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FOR PHILIPS SERVICE DEALERS ONLY

PHILIPS

SERVICE MANUAL

SUPER-INDUCTANCE RECEIVER FOR A.C. AND D.C. MAINS

Type 840U

GENERAL REMARKS.

This receiver can be connected either to a D.C. or A.C. mains supply within a voltage range of 200–250 volts, and within a frequency range of 25–100 cycles. Three control knobs are provided. The volume control, as well as the on/off switch, are operated with the left-hand knob, while the centre one is used for tuning. The right-hand knob is marked with a white spot; when this spot points to the left, the set is connected for a wave range from 180–560 metres, while with the spot upright the receiver is connected for a wave range from 760–1,900 metres. With the spot pointing to the right a filter for a wavelength of 1,500 metres is switched in. A mains socket on the back panel (safety switch) is provided which automatically renders the receiver electrically dead when the back is removed.

IMPORTANT.

When adjusting, testing or repairing the receiver it is desirable to use an A.C. supply which should have a double wound transformer between the supply and the receiver with the secondary winding not earthed.

CIRCUIT.

The receiver Type 840U has two tuned circuits, one between the aerial and the H.F. valve and one between the H.F. valve and the detector valve.

The aerial is connected via C17 (1,000 $\mu\mu$F) and the coil unit S1, S2, S3 and S4 inductively coupled to the grid circuit of the H.F. valve L1 (VP13A). The anode circuit of L1 is inductively coupled by the coil unit S5, S6, S7 and S8 with the grid circuit of the detector valve L2 (SP13).

Resistance capacity coupling is used for L.F. amplification. Automatic volume control has been incorporated. The resistance R9, which is connected in the grid circuit of L2 will cause a drop in the grid bias on L1 via R14, R15 when a strong signal causes an increase of the grid current of L2.

The heater circuits of L1, L2, L3 and L4 are connected in series, while the pilot lamp Type 8070, L6 (10 volts, 0.2 amps.), and the barretter L5 (C1) are incorporated in the same circuit. L4 (CY1) acts as a rectifier when the set is connected to A.C. mains, and for D.C. mains L4 is a simple series resistance. An extra loudspeaker of high impedance can be connected to the special secondary winding of the output transformer.

A resistance R17, is incorporated in the grid circuit of L3 (Pen. 26), and is connected close to the valve cap and is enclosed in systoflex. The connection from the valve cap to the resistance as well as the resistance itself are screened. R17 serves to prevent self-oscillating of L3.

The wave trap S14, S15, C28, is tuned for a wavelength of 1,500 metres, and attenuates on that wavelength.

VERY IMPORTANT NOTES.

As previously mentioned, if the chassis is being handled under a voltage such as when trimming, testing for faults, measuring, etc., there is a possibility of a shock being experienced. It is, therefore, necessary to use a transformer which is double wound and has reasonably good insulation between the windings. On no account should the secondary winding be earthed. If such a transformer is not used it is possible for the chassis to have a voltage to earth and, therefore, touching it then would be dangerous. If, therefore, a double wound transformer having no connection to earth is used the chassis may be earthed direct, and the handling of the chassis is quite safe and is exactly the same as operating an ordinary A.C. set. The earth via the clip is not sufficient as the chassis is then earthed via C.A. (see Fig. 1). If two or more chassis are connected to the same double wound transformer it is essential to connect the same points of the chassis together, otherwise there is a possibility of voltage occurring on the chassis of one of the

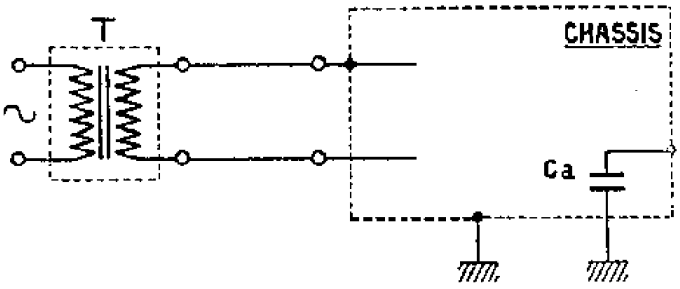

Fig. 1.

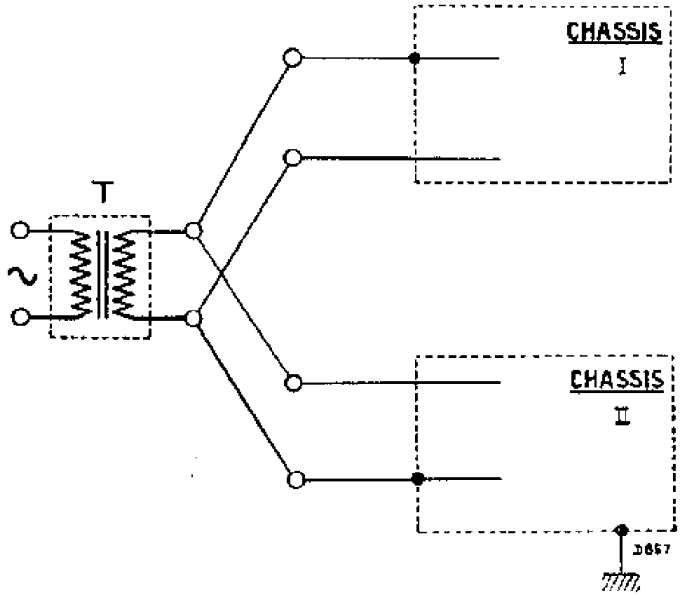

Fig. 2.

receivers. Providing, however, both chassis are correctly earthed the secondary side of the transformer will become short-circuited if a faulty connection is made. If dealers require a transformer suitable for testing the universal type of receivers a special type of transformer can be supplied for this purpose. These transformers are supplied in two types, one with an automatic cut-out, Code No. 28.522.470, and one without a cut-out, Code No. 28.522.460. Particulars can be had upon application to the Service Dept.

BALANCING THE RECEIVER.

The following instruments and tools will be required :

1. A Service Oscillator, Type 4028C, which covers a wave range of 100–1,500 K.C. or GM.2880 with a wave range of 21 M.C.–100 K.C., see Fig. 3. Particulars and prices can be had upon application.

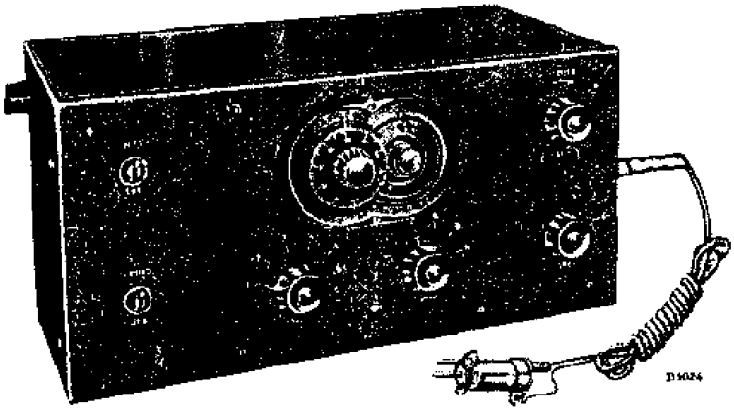

Fig. 3.

2. An output indicator. For this purpose a unit (GM. 2295), containing an adapted impedance with a selenium rectifier, can be used, so that a reading can be obtained directly on a sensitive D.C. instrument.
3. A trimming tool.
   It is only desirable to change the variable condenser, screened coils or trimming condensers when a Service Oscillator is available.

TRIMMING AND ADJUSTING.

1. The artificial aerial of 200 $\mu\mu$F is connected to the aerial socket and output meter to the loud-speaker sockets. The chassis is to be connected to earth. The auxiliary dial, on which the position for 225 metres is given, is fixed on to the chassis. Trimming condensers C12 and C25 are opened as far as possible and the set is switched for the short-wave band.
2. The negative grid bias of L1 is adjusted to negative three volts with the aid of the volume control. (To be measured between the chassis and cathode L1 by means of a moving coil D.C. voltmeter.)
3. The variable condenser is turned to zero, a signal of 180 metres is applied to the set and the trimming condensers C12 and C25 are adjusted until the signal of 180 metres is received.
4. A signal of 225 metres is applied to the set, the variable condenser is now turned to 225 metres (maximum reading on output meter), the screws which keep the driving dial in position loosened, and the dial turned until it shows the correct reading.
5. After this C12 and C25 are re-trimmed for 225 metres.
6. The set is now switched over to long-wave, a signal of 900 metres is applied, and the set is tuned in for 900 metres. The trimming condensers C13 and C26 are now adjusted until maximum output has been obtained.

HOW TO TRACE FAULTS.

GENERAL REMARKS.

1. The following data is as complete as possible, but some of the cases may not occur in practice.
2. This list cannot be complete as there may be compound faults.
3. In general, it may be said that the majority of faults are due to short circuits in the bare wires or to open or short-circuits in one of the component parts. These are indicated as R. or C. shorted or open-circuit as the case may be.
4. Always carry out, first of all, test measurements so as to find the cause of the fault.

The method of procedure is as follows :

I. Always carefully check all contacts connected to the removable back, mains switch, the filaments of the valves, together with the barretter. If the lamps burn normally, this indicates that the safety contacts, mains switch and filaments of the valves are in order (subject to the possibility that the filament of one of the valves may be short-circuited).

II. If the valves appear to be operating satisfactorily and no output is obtained from the receiver, it is desirable to replace the valves with good ones. If results are still unsatisfactory test in the following order.

III. The voltage across C2 is abnormal.

1. C1, C2 short-circuited.
2. R1, S13 open-circuited.
3. L4 (CY1) defective.
4. C4 short-circuited.
5. Short-circuit in screened cable.
6. Mains switch contact open-circuited.

IV. Voltage at C2 is in order but defective reproduction.

A. Abnormal voltage and current at L3.

1. R5, S9, R7, R17, R13, R12 open-circuited.
2. C8, C3, C23, C22 short-circuited.
3. Short in screened wiring.
4. Fault in loudspeaker transformer or speaker.
5. Bad contact in valve holder.

B. Normal voltage and current at L3.

1. C24 open-circuited.
2. C22 open-circuited.
3. C23 open-circuited.

V. Voltage at C2 is in order but defective reproduction.

A. Abnormal current and voltage at L2.

1. R4, R11, R10 open-circuited.
2. R7, C21, C20 short-circuited.
3. R19, R15, R9 open-circuited.
4. C15 short-circuited.
5. C19, C6 short-circuited.
6. S9, S8 open-circuited.
7. Defect in valve holder.
8. Short-circuit in screened wiring.

B. Normal voltage and current at L2.

1. C7, C20, C21 open-circuited.
2. C19, open-circuited.
3. C15 open-circuited.
4. C11, C13, C25 short-circuited.

VI. Voltage and current at G2 normal but defective reproduction.

A. Abnormal voltage and current at L1.

1. R3, S5, S6 open-circuited.
2. C6 short-circuited.
3. R6, R8, R16, R2 open-circuited.
4. C18, C9, C27, C5 short-circuited.
5. R14 open-circuited.
6. Short-circuit in screened wiring.
7. Defect in valve holder.

B. Normal voltage and current at L1.

1. C18 open-circuited.
2. S1, S2, S3, S4 open or short-circuited.
3. C10, C12, C26 short-circuited.
4. C17 open-circuited.
5. S14, S15 open-circuited.
6. C16, C14 short-circuited.
7. Short in screened wiring.

VII. Reception on one wavelength only.

A. Reception on short-wave only.

1. S2, S4, S6, S8 open-circuited.
2. C26, C13 short-circuited.
3. Defective wave change switch.

B. Reception on long-wave only.

1. Defective wave change switch.
2. Short wave circuits out of balance.

VIII. Reception not up to standard quality.

A. Weak.

1. Voltages and currents are not correct.
2. C18, C19, C22 open-circuited.
3. C20 open-circuited.
4. Receiver out of balance.
5. Defect in loudspeaker or loudspeaker transformer.

B. Distorted reception.

1. One of the valves has excessive grid current, possible caused by shorted C3.
2. R12, R19, R9 open-circuited.
3. R7 open-circuited.
4. Screening on wiring open-circuited.
5. Defect in loudspeaker or associated wiring or screening.

C. Excessive Hum.

1. C1, C2, C4 open-circuited.
2. C16 open-circuited.
3. One of the L.F. by-pass condensers open-circuited.
4. A defective earth connection either inside or outside the chassis.
5. Screened wiring open-circuited.

D. **Crackling.**

1. A defective contact to aerial or earth sockets or connections to them.
2. R18 open-circuited.
3. An intermittent contact in one of the soldered joints or two bare wires may be touching one another or making bad contact.
4. Defective contact in one of the switches or valve sockets.
5. Defective contact in the moving arm of one of the variable controls.
6. Defective CY1 or R1.

E. **Receiver "Motor-Boats."**

1. Defective decoupling condenser.
2. Defective grid resistance.
3. One of the earth connections disconnected.

F. **Cabinet Resonance.**

A defect of this nature is generally due to some loose part such as valve screen caps, springs, washers or screws. When the vibrating part has been located and is secured a piece of felt can be used, if necessary, for fixing.

Note.—Fault finding will be considerably facilitated by the use of efficient testing apparatus.

Attention is drawn to Philips Universal Measuring Test Board (shown below) which enables both A.C. and D.C. voltages and currents together with capacities and resistances to be measured over a large number of ranges.

It can also be used as an output meter when trimming.

Full particulars and prices can be had from the Service Dept., Mitcham Junction, Surrey.

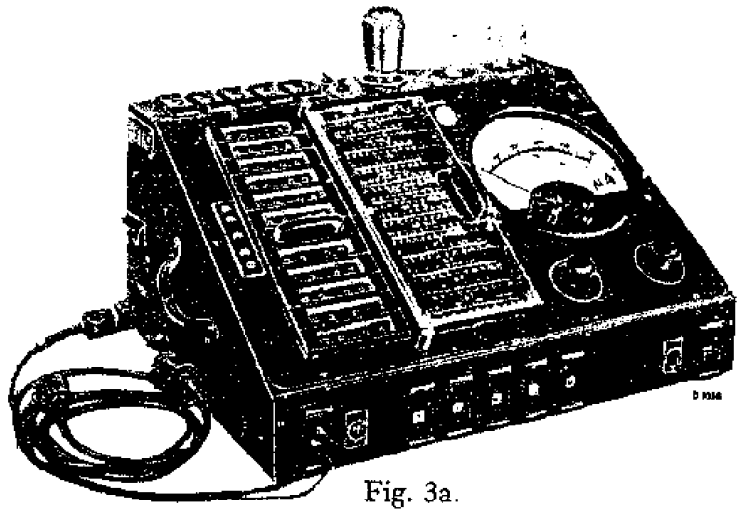

Fig. 3a.

REMOVING AND CHANGING OF PARTS.

Removing the chassis.

The method of removing the chassis should be done in the following way:

1. Remove the rear panel.
2. Remove the valves.
3. Remove the control knobs on the front of the receiver by releasing the grub screws.
4. Release the driving band from the spring clip securing the cursor which carries the pointer. The chassis may now be turned over for inspection and repair. If, however, it should be necessary to remove the chassis entirely from the cabinet remove the leads from the output transformer.
5. Remove the screening plate.

Important points to be noted.

1. In addition to the points shown above special attention is drawn to the following:
2. It is advisable to use a support when the chassis is repaired and attention is drawn to the universal type shown in Fig. 4 (Code No. 09.991,000).

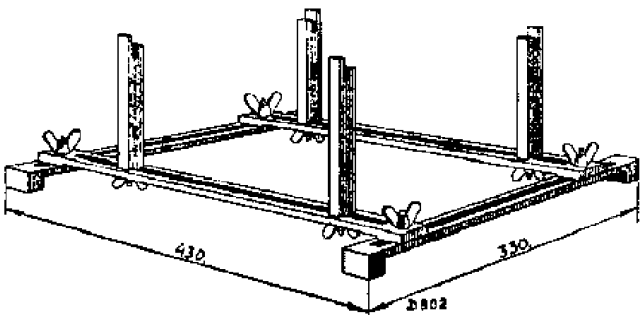

Fig. 4.

3. Do not make any alteration in the wiring or screening plates.
4. Always replace earth connections to their original points.
5. If necessary, make a sketch of the wiring or mark the wires with coloured sealing wax for clear indication.
6. Make sure that all wires are kept clear of each other; not less than $\frac{1}{8}$".
7. Replace all spring washers, insulating material, etc., in their original places. If necessary, rivets may be replaced by screws and nuts.
8. All moving parts may be greased with a little pure vaseline.
9. If necessary, give the contacts a slight mechanical tension.
10. All soldering should be done as quickly as possible in order not to heat various parts.
11. All soldered joints to the leads of compound treated condensers should be soldered $\frac{1}{2}$" from the compound in order to avoid overheating. Further, these condensers should be suspended clear of all other wiring.

Electrolytic condensers C1 and C2.

For removing, use a box spanner as shown in Fig. 5.

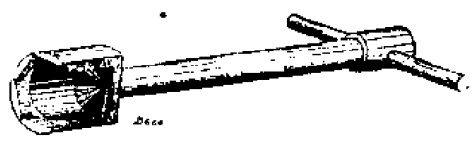

Fig. 5.

Electrolytic condenser C3.

This condenser is polarised, therefore the side which has a red band is the positive pole.

Resistances.

As some of the resistances are likely to get warm during operation they should always be mounted so that contact is not made with any other part.

Driving Mechanism.

The driving band can be adjusted by the screw at the right-hand side at the back. Any slight roughness on the scale pointer can be removed by adjusting the pointer or slightly greasing the guide rod which carries the cursor.

Should it be necessary to remove the drive band it can easily be reassembled by placing the pin fixed on the band in the hole in the condenser drum and resecuring the spring where necessary.

The drum disc is secured by two set screws and these must be effectively locked if they are removed at any time.

Volume control and Mains switch.

This part is coupled in one assembly. It is secured to the chassis by two screws and the spindle is pinned. No difficulty should be experienced in removing it for repairs or replacement.

Wave-change switch.

Any necessary adjustments should, as far as possible, be made while the switch is in position. If it is required to remove the spindle the back unpainted grub screw should be released and also the catch plate which is secured by two screws on the chassis front.

Reassembling chassis in receiver.

When the chassis is replaced turn the variable condenser and cursor to minimum. The small fluted engaging pin can then be slipped into the metal fork quite easily.

REMOVING AND REPAIRING THE LOUDSPEAKER.

Method of Removal.

The loudspeaker can be removed by merely loosening the three eccentric clamps and unsoldering the leads to the transformer.

Important points to be considered when repairing.

1. See that the repair is carried out with good tools on a table or bench (not an iron one) free from dust or filings.
2. Under no circumstances should the front and rear plates (item 107 and 109, Fig. 6) be removed from the magnet, as this would impair its magnetism (as also would be the case when working on an iron bench).

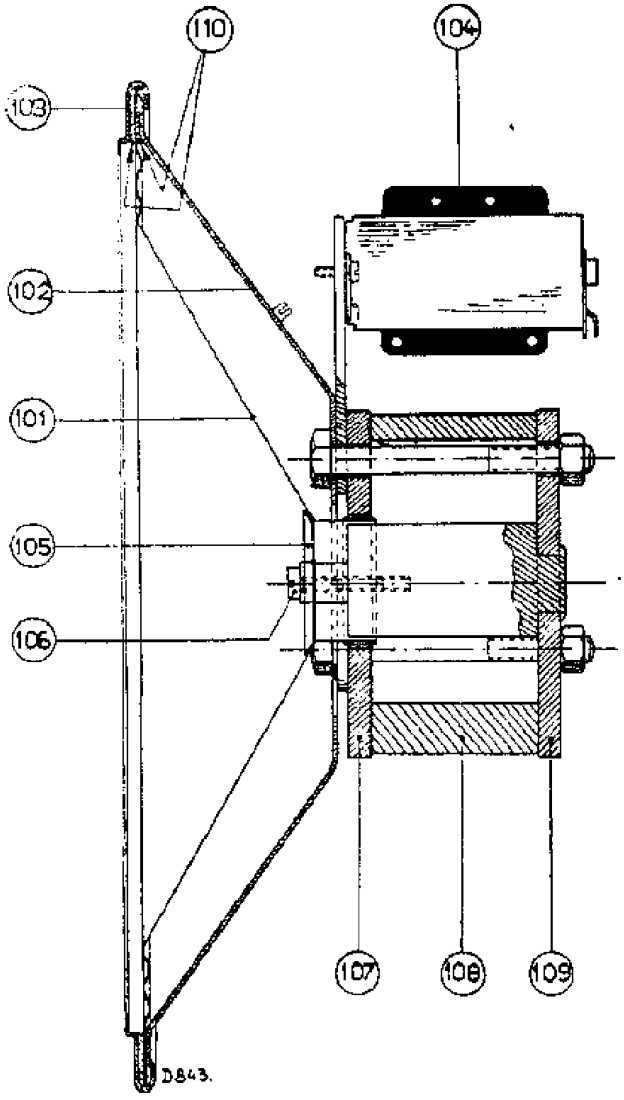

Fig. 6.

3. Replace the cover of the loudspeaker immediately after the repair has been carried out.

Centring the cone.

Loosen the centring screw, place four feelers of .008" thickness (Code No. 09.990.840) through the perforations of the spider into the air-gap. Tighten up the centring screw and withdraw the feelers. No sound should be heard when the cone is carefully moved up and down (see Fig. 7).

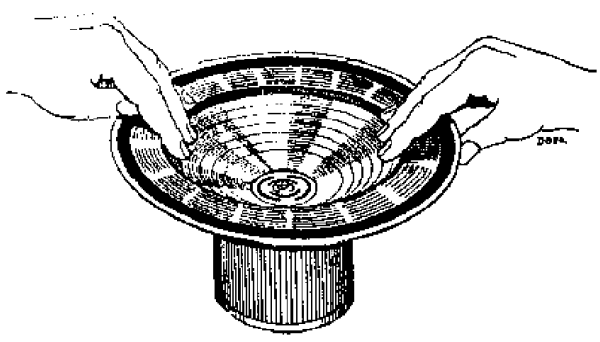

Fig. 7.

Changing the cone.

Unsolder the connections from the transformer, cut through the clamping ring and loosen the centre screw. The air-gap, if dirty, should be cleaned with a piece of strong material, namely brass, pertinax, etc., wrapped in wadding that has been moistened with alcohol. Any iron particles should be removed from the air-gap by means of a steel plate spring. The new cone is to be centred as indicated above, and can be fixed with a special service clamping ring (Code No. 28.445.821). Commence by bending the tags at four points positioned at angles of 90° from each other; the feelers are not to be removed from the air-gap until all the tags have been bent. The flexible leads to the transformer should be of the correct length. It will be found that if they are fitted too tight they will impede movement of the cone and if they are too loose they are likely to touch the cone and cause rustling.

Changing the cone holder.

If such an adjustment is necessary a gauge will be required as shown in Fig. 8 (Code No. 09.991.022).

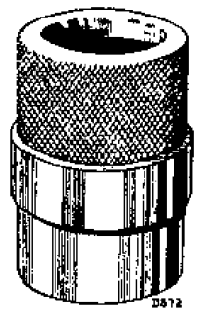

Fig. 8.

Remove the cone and place the gauge in the air-gap. Mark out the internal circumference of the cone-holder, unscrew the nuts of the three bolts and stand the loudspeaker on the back plate, bearing in mind paragraph 2. When remounting do not withdraw the gauge from the air-gap until the three bolts have been secured tightly. A gauge will also be found necessary for centring the pole pieces in the air-gap.

Faults.

Before commencing a repair, try a different loudspeaker and transformer in order to make sure that there is actually a defect in the loudspeaker assembly.

No sound.

This may be due to an open or short-circuit in the speech coil or output transformer. Measure with an ohm-meter and check with the values given at the back of the manual.

Sound weak or distorted.

The coil may have become jammed in the air-gap or there may be a partial short-circuit in the windings of the speech coil or transformer.

Rustling or resonance.

This fault may be caused by loose particles in the loudspeaker assembly or by loose parts attached to the cabinet or chassis. It may also be caused by some hindrance in the movement of the cone, namely, too tight or too slack, dirt in the air-gap or the speech coil may have become distorted.

LIST OF SPARE PARTS, TOOLS AND GAUGES, ETC.

When ordering any of these items please state :—

1. Code number.
2. Type and serial number of receiver.
3. Description.

Fig.	Item.	Description.	Code No.
9	1	Cabinet	28.242.320
9	2	Station dial	28.698.860
9	3	Escutcheon, colour 007	23.999.360
		Driving strip	28.884.740
		Driving disc	28.853.200
		Spring for driving strip	28.740.050
		Needle	28.944.181
		Sliding support for needle	25.868.800
9	5	Knob for condenser	23.995.590
9	4	Knob for switch	23.995.590
9	6	Knob for volume control	23.995.590
12	7	Back plate assembly	28.870.390
12	8	Moulded socket for safety switch	25.742.000
12	9	Protecting cover for aerial and earth	23.994.680
		Socket plate for aerial and earth connection	28.884.420
12	10	Protecting cover for loudspeaker	23.992.541
		Socket plate for loudspeaker	28.884.440
12	11	2-pin plug plate for safety switch	28.864.270
	20	Holder for dial lamp	28.837.390
	21	Milled nut for dial lamp	07.749.160
12	12	Valve cap	28.852.050
10	23	Valve holder	25.161.921
10	24	Spindle volume control and mains switch	28.884.970
10	25	Spindle wavelength switch	28.884.960
10	26	Friction drive	28.910.010
10	27	Spindle for variable condenser	28.885.570
10	28	Volume control	28.809.450
10	29	Mains switch	08.529.460
10	30	Stator ; wavelength switch with 12 contacts	25.868.760
10	31	Rotor without contact	25.439.381
10	32	Contact piece	25.046.592
10	33	Tube with flange (hub)	25.104.180
10	34	Spring	25.668.710
10	35	Lever for " Star " click plate	28.866.520
		Bottom cover	28.867.792
10	37	Spring for bottom cover	28.750.490
		Celluloid envelope for scale	28.337.051
		LOUDSPEAKER.	
6		Protecting cap	28.250.430
6		Clamping ring	28.445.820
6		Cardboard ring	28.445.390
6		Clamp for loudspeaker	25.012.943
6		Cone and coil	25.152.420
		TOOLS, ETC.	
4		Universal support	09.991.000
8		Centring gauge for air-gap	09.991.022
		Pertinax distance-pieces for centring cone	09.990.840
5		Box spanner for electrolytic condensers	09.990.760
3		Service oscillator	09.040.280C
		Screened cable for service oscillator	25.980.450
		Artificial aerial	25.730.840
		Trimming tool	

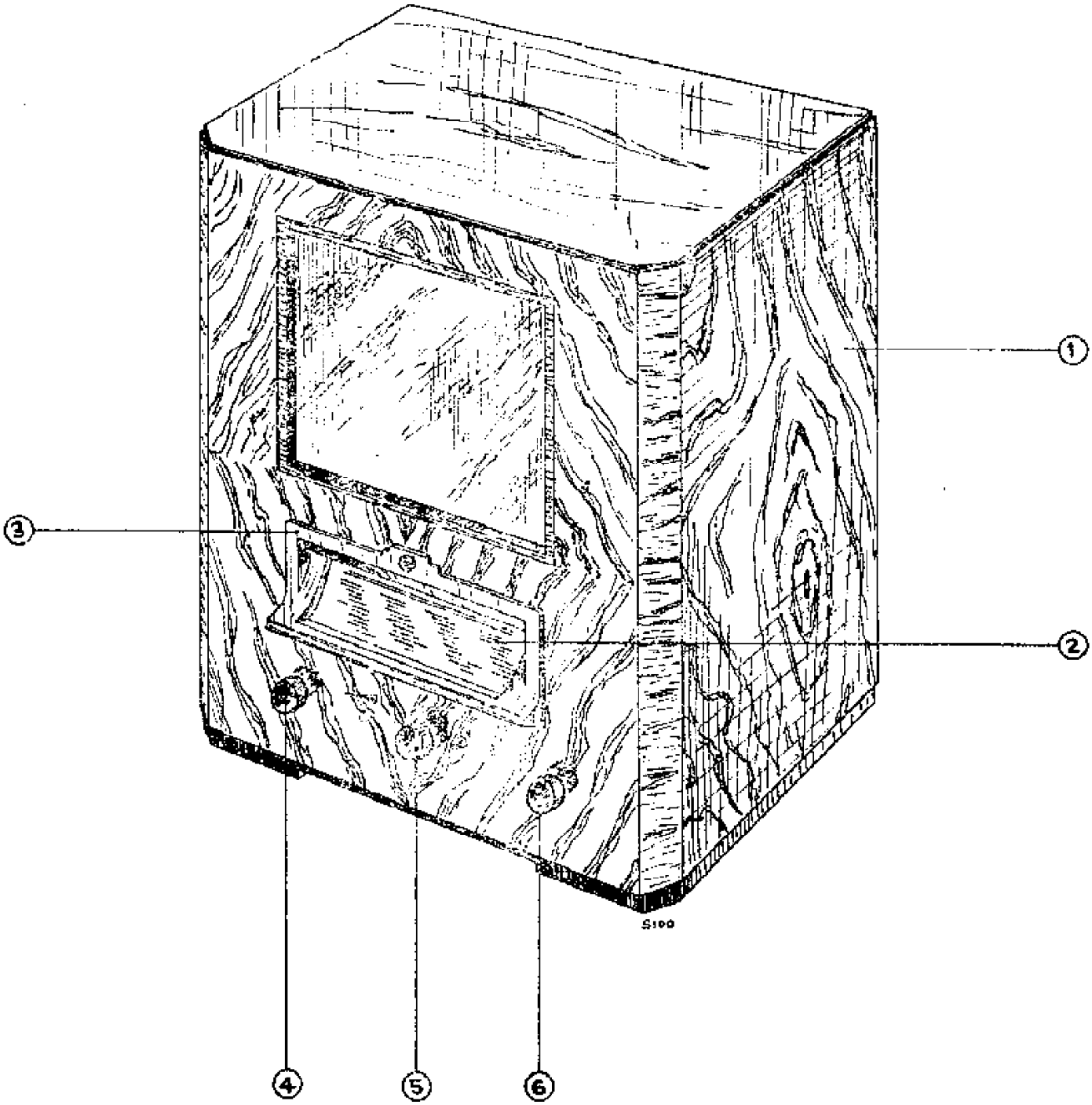

Fig. 9

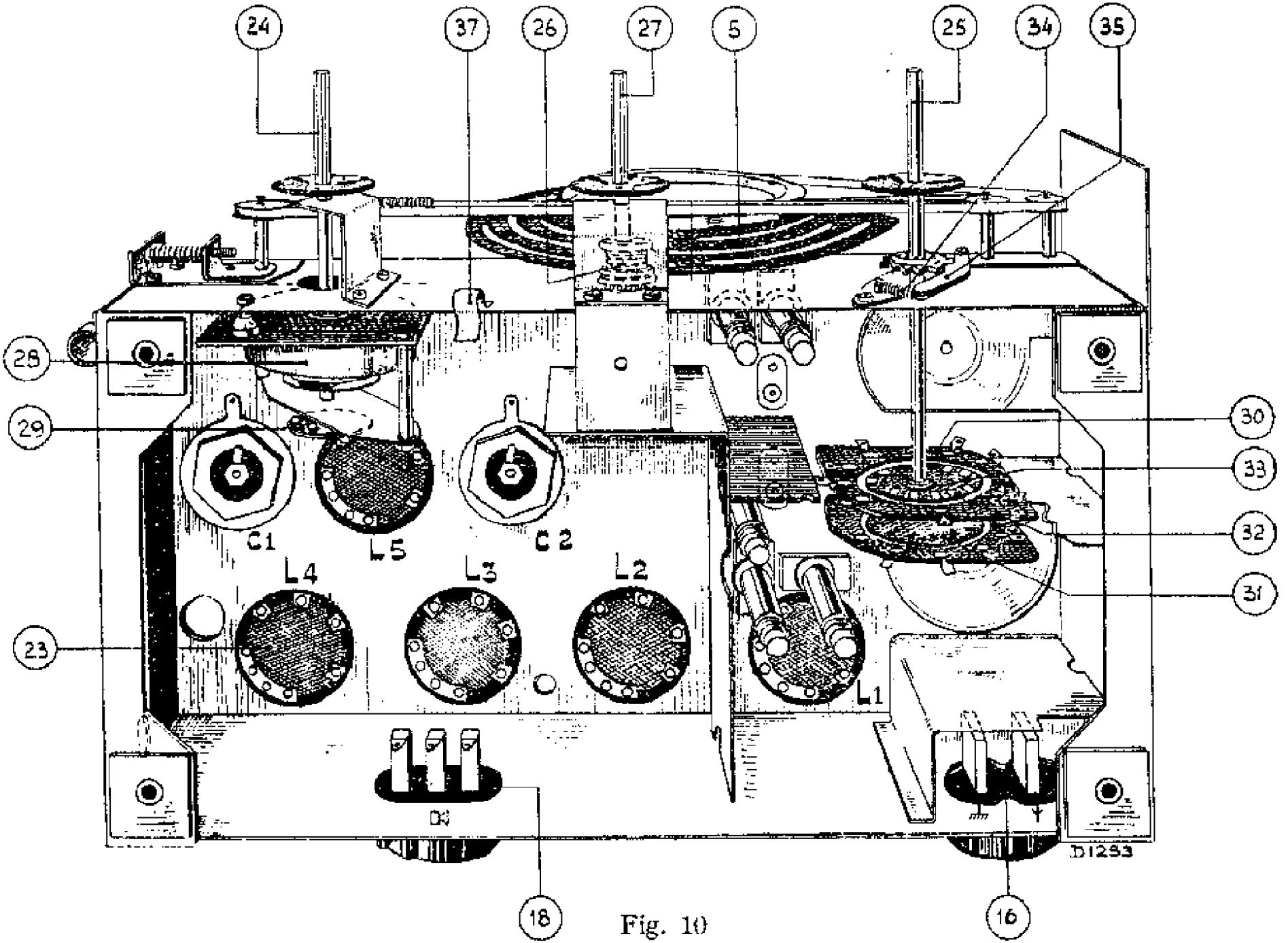
24
37
26
27
5
25
34
35
28
29
30
33
32
31
23
C1
L5
C2
L4
L3
L2
L1
18
16
D1283

Fig. 10

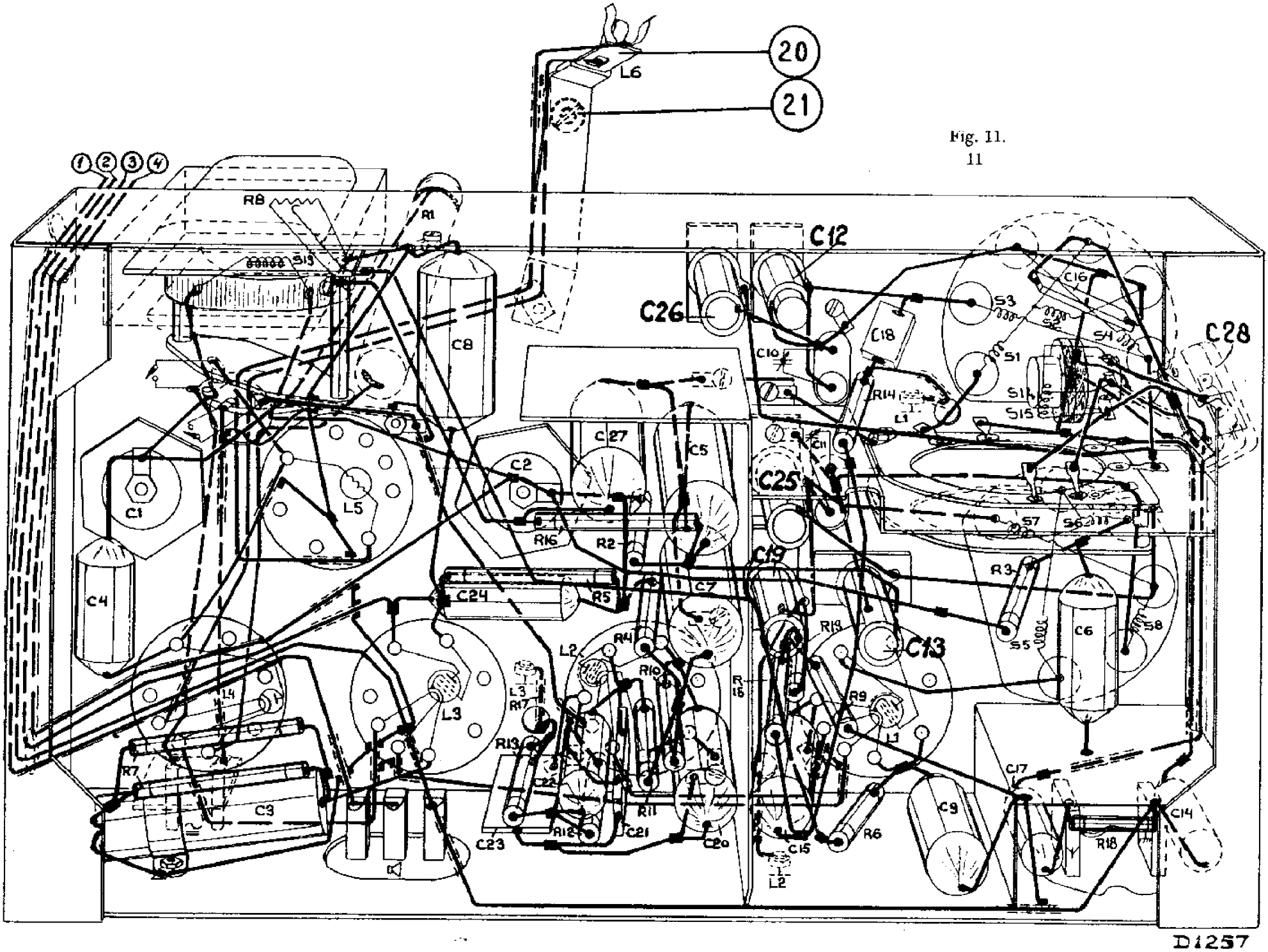
20
21
L6
1 2 3 4
R8
R1
S13
C12
C26
C28
C16
S3
S2
S4
C18
C10
S1
S1A
S1B
R14
L1
C27
C5
C11
C2
C25
C1
L5
S7
S6
R16
R2
C19
R3
C24
R5
C7
C4
R4
R18
C13
C6
S8
S5
L2
R10
L3
R17
R15
R9
L4
L3
R13
C22
R7
C3
R11
C17
C9
C14
C23
R12
C21
C20
C15
R6
R18
L2
D1257

Fig. 11.

RESISTANCES.		
Designation.	Resistances.	Code No.
R1	320 Ohm	28.799.440
R2	20000 Ohm	28.771.030
R3	1000 Ohm	28.770.250
R4	20000 Ohm	28.770.380
R5	20000 Ohm	28.771.030
R6	400 Ohm	28.770.210
R7	640/2 Ohm	28.770.880
R8	6000 Ohm	25.717.770
R9	0.64 M. Ohm	28.770.530
R10	1 M. Ohm	28.770.550
R11	0.32 M. Ohm	28.770.500
R12	0.64 M. Ohm	28.770.530
R13	0.1 M. Ohm	28.770.450
R14	1.25 M. Ohm	28.770.560
R15	0.8 M. Ohm	28.770.540
R16	25000 Ohm	28.771.040
R17	1000 Ohm	28.495.540
R18	0.1 M. Ohm	28.770.450
R19	1.6 M. Ohm	28.770.570
CONDENSERS.		
C1	32 μF	28.180.130
C2	32 μF	28.180.130
C3	25 μF	28.180.020
C4	0.1 μF	28.199.900
C5	0.5 μF	28.198.270
C6	0.1 μF	28.199.090
C7	0.5 μF	28.198.270
C8	0.5 μF	28.198.270
C9	0.1 μF	28.199.090
C10	11—450 $\mu\mu$F	28.210.510
C11	11—450 $\mu\mu$F	
C12	0—27 $\mu\mu$F	25.115.410
C13	0—27 $\mu\mu$F	25.115.410
C14	0.1 μF	28.199.370
C15	0.1 μF	28.199.090
C16	80 $\mu\mu$F	28.190.120
C17	1000 $\mu\mu$F	28.199.650
C18	64 $\mu\mu$F	28.190.110
C19	25 $\mu\mu$F	28.210.040
C20	0.1 μF	28.199.090
C21	125 $\mu\mu$F	28.190.140
C22	20000 $\mu\mu$F	28.199.020
C23	125 $\mu\mu$F	28.190.140
C24	4000 $\mu\mu$F	28.199.710
C25	0—27 $\mu\mu$F	25.115.410
C26	0—27 $\mu\mu$F	25.115.410
C27	0.5 μF	28.198.270
C28	60—160 $\mu\mu$F	28.210.720

OHMIC RESISTANCE OF COILS

Coil.	Resistance (Ohms).	Code No.
S1 ; S2 ; S3 ; S4	14.2 ; 110 ; 2 ; 30	28.564.780
S5 ; S6 ; S7 ; S8	10.5 ; 60 ; 2.4 ; 27	28.564.520
S9 ; S10 ; S11	250 ; 0.8 ; 1100	28.525.100
S12	5	25.152.722
S13	290	28.550.760
S14 ; S15	10.5 ; 30	28.565.060

S:	14,15, 1, 2, 3,4, 13, 5,7, 6,8, 9, 10, 11, 12
C:	14,28,16, 4 17,1,26, 10,2,18,12, 9, 5,27, 6, 13,15, 11, 19,25 20, 21,7,22, 23, 3, 8, 24.
R	18 1, 6,14,8,16,2 3, 15,19,9, 10, 11, 4, 12, 13, 17,7, 5.

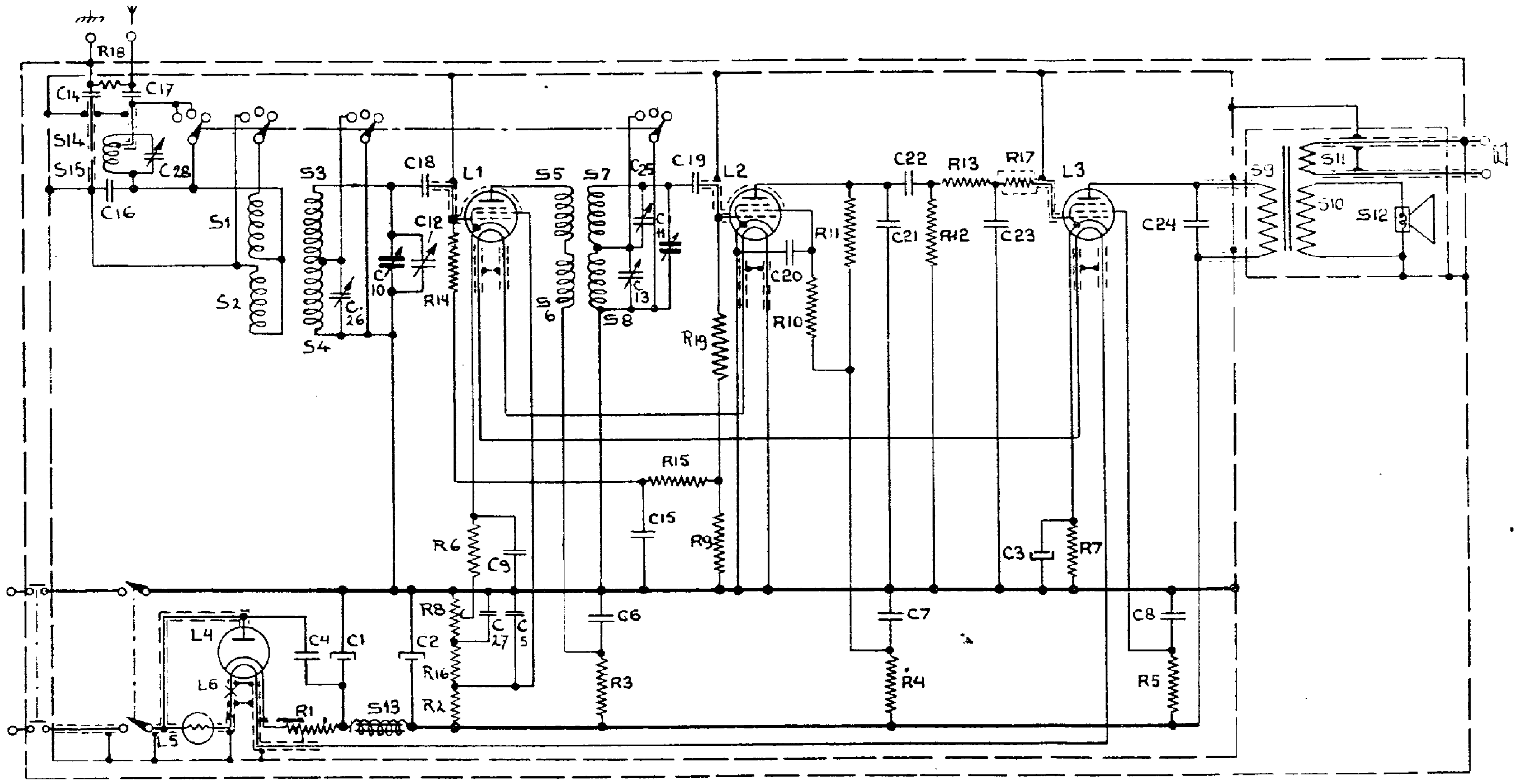

TABLE OF VOLTAGES AND CURRENTS

	L1 (VP13A)	L2 (SP13)	L3 (Pen. 26)	
Va	180	28.5	162	Volts
Vg'	88	24.5	84	Volts
—Vg	1.7/15.7	—	13.3	Volts
Ia	2.78	0.53	35.5	mA
Ig'	0.9	0.18	4.7	mA

L4 = Rectifier C7. L5 = Barretter Lamp C1. L6 = Pilot Lamp 8070.

The voltages are measured with voltmeters which take practically no current. Moving coil voltmeters give readings which depend upon the resistance used and the current consumption of the meter itself.

The values given above are the mean of several measurements, therefore some readings obtained may differ appreciably, particularly as variations may arise due to the tolerances of the components as well as the valves.

Before finally deciding that a valve is defective it is recommended that a replacement test with the same type of valve is made.

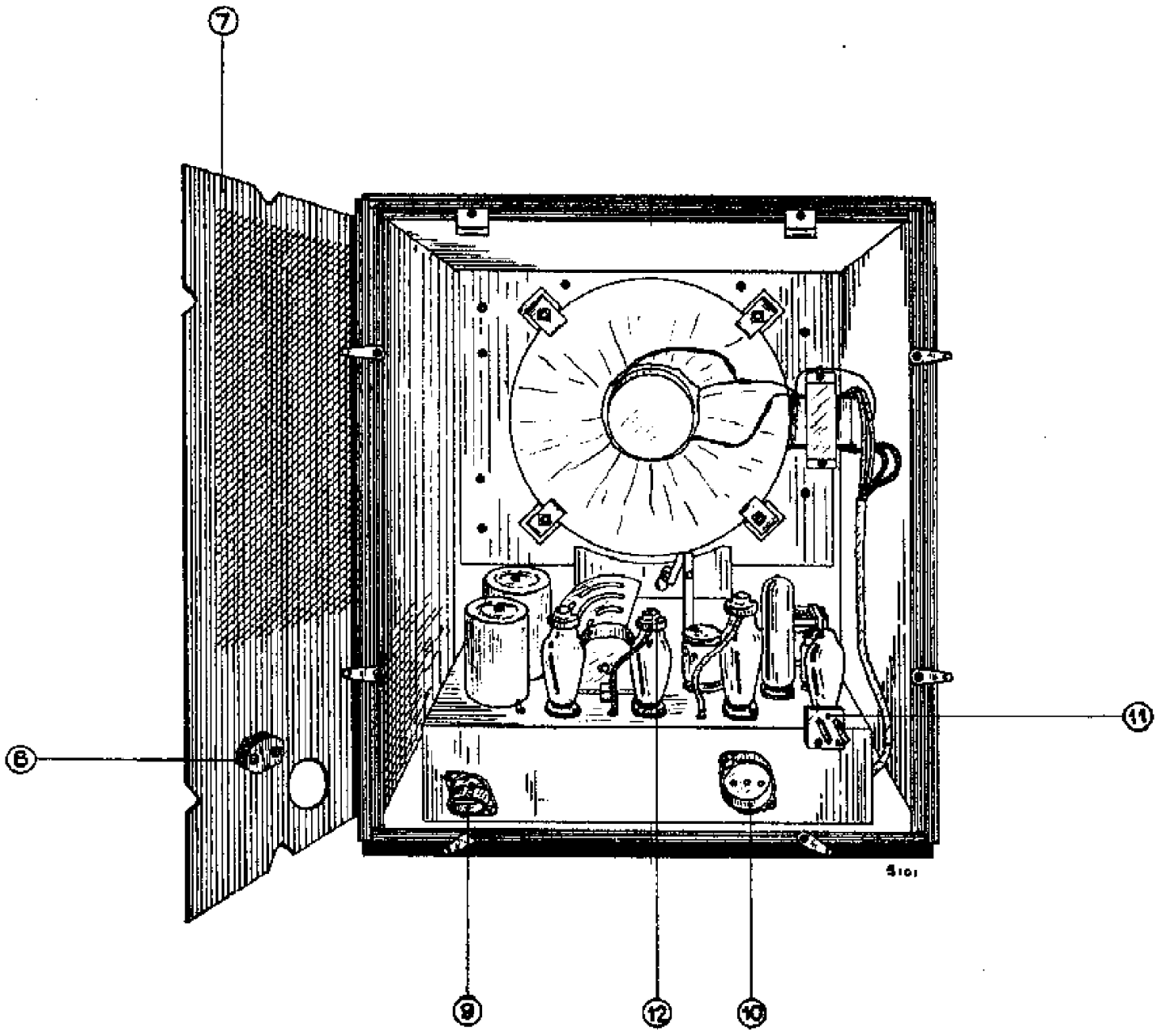

Fig. 12