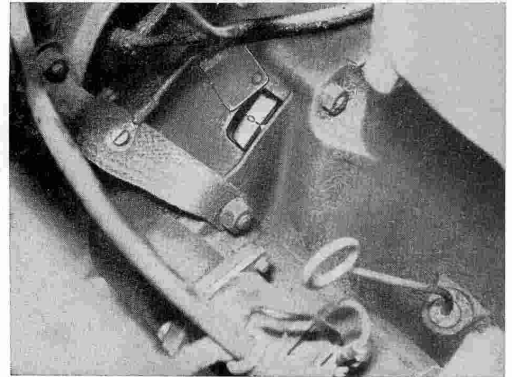
1. Remove sparking plugs so that the engine can be cranked without resistance.
2. Remove distributor top cover and check contact breaker point gap. Point gap at highest cam lift 0,4 mm or .0157".

Figure 17



3. Set the contact breaker points, if necessary to the essential gap. Loosen locking screw for anvil plate and turn anvil with the eccentric adjusting screw. Tighten locking screw again after correct setting.
4. Turn the engine until No. 1 piston (Cylinder on flywheel side) is at T.D.C. on its compression stroke. Both valves must be closed.
5. Push peephole cover for flywheel marking aside and rotate flywheel slowly in sense of rotation until locating marks on flywheel and housing are in line.

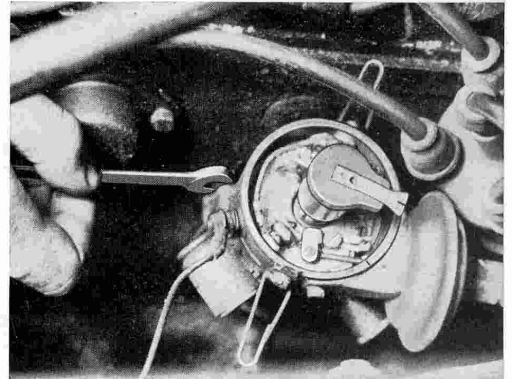
Figure 18



**Caution:** If the marking was passed over, turn back a considerable length and rotate slowly anew until the marking is correct. In this position the rotor arm with its locating mark must coincide with the locating mark on the upper edge of the distributor housing.

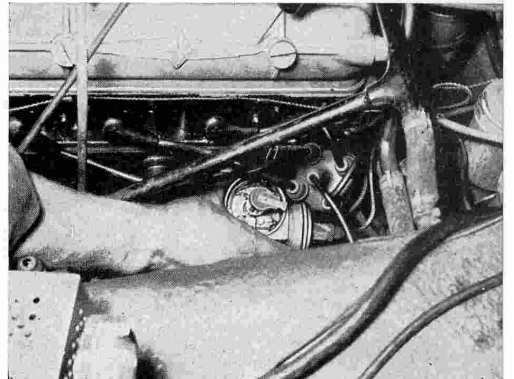
6. Loosen distributor on clamping screw so that the distributor can be turned.

Figure 19



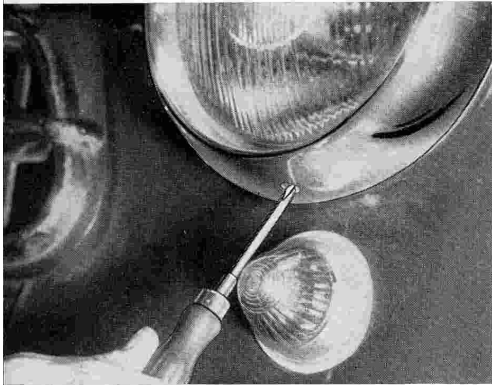
7. Connect 6-volt test lamp. 1 pole on primary current (terminal 1 on distributor). 1 pole on earth, switch on ignition.
8. Turn distributor slowly against sense of direction of the rotating arm until the test lamp just begins to light.

Figure 20



**Caution:** If one has here too passed over the lighting up of the test lamp, turn back a considerable length and turn slowly anew until the lamp just begins to light.

9. Tighten distributor in this position. Put on distributor top cover and close peephole cover on flywheel housing.



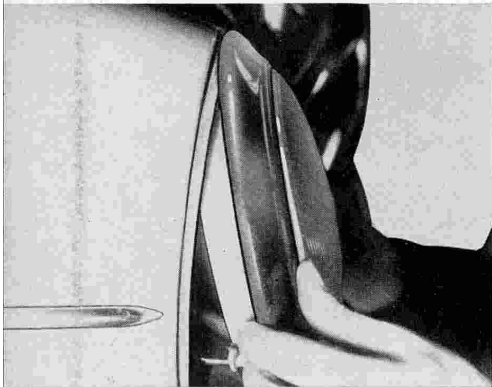
21

E 41/45. Removal and replacement of  
headlamps and adjustment  
(System Bosch)

Tools: "Stanley" screwdriver (for Phillip's screws),  
screwdriver 6 mm.

1. Loosen screw, bottom, on cover rim.  
("Stanley" screwdriver)

Figure 21



22

2. Insert screwdriver under nose at the bottom of the  
rim.  
(Screwdriver 6 mm)
3. Undo screw on headlamp, bottom, and remove head-  
lamp insert.  
(Screwdriver 6 mm)

Figure 22

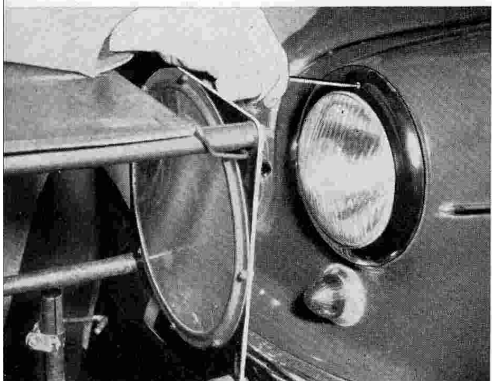


23

4. Separate lamp carrier by tipping of the tension clip  
from headlamp, remove headlamp.

**Caution:** Adjustment of the Bosch headlamp is made  
in the two adjusting screws top and left, seen from  
the front. The left screw is for the side movement,  
the upper screw for elevation adjustment. The  
screws must engage at each half a turn.

Figure 23



24

**Adjustment of the headlamps is effectuated on the  
adjustment screen or with an adjusting device. For  
adjustment the car must be loaded with two persons  
or a corresponding weight.**

Reassembly as usual in reversed sequence.

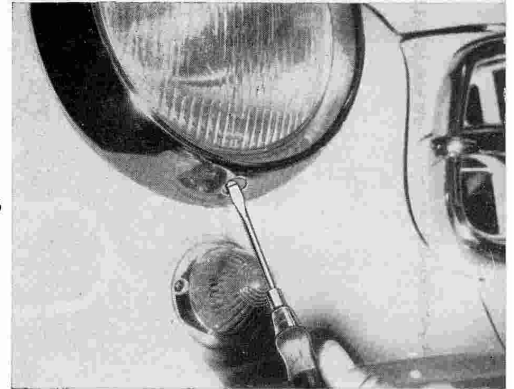
E 41/45. Removal and reassembly of  
headlamps and adjustment  
(System "Hella")

Tools: Screwdriver 6 mm.

1. Undo screw on cover rim, bottom.  
(Screwdriver)

Figure 25

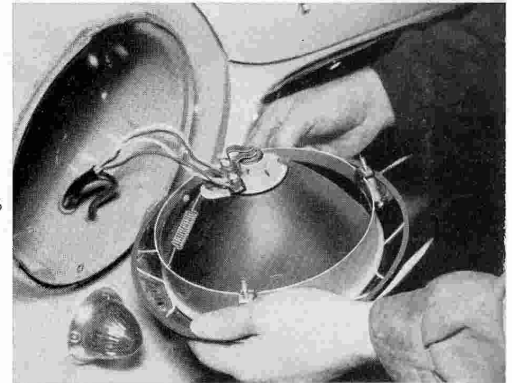
25



2. Insert screwdriver under nose on rim, bottom, and remove rim.  
(Screwdriver)
3. Undo screw on headlamp, bottom, and remove headlamp insert.  
(Screwdriver)
4. Separate lamp carrier by disengaging the tension spring from headlamp insert.

Figure 26

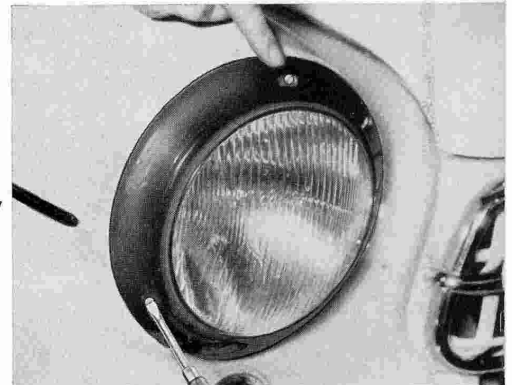
26



**Caution:** The adjustment of the "Hella" headlamps is also effectuated on the two screws top and L.H., seen from the front. The left screw (in figure with screwdriver) is for the side direction, the upper screw (in figure designated by finger) for the elevation of height.

Figure 27

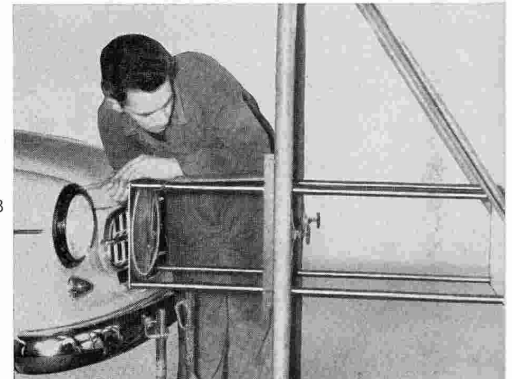
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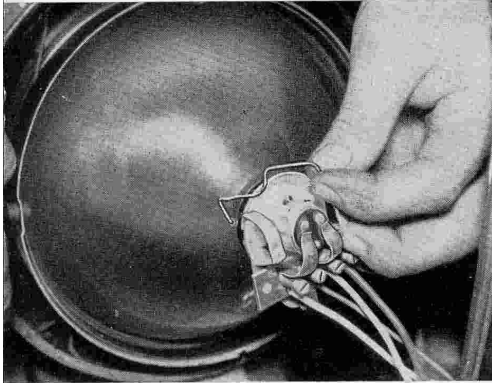


**The adjustment of the headlamps is made on the adjustment screen or with an adjustment device. Load vehicle with 2 passengers or corresponding weight.**

Figure 28

28

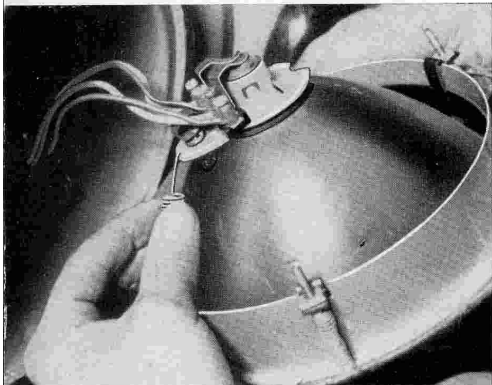




29

**E 43. Removal and replacement of a  
"Bilux" bulb.**

We have described this procedure, which belongs normally to the most simple procedures and which can be carried out at every filling station or by the customer himself, in our Workshop Manual, as quite often a mistake is made with this primitive procedure, which is the starting point and cause for a later destruction of the headlamp. Headlamps, whose luminous intensity is increased by reflectors, must never be touched with bare hand. Even if the hands are clean and free from traces of oil or grease, the perspiration of the hand which remains on the glass bulb suffices to destroy the reflector of the lamp. The traces of hand perspiration or oil rests evaporate when the switched on glass bulb becomes hot and the resulting vapours cause the reflector to become blind and yellow. All headlamps with decreasing luminous intensity reveal as cause a reflector, which has become blind and yellow and the cause for this again is the touching of bulbs with bare hands at any one time. Bulbs therefore, which are replaced or newly inserted, should either be handled with a clean rag or in case of a new bulb, in its carton, which is supplied with the bulb. Later cleaning of the bulbs with a rag is not suitable to remove all traces of hand perspiration or oil from the glass bulb. These directions therefore should always be strictly observed when manipulating headlamp bulbs. Figure series 29-32 show the procedure when changing a bulb.



30

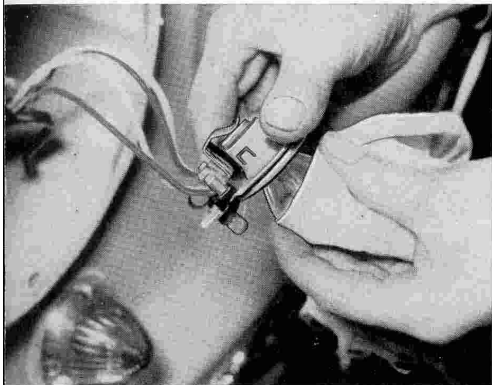
**Figure 29**

Tiping of tension clip to remove lamp carrier for "Bosch" headlamp.

31

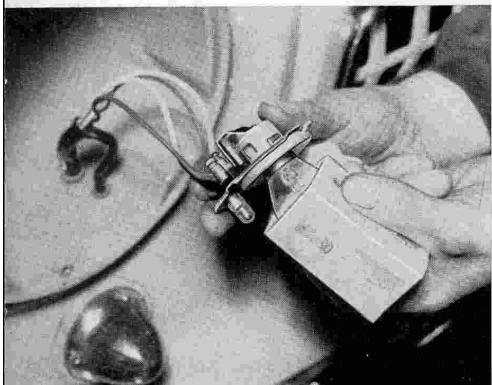
**Figure 30**

Disengaging of tension spring to remove lamp carrier for "Hella" headlamp.



**Figure 31**

Removal and replacement of a bulb, hand insulated by clean rag.



32

**Figure 32**

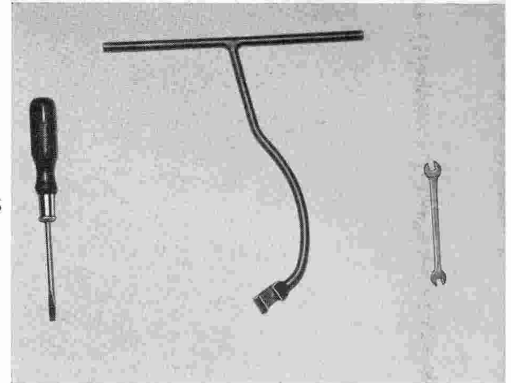
Fitting of a new bulb, bulb handled with carton.

E 61. Removal and reassembly of speedometer cable.

Tools: Screwdriver, spanner 7 mm, special spanner WK 140.

Figure 33

33



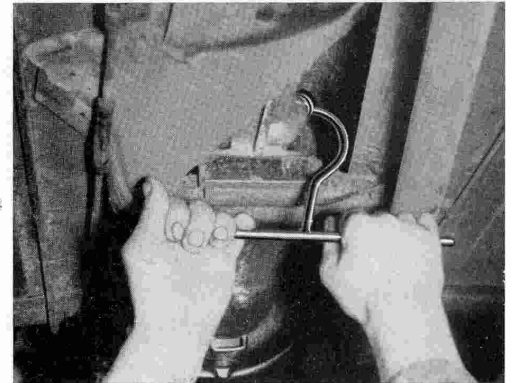
1. Undo speedometer cable on speedometer head. Undo knurled nut.

**Caution:** After the cable has become free, the cable can be checked on the four cornered shaft if the cable is fractured.

2. Undo speedometer connection on gearbox casing from underneath. (Special tool WK 140).

Figure 34

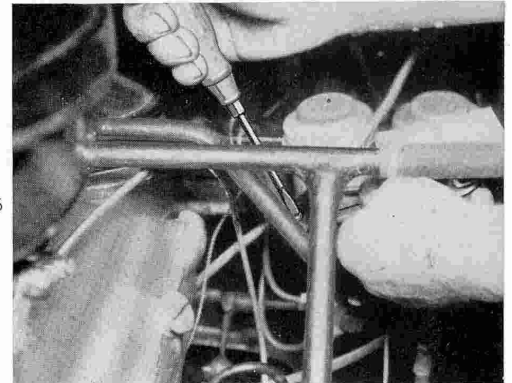
34



3. Undo clip for speedometer drive on body. (Screwdriver)
4. Loosen 4 clips for speedometer drive on hot water tube and engine block. (Screwdriver, spanner 7 mm).

Figure 35

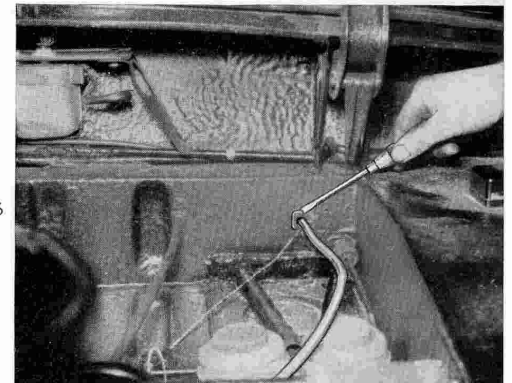
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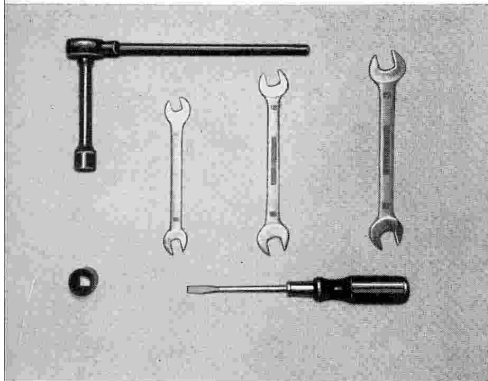
5. Remove rubber grommet for speedometer drive on body wall and pull out speedometer drive forward. (Screwdriver).

Figure 36

36



**Caution:** When installing the speedometer cable care must be taken that the form clip (sheet iron nozzle on the lower end of the cable) is laid away from the gearbox in a radius of 120 mm or 4 3/4" and that the speedometer cable leads in straight line to the first support clip.

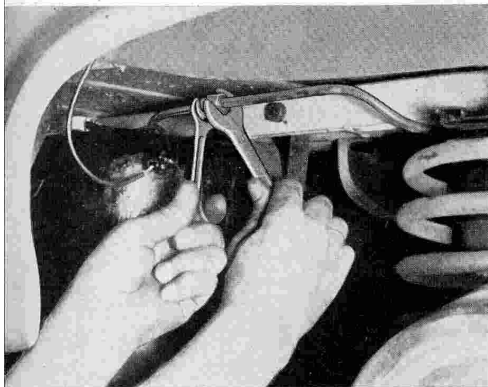


37

**E 65. Removal and reassembly of transmitter instrument for fuel gauge**

**Tools:** Screwdriver, wheelnut wrench, spanner 14, 17 mm, insulated screwdriver, socket wrench 9, 14 mm with ratchet.

Figure 37



38

1. Remove wheel hub disk, rear, R.H., undo wheel nuts (Screwdriver, wheelnut wrench).
2. Jack up car in rear.
3. Remove right wheel. (Wheelnut wrench)
4. Bend up rubber spray protection on two sheet iron noses. (Screwdriver)
5. Undo fuel pipe connection. (Spanner 14 and 17 mm)

Figure 38



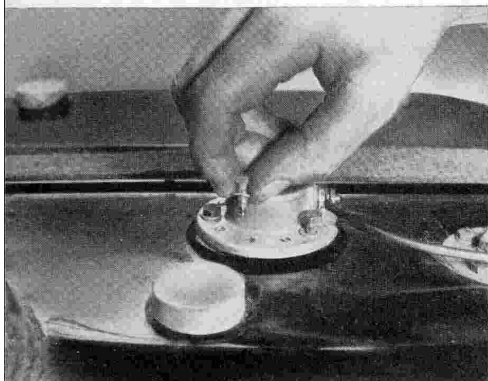
39

6. Disconnect electrical cable to fuel gauge on porcelain insulator. (Insulated screwdriver)

**Caution:** Wrap porcelain insulator with insulating tape after installation.

7. Remove tank filler cap.
8. Loosen tank strap. Undo locking nut and undo long bolt.

Figure 39



40

9. Let tank downward and disconnect earth cable of the tank unit on tank unit. (Spanner 9 mm)
10. Remove tank unit. (Socket wrench 9 mm)

**Caution:** When installing the tank unit or a new pipe connection smear top and bottom of gasket with jointing compound, use copper washers and immerse bolts in jointing compound before they are fitted.

Figure 40

Assembly in reversed sequence.