SECTION
I
NOTE MAGNIFIERS

NOTE MAGNIFIER N9

PATTERN 6957A (NEW).

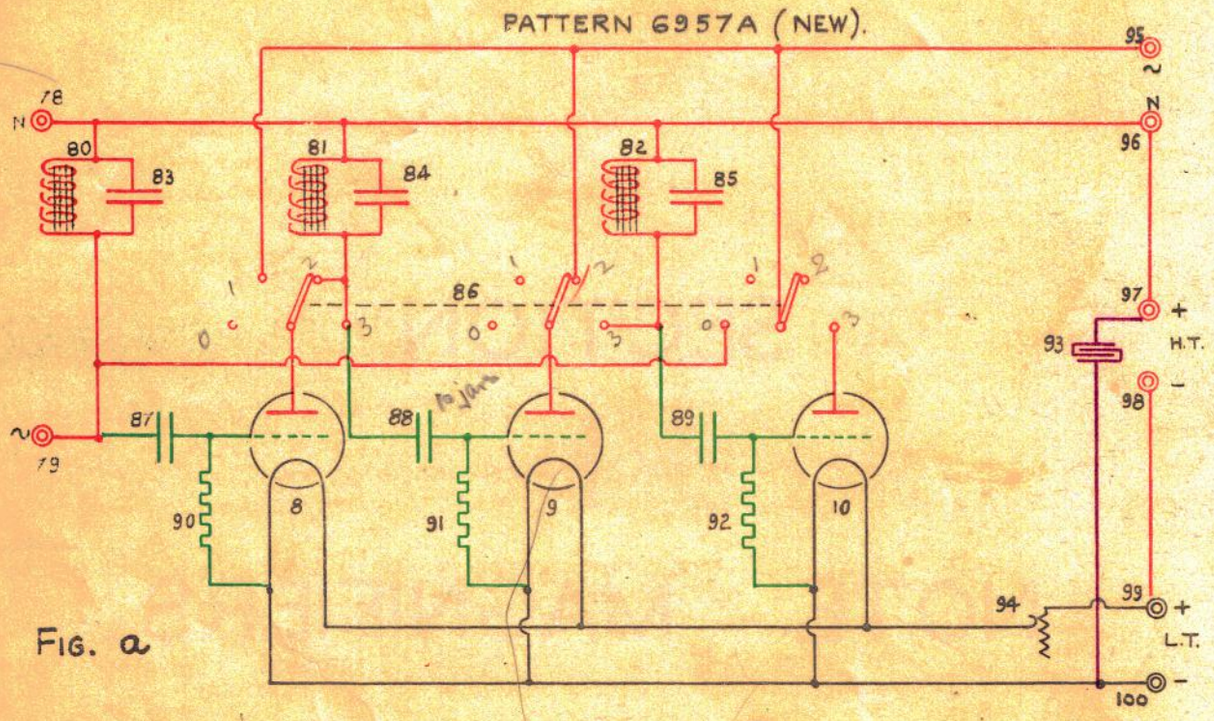


FIG. a

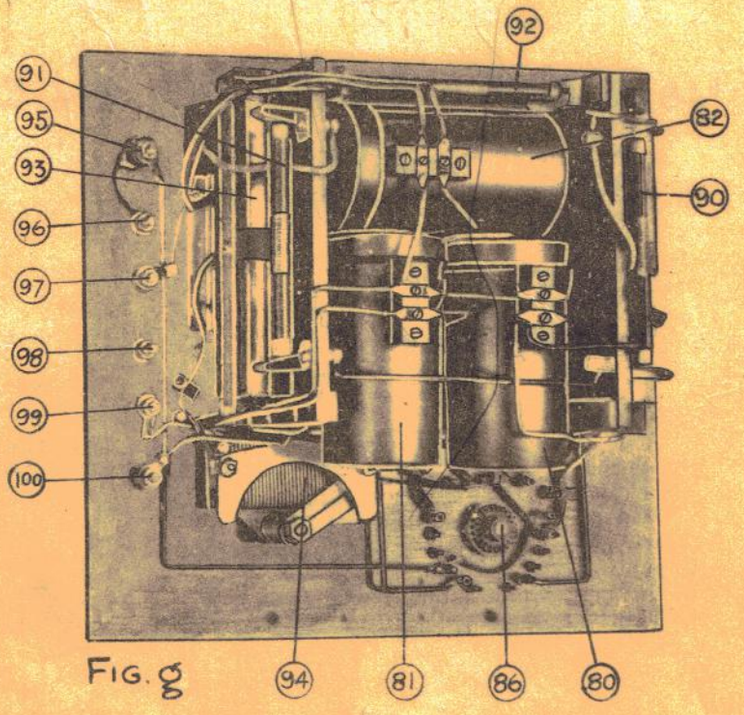


FIG. g

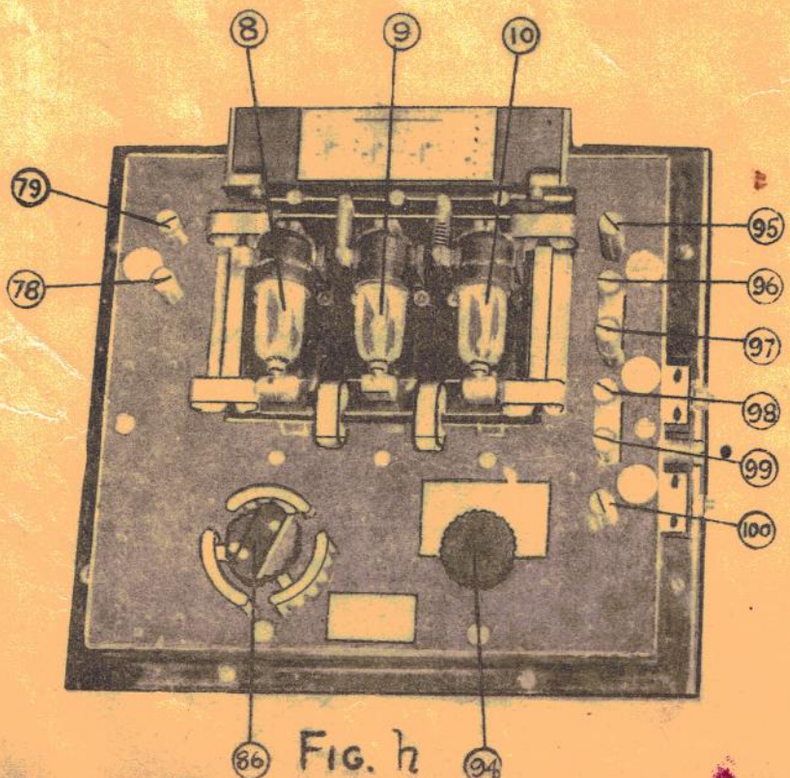


FIG. h

NOTE MAGNIFIER N9

Date of design:- 1924.

Valves and method of coupling:- Three NR14 A/F amplifiers - Tuned choke capacity. (fixed tuning).

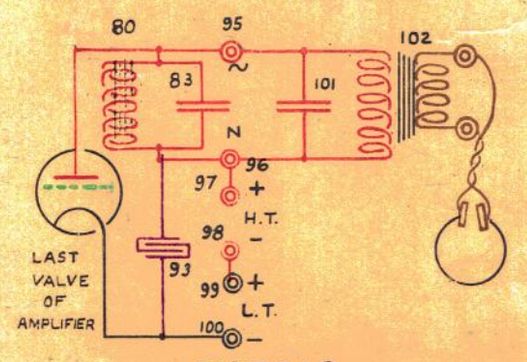
Note:- The identity numbers on the figures correspond with those shown in Section D (~~Model and~~ Receiver Outfits).

N9 is the general service note-magnifier and can be used where required with almost any amplifier. The tuning of the choke capacity coupling is fixed at about 1 kc/s, the coils (80), (81) and (82) having a value of 32 henries and the condensers (83), (84) and (85), 1 jar. This provides a rejector circuit of high impedance to audio-frequencies and hence good amplification is obtained. This amplification extends over the whole band of audio-frequencies, as the tuning of the rejector circuit is very flat. There is no noticeable peak in the amplification at a note of the resonant frequency (1000 cycles /sec).

When fitted with central battery wiring, (i.e., common anode or filament batteries) terminal marked "Input N" (78) need not be connected to the amplifier, since the + H.T. supply makes the same connection.

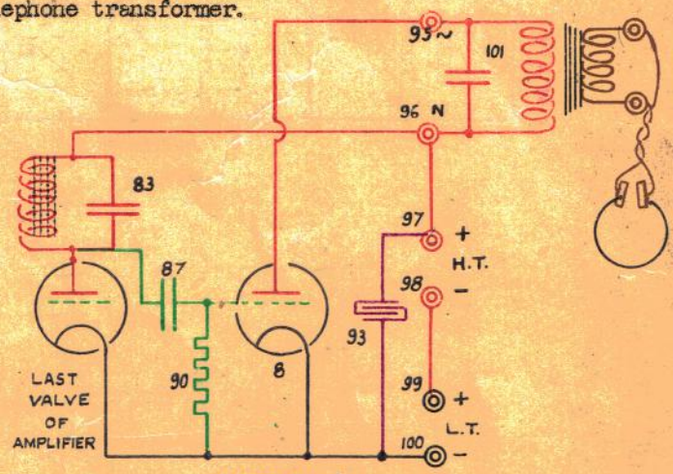
The stage switch (86) in the newer pattern instruments has the following effect:-

Position 0. No N9 valve in use. Telephone Condenser (101) and Transformer (102) are connected in anode supply of last valve of amplifier. The tuned anode circuit (80) (83) is connected in parallel with (101) and (102) and acts as by-pass for R/F, while it is a rejector circuit with high impedance to A/F, which therefore passes through the telephone transformer.



POSITION 0

FIG. B.

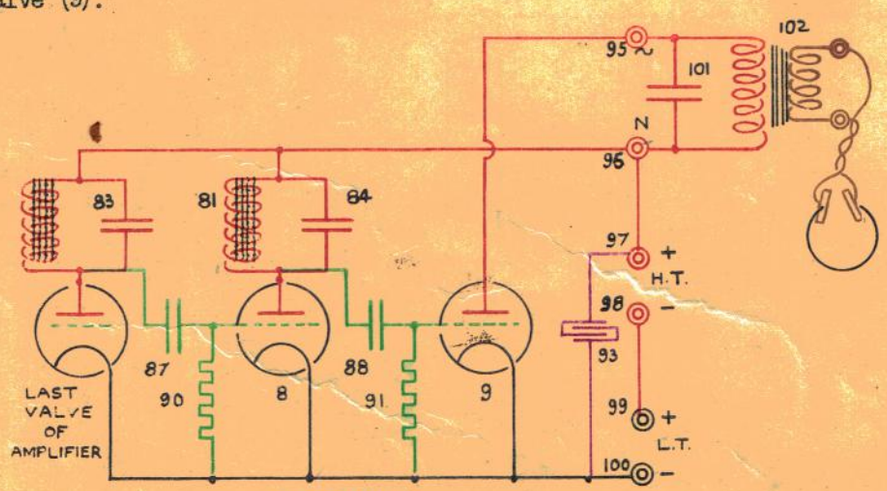


POSITION 1.

FIG. C.

Position 1. One N9 valve in use. The tuned anode circuit (80) (83) is now connected directly in the anode supply of the last valve of the amplifier, which is thus "tuned choke capacity coupled" by condenser (87) to the grid of the first valve (8) of N9. The telephone transformer (102) is now in the anode supply of this valve (8).

Position 2. Two N9 valves in use. As for position 1, except that the tuned anode circuit (81) (84) is connected to the anode supply of valve (8), which is thus "tuned choke capacity coupled" by condenser (88) to the grid of valve (9). The telephone transformer (102) is now in the anode supply of this valve (9).



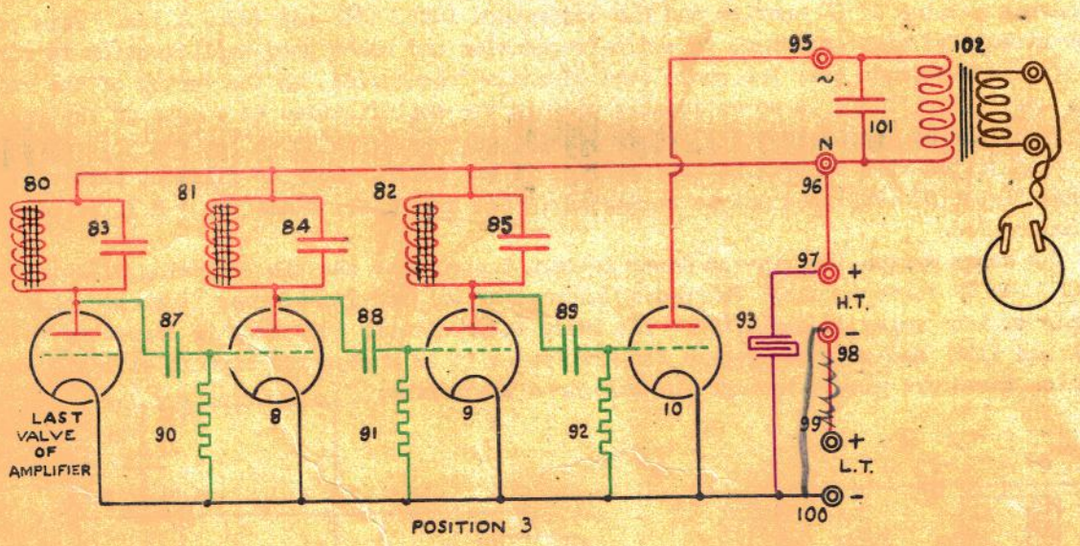
POSITION 2

FIG. D

NOTE MAGNIFIER N9

Position 3. Three N9 valves in use. As for position 2, except that the tuned anode circuit (82) (85) is connected to the anode supply of valve (9) which is thus "tuned choke capacity coupled" by condenser (89) to the grid of valve (10). The telephone transformer (102) is now in the anode supply of this valve (10).

There are two patterns of N9 in use, Pattern 6957A figure a, being the later and superseding Pattern 6957 figure f. Complete sketches of both are given but the equivalent circuits, b to e refer only to the newer pattern. Photographs of the new model are given (figures g and h).



POSITION 3

Fig. e.

PATTERN 6957 (OLD).

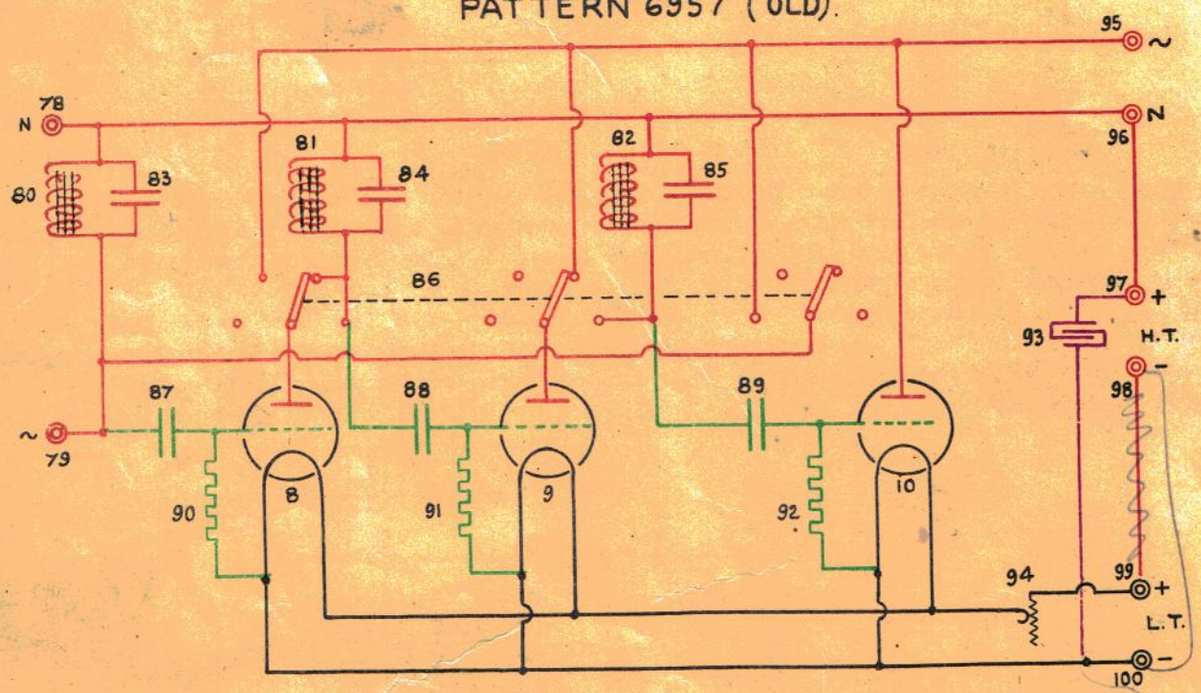


Fig. f.

NOTE MAGNIFIER N19

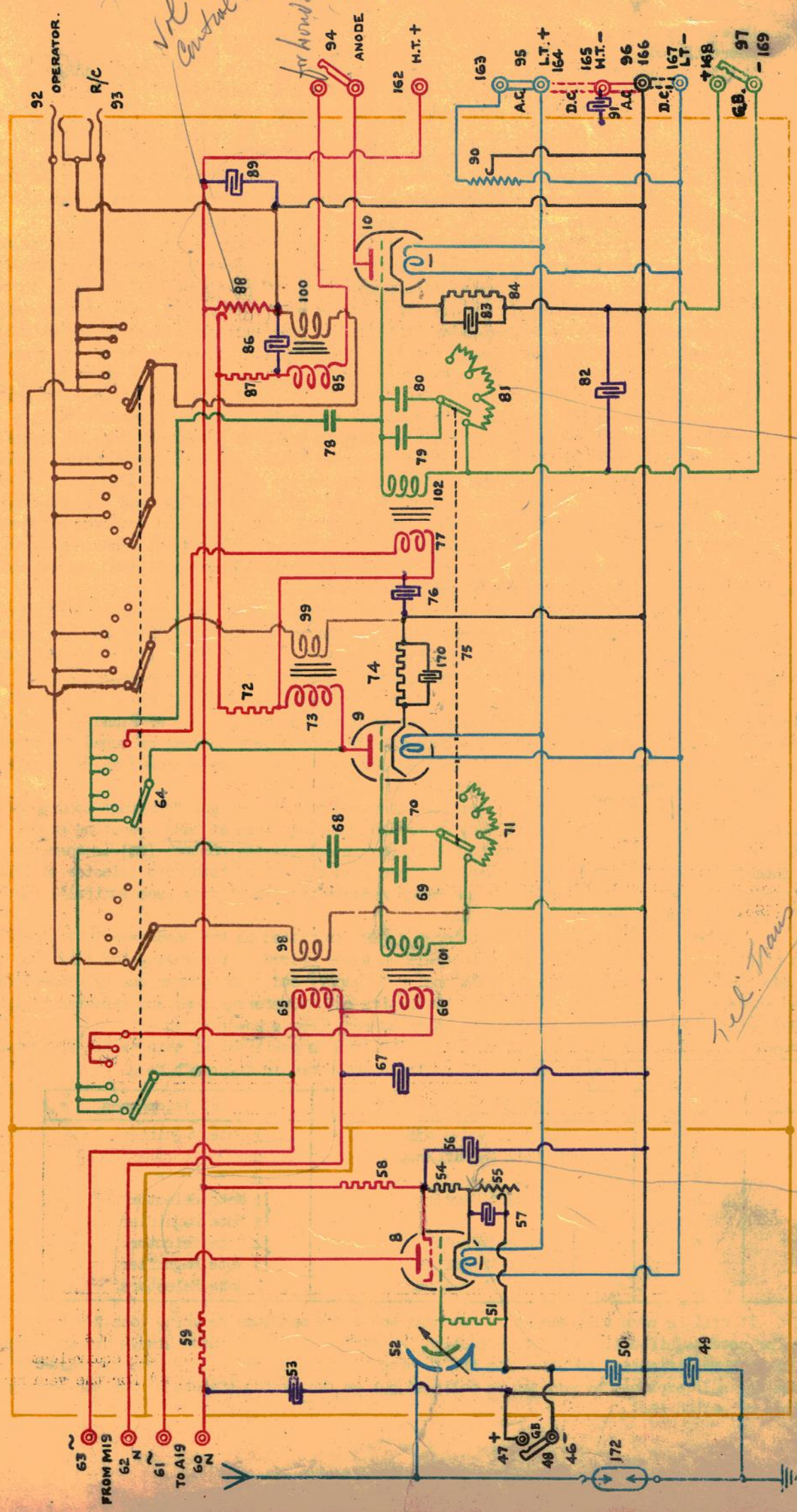


Fig. 2.

NOTE MAGNIFIER N19

Date of design:- 1932.
Where fitted:- Receiver Outfits CM, CN.
Valves and method of coupling:- (A.C. Two NR27) or (D.C. Two NR15 or 15A).
Two A/F amplifiers (9) (10) - Choke capacity.
Two Note selectors (9) (10) - Tuned transformer.
One isolating valve (8) for use with Tuner A19 (see page BA12).

Note magnifier N19 is contained in a completely screened box which is divided by a further screen into two compartments. One of these contains the aerial isolating unit, and the other the note magnifier. The former is included purely in order to simplify wiring when the outfit is fitted in a rack, and to equalise the size and weight of A19, M19 and N19.

The note magnifier N19 consists of two audio frequency stages which may be used as note magnifiers or note selectors or a combination of both; this is effected by means of a switch (64).

The output from the detector valve (2) of amplifier M19 (see page H18) is taken to terminals (62) and (63) on the note magnifier N19, to which is connected the 10 henry primary (65) of a telephone transformer. Similar transformers (73)(99) and (85)(100) are placed in the outputs of the two A/F stages. When using these stages for note magnification the primaries of the transformers (65)(73) are used to form a choke capacity coupling to the next stage by means of the condensers (68)(78) which are switched in by the switch (64). The grid leaks for these condensers (68)(78) are formed by the tuned grid circuits used for note selection (see figures b to f). It may be remarked that this is the same circuit as used in the note selection stage of amplifier M18 (see figure a. page H17 (45)(46)). The difference lies in the value of the coupling condensers (68)(78), that in M18 (41) being very much smaller. N19, in the magnifier positions, is not critical, owing to the impedance of the previous valve, ((2) in M19 or (9) in N19) and the coupling condenser (68) or (78) being of a small value(i.e., 10,000 ohms). The valve and coupling condenser forms a parallel path with the grid leak circuit to earth, thus flattening the resonance curve of the grid leak circuit which otherwise would reach a peak of about 3 megohms at 1350 cycles, and so an even response from about 200 to 2000 cycles is obtained.

The tuned grid circuits of the valves (9)(10) consist of an inductance (101)(102) and two condensers (69)(70) and (79)(80) in parallel. The inductances are 7 henries, and the condensers are a 1 jar fixed, and a .5 jar semi-variable. These circuits are selectively tuned to a frequency of 1350 cycles. The inductances (101)(102) of the circuits form the secondaries of transformer coupling from the previous stage, that is from the primaries (66)(77) which are brought into the circuit by the switch (64) when note selection is required (see figures e, f and g). Thus for each valve the coupling may be either choke capacity for note magnification, or tuned transformer for note selection. These tuned grids, or note selection circuits, are enclosed in sheet iron to reduce coupling between the stages and stray pick up.

The selectivity of the tuned circuits is so great that a slight "ringing" occurs when a signal is received. This is not sufficient to prevent reading morse at hand operating speed, but becomes too great for high speed automatic reception. A selectivity control (75) is therefore used which introduces resistances (71)(81) into the tuned grid circuit of both note selector stages. This introduces damping into the circuit and hence reduces the selectivity (see Admiralty Handbook of W/T (1931) paragraph 302 and figure 138).

A 15000 ohm volume control potentiometer (88) is fitted in the anode supply of the A/F valves (9)(10), and controls the anode potentials on these valves. By removing the link (94) in the anode supply of the valve (10) an additional H.T. supply and loud speaker can be connected between Anode and H.T. positive terminals thus cutting out transformer (85) and resistances (87) and (88) which might be damaged by the high anode current from a power valve.

Note Magnifier - Selector Stages. Switch (64). The various positions of this switch are tabulated and equivalent circuit sketches of each position are shown in figures b to g.

Position.	Figure.	Operator's telephones.	R/C Telephones.
D	b	Detector valve M19.	1 Note Magnifier.
M	c	1 Note Magnifier.	2 " "
MM	d	2 " "	2 " "
S	e	1 Note Selector.	1 Note Selector. 1 Note Magnifier.
SM	f	1 Note Selector. 1 Note Magnifier.	1 Note Selector. 1 Note Magnifier.
SS	g	2 Note Selectors.	2 Note Selectors.

It will be seen that except in the case where the operator is using both A/F stages either for note magnification or note selection, or both, the R/C operator always has an extra stage of note magnification to allow for the IR drop in leads to the R.C.O. The equivalent sketches are self explanatory and may be followed out on the sketch (figure a) for the various positions of switch (64).

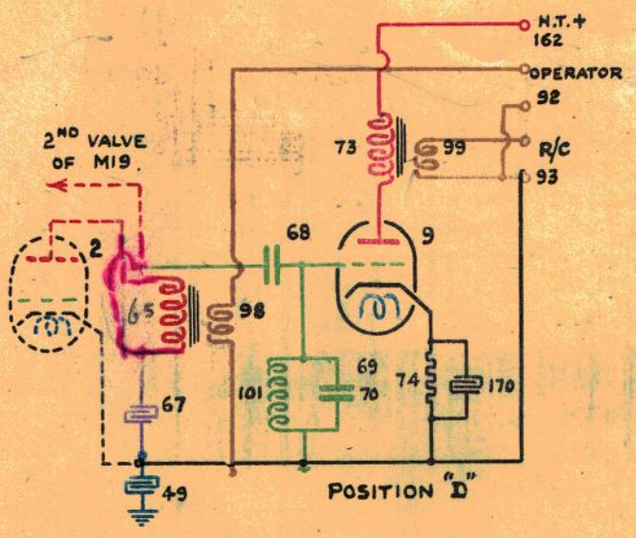


Fig. b

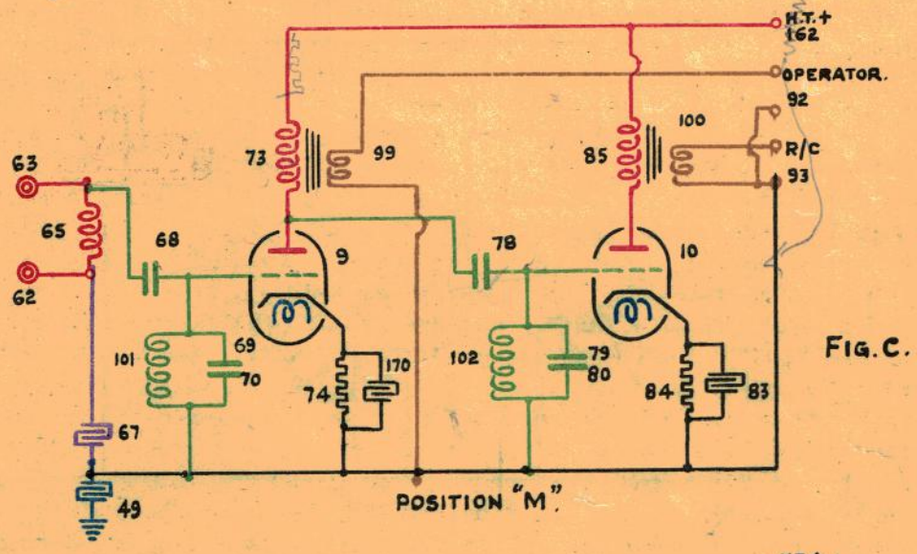


Fig. C.

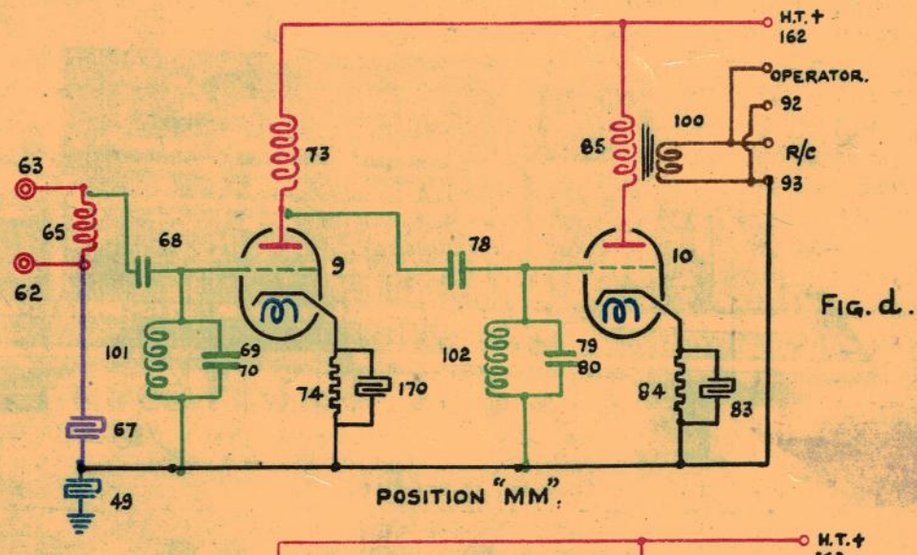


Fig. d.

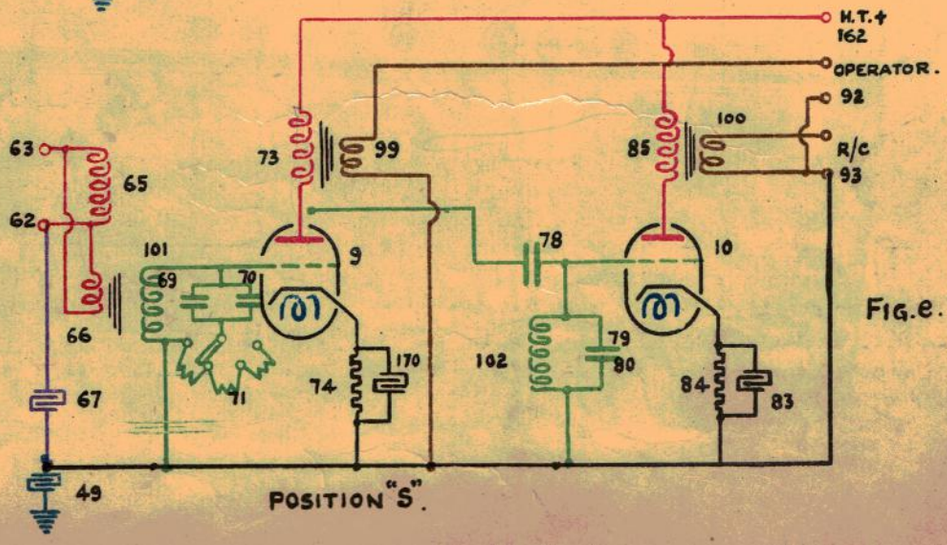


Fig. e.

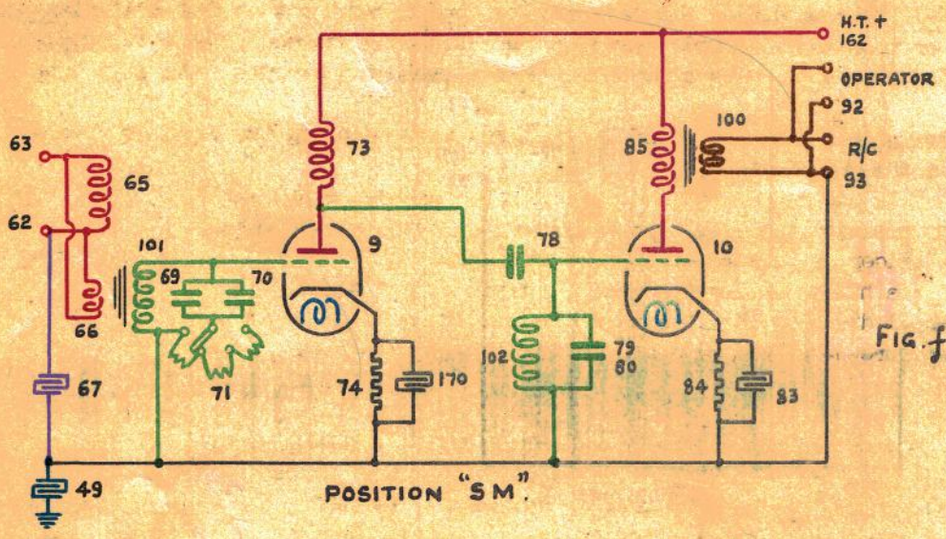


FIG. f.

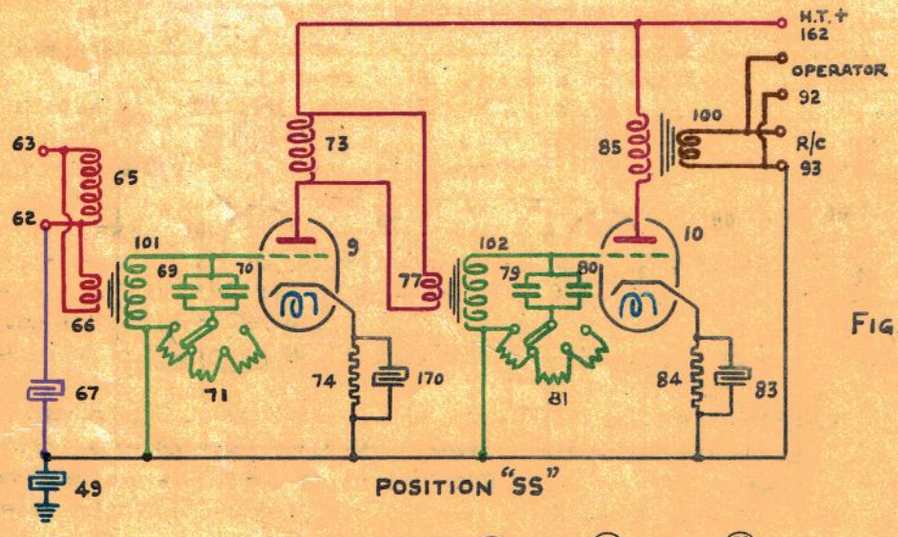


FIG. g.

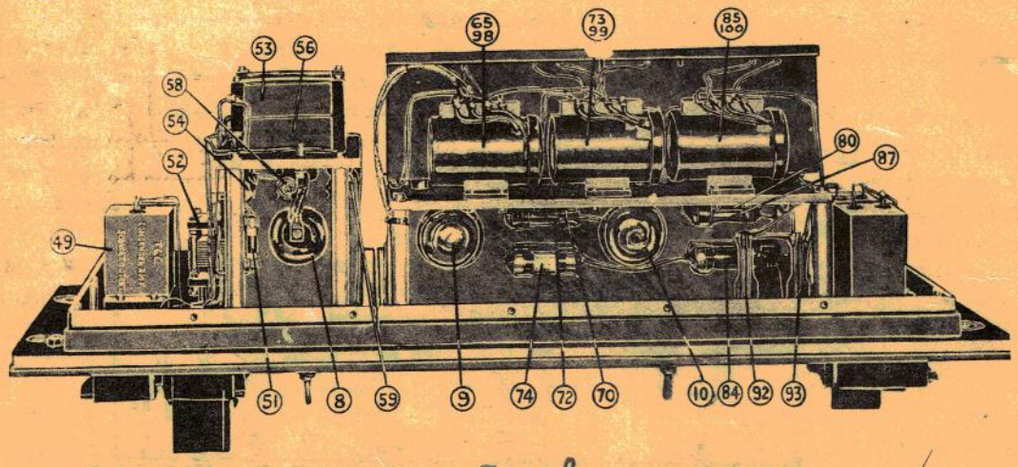


FIG. h.

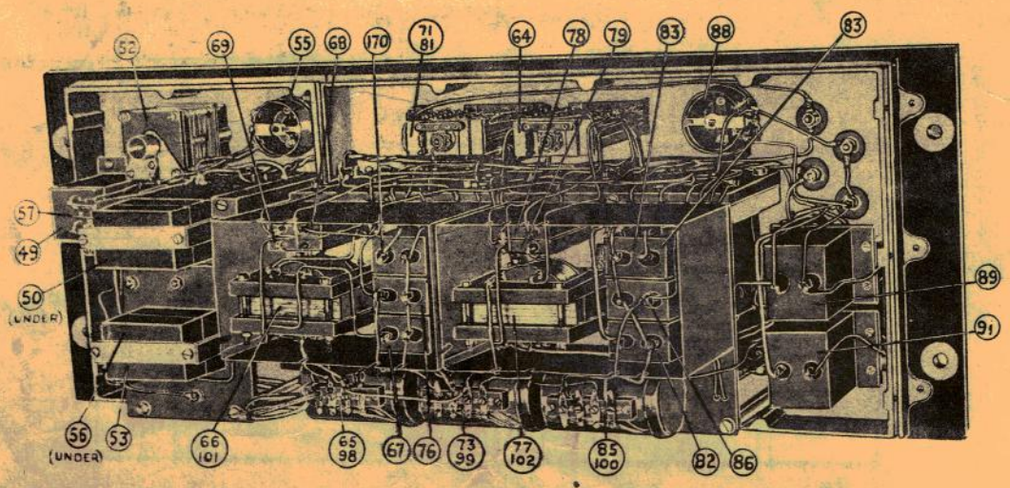


FIG. i.

A.C. and D.C. Supplies. Note magnifier N19 has been designed to work either from batteries using ordinary D.C. valves or from an A.C. supply using indirectly heated valves. The H.T. supply is 100 volts, obtained in the case of A.C. by a rectifier with a smoothing circuit. The L.T. supply is 4 volts.

Certain alterations to the circuit are required when changing the supplies from A.C. to D.C. or vice versa, and are as follows:-

The change from one supply to the other is effected by the two links (95)(96).

In the A.C. position the link (95) connects the "hum potentiometer" (90) across the heater supply. The slider of this potentiometer is altered until the A.C. hum is reduced to a minimum. The action of the hum potentiometer (90) is, that, in any model, owing to constructional difficulties, the lead (G) from the grid of the valve shown in figure j. will always be nearer to the heater lead (A) than to (B). That is, the heater lead (A) will, by capacitive coupling to the grid lead (G), affect the potential in the grid more than the heater lead (B). By moving the slider of the potentiometer, which is connected to earth, the amount above and below earth potential which this heater lead (A) varies, may be increased or decreased. In other words, the effect of this heater lead (A) on the grid lead (G) can be reduced until it becomes exactly equal to the effect produced by the other heater lead (B). As these are in anti-phase the hum will disappear. In practice it is not possible to get rid of all hum, but it can be considerably reduced.

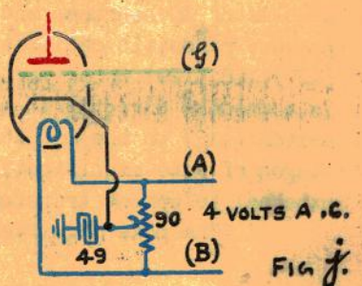


Fig. j.

The link (96) connects the cathodes of the valves and the decoupling and earthing condensers to the negative H.T.

The link (97) short circuits the terminals (168)(169) which are only used for D.C. supplies to provide grid bias if a power valve is required in this position.

"Free" grid bias is obtained with A.C. supplies by means of the resistances (74)(84) which are by-passed by condensers (170)(83). These resistances are connected between the cathodes and negative H.T., so that the cathodes are at a positive potential to negative H.T. As the grids are connected directly to negative H.T., they are therefore at a negative potential to the cathode, the amount of negative potential or grid bias, being dependent on the IR. drop across the resistances (74)(84).

To change to D.C. supply, the links (95)(96) are connected between the terminals (164)(165) and (166)(167). In this position the common earth terminal (166) is connected to negative L.T., the "hum potentiometer" is disconnected, and negative H.T. and positive L.T. are made common.

Grid bias, is now supplied by removing the link (97) and inserting a battery between the terminals (168)(169). It can only be applied to the last valve (10).

When using an A.C. valve in the aerial isolating unit the cathode of the valve (8) is connected to a point between a variable 15,000 ohm resistance (55) and a 10,000 ohm fixed resistance (54) which, together with a 5,000 ohm resistance (58) constitute a potentiometer for the H.T. supply to the screen grid of the valve. The variable resistance (55) with its by-pass condenser (57) is connected between the cathode and grid and the IR. drop in the resistance is used to give a variable negative bias to the grid. A bias of 40 volts is obtainable thus allowing for a variable mu valve to be used in this position.

When using a D.C. valve in the above unit, grid bias may be supplied by removing the link (48) and connecting a battery between the terminals (46)(47).

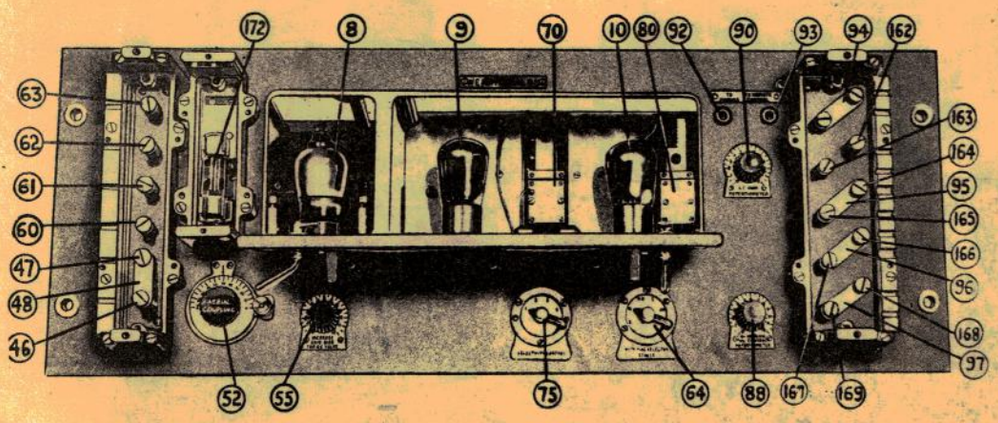


Fig. k.

NOTE MAGNIFIER N20

Date of design:- 1931
Where fitted:- D/F Outfits SG and SHX.
Valves used and method of coupling:- Two NR15 or NR15A. Tuned choke capacity (fixed tuning).

Note Magnifier N20 is used with Tuner A46 (see page BB12), Amplifier M9 (see page H13), and Heterodyne Unit K7 (see page GE3) in D/F outfits SG and SHX. Tuned choke capacity coupling is employed between the stages and also to the detector valve of M9.

The tuning is fixed at approximately 1070 cycles/sec. The chokes (104)(111)(115) have a value of 10 henries, and the condensers (103)(110)(114) of 2 jars. The resistance (108) is to prevent parasitic oscillations. The chokes (104)(111)(115) are fitted with secondary windings (127)(128)(129) which perform the function of telephone transformers, when their particular valve is connected directly to the output. The telephone terminals (121)(122) can be connected by the switch (117) to the output of the detector valve of the preceding amplifier, or to one or two stages of note magnification, through the secondary windings (127)(128)(129), of the chokes. No external telephone transformer is therefore necessary.

The note magnifier is switched on and off by means of the filament rheostat (116).

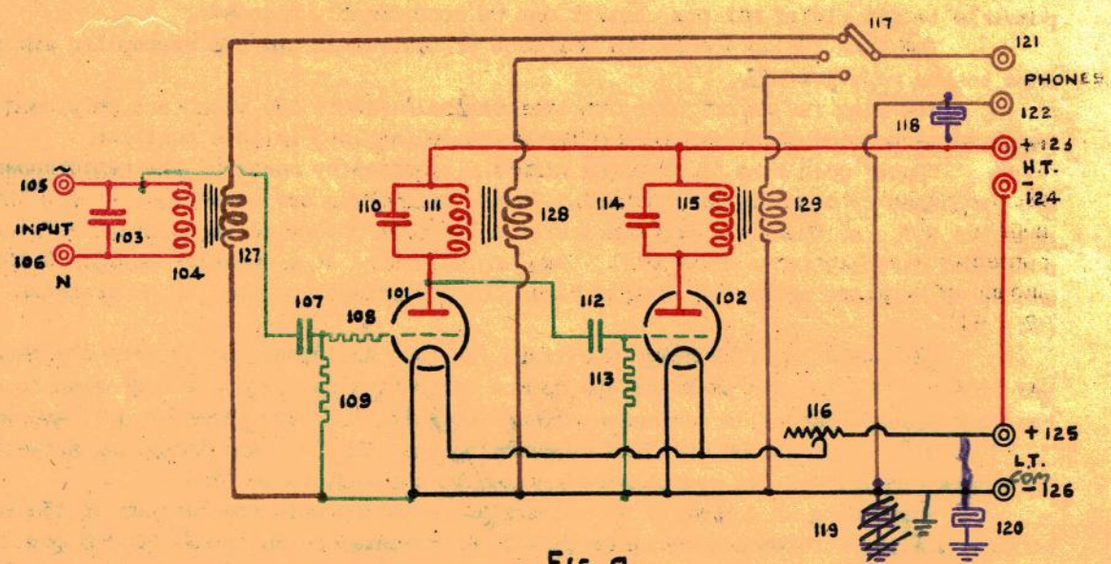


FIG. a.

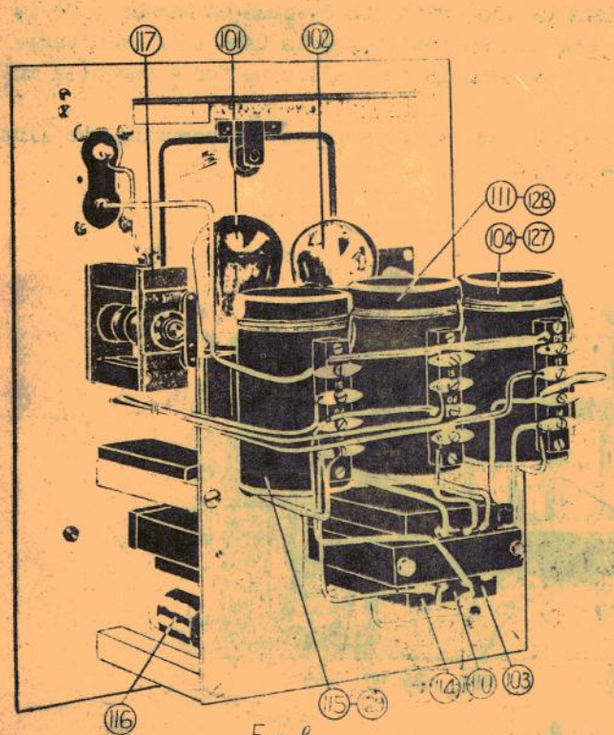


FIG b

FIG. C.