

470 A

Radio Techn. Bureau  
VOBELENZANG  
TILBURG

A 1

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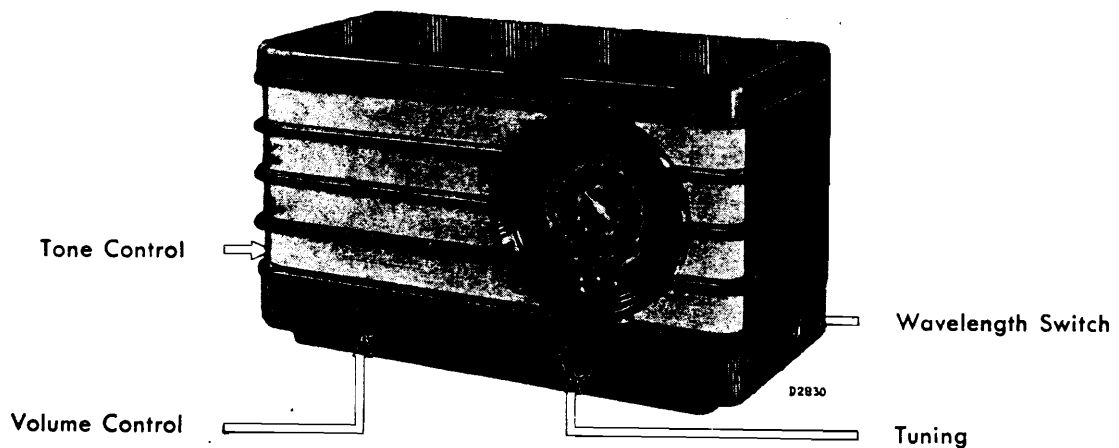
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# PHILIPS

## SERVICE MANUAL

### FOR RECEIVER

# 470 A



FOR USE ON ALTERNATING CURRENT MAINS  
Executions A, A-14, A-25, A-29, A-32, A-46, A-49.

### GENERAL.

This receiver is of the superheterodyne type and embodies the following features:

- Band filter pre-selection.
- Seven tuned circuits.
- I.F. filter circuit for suppression of signals at the I.F. frequency.
- Image frequency filter.
- Delayed automatic volume control.
- Large indirectly lighted station scale.
- Connection for gramophone pick-up.
- Connection for external speaker.
- Safety contact which breaks the current when the backplate is removed.
- Mains tapping plate for voltages of 110 to 245 v., 50 to 100 c.s.

### Wave ranges:

S.W.: 16.7— 51 m. ( 17.96— 5.88 M.c.).  
M.W.: 198 — 585 m. (1515 —512.8 kc.).  
L.W.: 720 —2,000 m. ( 416,7 —150 kc.).

**Weight:** 10,2 kg.

### Dimensions:

Height: 29 cm )  
Width: 51 cm ) including knobs.  
Depth: 23.5 cm )

### DESCRIPTION OF CIRCUIT.

#### S.W.

Aerial circuit: S12 inductively coupled to S13.  
Grid circuit of L1: S13, tuning condenser C8 and C32.  
Oscillator grid circuit: S18, tuning condenser C9.  
Oscillator grid circuit: S18, tuning condenser C9, grid condenser C29 and grid leak R6.  
Oscillator anode circuit: S19, R25.

#### M.W.

Aerial circuit: S6, coupled inductively and capacitively (C14) to S8.  
Band filter: 1st circuit: S8, tuning condenser C7, trimmer C10, coupling coil S30, coupling condenser S16;  
2nd circuit: coupling condenser S16, coupling coil S31, S10, tuning condenser C8, and trimmer C11.  
Oscillator grid circuit: S14, tuning condenser C9, trimmer C31, padding condenser C20.  
Oscillator anode circuit: S15, R19.

#### L.W.

Aerial circuit: S6-S7 coupled inductively and capacitively (C14) to S8-S9.  
Band filter: 1st circuit: S8-S9, tuning condenser C7, coupling condensers C15-C16, and  
2nd circuit: coupling condensers C15-C16, S10-S11, tuning condenser C8.

TRIMMING THE RECEIVER.

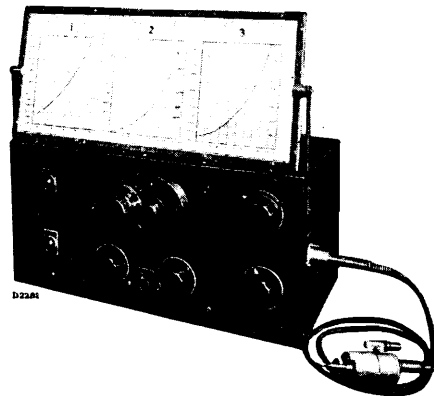


Fig. 1.

**GENERAL.**

Should it be necessary to retrim the whole receiver, the chassis, complete with baffle and speaker, should be removed from the cabinet by loosening the six bolts (see G sheets). It should be noted that the oscillator trimmer for the L.W. range (wire-wound trimmer) is mounted under the chassis.

**Wire-Wound Trimmers.**

These components consist of a bush of H.F. insulating material sprayed internally with a layer of metal and covered on the outside with a winding of copper wire. The capacity is reduced by removing the wire. In trimming, turns are removed until the deflection of the output indicator, having reached maximum, begins to drop back. Some of the turns are then replaced until maximum output is obtained and the wire is then clipped off and the loose turns are fixed with a small quantity of wax.

If maximum output cannot be obtained by removing turns, i.e., if the capacity is too small, a new trimmer must be fitted. **Extra wire** must not be added to increase a capacity which is too small, as extra turns cannot be wound tightly enough and would cause instability.

**Retrimming is necessary.**

1. Upon replacement of coils or condensers in the I.F. or R.F. sections.
2. If the receiver is not sufficiently sensitive or selective (see E sheets).

**The following equipment is required for trimming.**

1. Service oscillator GM 2880F (see Fig. 1).
2. Output indicator: Universal testboard GM 4256 or GM 7629.
3. Aperiodic amplifier GM 2404.
4. 15° jig for establishing the relation between condenser setting and scale.
5. Insulated trimming key.
6. Trimming transformer.
7. Condensers 0.1  $\mu\text{F}$  and 32,000  $\mu\mu\text{F}$ .
8. Resistances 50,000 and 80,000 ohms.
9. Fork for adjusting the scale.

**Artificial Aerials.**

1. For I.F.: condenser of 32,000  $\mu\mu\text{F}$ .
2. For M. and L.W.: standard artificial aerial supplied with GM 2880F.
3. For S.W.: S.W. artificial aerial (red spot on standard artificial aerial).

**Always trim the receiver with its own valves.**

Before trimming is commenced the locking wax on the trimmers must be carefully removed with a pair of tweezers and the rotor of the trimmer moved up and down several times to ensure that all traces of the wax are removed. After trimming, the trimmers are again locked with wax, e.g., by holding the wax against a warm iron so that a few drops of the wax fall on to the centre of the trimmer.

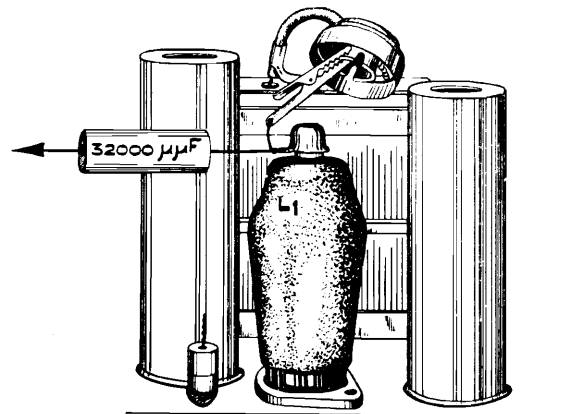


Fig. 2.

**A. I.F. Circuits.**

The I.F. is 128 kc for the executions A, A-14, A-25, A-26, A-29, but 118 kc for A-32 and 131 kc for A-46 and A-49.

**I. The Band Filters.**

1. Earth the receiver and tune to the lower end of the L.W. range (about 700 m).
2. Turn the volume control to maximum.
3. Connect output indicator to the extension speaker sockets across the trimming transformer.

**C. Calibration.**

1. Apply modulated 857 kc signal (350 m) through standard artificial to the aerial socket.
2. Carefully tune the receiver to this signal.
3. Place fork A (Fig. 6) on the pointer spindle with one prong in the groove in the spindle and the other gripping the flat end of the spindle.
4. Loosen screw B.
5. By means of the fork, turn the pointer to 350 m. and tighten screw B.
6. Remove the fork and if necessary correct the setting by slightly bending the reflector plate behind the scale. To do this, place thumb about 4 cm from the top edge against the plate and slightly bend the top edge backwards or forwards.

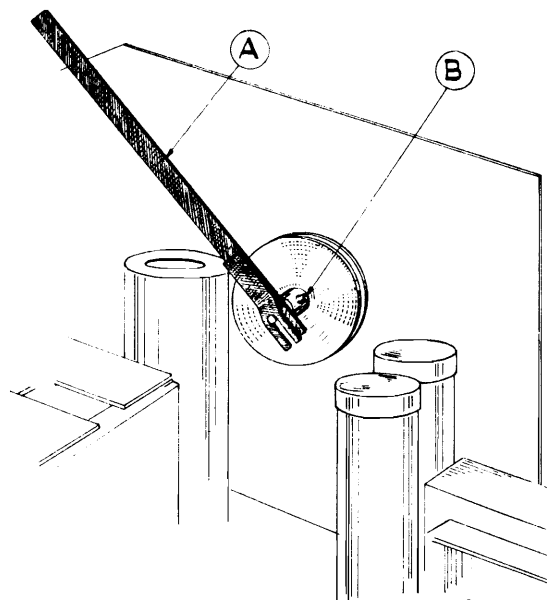


Fig. 6.

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FAULT FINDING.

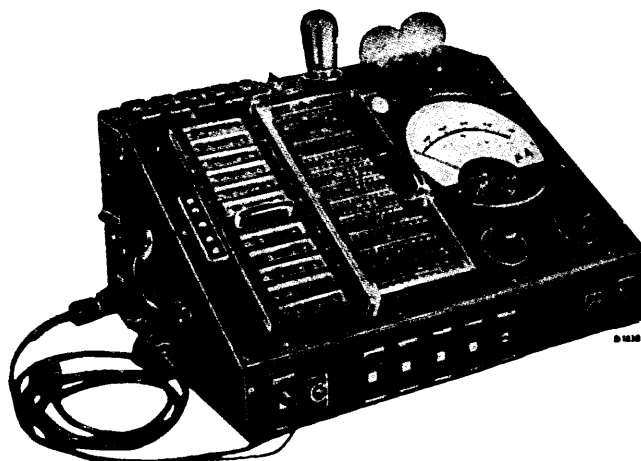


Fig. 7.

For efficient fault-finding it is necessary to use a good test instrument and either the universal test-board type 4256 or 7629 should always be employed. It is advisable when localising faults to remove the receiver from the cabinet as all components are then accessible (see G sheets "Uncasing the Receiver"). No connections must be unsoldered until the fault has been localised by means of measurements. Currents and voltages will be found in the table in the S sheets.

These instructions are not comprehensive as combinations of faults may occur.

**I. Test the receiver on the correct mains voltage, with its own valves and connected to outside aerial or service oscillator.**

- a. Receiver works normally; leave working under observation.
- b. Receiver works badly or not at all; see below.

**II. Replace the valves by a set taken from a good receiver and, if necessary, try out with another speaker.**

Faults in the valves or loud speaker are thus eliminated or localised.

**III. Test for gramophone reproduction.**

- a. Reproduction possible: the fault will be found in the I.F. or R.F. section (see Para. V).
- b. No reproduction: faulty A.F. or feed section (see Para. IV).

**IV. No radio or gramophone reproduction.**

**a. Abnormal Voltage across C2.**

- 1. Safety contact, mains switch, tapping plate (Z1) or S1 defective; measure voltage across the whole primary. (Should be 245 V.).
- 2. S3 defective; measure voltage at the heater pins of L4 (4 V.).
- 3. S2 defective or C38 shorted; measure voltage across both halves of S2 ( $2 \times 250$  V.).

- 4. C1 or C2 shorted.
- 5. R2 open.
- 6. L3 giving abnormal currents and voltages (see next column).
- 7. Short-circuit to chassis in the screening box of S22 or S20.
- 8. S25 shorting to core or to S26.
- 9. L4 defective.

**b. L3 giving abnormal currents and voltages.**

- 1. S25, R13, R15 open: no anode current; C27 shorted; anode current too low.
- 2. C28, C26 shorted; anode current too high.
- 3. R11, R12 open.

**c. L3 giving normal currents and voltages, but no gramophone reproduction.**

- 1. C30 shorted.
- 2. Shorted turns in S25 or S26; C26, S26 open.

**V. Gramophone reproduction but no radio reception.**

**2. L2 giving abnormal currents and voltages.**

- 1. S22, R7, R20 open or C29 shorted; no anode current or too low.
- 2. C6 shorted: anode current too high.
- 3. R9, R5, S21 open.

**b. L1 giving abnormal currents and voltages.**

- 1. S20, R1, R21, R3, open, C4, C40 shorted: no anode current or too low.
- 2. C13 shorted: anode current too high.
- 3. R26, R6, R4, R14 open.

**c. L1 and L2 giving normal currents and voltages.**

- 1. No reproduction of modulated I.F. signal applied to control grid of L2 (valve top). S23, S24, R8 open, C23, C24 shorted.
- 2. No reproduction of modulated I.F. signal applied to control grid of L1

FAULT-FINDING IN ACCORDANCE WITH THE "POINT TO POINT" SYSTEM.

If either of the testboard types GM 7629 or 4256 is available, faults can be easily localised by making use of the "Point to Point" system. The preliminary operations in this case are practically the same as those mentioned in the S sheets, to which reference should be made, see Paras. I and II. Then proceed as follows:

1. Disconnect the receiver from the mains and remove all the valves. Connect the universal testboards type 7629 or 4526 and set the testboard for resistance testing, successively to positions 12, 11, 10 and 9. The positive pin on the test lead should be extended to reach various valveholder contacts without difficulty, the negative pin being connected to the chassis.
2. The contacts of the rectifier socket must be shorted. This also protects the meter as otherwise there would be a risk of the smoothing condensers becoming charged, with consequent damage to the meter.
3. The various resistance values between the points indicated in the accompanying table and the chassis are measured by touching the point indicated with the positive pin, the meter deflection being compared with the value given in the table. P indicates that the test must be made between the pick-up sockets and earth, etc., 11/12 means that the test is to be made between points 11 and 12. Differences of 10 per cent, may be met with, but these do not necessarily indicate that the particular component is defective.

4. When all the resistances have been measured, the testboard switch is set for capacity testing and the various capacities are then measured in accordance with the table.

As almost all circuits are measured, the fault will generally come to light and the faulty component can be identified by means of the circuit. If the fault is still undetected, it is advisable to repeat the tests indicated in the E sheets. The valveholder contacts are numbered systematically in the following manner.

The first figure indicates the valveholder and the second figure one of the following:

- 1 & 2 = filament.
- 3 = control grid.
- 4 = contact for metallising (if separate).
- 5 = cathode.
- 6 = extra grid.
- 7 = screen grid.
- 8 = anode.
- 9 = extra grid (e.g., in octode).

It is necessary, for some of the tests, to change the setting of the wavelength switch, and this is indicated in the table as follows.

3 × 19

In testing electrolytic condensers (resistance tests), it will be found that the reflection drops back to a certain value due to the fall in the leak current. The value obtained may be much too high owing to the condenser being defective, but may also be due to the fact that the receiver has not been used for a considerable time. It is, therefore, necessary to exercise some care in judging the condition of these condensers.

REPAIRS AND REPLACEMENTS OF COMPONENTS.

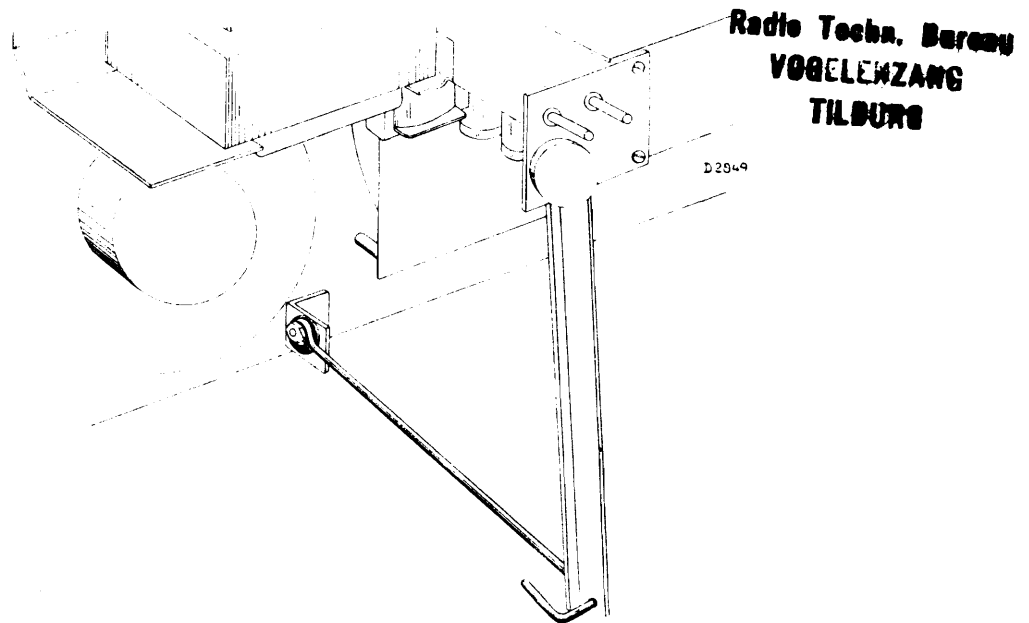


Fig. 8.

**General.**

The following must always be borne in mind:

1. When completing repairs always restore wiring and screening to their original positions.
2. Replace spring washers, washers and insulating material as they were before repairs were started.
3. Rivets which have been removed may be replaced by screws and nuts.
4. Lubricate moving parts with a little pure vaseline where necessary.
5. Solder all compounded condensers at least 1 cm from the compound.
6. Always hang resistances clear of other components (development of heat).
7. Never lift up the chassis by the coils.
8. Do not put the chassis on the rear side, as this breaks off the mains plug pin plate.
9. **Never lift the receiver by the top of the cabinet, but always hold it by the sides, with both hands.**

**UNCASING THE RECEIVER.**

For most repairs it will be found convenient to remove the receiver from the cabinet. This is done in the following manner:

1. Take off the backplate (four screws).
2. Remove the knobs.
3. Unsolder the screened lead under the cabinet.
4. Remove the six screws holding the speaker baffle to the cabinet.
5. Lift the complete assembly of speaker, baffle and chassis from the cabinet. By loosening the suspension bracket and fitting a piece of iron wire, bent as shown in Fig. 8, between the bracket and the bolt, the whole assembly can be placed upside down on the bench and the wiring is then easily accessible.

**RENEWING VARIABLE CONDENSER.**

Two types of variable condenser are used, one which is fitted with a cap and the other without. As the chassis is arranged for assembly of either type condenser, these are interchangeable. As replacements will be of the open type only, a description follows of the method of replacing a covered condenser by one of the open type.

1. Uncase the receiver (see above).
2. Unscrew the driving drum and rest this on the chassis next to the spindle.
3. Drill out the two rivets A (Fig. 13) or cut them off with a small chisel.
4. Loosen the two screws B (Fig. 13).
5. Unsolder the leads.
6. Change the condenser and solder the leads in position again. When the open condenser is used the earth lead is taken through the centre row of holes in the chassis.
7. Clamp the condenser to the chassis with three brackets (for Code No. see part list, item K). The advantage of this method of mounting is that soldering to the chassis is not necessary in view of the fact that the clamping brackets ensure sufficient electrical contact between the condenser housing and the chassis.
8. Fix the driving drum on the spindle in such a way that when rotated from zero to maximum, the driving cord leave the drum at the same point in both extreme positions.
9. Transfer the top connection for the mixer valve from the faulty condenser to the new one.

**RENEWING THE SCALE.**

1. Uncase the receiver (see above).
2. Disengage the eyelet on the driving cable from the pin in the drum on the condenser spindle and secure to pilot lamp bracket.
3. Unsolder the leads on the tone control (3) and

# LIST OF COMPONENTS AND TOOLS

When ordering, please always state:

1. Type No. of the receiver.
2. Description.
3. Code No.

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Fig.	Item.	Description	Code No.	Price
10	1	Cabinet, colour 041 .....	23 660	50.8
10	2	Speaker Silk .....	06 601	14.0
10	3	Station Scale (general) .....	28 712	84.6*
10	3	Station Scale (A-14) .....	28 713	48.2*
10	3	Station Scale (A-32) .....	A1 890	01.0*
10	3	Station Scale (A-26, A-29, A-46, A-49) .....	28 713	47.3*
10	3	Station scale for Ireland .....	A1 890	20.1
10	4	Pointer and spindle assembly .....	28 897	58.1
10	5	Side knob, (colour 041) .....	23 610	65.4
10	5	Side knob colour 041 (for A-14) .....	23 610	79.1
10	6	Front knob, (colour 041) .....	23 611	23.0
11	7	Backplate .....	28 403	27.2
11	7	Backplate (for 470A-14) .....	28 404	90.1
11	8	Glass mask at rear of station scale .....	28 340	63.5
11	9	Reflector plate assembly for rear of station scale ....	28 875	09.0
11	10	Pilot lampholder .....	08 515	27.1
11		Knurled screw for pilot lampholder .....	07 743	05.0
11	11	Steel cable for pointer drive .....	33 635	55.0
11	12	Torsion spring for pointer drum .....	28 760	27.1
11	13	Rubber grommet for top of suspension bracket .....	28 725	47.0
11	14	Plug socket plate .....	28 874	52.0
11	15	Valve cap for L1 .....	28 838	74.1
11	16	Driving spindle .....	28 621	42.4
11	17	Tension spring for driving drum .....	28 740	66.2
11	18	Plate with pins .....	28 874	48.0
11	18	Plate with pins (for 470A-14) .....	28 875	04.0
11	19	Rubber grommet for bottom of chassis .....	25 655	95.1
11	20	Square nut $\frac{3}{16}$ in. for fixing speaker or chassis .....	07 080	06.0
11	21	Bracket for fixing volume control for transf. with separate coils .....	28 072	07.1
11	21	Bracket for fixing volume control for transf. having primary and secondary in one coil .....	28 072	18.0
11	22	Safety contact, colour 111 .....	28 837	83.0
11	22	Safety contact (for 470A-14) .....	28 839	51.0
11	23	Mains lead .....	33 981	00.0
11	24	Mains plug .....	08 281	95.0
11	24	Mains plug (for 470A-14) .....	08 280	40.0
13	25	Rubber grommet, $3.5 \times 1$ .....	25 655	69.0
13	26	Rubber grommet, $9 \times 2$ .....	25 655	49.0
13	26	Rubber grommet $5,5 \times 1$ .....	25 655	44.0
13	27	Earthing spring .....	28 942	74.0
		Felt strip for groove in cabinet near scale .....	28 683	97.0
†	K	Clamping bracket for fixing open type variable con- denser .....	28 071	97.0
13	28	Switch unit, 1 .....	25 873	57.0
13	29	Switch unit, 2 .....	25 873	58.0
		Switch for mains aerial (A-14) .....	28 650	49.0
13	30	Tension spring .....	27 740	67.0
		Loud speaker ) Paper ring .....	28 451	54.0
		) Service clamping ring .....	25 871	81.0
		) Centring jig .....	09 991	53.0
		Trade mark disc .....	28 713	27.1
		Fuse .....	08 100	99.0

\* When changing a station scale, use a scale bearing the same code no. as shown on the old scale. Components, not found in above list, appear in the General Parts list.

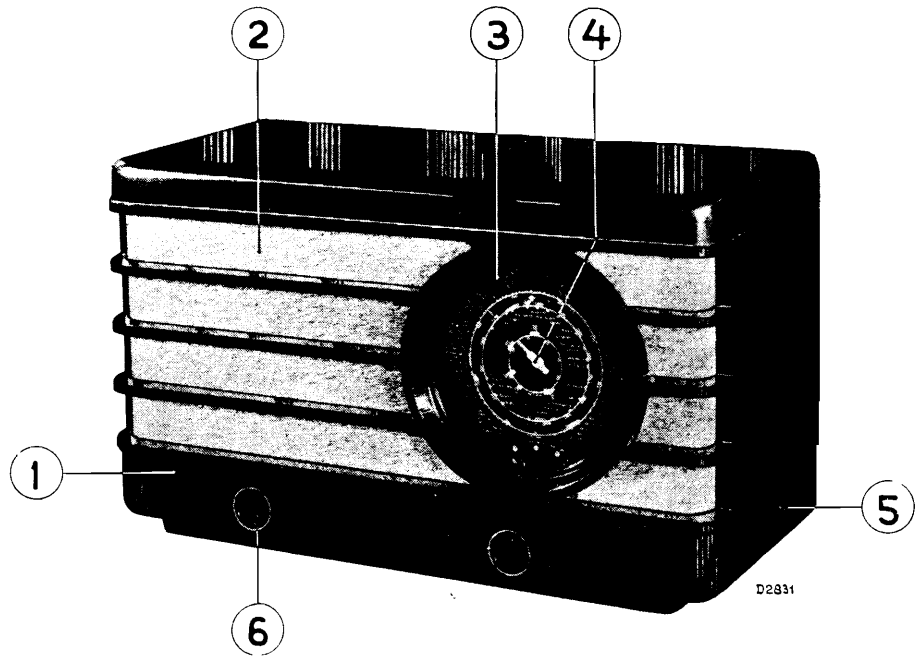


Fig. 10.

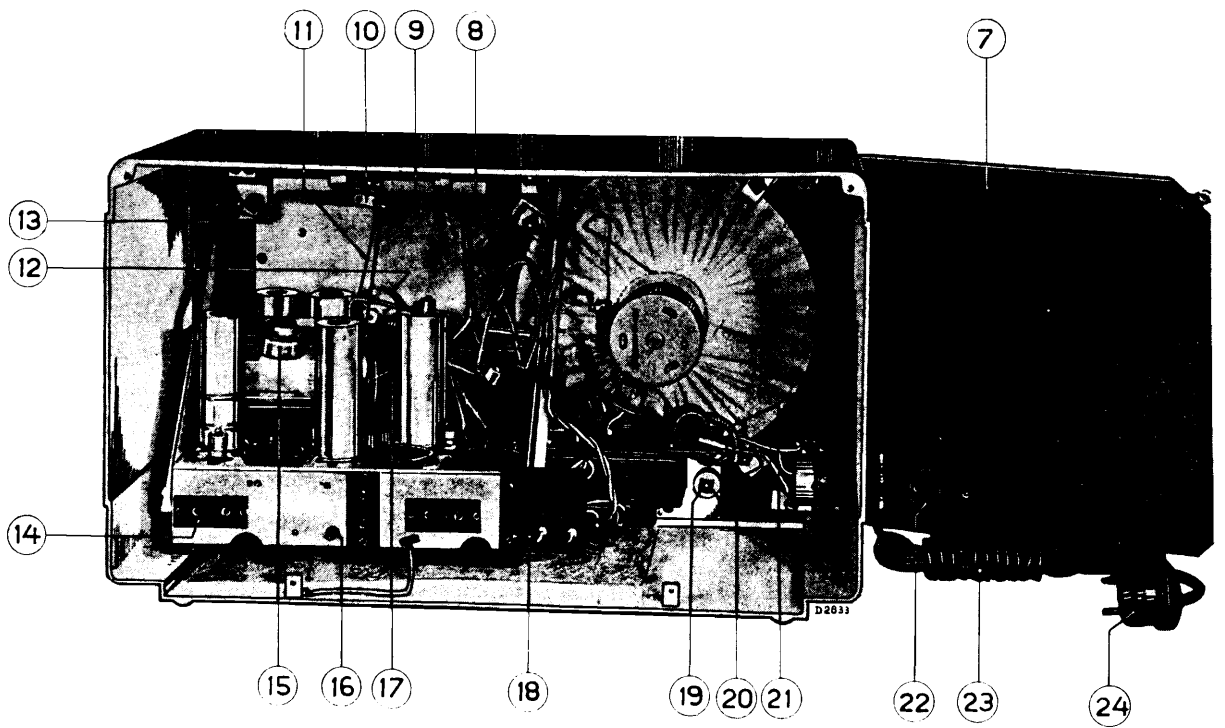


Fig. 11.



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S		3,1	2	4		23	24	22	21,22,20	15	13,16,18	14	12,13,11	10,23,31,30
C		35			28	23	1,2,6		22,4, 5,20,13,19,21,40		31,29,12,32,8,17		11,14,7,15, 16	
R	18	17	10			R	7				6,13,21	1	26	

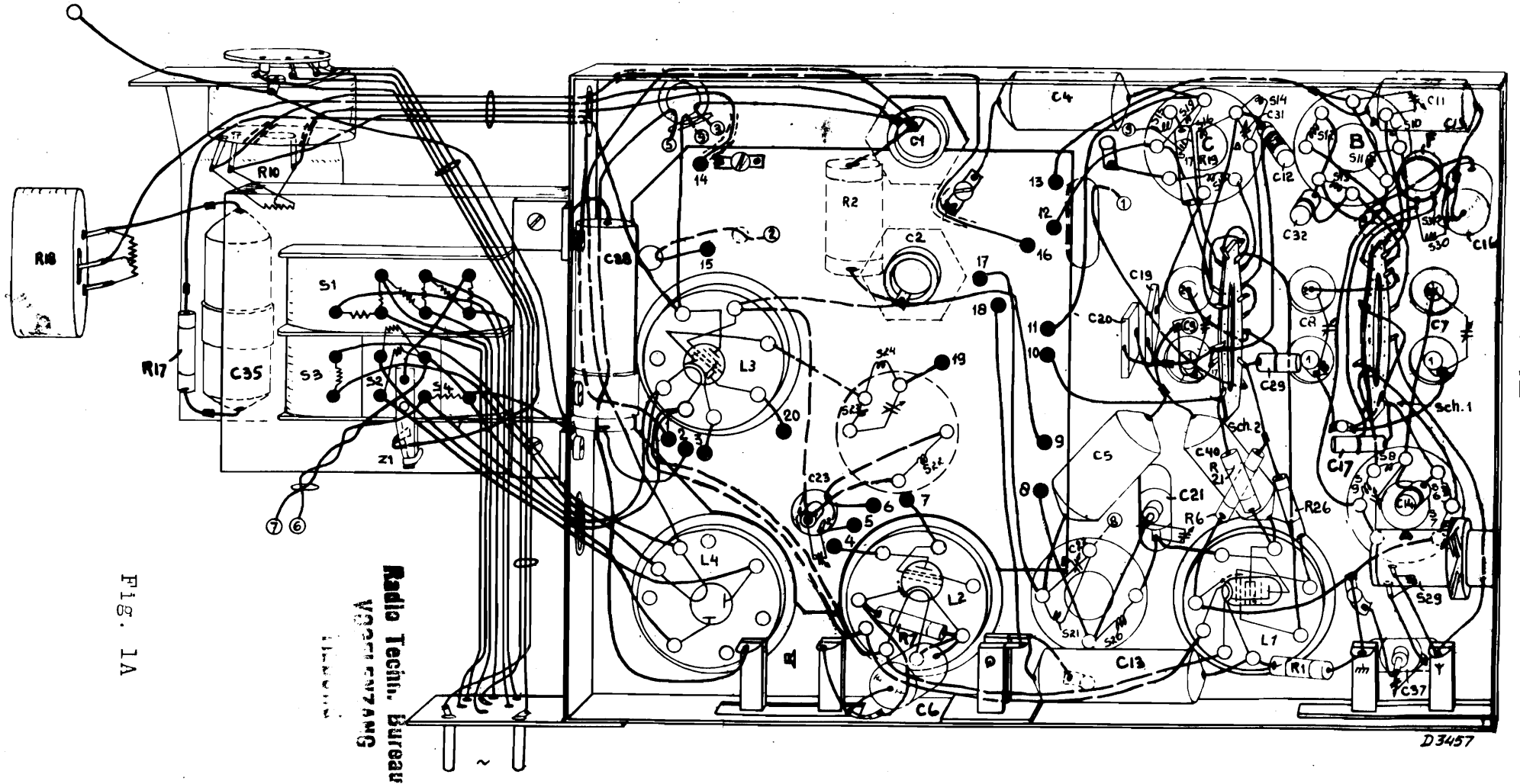


Fig. 1A

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Defecte verbindingen

Indien een breuk is ontstaan in een van de verbindingen aan de onderzyde van het plaatje (dit kan zonder het plaatje los te nemen worden opgemeten aan de hand van fig.2A) kan deze met gewoon tinsoldeer worden gerepareerd.

Het losnemen van de unit uit het chassis geschiedt door:

1. De verbindingen van de unit met de toestel-bedrading los te soldeeren (zie hiervoor fig.1A). De soldeerpunten moeten hierby niet langer worden verhit dan strikt noodzakelyk is.
2. De moertjes aan de bovenzide van het plaatje los te draaien.
3. De unit kan dan worden verwijderd.  
Het wedermontereeren geschiedt in omgekeerde volgorde.

Radio Database  
 1940-1945  
 Radio

470 A

Radio Techn. Dienst  
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S															21, 20, 15, 17, 19, 16, 18, 14, 12, 13, 11, 10, 30, 31, 29													
C	35, 4, 4, 2, 3,														28, 27, 26, 23, 25, X, 4, 2, 6, 39, 4, 22, 20, 5, 13, 19, 9, 21, 40, 31, 29, 2, 5, 2, 17, 11, 14, 7, 15, 7, 16,													
R	18, 17, 10,														5, 15, 12, 13, 11, 2, 7, 9, 8, 20, 4, 3, 19, 21, 6, 1,													

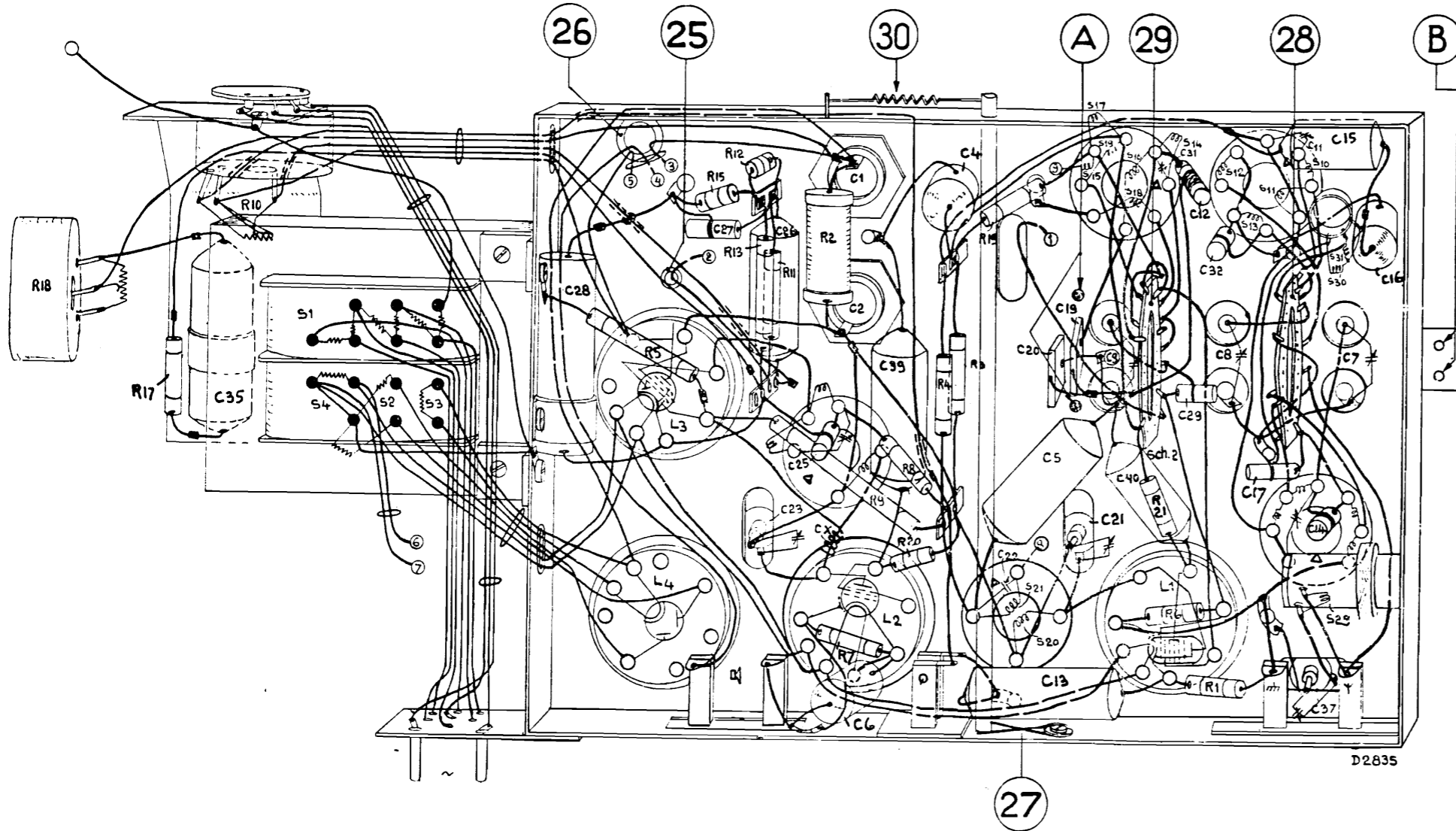


Fig. 13.

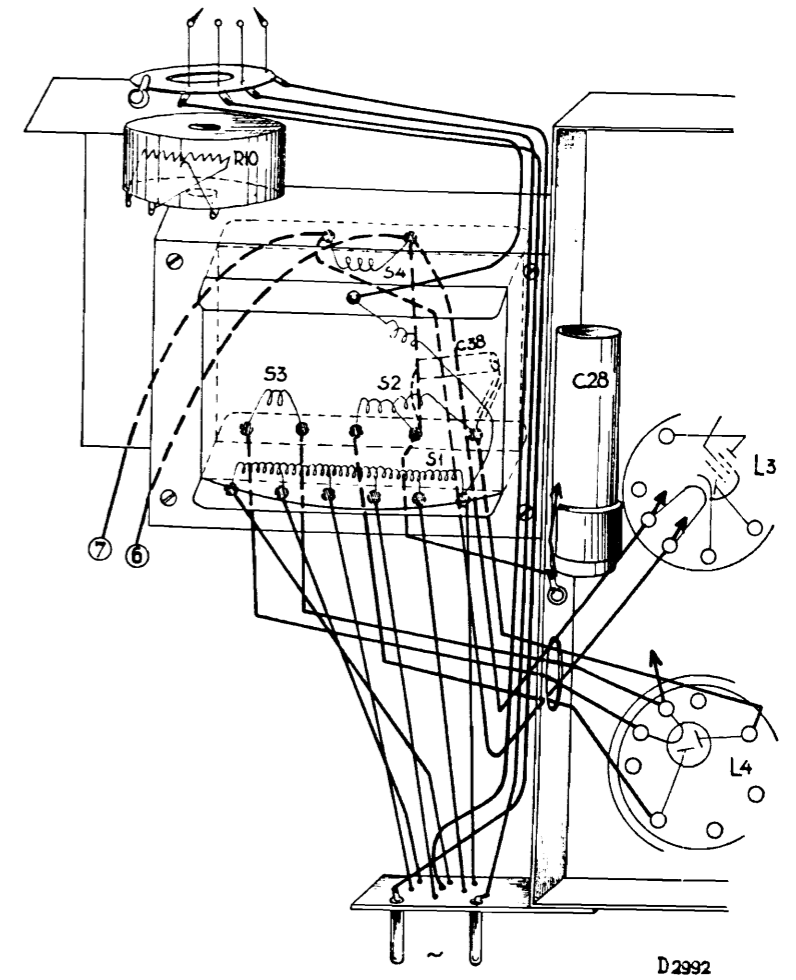


Fig. 14.

The above fig. shows the alternative assembly of the mains transformer.

Code No.	Price
28 572 89.3)	
28 573 58.0)	
28 573 82.0)	
28 573 84.0)	
28 572 90.2)	
28 573 82.0)	
28 573 85.0)	
28 537 29.3	
28 220 51.0	
28 587 88.0)	
28 588 68.0)	
28 587 71.0	

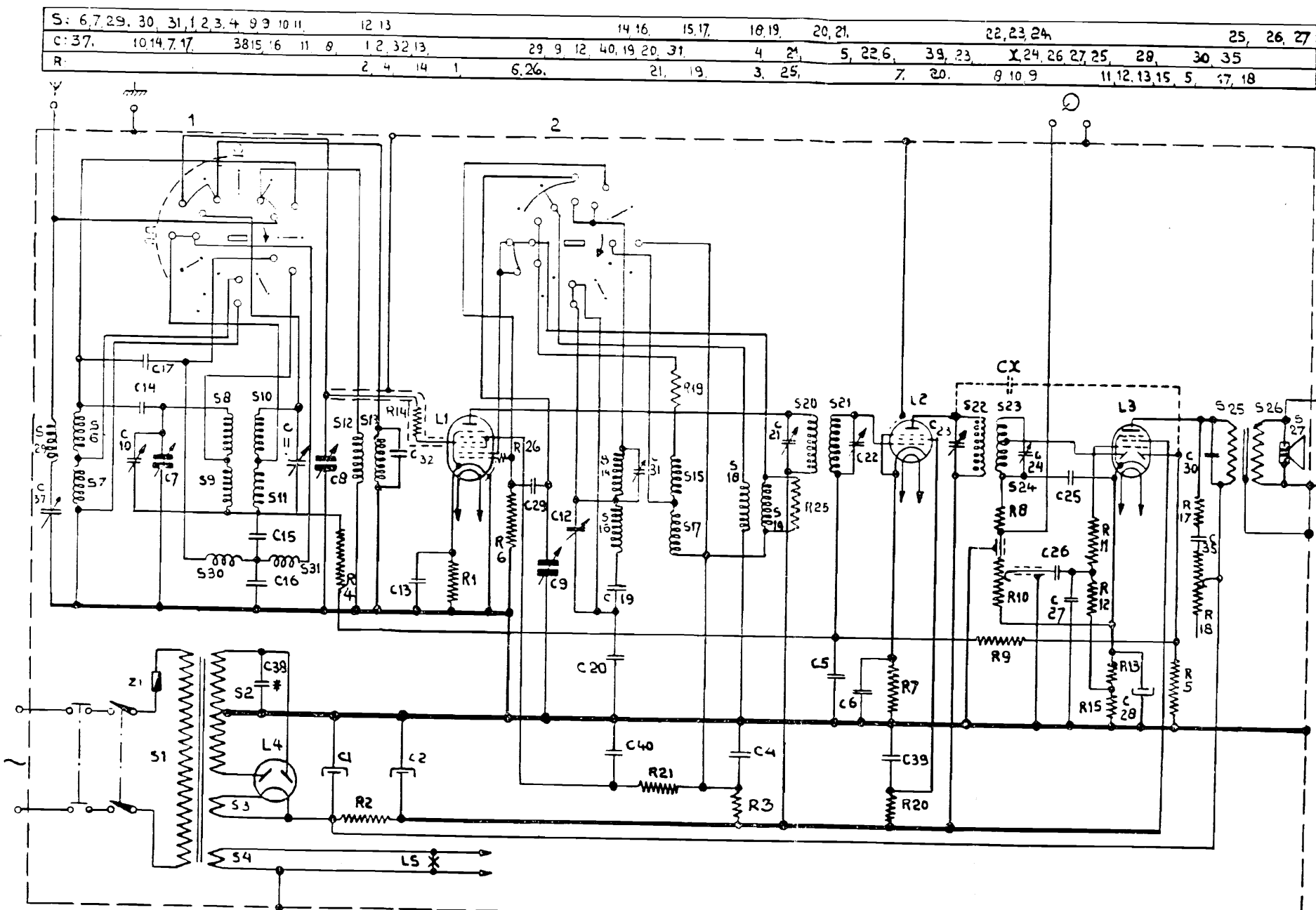


Fig. 12.

RESISTANCES

No.	Valve	Code No.	Price	No.	Valve	Code No.	Price
R1	400 ohm	28 770 21.0		R12	1 M.ohm	28 770 55.0	
R2	2000 ohm	28 802 66.0		R13	160 ohm	28 770 17.0	
R3	25000 ohm	28 770 39.0		R14	50 ohm	28 773 57.0	
R4	0.1 M.ohm	28 770 45.0		R15	80 ohm	28 770 14.0	
R5	0.5 M.ohm	28 770 52.0		R17	100 ohm	28 773 60.0	
R6	50000 ohm	28 770 42.0		R18	50000 ohm	49 471 00.0	
R7	320 ohm	28 770 20.0		R19	4000 ohm	28 770 31.0	
R8	0.1 M.ohm	28 770 45.0		R20	80000 ohm	28 770 44.0	
R9	2 M.ohm	28 771 23.0		R21	0,16 M.ohm	28 770 47.0	
R10	0.5 M.ohm	49 500 01.0		R25	20000 ohm	28 770 38.0	
R11	10000 ohm	28 770 35.0		R26	40 ohm	28 770 11.0	

No.	Valve	Code No.	Price
C1	32 $\mu$ F	28 182 40.0	
C2	32 $\mu$ F	28 182 40.0	
C4	50000 $\mu$ F	28 199 06.0	
C5	50000 $\mu$ F	28 199 06.0	
C6	50000 $\mu$ F	28 199 06.0	
C7	11-490 $\mu$ F		
C8	11-490 $\mu$ F	28 212 30.0	
C9	11-490 $\mu$ F		
C10	30 $\mu$ F		
C11	30 $\mu$ F	See coils	
C12	30 $\mu$ F	28 212 06.0	
C13	50000 $\mu$ F	28 199 06.0	
C14	16 $\mu$ F	28 206 36.0	
C15	12500 $\mu$ F	28 199 00.0	
C16	40000 $\mu$ F	28 199 05.0	
C17	40 $\mu$ F	28 206 23.0)	
C17	50 $\mu$ F	28 206 24.0)	
C19	680 $\mu$ F	49 080 00.0)	
C19	947 $\mu$ F	49 080 32.0)	
C20	1575 $\mu$ F	28 195 94.0)	
C20	1718 $\mu$ F	49 080 33.0)	
C19	775 $\mu$ F	49 080 30.0)	
C20	1379 $\mu$ F	49 080 31.0)	
C21	70+30 $\mu$ F	28 212 46.0	
C22	70+30 $\mu$ F	See coils	
C23	70+30 $\mu$ F	28 212 46.0	
C24	70+30 $\mu$ F	See coils	
C25	80 $\mu$ F	28 206 26.0	
C26	10000 $\mu$ F	28 198 99.0	
C27	80 $\mu$ F	28 206 26.0	
C28	50 $\mu$ F	28 182 32.0	
C29	50 $\mu$ F	28 206 24.0	
C30	2000 $\mu$ F	28 201 48.0	
C31	70+30 $\mu$ F	See coils	
C32	12,5 $\mu$ F	28 206 35.0	
C35	50000 $\mu$ F	28 201 64.0	
C37	70+30 $\mu$ F	28 212 46.0	
C38	20000 $\mu$ F	28 201 65.0*)	
C39	50000 $\mu$ F	28 199 06.0	
C40	50000 $\mu$ F	28 199 06.0	
C42	250 $\mu$ F	28 192 47.0†	

\* Not fitted to receivers when mains transformer has separate coils (see sheet G2).  
† See sheet A2 under "Mains aerial".

VALVES

L1	L2	L3	L4	L5
EK2	EF9	EBL1	AZ1	8045D-C

- 1) 470A
- 2) 470A-14
- 3) 470A-25
- 4) 470A-26
- 5) 470A-29
- 6) 470A-32
- 7) 470A-46
- 8) 470A-49

voltages are in respect of  
the volt meters having a  
internal resistance is less, the  
small deviations, therefore.

Volt
Volt
Volt
Volt
Volt
mA
mA
mA