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## I. DESCRIPTION

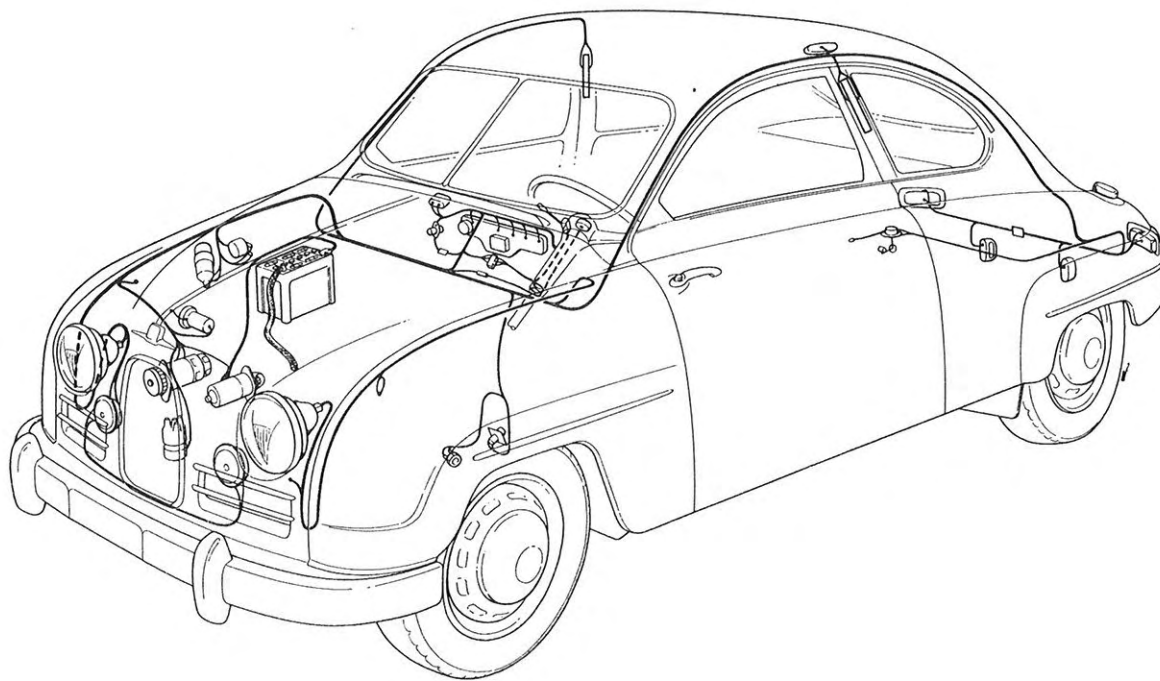


Fig. 1. Electric system  
a. To serial number 30200.

### I.1. General

The Saab 93 has a 12 volt system, and the electric equipment includes the following units:

Battery, starter, generator, relay, distributor, ignition coil, spark plugs, fuel pump, exterior and interior lighting, direction indicators (semaphore or flashing type), windshield wipers, horn, fan motor, stop light switch, cable bunches and loose cables, electric instruments, switches and fuses.

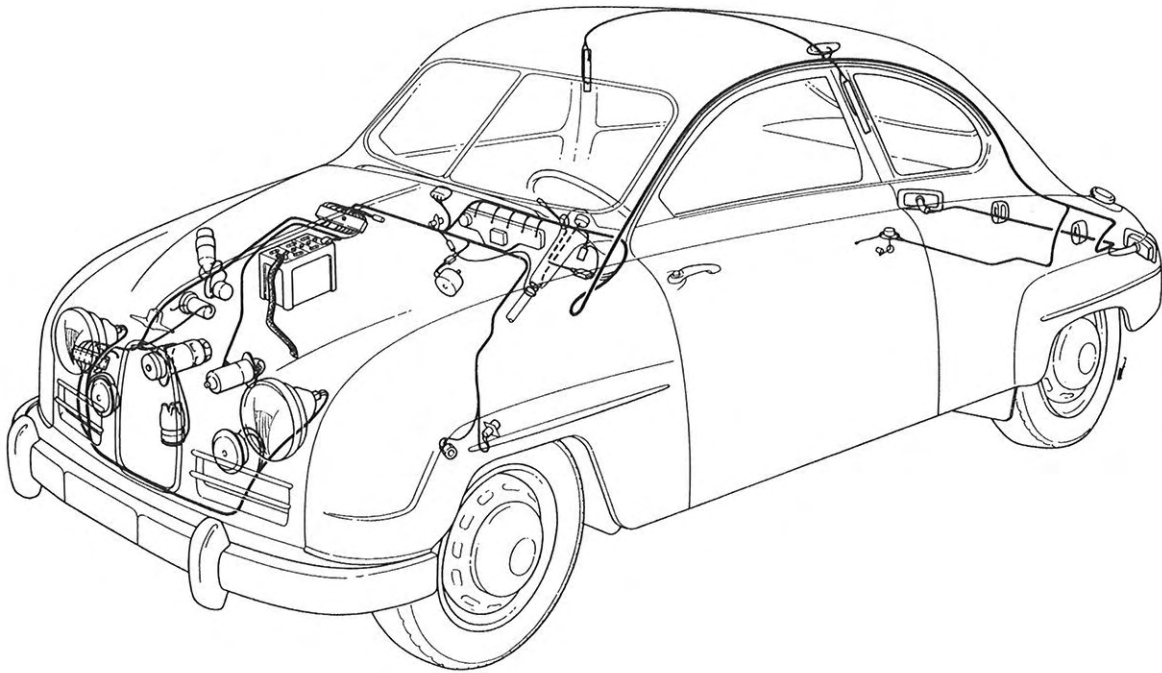
In addition to the electric instruments - ammeter and fuel gauge - there are a speedometer with mileage recorder, coolant thermometer and clock.

### I.2. Lighting

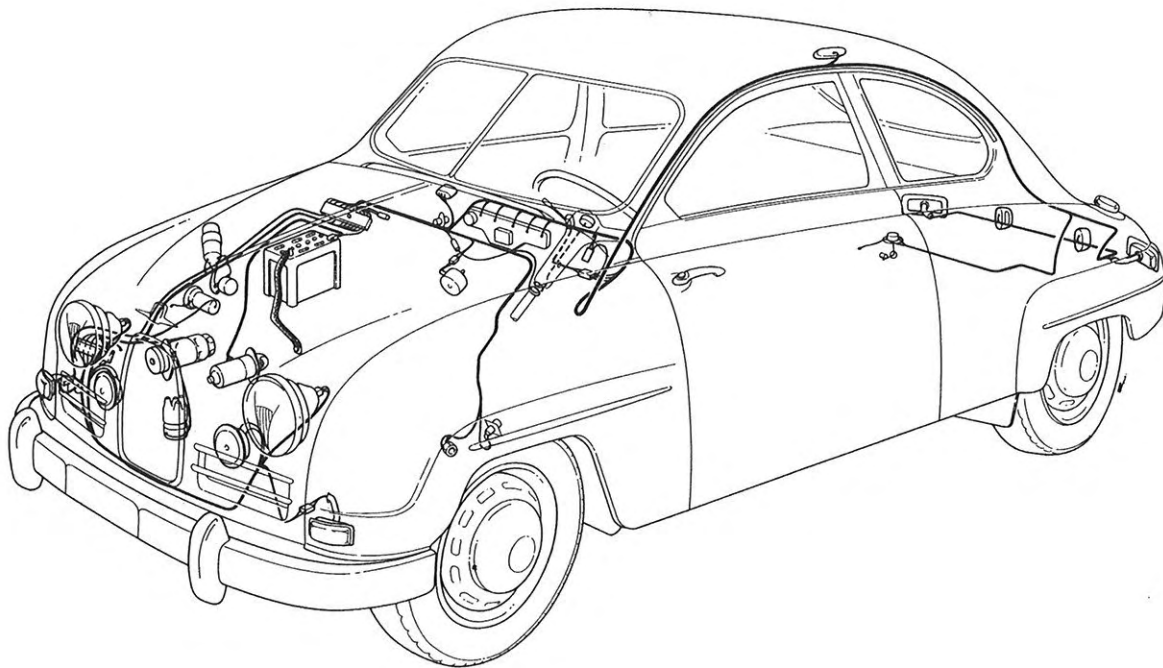
The exterior lighting consists of headlights, parking lights, licence plate lights, tail lights with parking and stop lights and bulbs in the direction indicators.

The headlights are mounted in the engine hood. The left-hand and right-hand units are identical and thus they can be installed on either side without alteration.

The headlight bulbs have two separate filaments for upper and lower beams. The dimmer switch is foot-operated and an indicator light in the speedo-



b. From serial number 30201.



c. Cars exported to the U.S.A.

meter lights up when the main beam is on. The front parking light has a separate bulb in each headlight.

The tail lights with stop and parking lights are built into the rear fenders and have common dual-filament bulbs.

In cars intended for export to the U.S.A., which are fitted with Sealed Beam headlights, the front parking lights are mounted in the fenders and serve also as flashing direction indicators. See Fig. 1.C and point 1.10.

The interior lighting includes a roof light, instrument light and indicator lights for main beam, direction indicators and fuel reserve.

The roof light with switch is mounted on the left-hand roof member.

The two bulbs for illumination of the instruments are, like the indicator lights, fitted into holders in the combination instrument. These holders can easily be removed if the bulbs are to be replaced.

The combination instrument is screened so as to give uniform illumination of the instruments while maintaining clear indications of fuel reserve, main beam and direction indicators.

The horns are mounted one on each of the two engine-hood stays and are of the loud-tone type. They are tuned together by one low and one high tune.

The bundle of cables and the loose cables carry current from the battery and generator to the various points at which it is consumed.

In order to reduce the risk of short-circuiting and for practical reasons, the cables are dressed in "bunches" as far as possible, that is, they are drawn together and wound with plastic tape.

In cars with serial numbers from 30201, the wiring is divided into three groups, one on the inside of the engine hood, one at the cowl and engine compartment and one to the rear of the car. See Fig. 1 B and C.

The loose cable ends consist mainly of ground connections.

The way in which the electric cables are drawn and the general layout of the electric system are shown in the wiring diagrams, Fig. 19. The cables are

color-coded in accordance with the table opposite each diagram.

In order to protect the cables, ammeter, etc. from excessively heavy currents, and to reduce the danger of fire in such cases, cars with serial numbers up to 30200 are fitted with two fuses. One of them is located in the lighting switch and protects all lights except the indication lights of the direction indicators. The other fuse is located in a holder on the cable from the ignition switch to the terminal board and protects other power-consuming apparatus except for the ignition and horn circuits, which are not fused. The fuses are rated at 15 amperes.

Cars with chassis numbers from 30201 have twelve 8 amp. fuses which are located in a box to the right on the cowl in the engine compartment. Two of the fuses are intended for extra equipment or as spares. The units protected by the various fuses are shown in the fuse box cover. All parts of the electric system except for the instrument light are fused.

## 1.3. Generator

When the engine is running the generator output is sufficient to supply all power-consuming units and also to charge the battery. A voltage regulator in the relay keeps the generator voltage practically constant, independent of the generator r.p.m. and the load, and also prevents the battery from being over-charged. The relay also delays connection of the generator until the r.p.m. or voltage is sufficiently high.

If the generator r.p.m. falls below a certain limit, the relay breaks the circuit between generator and battery and thus prevents the battery from discharging through the generator.

The generator pulley is provided with fan blades which draw air through the generator when it is running and thus dissipate the heat produced in it.

The cooling air enters through the slots in the commutator guard strip and discharged through openings in the bearing shield and through the pulley fan blades.

The generator is built onto the water pump, the impeller of which is mounted on the extension of the generator shaft.



### 1.4. Starter

The starter pinion slides on the armature shaft and is brought into engagement with the ring gear of the flywheel by a coupling lever which then actuates the starter contact and switches on the current circuit. When the engine starts, the flywheel ring gear drives the pinion which is then disconnected from the armature shaft by a freewheel device but remains in engagement with the ring gear as long as the coupling lever is in the starting position. When the starter control is pushed in, the lever and pinion are retracted by a return spring.

### 1.5. Fuel pump

The S.U. electric fuel pump consists essentially of three parts: pump housing with valves and filter, spacer with gasket, and solenoid housing with diaphragm and breaker mechanism. The valves are located under the fuel outlet of the pump housing. The outlet valve is placed outermost in a removable seat which has a fibre gasket on both sides. The valve proper consists of a brass plate which is kept in the seat by a spring clip. The seat for the inlet valve is integral with the pump housing, and this valve also consists of a brass plate. The lower part of the valve housing has passages from the space between the valves to the pump housing chamber, in the lower part of which there is a filter. The filter can be taken out for cleaning if the filter plug is removed.

The solenoid housing, which encloses the magnet winding and core, is secured to the pump housing by six screws. Between these housings, however, there is a spacer with a gasket against the pump-housing. The diaphragm seals against the other one. Diaphragm and armature are attached to a central spindle which runs through the solenoid and is connected to the contact breaker at the other end. Around the spindle between armature and housing there is a coil spring which determines the pump pressure. Eleven brass guide rollers are located under the diaphragm between the armature and solenoid housing so as to center the armature without impeding its axial movement.

The contact breaker is mounted on a bakelite

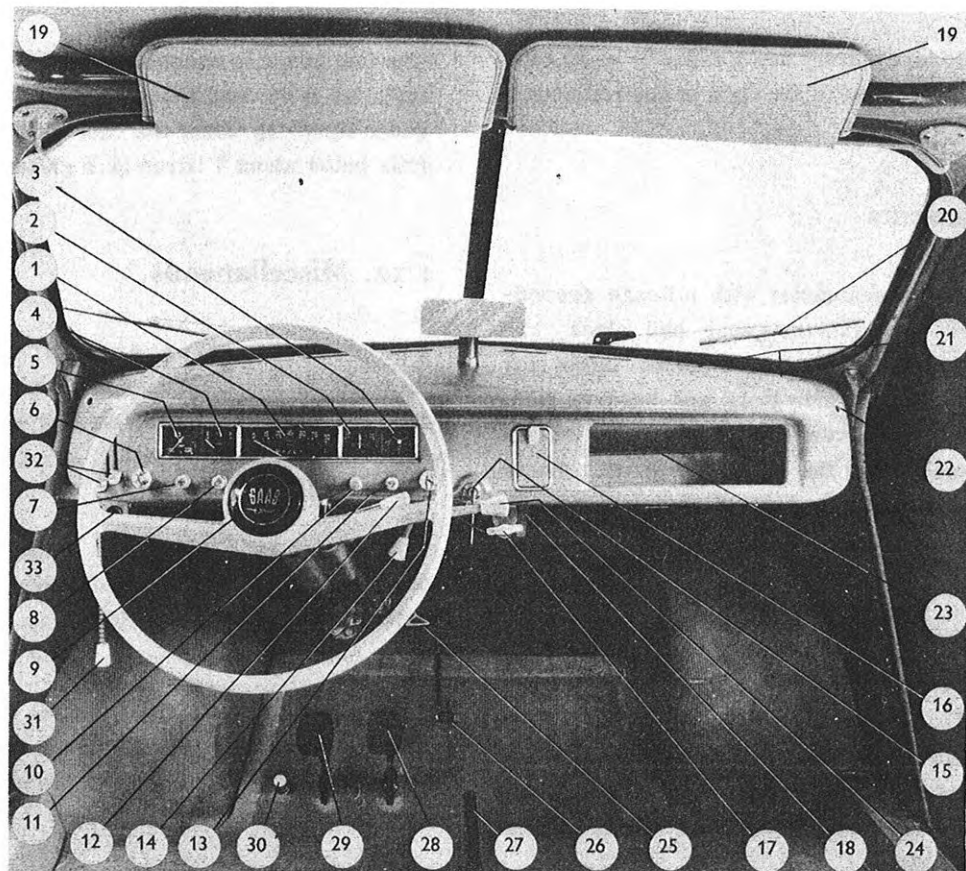
moulding and consists of one pair of points. One of the points is attached to a leaf spring and the other one to a rocker which is operated by the armature spindle. The rocker consists of two yokes, which are carried at one end in the bakelite moulding by a pivot. Between the free ends of the yokes there is a spring device which is so designed that the outer yoke with its breaker point rapidly changes position when the inner yoke is moved to one of its end positions by the armature spindle.

One end of the solenoid winding is connected to the contact terminal and the other one to the contact spring. The rocker is grounded through a cable connected to one of the retaining screws for the bakelite moulding.

When the pump is not working, the breaker points are pressed together so that when the current is turned on it can flow from the live cable of the pump through the solenoid winding to the contact spring and over the points and rockers to ground. When the ignition is switched on and the circuit closed, the electro-magnet attracts the armature, compressing the return spring and pulling in the diaphragm. This draws fuel through the inlet valve into the pump chamber. When the armature is pulled in sufficiently, the rocker operates. The inner yoke, which is attached to the armature spindle comes to its outer end position and the other yoke flips over, thus separating the breaker points and opening the circuit. The electro-magnet then no longer attracts the armature, the return spring pushes back the diaphragm and armature, and fuel is forced out through the outlet valve. When the diaphragm and armature have been pushed out to their end position by the return spring, the rocker operates again, closing the circuit and initiating the next stroke of the pump.

### 1.6. Ignition system

The battery ignition system produces the voltage required for the spark discharge and to supply current to the right spark plug at the right instant. The high voltage is produced in the ignition coil by the sudden collapse of the magnetic field - generated by the primary current - when the breaker points open, thus inducing a high-voltage impulse in the secondary winding of the coil. This current is conducted through the ignition cable and distributor to



- |  |  |
|--|--|
| 1. Speedometer and mileage recorder with indicator lights. | 18. Lever for fresh air intake (behind panel.) |
| 2. Ammeter.  | 19. Wind shield visors.                        |
| 3. Clock.  | 20. Windshield wipers.                         |
| 4. Fuel gauge.   | 21. Defroster openings.                        |
| 5. Temperature gauge.                                      | 22. Holes for heated air to door windows.      |
| 6. Lighting switch.  | 23. Glove compartment.                         |
| 7. Heater for switch.                                      | 24. Gear shift lever.                          |
| 8. Switch, instrument light.                               | 25. Freewheel control.                         |
| 9. Horn button.  | 26. Accelerator pedal.                         |
| 10. Switch for extra equipment.                            | 27. Handbrake lever.                           |
| 11. Switch, windshield wipers.                             | 28. Brake pedal.                               |
| 12. Switch, direction indicators.                          | 29. Clutch pedal.                              |
| 13. Cold-starting control.                                 | 30. Foot-operated dimmer switch.               |
| 14. Locking handle, engine hood.                           | 31. Seat adjustment mechanism.                 |
| 15. Ignition switch.                                       | 32. Air regulator.                             |
| 16. Ash receiver.  | 33. Heater regulator.                          |
| 17. Starter control.                                       | 34. Control for grill screen.                  |

Fig. 2. Instruments, controls etc.

the spark plug, where it jumps the gap between the electrodes as a spark. The condenser connected in parallel with the breaker points reduces any sparking at the breaker points and thus prevents them

from burning out too rapidly. A centrifugal governor in the distributor produces the necessary ignition advance.

### 1.7. Battery

The 12 volt storage battery has a capacity of 33 AH. It is mounted on a shelf to the right of the radiator.

### 1.8. Instruments

The fuel gauge, speedometer with mileage recorder, ammeter, temperature gauge and clock are combined, together with the indicator lights for main beam, direction indicators and reserve fuel, to a "combination instrument". This unit is installed in the panel above the steering column, where the driver has a good view of the instruments thanks to the two-spoke design of the steering wheel.

### 1.9. Windshield wipers

The windshield wiper is electric and has two wiper arms. The motor is located under the middle of the instrument panel and drives the wiper arms through push rods.

### 1.10. Direction indicators

The direction indicators are operated by a switch on the right-hand side of the steering column. If of semaphore type, they are built into the rear door pillars. If of flashing type they are placed with the front parking lights in the front fenders and combined with the stop and tail lights in the rear fenders. There are indicator lights for the direction indicators in the speedometer.

### 1.11. Fuel gauge

The fuel gauge is connected to a float unit which is installed in the fuel tank. An indicator light in the gauge lights up when the fuel quantity in the tank falls below about 7 litres (1.5 gallons).

### 1.12. Miscellaneous

The cold-starting control is mounted on the right of the combination instrument, and the lighting switch and heater control on the left. For description of heater control, see Chapter 6 "Cooling system".

The dimmer switch is located on the pedal board to the left of the clutch pedal. An indicator light in the speedometer lights up when the main beam is on.

The instrument light comes on together with the parking lights or headlights if the switch under the instrument immediately to the left of the steering column is pulled out.

The ignition key-switch is in the middle of the instrument panel, with the starter control below it to the right. The latter is of pull-out type with a T-shaped handle.

The stop light switch is located in the engine compartment on the left immediately behind the bearing bracket.

The flasher for the direction indicators is mounted inside the instrument panel under the lighting switch.

As regards fuses, see Fig. 12 and point 3.9.

## 2. TECHNICAL DATA

The car has a 12 volt electric system and all electric equipment is designed for this voltage.

Relay  
Type Bosch  
RS/PB 160/12/1

### Fuses:

Serial numbers to 30200, 2 fuses,  
25 mm. (1 in.) 15 A  
Serial numbers from 30201, 12 fuses  
25 mm. (1 in.) 8 A

### Starter Motor

Type Bosch  
CD 0.5/12 AR 12  
System Sliding pinion  
Rated power 0.5 h.p.  
Rated voltage 12 V  
Direction of rotation right-hand  
Number of pinion teeth 9

### Bulbs:

Headlights, 2 40/45 W  
Parking lights, in headlights, 2 3 W  
Stop and tail lights, incl. rear  
direction indicators, 2 23/7 W  
Front direction indicators and parking  
lights, 2 32/4 CP  
Licence-plate lighting, 2 3 W  
Semaphore direction indicators, 2 3 W  
Roof light, 1 5 W  
Instrument light, 2 2 W  
Indicator lamps, 4 2 W

Sealed Beam units, 2 40/50 W

Generator Bosch  
Type LJ/GEG 160/12/2500+W30R3  
Rated output 160 W  
Rated voltage 12 V  
Rated r.p.m. 2.500  
Direction of rotation right-hand

### Distributor

Type Bosch  
VJ 3 BR 1T  
Firing order (rearmost cyl. No. 1) 1 - 2 - 3  
Contact gap 0.3-0.4 mm. (0.012-0.016 in.)  
Condenser, type ZKO 29/13 Z  
Direction of rotation right-hand

### Ignition coil

Bosch  
Type TK 12 A3

### Spark plugs

Thread M 18  
Length of thread 12 mm (1/2 in)  
Electrode gap 0.7 mm (0.03 in)  
Type

Normal and hard driving

M 225 T 1

Light driving, i. e. mainly city  
driving with frequent starts and  
half-warm engine

M 175 T 1  
Champion 5 MJ

### Fuel pump

Type S. U.  
L  
Contact gap maximum 0.7-0.8 mm (0.03 in)

## 3. WORK ON CAR

### 3.1. Battery

Check electrolyte level and top up the cells with distilled water until the level is about 10 mm. (3/8 in.) above the plates.

The state of charge can be measured with a hydrometer, which shows the specific gravity of the electrolyte.

State of charge	Spec. gravity approx.
Fully charged	1.28
Half charged	1.21
Discharged	1.12

The above table gives the specific gravity of the electrolyte for various states of charge.

Check that the battery terminals and clamps are clean and grease with vaseline.

### 3.2. Replacement of breaker points, distributor

#### 3.2.1. Removal

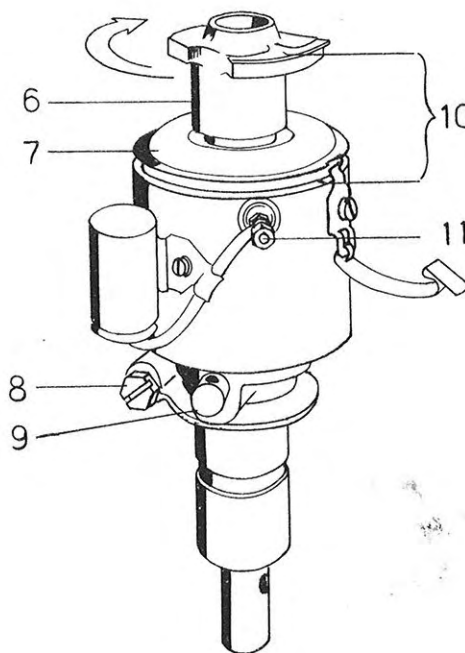
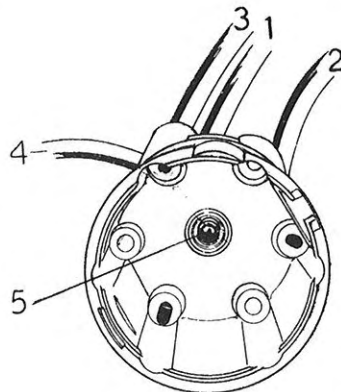
1. Unclip and remove distributor cover.
2. Remove rotor 6, Fig. 3, which is attached to the distributor shaft by means of a stop screw.
3. Remove protective cover 7.
4. Loosen screw 11 and remove contact plate 10 with the fixed point.

#### 3.2.2. Installation

1. Fit a new contact plate.
  2. Fit a new breaker arm. Place the required number of shims 4, Fig. 5, on breaker arm bearing and lock with a clip.
  3. Make sure that the breaker arm spring is correctly positioned, Fig. 5, and tighten the nuts for the condenser and primary cables.
  4. Adjust the contact gap by means of eccentric screw 9, Fig. 4. The contact gap should be 0.3 - 0.4 mm. (0.012 - 0.016 in.).
  5. Place the protective cover over the breaker mechanism so that the slot in the cover fits onto the guide lug formed by the spring attachment, which also guides the distributor cover.
  6. Screw on the rotor.
- Note that the spring washer under the stop screw always must be replaced with a new one if the screw has been loosed.
7. Check the ignition timing as described in 3.3. point 8 below.

8. Clean and inspect distributor cover, ignition cables, spark plugs and terminal rubber caps at distributor and ignition coil.

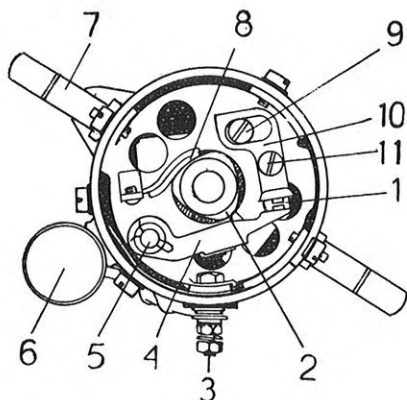
9. Put on distributor cover.



1. Ignition cable to cyl. No. 1
2. Ignition cable to cyl. No. 2
3. Ignition cable to cyl. No. 3
4. Cable to ignition coil
5. Center brush
6. Rotor
7. Protective cover
8. Lock screw
9. Grease cup
10. Marking for t.d.c. of piston in No. 2 cylinder
11. Primary cable terminal

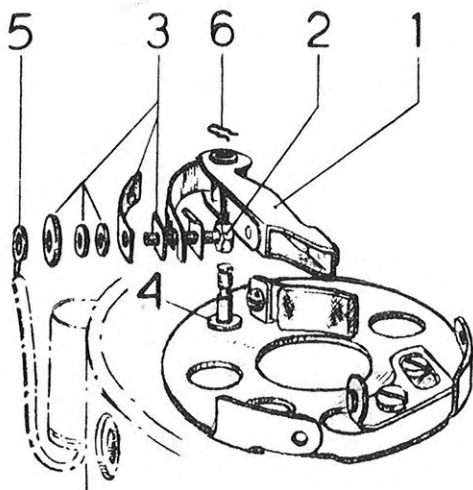
Fig. 3. Distributor





1. Breaker points
2. Camshaft
3. Primary cable terminal
4. Breaker arm
5. Breaker arm shaft
6. Condenser
7. Clamp spring
8. Lubricating felt
9. Eccentric screw
10. Contact plate
11. Locking screw for contact plate

Fig. 4. Contact breaker points in distributor



1. Breaker arm
2. Screw with contact washer
3. Insulating washers
4. Shims
5. Condenser cable
6. Clip

Fig. 5. Distributor breaker arm

## 3.3. Ignition timing

1. Remove distributor cover.
2. Remove rotor, which is attached to distributor shaft by means of a stop screw.
3. Remove protective cover from breaker mechanism.
4. Inspect breaker points. If they need to be replaced, proceed according to 3.2. above.
5. Loosen screw 11, Fig. 4, for the contact plate 10 and adjust contact gap by means of eccentric screw 9. The contact gap should be 0.3 - 0.4 mm. (0.012 - 0.016 in.).
6. Tighten the retaining screw for contact plate 11.
7. Place protective cover with notch at spring attachment and fit rotor.

Note that the spring washer under the rotor stop screw always must be replaced with a new one if the screw has been loosened.

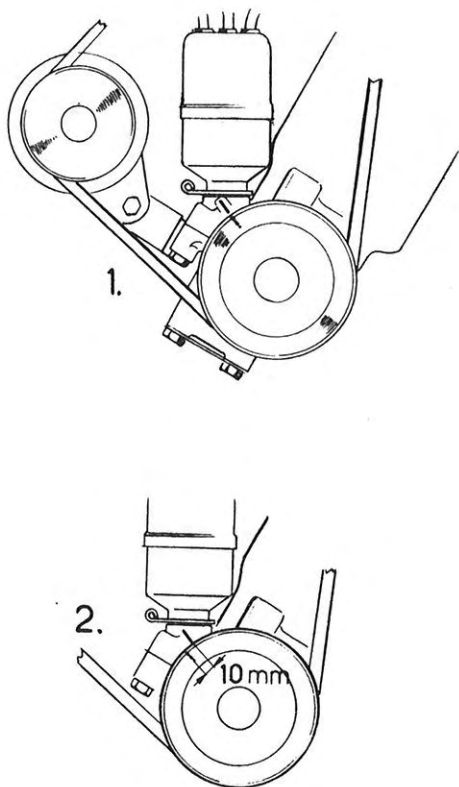
8. Remove the spark plugs.
9. Set piston in No. 2 cylinder at top dead centre, which position is reached when marks on pulley and engine block coincide, see Fig. 6.
10. Check that rotor marking is roughly opposite the line on the distributor housing. Looking from the front, the line is located immediately to the left of the spring attachment which acts as a guide for the distributor cover, see 10, Fig. 3. If the marks do not coincide, the distributor should be removed. Turn rotor so that it will point correctly, when the distributor is replaced.
11. Loosen clamp screw 8, Fig. 3, on retaining plate under distributor.
12. Turn pulley on crankshaft to the left, seen from in front, so that mark on the pulley comes about 10 mm (0.4 in.) to the left of the engine block mark. The piston in No. 2 cylinder is then 8° before top dead centre.

13. Connect a test lamp between the distributor primary cable terminal and ground, see Fig. 7, and switch on the ignition current.

14. Turn distributor to and fro until the exact limit is found where the test lamp goes out or lights up. Check at the same time that the weights in the

ignition advance regulator are retracted all the time by holding the rotor turned to the left (counter-clockwise).

Note: The normal rotation of the rotor is clockwise.



10 mm = 0.39 in.

1. Piston in No. 2 cylinder at t.d.c.
2. Piston in No. 2 cylinder 80° before t.d.c.

Fig. 6. Marking for ignition timing

15. Check that the marks 10, Fig. 3, coincide and lock distributor in the exact position in which the test lamp goes out or lights up.
16. Turn belt pulley a few turns and check that the timing is correct.
17. Switch off the ignition current.
18. Clean and inspect distributor cover, ignition cables, spark plugs and rubber caps of cable terminals at distributor and ignition coil. Defective parts should be replaced.
19. Fit distributor cover

20. Screw in spark plugs and connect ignition cables. Note connections of cables at distributor cover, see Fig. 3.

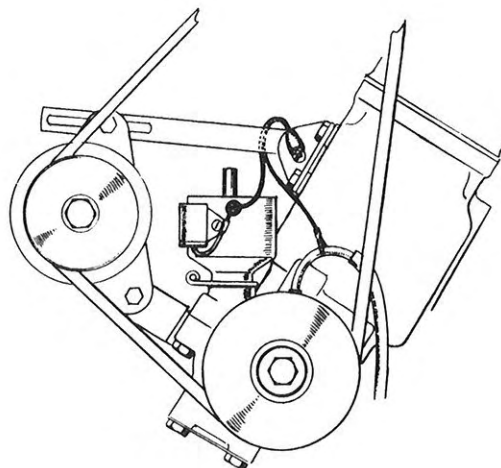


Fig. 7. Connecting test lamp.

### 3.4. Inspection and adjustment of breaker points, fuel pump

1. Loosen nut 21 and remove live cable, Fig. 8.
2. Unscrew nut 22 fold away the rubber strip and remove protective cap 9 over breaker mechanism. Observe great cleanliness so as to prevent dirt from getting into the mechanism.
3. Inspect and clean breaker points. Polish contacts lightly with very fine emery cloth. If the points are burned so badly that they must be replaced, the pump must be removed, see 4.4.1.
4. Fit protective cap, nut, cable terminal and nut for same.

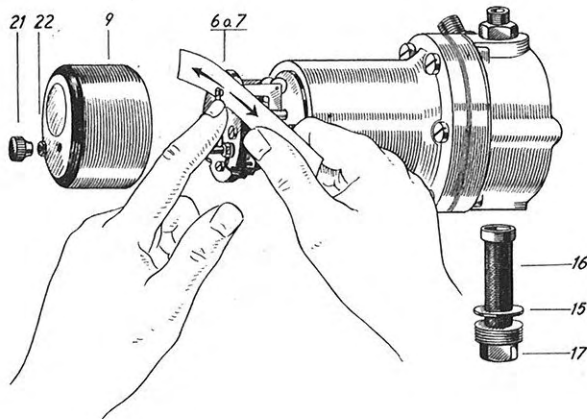


Fig. 8. Inspection of breaker points, fuel pump.  
Pos. numbers refer to instruction 3.4.

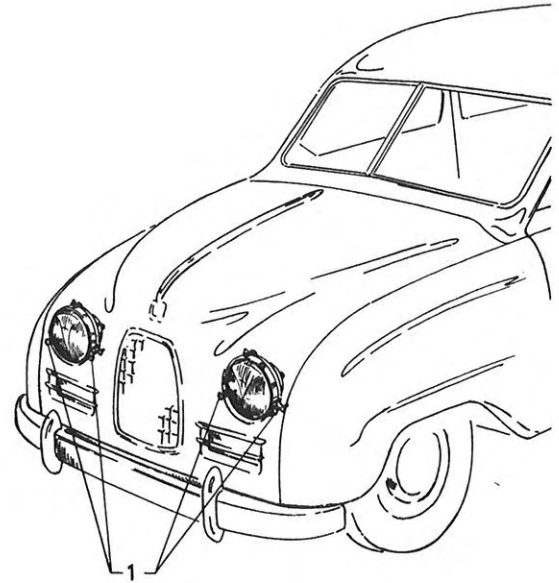
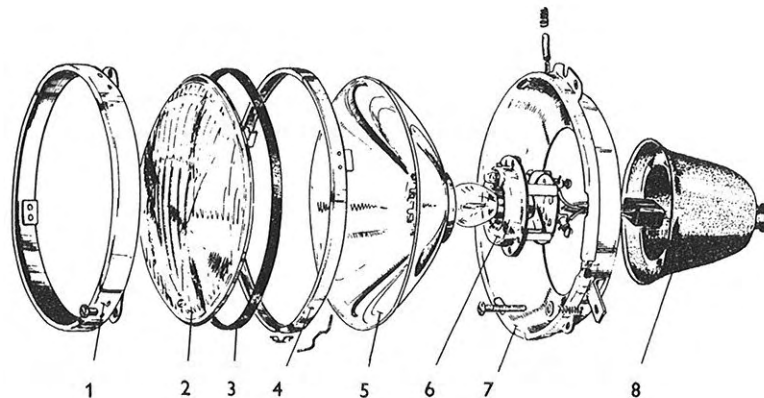


Fig. 9. Adjusting screws for headlight setting.

## 3.5. Headlamps — Adjustment and bulb replacement

### 3.5.1. Adjustment of headlamp settings

The two headlights are identical and each one is attached to the engine hood in a three-point mounting. The upper attachment is of hinge type, and the two lower ones, on each side of the headlight, consist of springloaded screws which also serve as adjusting screws, see Fig. 9. Fig. 10 shows the construction of domestic headlights. Cars intended for the U.S.A., however, are equipped with Sealed Beam units.



1. Chromium-plated ring
2. Lens
3. Gasket
4. Clamp ring

5. Reflector
6. Holder with bulbs
7. Body
8. Rubber cover

Fig. 10. Dismantled headlight, domestic.

**Lateral adjustment (to the right):**

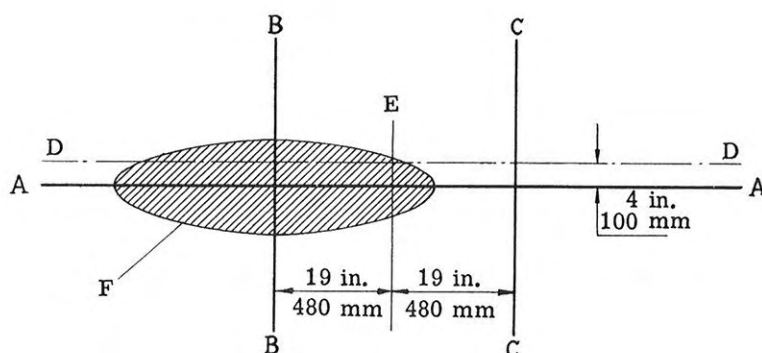
Turn left-hand screw to the left and right-hand screw to the right. Both screws must be turned an equal number of turns, otherwise the vertical setting will be altered. Adjustment to the left is done by turning the screws in the opposite direction.

**Vertical adjustment (upwards):**

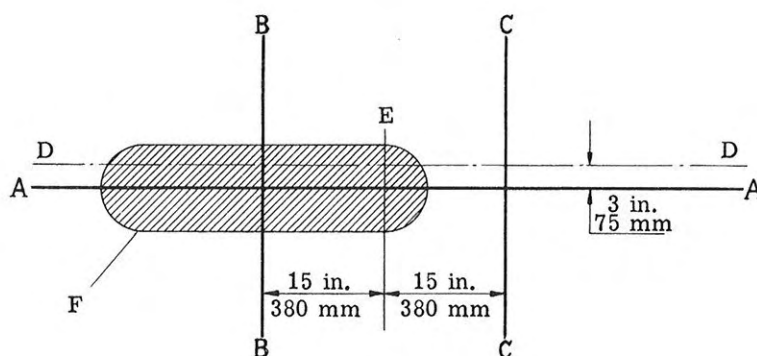
Turn both screws an equal number of turns to the right. To adjust downwards, turn both screws to the left.

**Adjustment of headlights against target.**

Park the car on level ground and square with the target. Make sure that tire pressures are as specified and that the distance between headlights and target is 10 metres (33 ft.) for domestic type and 7.5 metres (25 ft.) for Sealed Beam setting. Cover one headlight at the time and check that the upper beam is symmetric according to the marking on the target, see Fig. 11.



a. Domestic



b. Sealed Beam

A = Horizontal center line of beam.

B = Vertical center line of beam, left-hand headlight.

C = Vertical center line of beam, right-hand headlight.

D = Horizontal center line of head lights.

E = Center line of car.

F = Upper beam.

Distance between headlight and target:

Domestic 10 m (33 ft.)

Sealed Beam 7.5 m (25 ft.)

Adjust vertical center line of left-hand headlight beam sideways to line B-B and of right-hand headlight beam to line C-C.

Horizontal center line of beam must be on line A-A.

No separate adjustment needed for lower beam.

Fig. 11. Targets for headlight setting.

## 3.5.2. Replacement of bulbs in headlamps and parking lights

Removal.

1. Raise engine hood.
2. Loosen rubber cover over lamp holder.
3. Take out lamp holder while holding the catch spring on underside of reflector depressed.
4. Remove the bulb.

Installation.

1. Fit a new bulb. Don't touch the bulb with the bare hand. Use the packing of the bulb, etc., when installing.
2. Depress the catch spring on the underside of the reflector cover and push in the lamp holder.
3. Place the catch spring in the reflector slot and check that it secures the lamp holder firmly.
4. Fit the rubber cover and make sure that it seals properly against the reflector.

## 3.5.3. Replacement of "Sealed Beam" adapters

Removal.

1. Raise the hood.
2. Pull off the cable holder from the unit.
3. Remove the two adjusting screws and their springs.
4. Press the headlight backwards and detach it from its upper attachment. Collect the spring.
5. Loosen the chromium-plated ring and remove the unit.

Installation.

1. Place the Sealed Beam unit in the headlight body and fit the chromium-plated ring.
2. Fit upper spring and hook on the headlight to its upper attachment.
3. Fit the two lower springs and screw in the two adjusting screws.
4. Connect the cable holder to the unit.
5. Lock engine hood and adjust headlight setting, see 3.5.1.

## 3.6. Rear lamps and flashing direction signals — Bulb replacement

### 3.6.1. Replacement of bulbs for licence plate lighting

1. Loosen attachment screw and remove lamp cover. Bulb can then be removed.
2. Clean lamp holder and cover.
3. When installing bulb, make sure that it makes good contact.
4. Fit cover and tighten retaining screw. Check that cover seals properly against rubber gasket.

### 3.6.2. Replacement of bulbs for brake and position lights, flashing direction signals and front parking lights

1. Loosen the two retaining screws and remove the glass with frame and screws.
2. Remove bulb.
3. Clean lamp holder, reflector and glass.
4. Insert bulb. Make sure that good contact is obtained.
5. Fit glass and frame and tighten screws, making sure that a tight seal is obtained.

## 3.7. Roof light — Bulb replacement

Bulb replacement.

1. Loosen the two retaining screws for the glass. Remove screws, glass and bulb.
2. Make sure that the two bulb attachments are clean and fit tightly so that the new bulb is held firmly in position.
3. Install in reverse order. In case of poor contact, remove glass as described above, then detach base plate for repair or replacement.



### 3.8. Direction indicators — Bulb replacement

Bulb replacement.

1. Put out indicator.
2. Loosen screw on its underside and slide the cover plate towards car.
3. Remove bulb and clean contact surfaces.
4. Insert a new bulb and check that it makes good contact. Trim inner attachment if necessary. Lock the bulb by pushing back the cover plate.
5. Tighten the screw.
6. Check that the indicator comes out correctly and that the bulb lights up.

### 3.9. Fuses

In cars with serial numbers to 30200, the electric system has two 15 amp. fuses.

The fuse in the lighting switch is mounted in a socket which is screwed into the switch. The fuse in the cable between ignition switch and terminal board is mounted in a holder under the instrument panel. To remove the fuse, compress the holder and open it, see Fig. 12 A.

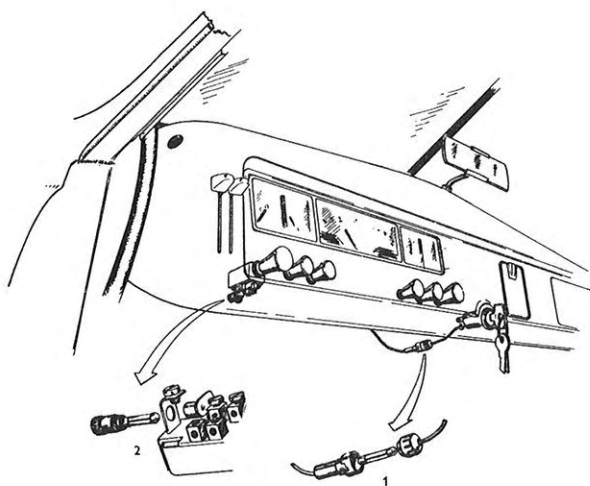


Fig. 12A. Location of fuses  
To serial number 30200

In cars with serial numbers from 30201, the electric system has twelve 8 amp. fuses, two of which are intended for extra equipment or as spares. The fuses are assembled in a box which is mounted on the right-hand side of the cowl in the engine compartment. The units which the various fuses protect are indicated inside the fuse box cover, see Fig. 12B. The only part of the electric system which is not fused is the instrument lighting.

When installing a fuse, be sure that good contact is obtained.

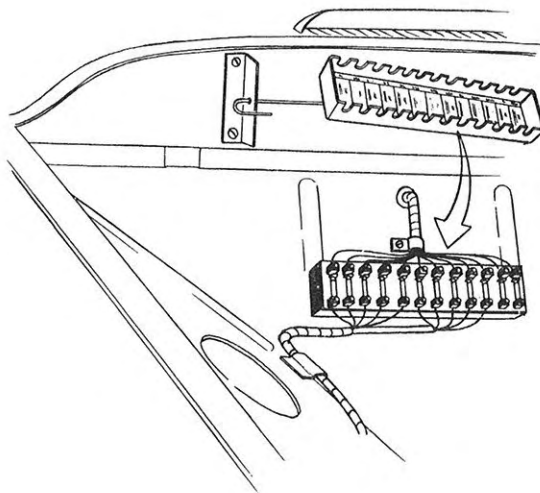


Fig. 12B. Location of fuses  
From serial number 30201

### 3.10. Horn adjustment

If the horns have a discordant tone, locate the defective horn and adjust it by turning the red-coloured contact screw on the rear of the horn until desired tone is obtained.

### 3.11. Coolant thermometer

In the event of damage to the temperature gauge, its bulb or tube, the entire unit must be replaced. The bulb in the cylinder block, the capillary tube and the gauge on the instrument panel form a fluid system which cannot be repaired.

## 3.12. Speedometer cable

The two connections of the speedometer cable are of soft material and should be tightened by hand. If tightened too hard with a wrench they are liable to

be damaged and cannot guide the cable properly which may cause noise.

The cable should be well lubricated. See Chapter 15, "Lubrication".

## 4. INSPECTION WORK

### 4.1. Battery

#### 4.1.1. Removal of battery

Disconnect the cables and loosen the two wing nuts holding the battery in place. The battery can then be removed.

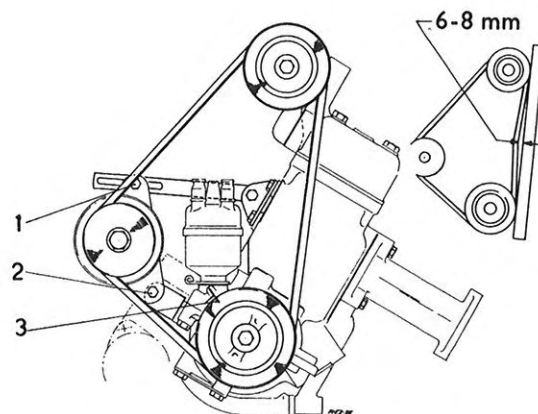
#### 4.1.2. Installation of battery

Place the battery on its shelf and clamp it into place with the wing nuts. Connect the battery cable to the positive terminal and the ground cable to the negative terminal, tighten cable clamps securely.

### 4.2. Generator

#### 4.2.1. Removal and installation

1. Disconnect the battery ground cable.
  2. Drain off coolant and disconnect distributor cable.
  3. Disconnect generator cables, loosen retaining screws and adjusting screw and take off V-belt.
  4. Disconnect hoses from water pump and lift out generator.
  5. To install generator, reverse above procedure. For adjustment of V-belt tension, see Fig. 13.
- Instructions for dismantling water pump, see Chapter 6, "Cooling System".



1. Adjusting screw.
2. Generator attachment screws.
3. Marks for ignition timing.

Fig. 13. Adjustment of V-belt tension.

#### 4.2.2. Carbon brushes

The generator brushes and commutator should be inspected after about 30,000 km. (18,000 miles).

1. Remove cover band over commutator.

# 12 ELECTRIC SYSTEM AND INSTRUMENTS

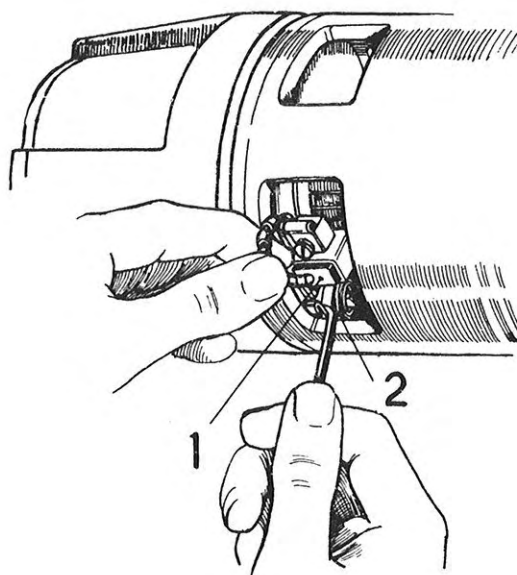
2. Lift carbon brushes with a hook as shown in Fig. 14, and check that they slide easily in their holders.

3. If a brush binds in its holder, lift it out and clean brush and holder. Use a cloth moistened with kerosene. The contact surface of the brush must not be cleaned.

4. After cleaning the brush, place it in the same position, so that it makes contact with the commutator as before.

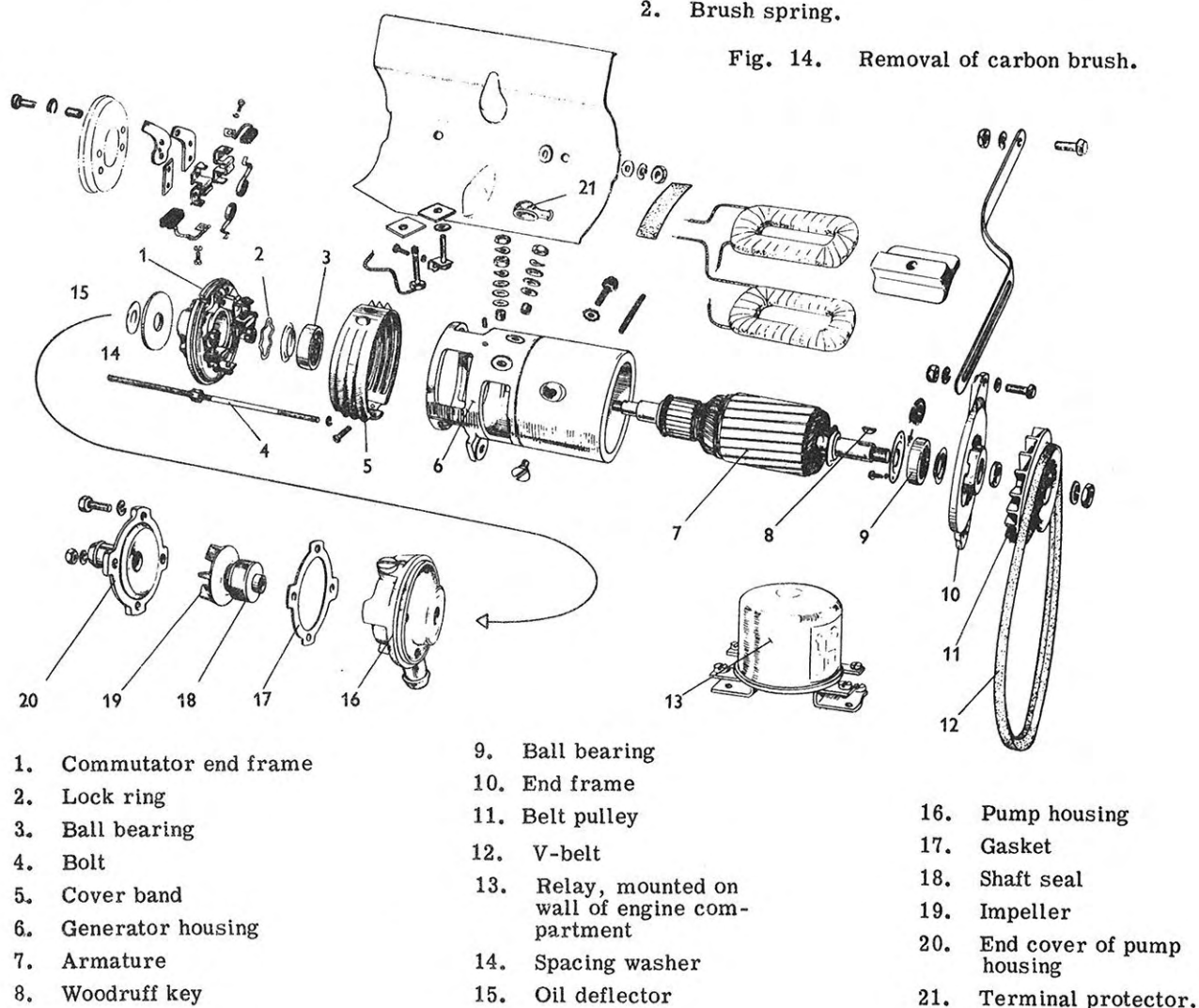
5. If a brush is damaged or so badly worn that the brush spring is in contact with the stop, the brush must be replaced.

When inserting new brushes, don't let the brush spring strike the brush too hard, as this might damage the brush.



1. Carbon brush.
2. Brush spring.

Fig. 14. Removal of carbon brush.



- |                         |  |                               |
|-------------------------|--|-------------------------------|
| 1. Commutator end frame | 9. Ball bearing                                  |                               |
| 2. Lock ring            | 10. End frame                                    |                               |
| 3. Ball bearing         | 11. Belt pulley                                  |                               |
| 4. Bolt                 | 12. V-belt                                       |                               |
| 5. Cover band           | 13. Relay, mounted on wall of engine compartment |                               |
| 6. Generator housing    | 14. Spacing washer                               |                               |
| 7. Armature             | 15. Oil deflector                                |                               |
| 8. Woodruff key         |  |                               |
|                         |  | 16. Pump housing              |
|                         |  | 17. Gasket                    |
|                         |  | 18. Shaft seal                |
|                         |  | 19. Impeller                  |
|                         |  | 20. End cover of pump housing |
|                         |  | 21. Terminal protector.       |

Fig. 15. Generator incl. water pump.

## 4.2.3. Commutator

The commutator should present a smooth, dark-grey contact surface to the brushes, and it must be free from oil and grease. If the commutator is dirty, clean it with a cloth moistened with kerosene and then dry it. If the commutator is scratched or worn out-of-round, it must be lathe-turned, grooved and polished at a specialist workshop. The commutator must on no account be polished with emery cloth or filed.

## 4.3. Starter

### 4.3.1. Removal

1. Disconnect ground cable from battery.
2. Disconnect starter cables and starter control.
3. Loosen the nuts on the two screws which hold the starter to the lower part of the crankcase.
4. Pull out the starter until it comes free from the fly wheel, then lift it out of the engine compartment.

1. Flat washer
2. Spring washer
3. Insulating washer
4. Insulating bushing
5. Spring
6. Insulating strip
7. Insulating washer
8. Flat washer
9. Starter control
10. Return spring
11. Pinion end frame
12. Bearing bushing
13. Pinion
14. Spring
15. Snap ring
16. Spacing washer
17. Pivot bolt, coupling arm
18. Coupling arm
19. Armature
20. Washers, armature brake
21. Insulating washer
22. Field winding
23. Starter housing.
24. Retaining screw, field winding
25. Field winding terminal
26. Bolts
27. Brushes
28. Brush spring
29. Commutator end frame
30. Cover strip
31. Bearing bushing
32. Starter switch
33. Insulating piece
34. Contact piece
35. Terminal protector

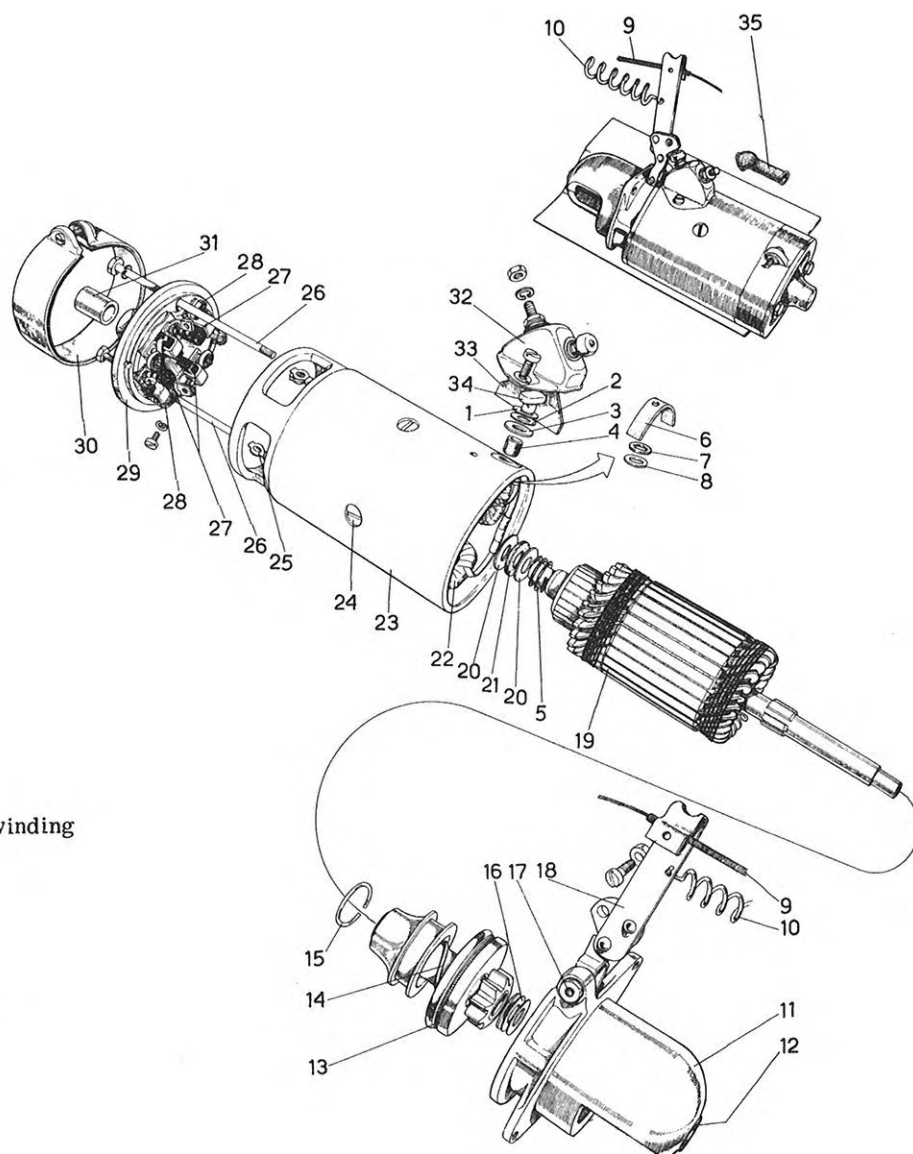


Fig. 16. Starter.

## 4.3.2. Dismantling

1. Remove cover band over brushes, see Fig. 16.
2. Remove the long screws 26.
3. Remove the pinion end frame. Note that the spacing washers 16 must later be replaced to the same number and in the same order as they are removed.
4. Pull out the armature after relieving the brush spring tension. Collect the washers 20 and 21.
5. Disconnect field-winding terminals and other retaining screws at the commutator end frame.
6. Remove commutator end frame 29.

## 4.3.3. Cleaning

1. Wash all parts except pinion 13 in kerosene and remove all dirt. The bearing bushings 12 and 31 must be protected from kerosene and other grease-solving agents when washing.
2. Check that the brushes are undamaged and that they slide easily in their holders.

## 4.3.4. Assembly

1. Lubricate bearing bushings with suitable mineral oil.
2. Insert armature and place correct number of washers 20 and 21 on shaft. Note that insulating washer 21 must be placed between the washers 20.
3. Place commutator end frame 29 into position and insert screws 26. Make sure that guide lug enters the notch.
4. Place pinion 13 and spacing washers 16 on shaft. Be sure to replace the same number of washers as were removed.
5. Fit fork of coupling arm 18 into pinion groove and place pinion end frame in position.
6. Tighten screws 26.
7. Connect field winding terminals to brushes.
8. Put on cover band, with joint downwards.

## 4.3.5. Installation

1. Fit starter to motor and tighten the two retaining screws.
2. Connect the electric cables to the starter switch and connect the starter control sheath to coupling arm and the wire to the attachment in

floor of engine compartment.

3. Connect ground cable to battery.

## 4.4. Distributor

### 4.4.1. Removal

1. Disconnect ground cable from battery and primary cable from distributor.
2. Remove distributor cover.
3. Loosen locking screw 34, Fig. 17, on attachment plate under distributor.
4. Remove distributor from engine.
5. Disconnect ignition cables from distributor cover.

### 4.4.2. Dismantling

The distributor must be cleaned thoroughly before dismantling.

1. Remove rotor 3. It is locked to the camshaft by stop screw 5, Fig. 17.
2. Lift off protective cover 2 over breaker mechanism.
3. Loosen nut 11 for condenser cable.
4. Remove locking clamp 6 and lift up breaker arm 7.
5. Remove screw 8 with contact washer, insulating washer and insulating strip 10 and collect insulating washers 11.
6. Loosen the three screws 29 which hold the support plate 13. Two of these screws also hold the clamp springs 32 for the distributor cover.
7. Collect the springs and lift up the support plate 13.
8. File off and drive out the rivet 26 which holds the distributor pinion 28 on the shaft 22. Be careful not to damage the shaft.
9. Lift out the distributor shaft with the automatic timing regulator. Collect washers 24, 25 and shims 27 if fitted.
10. Unhook the two springs 17 from the spring attachment 23 and lift off the cam assembly 16.
11. Unhook the springs from the cam assembly. Bend down the spring attachments carefully if necessary.



1. Distributor cover
2. Protective cover
3. Rotor
4. Spring washer
5. Stop screw
6. Locking clip
7. Breaker arm
8. Contact screw with washer
9. Insulating strip
10. Insulating washers
11. Nut and washers for condenser cable
12. Nut and washers for primary cable
13. Support plate
14. Spacer washer
15. Fibre washer
16. Cam assembly
17. Ignition regulator springs
18. Regulator weight
19. Regulator weight
20. Fibre washer
21. Fibre plate
22. Distributor shaft with plate
23. Spring attachment
24. Spacer washer
25. Fibre washer
26. Slotted rivet
27. Shims
28. Distributor pinion
29. Attachment screw for support plate and clamp springs.
30. Condenser
31. Locking clip
32. Clamp spring
33. Screw and washers
34. Locking screw
35. Distributor body
36. Seal ring
37. Bushing

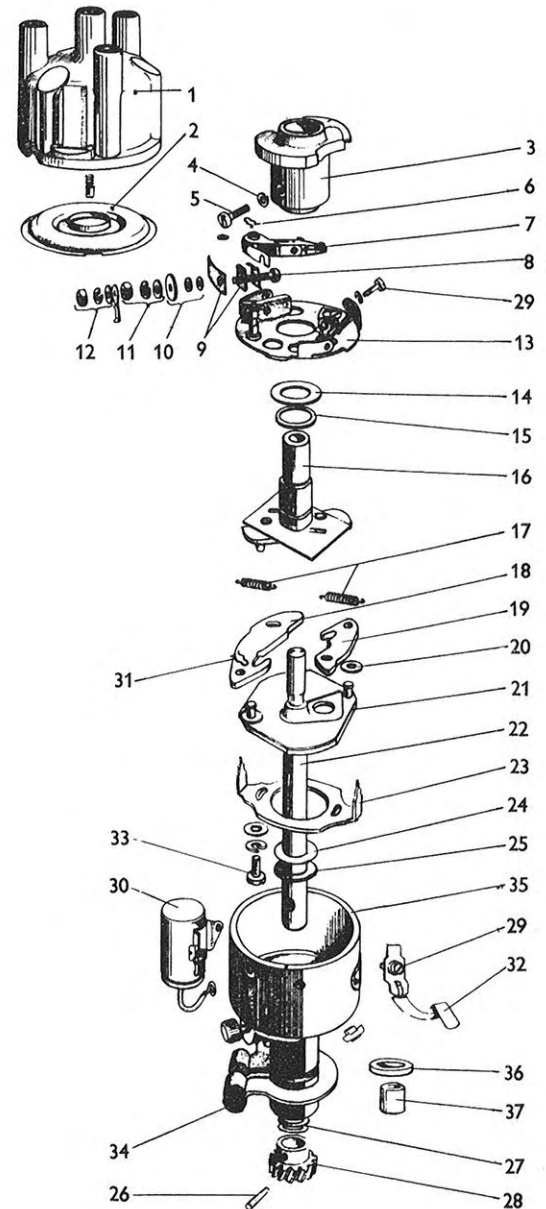


Fig. 17. Distributor.

12. Remove locking clips 31 and lift off regulator weights 18 and 19. Collect the fibre washers 20 under the weights.

13. Remove fibre plate 21.

Note screws 33 on the underside of the distributor-shaft plate. If these screws are loosened, the spring attachment 23 can be turned for adjustment of the regulator spring tension. Initially, this tension is correctly set and should not be changed.

14. Remove condenser 30 from distributor body.

15. Remove seal ring 36.

16. If the bushings 37 is to be removed they must be destroyed.

### 4.4.3. Assembly

Before assembling, wash and inspect all parts, replacing any that are worn or damaged.

1. Press new bushings 37 into the distributor body if they have been removed.
2. Fit the condenser to the distributor body.
3. Fit a new seal ring.

4. Place fibre plate 21 on distributor shaft plate. Place the fibre plate so that the hole in the steel plate is not covered.

5. Place the fibre washers 20 on the regulator weight pivots. Note that lubricant should be used sparingly on bearings and sliding surfaces in the distributor. As regards lubricants, see Chapter 15, "Lubrication".

6. Place the smaller of the two regulator weights 19 on the pivot nearest the hole in the steel plate. Note that the regulator weights should be installed with their sliding shoes against the fibre plate.

7. Fit the other regulator weight and secure the weights with the clips 31.

8. Hook on the regulator springs 17 to the attachments on the cam assembly 16 and close spring loops so that the springs cannot come loose during the subsequent assembly.

9. Place the cam assembly on the distributor shaft after greasing the shaft. Make sure that the pins on the underside of the assembly.

10. Hook on the regulator springs to the two outer spring attachments 23.

11. Check that the ignition regulator operates properly by turning the cam clockwise.

12. Place spacer 24 and then fibre washer 25 on the distributor shaft.

13. Grease the shaft and insert it into the distributor body.

14. Assemble the support plate 13.

15. Secure the plate with one screw 29 in distributor.

16. Attach the two clamp springs 32 with the two screws 29 which also hold the support plate.

Note that the spring attachment, which forms a guide shoe for the distributor cover, should be placed at the mark on the distributor body, see Fig. 3.

17. Fit screw 8, Fig. 17, for the condenser and primary cables. Note that the various washers must be correctly fitted, see Figs. 5 and 17. Do not tighten.

18. Fit breaker arm after greasing pivot. Place the requisite number of spacers 4, Fig. 5, on the breaker arm pivot and secure it with the clip 6.

19. Be sure to fit the breaker arm spring cor-

rectly, see Fig. 5, and tighten the nut for the condenser cable.

20. Fit the distributor pinion to the shaft. Before the pinion is riveted to shaft, the end play of the shaft must be adjusted by means of shims, 27, Fig. 17. The permissible end play is 0.1 - 0.2 mm. (0.004 - 0.008 in.). When driving in and riveting the slotted pin, be careful not to damage the shaft or its bearing.

21. Adjust the gap between the breaker points, see Fig. 4. To do this, loosen the screw 11 securing the contact plate and adjust the gap by means of the eccentric screw 9 to 0.3 - 0.4 mm. (0.012 - 0.016 in.).

22. Fit the protective cover 2 and the rotor.

Note that the spring washer 4, Fig. 17, under the stop screw must be replaced by a new one.

#### 4.4.4. Installation

1. Remove the spark plugs and set the piston in No. 2 cylinder at top dead center. This position is attained when the marks on the crankshaft belt pulley and the cylinder block coincide, see Fig. 6.

2. Fit the distributor to the motor.

Note that the markings of rotor and distributor body 10, Fig. 3, should point forward.

3. Connect the primary cable and adjust the ignition timing as described in 3.3.

4. Clamp on the distributor cover. The cable from the middle cylinder must be placed in the socket marked 1 in the distributor cover. The other cables should then be placed as shown in Fig. 3. Make sure that the cables are clean and make good contact and that their terminal protectors are undamaged.

### 4.5. Fuel pump

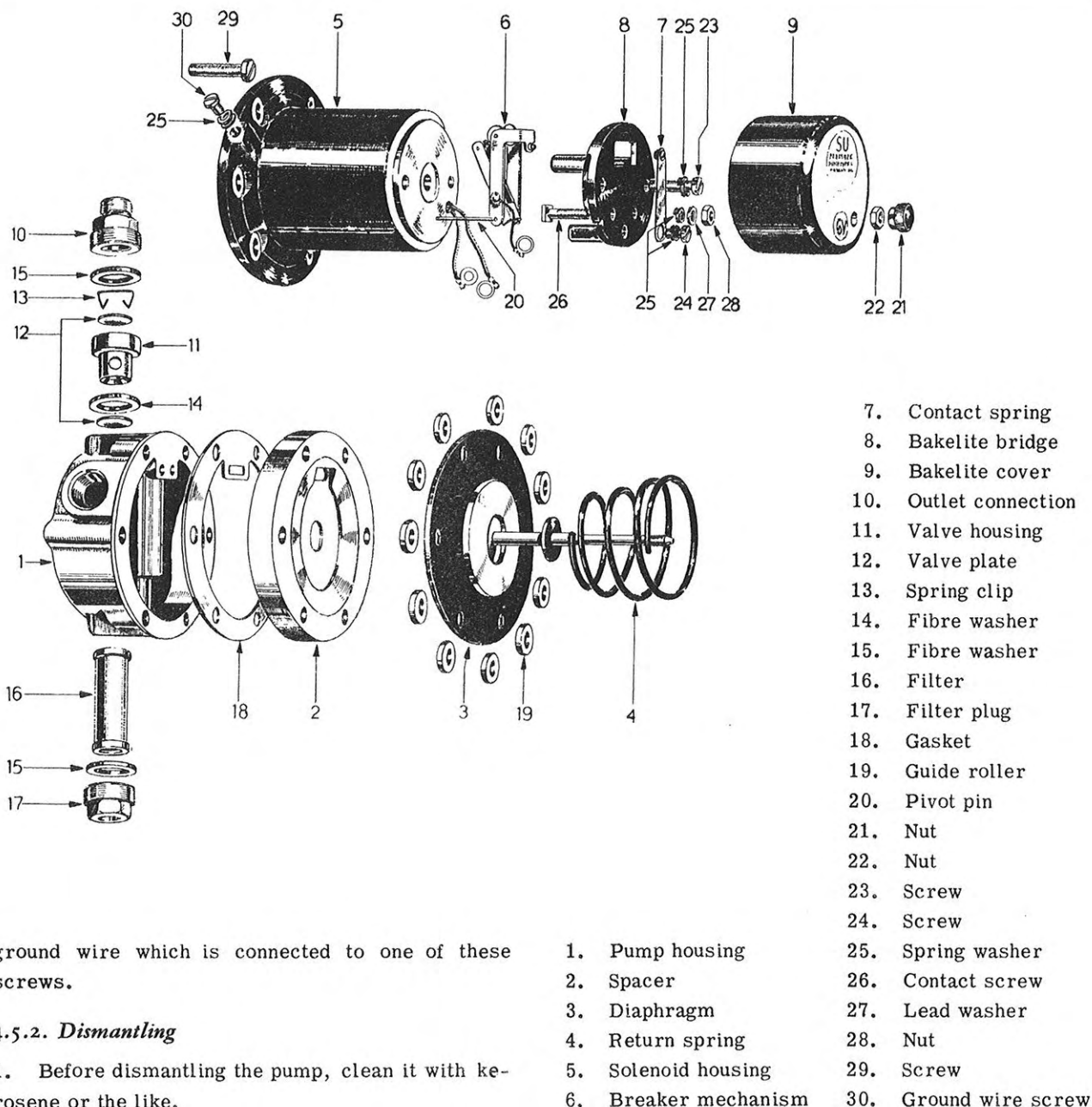
#### 4.5.1. Removal

1. Disconnect inlet line from pump.

2. Disconnect fuel hose to carburetor.

3. Remove nut 21 and wire, see Fig. 18.

4. Loosen the two screws which hold the fuel pump to wheel housing wall and remove the pump



ground wire which is connected to one of these screws.

#### 4.5.2. Dismantling

1. Before dismantling the pump, clean it with kerosene or the like.
2. Loosen the six screws 29 which hold the solenoid housing and pump together.
3. When the six screws are removed, the pump comes apart into three sections:  
Solenoid housing 5 with breaker mechanism, pump housing 1 and spacer 2 with gasket 18.
4. Unscrew diaphragm 3 with its spindle from solenoid housing and breaker mechanism.
5. Collect the eleven guide rollers 19, which fall out when the diaphragm is unscrewed.
6. Remove diaphragm with spindle and spring 4.
7. Turn over the pump and loosen nut 22, which

secures the bakelite cover 9.

8. Remove the bakelite cover.
9. Loosen the two screws 23, which hold the bakelite bridge 8 to the solenoid housing, but remove only the screw to which the rocker ground wire is connected.
10. Remove pivot pin 20 which carries the rocker 6 in the bridge.
11. The rocker can now be removed by pulling it out in direction away from the pivot pin.

Fig. 18. Fuel pump.

12. Loosen and remove the screw 24 which holds the contact spring 7, and the cable from the solenoid winding.

If not the bakelite bridge or the entire solenoid housing is to be replaced, further dismantling is unnecessary. Otherwise proceed as follows:

13. Loosen and remove the nut 28 holding the cable to the solenoid winding.

14. Remove the already loosened screw 23, which holds the bakelite bridge to the solenoid housing.

15. Loosen the solenoid winding cable lug with a thin screwdriver inserted between the lug and the contact bridge, or cut away the lead washer 27 with a knife.

16. After removing cable lug, remove contact screw 26, and spring washer 25.

17. Remove outlet connection 10 from pump housing.

18. Remove fibre gasket 15 in the outlet.

19. Lift out valve housing 11 and the thin fibre gasket 14 under the valve housing. The easiest way of removing the gasket is to invert the pump housing, when the gasket will fall out together with the inner valve plate 12.

20. Unscrew the filter plug 17 and remove filter 16 and fibre washer 15.

#### 4.5.3. Assembly

Clean all parts, check valves and seats and replace any defective parts.

1. Place contact screw with square head in bakelite bridge.

2. Place spring washer on screw.

3. Connect solenoid winding cable to contact screw.

4. Fit contact washer (lead washer). Use a new washer if available.

5. Screw on and tighten the nut with its concave side towards the lead washer.

6. Fit the bakelite bridge with screw 23 and spring washer to the solenoid housing. Do not tighten.

7. Place the rocker between bridge and solenoid housing so that its ground wire fits in the notch.

8. Place the return spring on the diaphragm

spindle so that its larger diameter faces the solenoid housing.

9. Insert the spindle through the solenoid housing and fix the rocker so that the spindle can be screwed in a couple of turns into the threaded hole in the rocker.

10. Fit the other screw, which holds the bridge to the solenoid housing. Place the spring washer between the bridge and the ground wire lug.

11. Make sure that the ground wire and the previously connected cable lie in their respective notches in the bridge.

12. Tighten the two screws holding the bakelite bridge in stages.

13. Fit the pivot pin through bridge and rocker. This is easier to do if the diaphragm is pressed in.

14. Fit and tighten the screw which holds the cable lug, the spring washer and the contact spring.

15. Place the eleven guide rollers around the armature under the diaphragm.

16. Hold the solenoid housing in one hand and screw in the diaphragm spindle clockwise until the exact point is reached where the rocker no longer flips over when the diaphragm is pressed down gently with the thumb.

17. From this limit, back off the diaphragm  $2/3$  of a turn, that is, four hole pitches. Check that the rocker operates properly.

18. The position of the diaphragm spindle is now fixed and the contact points can be inspected and, if necessary, adjusted.

19. First check that the leaf spring for the outer point rests against the ridge on the bakelite bridge when the circuit is broken. If not, the spring must be carefully adjusted.

20. Check at the same time that the surfaces of the contact points in the closed position cover one another completely. If not, adjust this by moving the leaf spring.

21. If adjustments have been correctly carried out, the following check should give satisfactory results:

a. Check that when the contact points are open the contact spring rests against the ridge on the bakelite bridge.

b. The spring must not be tensioned so hard that



it prevents the rocker from making a full stroke.

c. The points should contact one another when the rocker is in its central position. Check this by holding the spring pressed against the ridge on the contact bridge with a finger. Note that the part of the spring lying outside the ridge towards the contact point must not be depressed. When the spring is held in this position, it should be possible to pass an 0.3 mm. (0.012 in.) feeler gauge freely between the solenoid housing and the white rollers on the rocker. The distance between the points, that is, the contact gap, should not exceed 0.7 - 0.8 mm. (0.03 in.).

22. Place the inlet valve plate in the pump housing. The smooth surface of the plate should face downwards against the seat.

This also applies to the valve plate in the valve housing, if the spring clip has been removed and the valve plate taken out.

23. Place the thin fibre gasket in the seat for the valve housing.

24. Insert the valve housing containing valve plate spring clip, with the spring outwards.

25. Place the other fibre gasket over the valve housing.

26. Insert and tighten the outlet connection.

27. Place the filter and fibre gasket on the filter plug, and screw it into the pump housing.

28. Place gasket between the pump housing and the spacer. Check that it is undamaged.

29. Place the flat side of the spacer against the gasket and turn it so that the pump housing ducts are aligned with the corresponding opening in the spacer.

30. During assembly of pump housing, spacer and solenoid housing, the diaphragm must be kept flat, that is, in depressed position. This can be arranged in several ways, one of which is to insert a forked wedge or the like under the rocker so as to lift the inner yoke and keep it in this position while the six screws are inserted. Be careful not to damage the breaker mechanism.

31. Fix the solenoid housing in relation to the pump housing so that the contact points are turned towards the same side as the outlet connection. When the pump is installed in the car the filter will

thus come on the underside of the pump and the contact points will face upwards. Do not use any sealing compound, shellac etc. on the diaphragm.

32. Tighten the six screws.

33. Remove the tool used for lifting the rocker.

34. Lubricate the pivot pin in the breaker mechanism with 2 or 3 drops of oil.

35. Test the pump by connecting it to a battery. Be sure that the pivot pin does not fall out during testing when the bakelite cover is not fitted.

36. Fit the bakelite cover.

37. Tighten the nut which holds on the cover.

#### 4.5.4. Installation

1. Attach the pump to the wheel housing with the two screws. Note that the pump ground wire is connected with one of these screws.

2. Connect the electric wire to the terminal and tighten the nut.

3. Connect the fuel hose between pump and carburetor.

4. Connect the inlet line to the pump.

#### 4.5.5. Replacement of diaphragm, fuel pump

##### 4.5.5.1. Removal and dismantling.

After removing the pump as described in 4.5.1. and cleaning it, proceed as follows:

1. Remove the six screws 29, Fig. 18. The pump then comes apart into three sections, solenoid housing 5 with diaphragm 3 and breaker mechanism, pump housing 1 and spacer 2 with gasket 18.

2. Unscrew diaphragm spindle from the solenoid housing.

3. Collect the eleven guide rollers 19 which fall out when the spindle is screwed out.

4. Remove diaphragm spindle and spring 4 from solenoid housing.

5. Turn pump over and remove nut 22, which secures bakelite cover 9.

6. Remove bakelite cover.

##### 4.5.5.2. Assembly and installation.

1. Place return spring on the spindle of the new diaphragm, with its larger diameter facing the solenoid housing.



2. Insert the diaphragm spindle through the solenoid housing and fix the rocker so that the spindle can be screwed a couple of turns into the corresponding hole in the rocker.

3. Place the eleven guide rollers around the armature under the diaphragm.

4. Hold the solenoid housing in one hand and screw in the diaphragm until the exact position is reached where the rocker no longer flips over if the diaphragm is pressed down gently with the thumb.

5. From this position, back off the diaphragm  $2/3$  turn, that is, four hole pitches.

6. The position of the diaphragm spindle is now fixed and the contact points should be inspected and, if necessary, adjusted.

7. First check that the leaf spring for the outer contact point rests against the ridge on the bakelite bridge when the circuit is broken. If not, the spring must be carefully adjusted.

8. Check that the surfaces of the points cover one another completely in closed position. If not, adjust this by moving the leaf spring.

9. If the adjustments have been correctly carried out, the following check should give satisfactory results:

a. Check that when the contact points are open the contact spring rests against the ridge on the bakelite bridge.

b. The spring must not be tensioned so hard that it prevents the rocker from making a full stroke.

c. The points should contact one another when the rocker is in its central position. Check this by holding the spring pressed against the ridge on the bridge with a finger. Note that the part of the spring lying outside the ridge towards the contact point must not be pressed in. When the contact spring is held in this position it should be possible to pass an 0.3 mm. (0.012 in.) feeler gauge freely between the solenoid housing and the white rollers on the rocker. The distance between the points, that is, the contact gap, should not exceed 0.7 - 0.8 mm. (0.03 in.).

10. Check that the gasket is undamaged and fit it between pump housing and spacer.

11. Place the spacer against the pump housing so that the pump housing ducts are aligned with the

opening in the spacer. Note that the flat side of the spacer should face the gasket.

12. During assembly of the pump housing, spacer and solenoid housing, the diaphragm must be kept flat, that is, in depressed position. This can be arranged in several ways, one of which is to insert a forked wedge or the like under the rocker and keep this lifted up while the six screws are inserted and tightened. Be careful not to damage the breaker mechanism.

13. Place solenoid housing on spacer and pump housing with the contact points at the same direction as the outlet connection.

14. Gradually tighten the six screws which hold the main parts of the pump together. Do not use any sealing compound, shellac etc. on the diaphragm.

15. Remove the forked wedge from under the rocker and fit the bakelite cover.

16. Test the pump and install it in the car as described in 4.5.4.

## 4.5.6. Replacement of breaker points, fuel pump

### 4.5.6.1. Removal and dismantling.

After removing the pump as described in 4.5.1, proceed as follows:

1. Remove the six screws 29. The pump then comes apart into three sections; solenoid housing 5 with diaphragm and breaker mechanism, pump housing 1 and spacer 2 with gasket 18.

2. Unscrew the diaphragm spindle from the solenoid housing.

3. Collect the eleven guide rollers 19 which fall out when the spindle is screwed out.

4. Remove diaphragm spindle and spring 4.

5. Turn pump over and remove nut 22, which secures the bakelite cover 9.

6. Remove bakelite cover.

7. Loosen the two slotted-head screws 23 which hold the bakelite bridge 8 to the solenoid housing, but remove only the screw holding the rocker ground wire.

8. Remove the pivot pin 20 which carries the rocker 6 in the bakelite bridge.

9. The rocker can now be removed by pulling it out in direction away from the pivot pin.

10. Loosen and remove screw 24 which holds the

contact spring 7 and cable from solenoid winding.

## 4.5.6.2. Assembly and installation.

1. Place the new rocker between bakelite bridge and solenoid housing so that its ground wire fits in the notch.

2. Place the spring on the diaphragm spindle with its larger diameter facing the solenoid housing.

3. Insert the diaphragm spindle through the solenoid housing and fix the rocker so that the spindle

3. Insert the diaphragm spindle through the solenoid housing and fix the rocker so that the spindle can be screwed in a couple of turns into the threaded hole in the rocker.

4. Insert the screw which holds the bridge to the solenoid housing. The spring washer should be placed between the bakelite bridge and the ground wire.

5. Make sure that the ground wire comes in the notch in the contact bridge.

6. Gradually tighten the two screws which hold the bridge.

7. Insert the pivot pin through bridge and rocker. This is facilitated if the diaphragm is pressed in.

8. Insert and tighten the screw which secures the cable lug, spring washer and contact spring.

9. Place the eleven guide rollers around the armature under the diaphragm.

10. Hold the solenoid housing in one hand and screw in the diaphragm spindle until the exact position is reached where the rocker no longer flips over when the diaphragm is pressed in gently with the thumb.

11. From this limit, back off the diaphragm  $2/3$  turn, that is, four hole pitches.

12. The position of the diaphragm spindle is now fixed and the contact points should be inspected and, if necessary, adjusted.

13. First check that the leaf spring for the outer contact point rests against the ridge on the bakelite bridge when the circuit is broken. If not, the spring must be carefully adjusted.

14. Check that the surfaces of the contact points cover one another completely when in the closed position. If not, adjust this by moving the leaf spring.

15. If the adjustments have been correctly carried out, the following check should give satisfactory results:

a. Check that when the contact points are open the contact spring rests against the ridge on the bakelite bridge.

b. The spring must not be tensioned so hard that it prevents the rocker from making a full stroke.

c. The points should contact one another when the rocker is in its central position. Check this by holding the spring pressed against the ridge on the bridge with a finger. Note that the part of the spring lying outside the ridge towards the contact point must not be depressed. When the spring is held in this position it should be possible to pass an 0.3 mm. (0.012 in.) feeler gauge freely between the solenoid housing and the white rollers on the rocker.

The distance between the points, that is, the contact gap, should not exceed 0.7 - 0.8 mm. (0.03 in.).

16. Check that the gasket is undamaged and place it between pump housing and spacer.

17. Place the spacer against the pump housing so that the pump housing ducts are aligned with the opening in the spacer. Note that the flat side of the spacer should face the gasket.

18. The diaphragm must be kept flat, that is, in depressed position, during assembly of the pump housing, spacer and solenoid housing. This can be arranged in several ways, one of which is to insert a forked wedge or the like under the rocker so as to lift the inner yoke and keep it lifted up while the six screws are inserted and tightened. Be careful not to damage the breaker mechanism.

19. Place the solenoid housing on spacer and pump housing with the contact points at the same side as the outlet connection.

20. Gradually tighten the six screws which hold the pump together. Note that no sealing compound may be used on the diaphragm.

21. Remove the forked wedge from under the rocker and fit the bakelite cover.

22. Test the pump and install it in the car as described in 4.5.4.

## 4.6. Direction indicators

### 4.6.1. Semaphore indicators.

1. Loosen the two chromium-plated screws on the inside of the rear door pillar.

2. Disconnect the electric wiring.

Install the direction indicators in the reverse order. To lubricate the direction indicator bearing, put out the indicator by means of the switch, keep the indicator out by hand and switch off. The indicator can also be put out by depressing the catch with a thin screwdriver or the like.

### 4.6.2. Flashing indicators.

For bulb replacement, see instruction 3.6.2. The flasher is mounted behind the instrument panel under the lighting switch.

## 4.7. Wiring

### 4.7.1. General

The three wiring diagrams, Figs. 19 A, B and C, show the installation of cables and units in the various models. The wires are color-coded corresponding to the numbers in each diagram and the table on its opposite page.

Damaged cable lugs and connectors should be replaced. Make sure that good contact is obtained,

that terminals, connectors and ground connections are clean and tight to avoid excessive voltage drop and arcing.

Make sure that the cable from the horn button is run so that it cannot be pulled off when the steering wheel is turned.

The wiring should be given an insulation test if fuses blow frequently and if damaged insulation is suspected. Note that the fuses will not blow if a short-circuit occurs before the fuse or in a unit which is not fused.

### 4.7.2. Up to chassis number 30200, see Fig. 19 A.

A short-circuit of the battery cable, cables 50 and 2 between relay and ammeter or starter and ammeter, cables 26 and 3, ammeter or lighting switch and ignition switch, cable 12 before the fuse, ignition system and horn circuit shows up by irregular running of the engine, poor lighting etc., and arcing at the location of the short-circuit.

### 4.7.3. From chassis number 30201, see Fig. 19 B.

### 4.7.4. Cars intended for the U.S.A., see Fig. 19 C

## 5. INSTALLATION OF EXTRA ELECTRIC EQUIPMENT

Radio equipment and spot-light should be separately fused and connected to the ignition switch as should preferably also a cigarette lighter.

Other extra equipment should be connected directly to the terminal board or fuse box on the cowl.

The total current consumption of the extra electric equipment (with exception of cigarette lighter) for periods longer than five minutes should not exceed 5-6 A (60-72 W) to prevent generator and battery from being overloaded.

The cables used for the extra equipment should be dimensioned to keep the voltage drop in them as low as possible. Cable sizes should therefore be chosen with the aid of the nomogram shown in Fig. 20, which is used as follows:

When the current rating or wattage of the installed

unit and the length of the cable are known, place a ruler between these values. The appropriate conductor area is then found on the middle scale.

Example: Installation of fog light.

The bulb is rated at 30 W. Cable length from ignition switch through switch to fog light is 2 metres (6 1/2 ft.).

Lay ruler from 30-W line on the left-hand scale to the gradation for 2 metres (6 1/2 ft.) on the right-hand scale. The middle scale then gives a conductor area of 0.6 sq.mm. (approx. 18 AWG).

The nearest standard size, greater than this, should then be used, that is 0.75 sq.mm. (18 AS

The nearest standard size, greater than this, should then be used, that is 0.75 sq.mm. (18 AWG)

### **DIAGRAMS**

Fig. 19 A, B och C    Wiring diagram

Fig. 20    Nomogram for dimensioning of cables.

## Explanations to diagram fig. 19A

(Serial numbers to 30200)

Small numbers indicate colour of cable insulations according to table below

White	Green	Grey	Yellow	Red	Black
22	17b	14	3	2	1
28a	18b	16	13	4	5
28b	19a	20	15	10	6
29	24	21	26	12	7
37	31a	49	33	23	8
38a	31b		34	27	9
38b			34	32a	11
39a			35	32b	17a
39b			36a	43	18a
40			36b	44a	19b
41			50	47	25
42				48	30a
					30b
					44b
					45
					46
					51

Encircled numbers indicate the various units, which are:

1. Horns
2. Headlights
3. Generator
4. Stop light switch
5. Spark plugs
6. Distributor
7. Starter
8. Battery
9. Wiper motor
10. Connector
11. Direction indicators
12. Roof light with switch
13. Dimmer switch
14. Ignition coil
15. Fuel pump
16. Relay
17. Direction indicator switch
18. Steering wheel with horn button
19. Terminal board
20. Combination instrument
21. Connector
22. Ignition key-switch
23. Wiper switch
24. Instrument light switch
25. Heater fan switch
26. Lighting switch
27. Tank unit of fuel gauge
28. Connector
29. Tail and stop lights
30. Licence plate lights



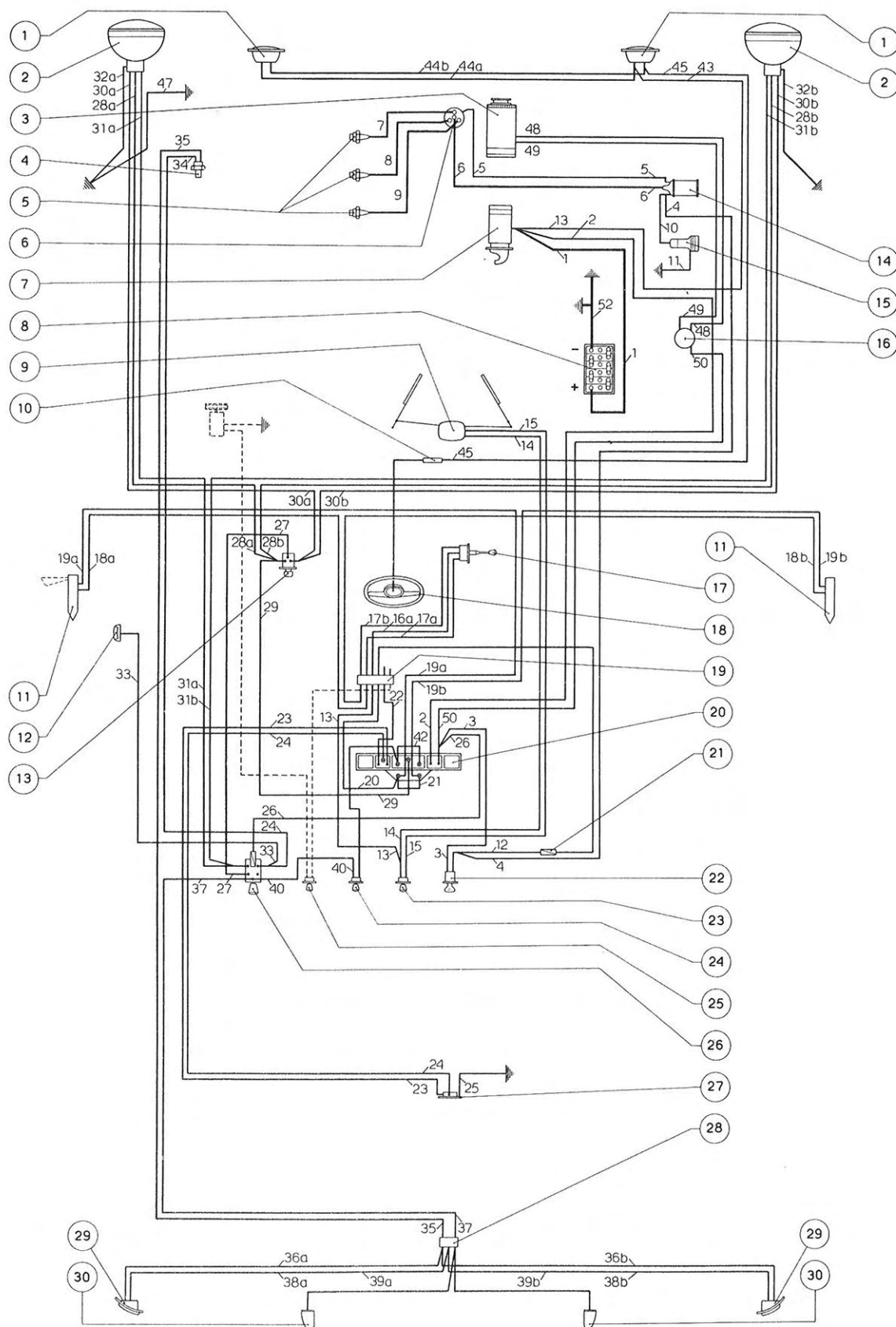


Fig. 19A Wiring diagram (serial numbers to 30200)

## Explanations to diagram fig. 19B

( Serial numbers from 30201)

Small numbers indicate  
colour of cable insulations  
according to table below

White	Black	Red	Yellow	Green	Grey	Blue
22b	1	2	26	24a	4	36a
23b	7	3	39	24b	6	37a
35	13	5	40b	44	12	40a
36b	22a	8	41b	45	16	41a
37b	23a	9	64	46a	25	
38	27	10		46b	31	
	28	11		47	32	
	42a	14		48	33	
	42b	15		49	65	
	43	17		50	66	
	60a	18		51		
	60b	19		52		
	61	20		53		
	62	21				
		29				
		30				
		34				
		54				
		55				
		56				
		57				
		58				
		59a				
		59b				
		63				

Encircled numbers indicate the  
various units, which are:

1. Horns
2. Headlights
3. Generator
4. Spark plugs
5. Distributor
6. Starter
7. Battery
8. Wiper motor
9. Heater fan motor
10. Stop light switch
11. Connector
12. Dimmer switch
13. Direction indicators
14. Connector box
15. Fuel pump
16. Ignition coil
17. Relay
18. Fuse box
19. Combination instrument
20. Connector
21. Ignition key-switch
22. Wiper switch
23. Instrument light switch
24. Heater fan switch
25. Lighting switch
26. Connector
27. Direction indicator switch
28. Steering wheel with horn button
29. Roof light with switch
30. Tank unit of fuel gauge
31. Tail and stop lights
32. License plate lights

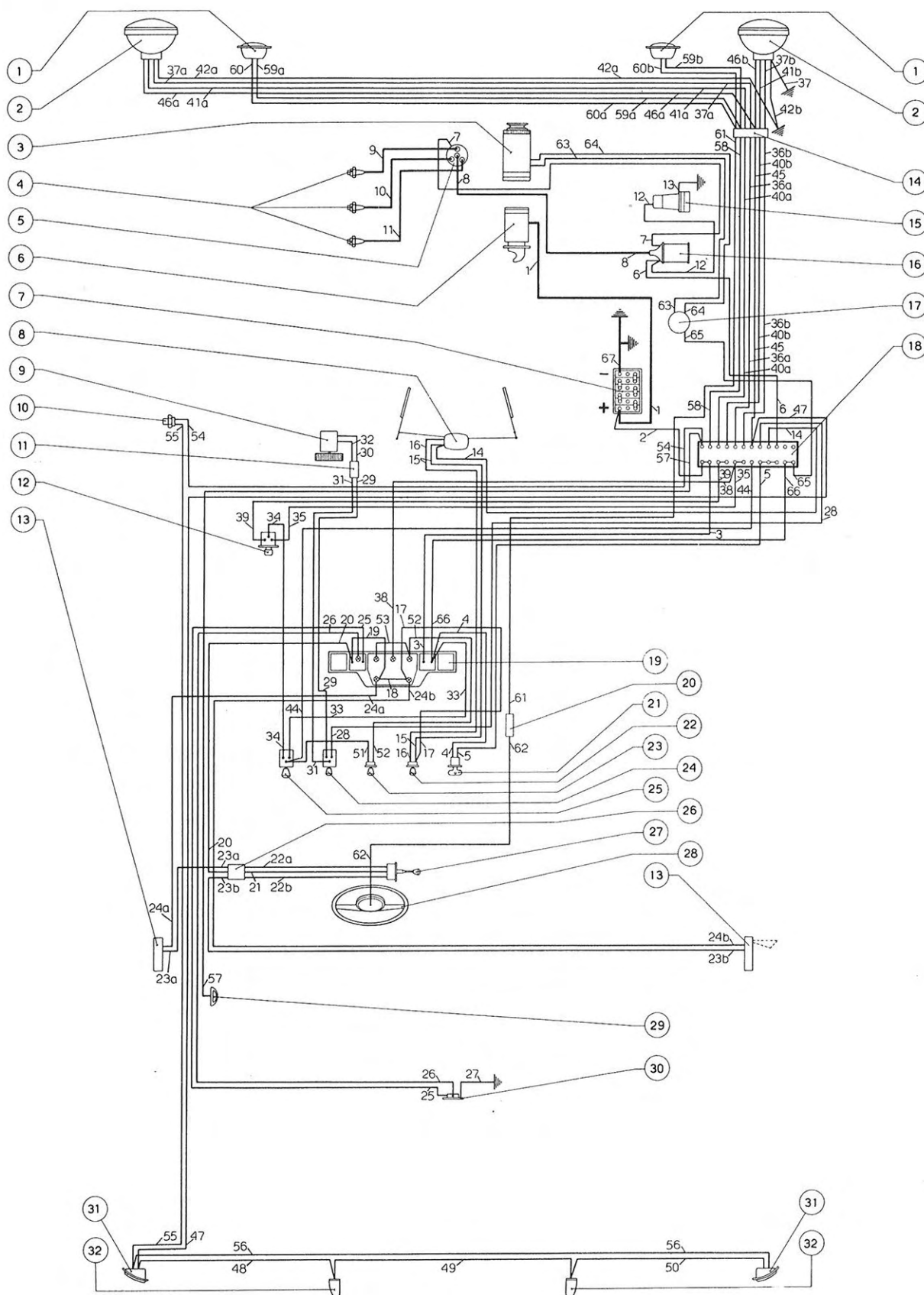


Fig. 19B Wiring diagram (serial numbers from 30201)

Explanations to diagram fig. 19C

Cars intended for U.S.A.

Small numbers indicate colour of cable insulations according to table below

White	Black	Red	Yellow	Green	Grey	Blue
22b	1	2	26	44	4	36a
23b	7	3	39	45	6	37a
24b	13	5	40b	46a	12	40a
35	18a	8	41b	46b	16	41a
36b	18b	9	55b	47	20	
37b	22a	10	64	48	21	
38	23a	11	71	49	25	
73	24a	14		50	31	
	27	15		51	32	
	28	17		52	33	
	42a	29		53	65	
	42b	30		67	66	
	43	34		72		
	60a	54		74		
	61	55a				
	62	57				
	69	58				
	75	59a				
		59b				
		63				
		68				
		70				

Encircled numbers indicate the various units, which are:

1. Horns
2. Headlights "Sealed Beam"
3. Parking lights and front direction indicators
4. Connector
5. Generator
6. Spark plug
7. Distributor
8. Starter
9. Battery
10. Wiper motor
11. Stop light switch
12. Heater fan motor
13. Connector
14. Dimmer switch
15. Connector
16. Connector box
17. Fuel pump
18. Ignition coil
19. Relay
20. Fuse box
21. Combination instrument
22. Connector
23. Ignition key-switch
24. Wiper switch
25. Instrument light switch
26. Heater fan switch
27. Lighting switch
28. Flasher
29. Direction indicator switch
30. Steering wheel with horn button
31. Connector
32. Roof light with switch
33. Tank unit of fuel gauge
34. Tail and stop lights incl. rear direction indicators
35. License plate lights

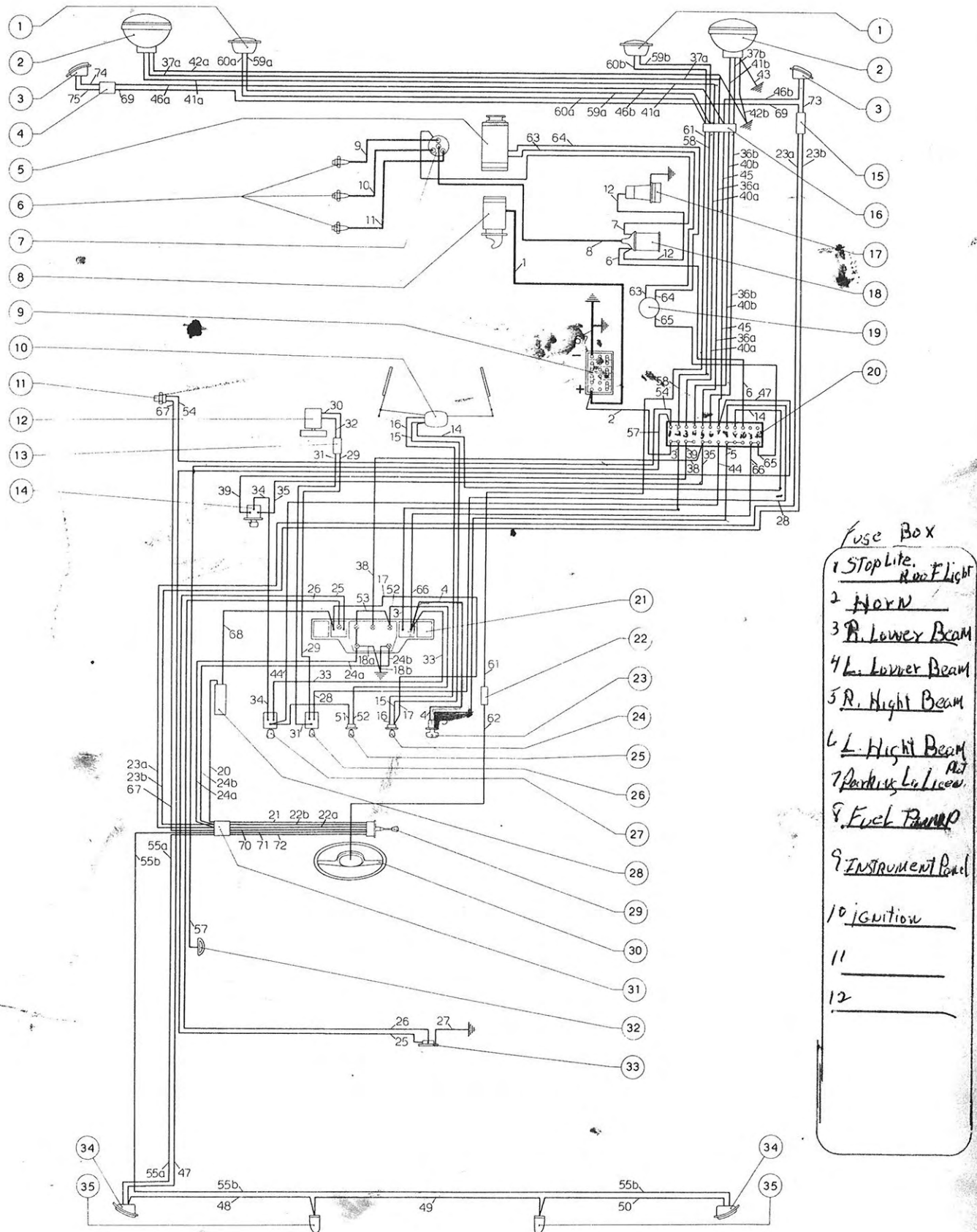


Fig. 19C Wiring diagram (cars intended for the U.S.A.)



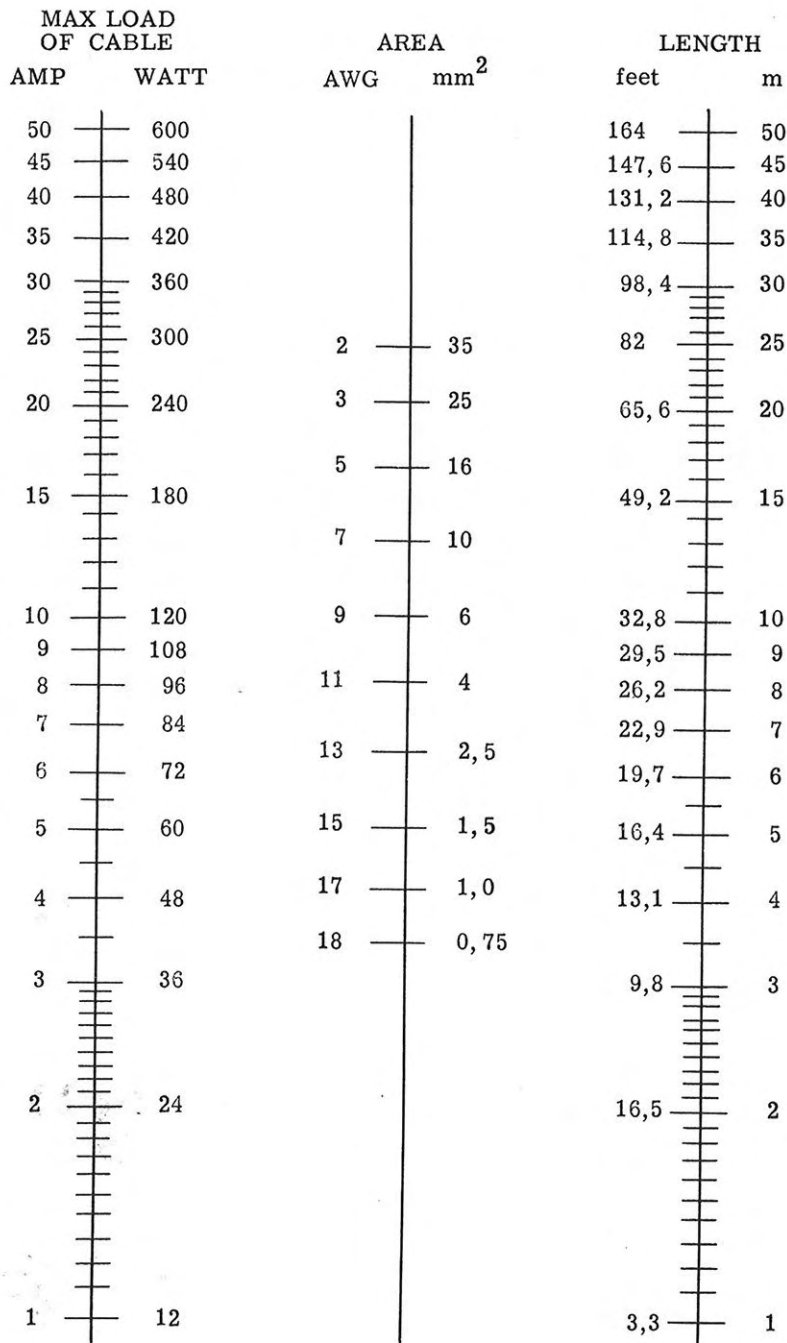


Fig. 20. Nomogram