

FERRANTI CONSTRUCTIONAL POWER AMPLIFIERS.



Super Power Valve,
Type LP4.



Audio Transformer,
Type AF5.

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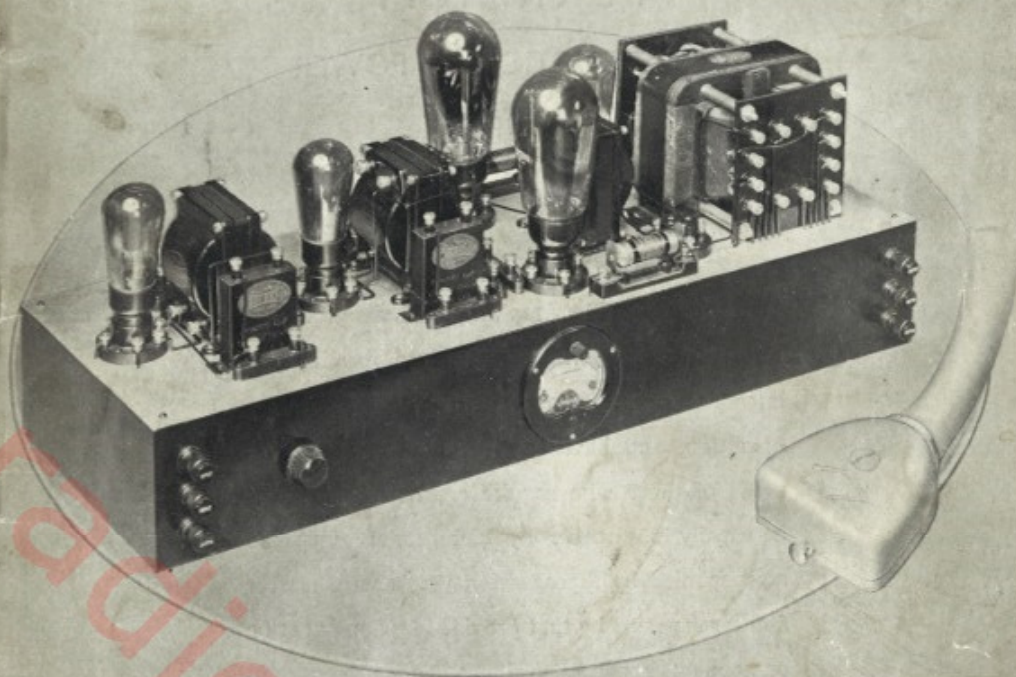
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P. P. P.

FERRANTI



CONSTRUCTIONAL POWER AMPLIFIERS

AUGUST 1935

PRICE 6⁹

FERRANTI
CONSTRUCTIONAL POWER
AMPLIFIERS

The FERRANTI Amplifiers, details for the construction of which are given herein, are intended respectively for Battery and A.C. Mains operation, and have been designed to meet the needs of those who require greater volume than is usually obtainable by commercial apparatus accompanied by reproduction very nearly perfect and unsurpassed by that provided by apparatus or components generally available at the present day.

FERRANTI LTD.

August, 1935.

FERRANTI
CONSTRUCTIONAL POWER
AMPLIFIERS

FERRANTI Ltd., knowing that in recent years there has been a tendency to lower the standard of Radio and Record reproduction, in response to popular taste, yet realizing that there are many to whom this does not apply and who must have the best, have designed the Amplifiers described herein so that reproduction superlative, and very nearly perfect, may still be had by the discerning, at a cost which must be considered moderate when performance is correctly judged.

Amplifiers are described for Battery and A.C. Mains operation respectively, the following being a list of the equipment included:—

BATTERY-OPERATED AMPLIFIER :

(1) TYPE Q.P.P. AMPLIFIER :

A two-stage Amplifier. It has a quiescent push-pull output stage, using a double valve for this purpose, and will give a maximum undistorted output of approximately 1,000 milliwatts. It is very economical, the average H.T. consumption being approximately 6 milliamps.

A.C. MAINS AMPLIFIERS :

For use on 200/250 volt 40/100 cycle supplies.

(2) TYPE A.C.2.5C AMPLIFIER :

This is a two-stage Amplifier employing a high magnification indirectly heated triode, transformer coupled to a single output triode, giving a maximum undistorted output of 2,500 milliwatts. Consumption : 0.05 unit per hour.

(3) TYPE A.C.6C AMPLIFIER :

A three-stage Amplifier employing two transformer coupled stages with two triodes connected in Class "A" push-pull to give an undistorted output of 6,250 milliwatts. Consumption : 0.09 unit per hour. Fig. 1 shows the overall response of this Amplifier.

(4) TYPE A.C.12C AMPLIFIER :

A three-stage Amplifier generally similar to the type A.C.6C, but giving the larger maximum undistorted output of 12,500 milliwatts. Consumption : 0.13 unit per hour. The curve of the Amplifier is shown in Fig. 2.

WARNING.

With regard to the Mains Operated Amplifiers herein described, the attention of Constructors is drawn to the fact that the voltages available are considerable, being from 500/900 volts A.C. in the case of the three A.C. Amplifiers, and 250 volts D.C. and 450 volts D.C. on the rectifier side of these Amplifiers, and these voltages are dangerous to life.

It is therefore essential that the constructional details indicated be followed implicitly, not only as regards the components and layout shown, but also that the whole of the gear be mounted within a Cabinet so as to prevent absolutely the possibility of shock, accidental or otherwise, by authorised or unauthorised persons, and also to enable the apparatus to comply with the recommendations of the Institution of Electrical Engineers.

The apparatus herein described, if totally enclosed as recommended, is perfectly safe to use, but FERRANTI Ltd. accept no responsibility for any accident or injury that may be received in any way whatsoever when employing these Amplifiers.

GENERAL.

In the design of the Amplifiers described in this pamphlet, nothing has been sacrificed to expediency, every point in each individual design having been carefully considered and precise measurements taken at every stage, so that the performances given by the various equipments leave very little to be desired, especially in the A.C. Push-Pull Models, which give results that are very *nearly perfect*.

Resistance-capacity compensation is provided in the 6 and 12 Watt Amplifiers, thus obtaining 100% response down to 25 cycles, whilst all the transformers have loaded secondaries, enabling them to give improved reproduction of transients.

Very great care has been taken with the smoothing and decoupling arrangements, so that no distortion is introduced through back-coupling between the stages, and the amount of mains hum in the A.C. models is negligible, being less than one volt R.M.S. in the anode circuit of the output valves at maximum volume.

The bias resistances for the output valves are in each case by-passed by large capacity Condensers, this reducing the loss of bass frequencies. The bias resistances which are in series with the output valves are also by-passed to avoid loss of power. Paper Condensers are used throughout to give utmost reliability and permanence.

In the A.C.6C and A.C.12C Amplifiers, the output valves are separately biased and the bias resistances individually decoupled, this arrangement having the advantage that if one of the output valves should fail the remaining valve will be unharmed.

The output valves have the same grid bias applied to each, as we find that any differences there may be between them are not such as to be of any consequence, and it is not necessary to use *matched valves*.

It is recommended that the differences in the respective anode currents of the respective valves should be not greater than 5 milliamps, and this condition is usual with standard valves of good make, such as the FERRANTI type LP4.

Stabilising Resistances are provided in connection with the output valves of the A.C. Amplifiers, these being provided in order to restrict any tendency of the output valve to oscillate, which sometimes happens with the modern, high-efficiency valves, particularly if they happen to be a little soft.

If a Tone Control is required for the A.C. Amplifiers, it is recommended that it be connected across the Pickup terminals in the usual way.

The Mains Transformers follow the latest FERRANTI practice of being the most up-to-date in the world. They are heavily insulated, are provided with earth shields between their windings, and their windings and design are so arranged that external magnetic fields are reduced to a minimum.

This point is particularly stressed, as in the case of an Amplifier designed for use with a certain Mains Transformer appreciable hum may be introduced if a transformer of any other design is used.

The Battery-operated Amplifier does not call for any special comment, except to point out that it gives considerable power output and is very economical, whilst being capable of providing greater volume than is commonly required for domestic purposes.

Box type bases are provided for the two A.C. Amplifiers, this form of construction enabling an ideal component and wiring layout to be provided and resulting, incidentally, in a compact structure and neat and imposing appearance. The top of the baseboard is covered with aluminium or copper sheet about .040" thick, which forms a convenient method of earthing all parts, and also acts as a shield between above and below baseboard wiring and components.

Naturally, the goodness of the reproduction of gramophone records depends to a very great extent on the pickup used, and we would therefore mention that it has been assumed that the Marconiphone or Garrard Pickup will be used in all cases; but if for some reason these pickups cannot be employed, a pickup capable of a similar input voltage must be used. With certain pickups it may be necessary to use an input transformer between the pickup and the input terminals. The FERRANTI Type AF8 or AF3 Transformers are suitable.

Both the A.C. Amplifiers possess sufficient magnification to give their maximum undistorted output when used with any good Microphone and its associated transformer.

FIDELITY CURVES.

The fidelity or performance curve of an Amplifier is the only true indication of its merit, for which reason we show, immediately following, the overall amplification curves of the two A.C. Amplifiers *from the pickup input terminals to the terminals of the output transformer that are connected to the speaker*.

We emphasise the point that the curves include the Output Transformer, as it is relatively easy to obtain straight-line amplification up to the grid of the last valve by other means, but to provide the performance herein indicated is difficult, if not impossible of attainment otherwise, except perhaps in the laboratory and at far greater cost.

A glance at these curves, which have been taken in the FERRANTI Laboratories, and are guaranteed to be correct, shows the extraordinarily fine performance given, and further comment on this point is unnecessary.

It should be observed that the vertical scale is in all cases a linear one, and in consequence does not tend in any way to minimize deviations from perfection that exist in the apparatus. If drawn on a decibel scale, the maximum deviation from perfection is less than a $\frac{1}{2}$ d.b. for the A.C. 6C Amplifier from 25 to 10,000 cycles and less than 5 d.b. at 12,000 cycles. For the A.C. 12C Amplifier, the curve is within a $\frac{1}{2}$ d.b. from 25 to 8,000 cycles, within 3.5 d.b. to 10,000 cycles.

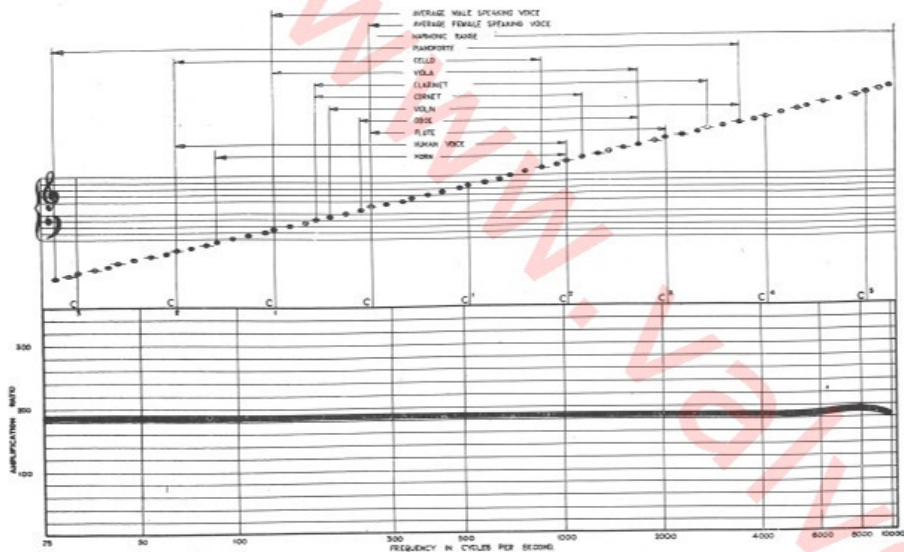


Fig. 1.

Fig. 1 shows the overall amplification of the A.C. Mains Amplifier, Type A.C. 6C.

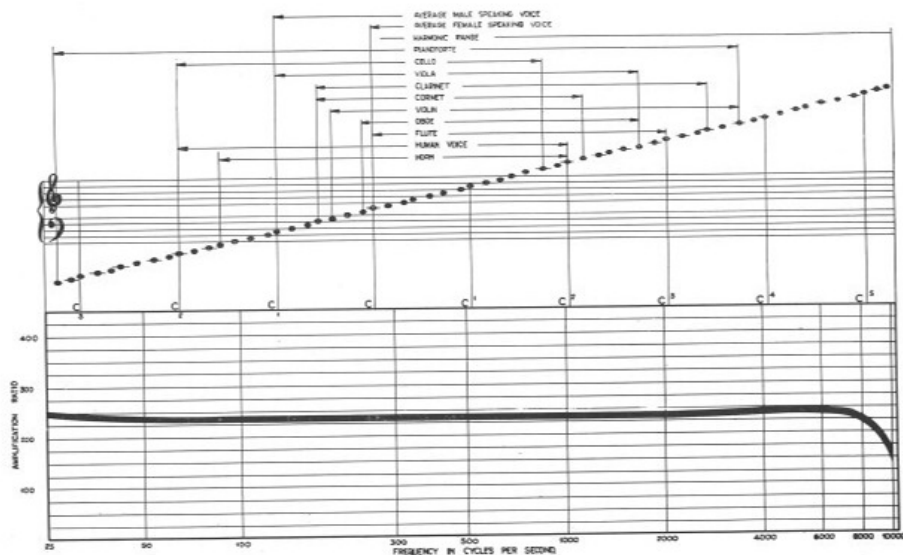


Fig. 2.

Fig. 2 shows the overall amplification of the A.C. Mains Amplifier, Type A.C. 12C.

OPERATION.

The manipulation and operation of these Amplifiers is quite simple, but there are one or two points to watch, and these are therefore dealt with as follows :—

CAUTION : Always switch off, and in the case of mains apparatus, disconnect from the mains before making adjustments.

In all cases, more especially in the mains-operated apparatus, it is desirable to insert all the valves in their various holders before switching on (having previously ascertained that all connections are correct), as unless this is done unduly high voltages may be imposed on certain apparatus, such as condensers and resistances, and so introducing the possibility of breakdown. The whole of the apparatus included in these Amplifiers has, of course, a very high safety factor, but unless the procedure just outlined is adopted, it may result in pressures of the order of 700 or 800 volts being applied to condensers and other apparatus, which, when the Amplifier is functioning normally, has applied to it a pressure only of the order of about 150 volts.

Accompanying the details for the construction of each Amplifier are given particulars as to recommended valves, and whilst in certain instances the apparatus may function satisfactorily with others, it should be understood that any Amplifier will function best with a given combination of valves ; and, therefore, any departure from our recommendations in this respect is to be deprecated.

In the same way, we would emphasize most strongly the fact that the actual type and position of the various components has a material effect on the performance of each Amplifier, and that if the arrangements shown are departed from appreciably it may give rise to difficulties, such, for example, as mains hum and other problems.

The operation of the Battery-operated Amplifier Type Q.P.P. calls for little comment, except to see that the output transformer ratio is correct for the type of speaker or speakers operated (and, of course, this applies with equal force to all other Amplifiers), and also that adequate H.T. is used. It is recommended for this Amplifier that the H.T. battery gives not less than 120 volts (preferably 150), and if H.T. accumulators can be used, so much the better. It is important to note that if the H.T. voltage falls below about 90 the results will not be satisfactory, although they can then sometimes be improved by increasing the output transformer ratio to compensate for the increased impedance of the output valve.

Sometimes, where no mains are available but where adequate H.T. can be provided, the Class "A" system of push-pull is preferred, as, for example, in connection with small portable public-address equipments which may be run from batteries or from a battery-operated motor generator provided that H.T. up to about 500 volts at 130 milliamps is available. In such a case either the A.C. 6C or A.C. 12C Amplifier may quite readily be modified by omitting the Mains Transformer and Rectifying Valve and feeding H.T. directly across the Rectifier smoothing condensers. Sometimes additional smoothing may be required in this case.

Two 4 volts batteries would also be required to provide the necessary heater current for all the valves.

OUTPUT TRANSFORMERS.

It is important to utilise the correct ratio of output transformer to match the output valve or valves to the speaker, and a table is given on page 27 for guidance in this respect.

Each amplifier is provided with a volume control which should be carefully regulated so that the volume is such that distortion due to valve overloading is not apparent.

The Amplifiers A.C.6C and A.C.12C are suitable for use with a microphone. In such cases the microphone must, of course, include a microphone transformer, and this should be fairly close to the amplifier and not in a position where it will pick up hum.

It will, with the average microphone, be found desirable to increase the value of the volume control to .25 or .5 megohms.

The leads between the pickup or microphone should be screened and the metal casing of the screen should be earthed to the earth terminal.

CONSTRUCTIONAL DATA

TYPE Q.P.P. AMPLIFIER :
FOR BATTERY OR ELIMINATOR OPERATION.

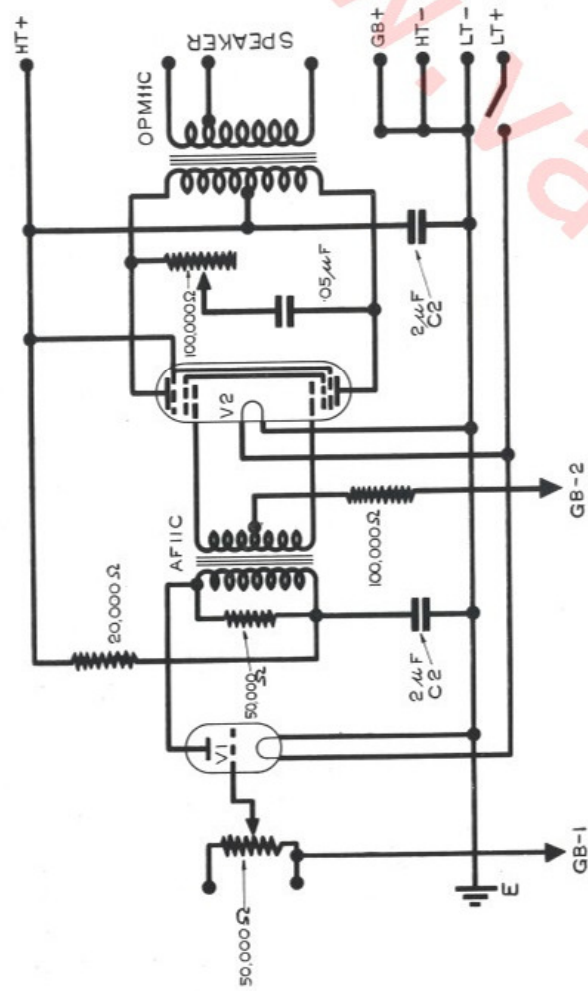


Fig. 3. The theoretical circuit of the type Q.P.P. Amplifier.

TYPE Q.P.P. AMPLIFIER—(continued).

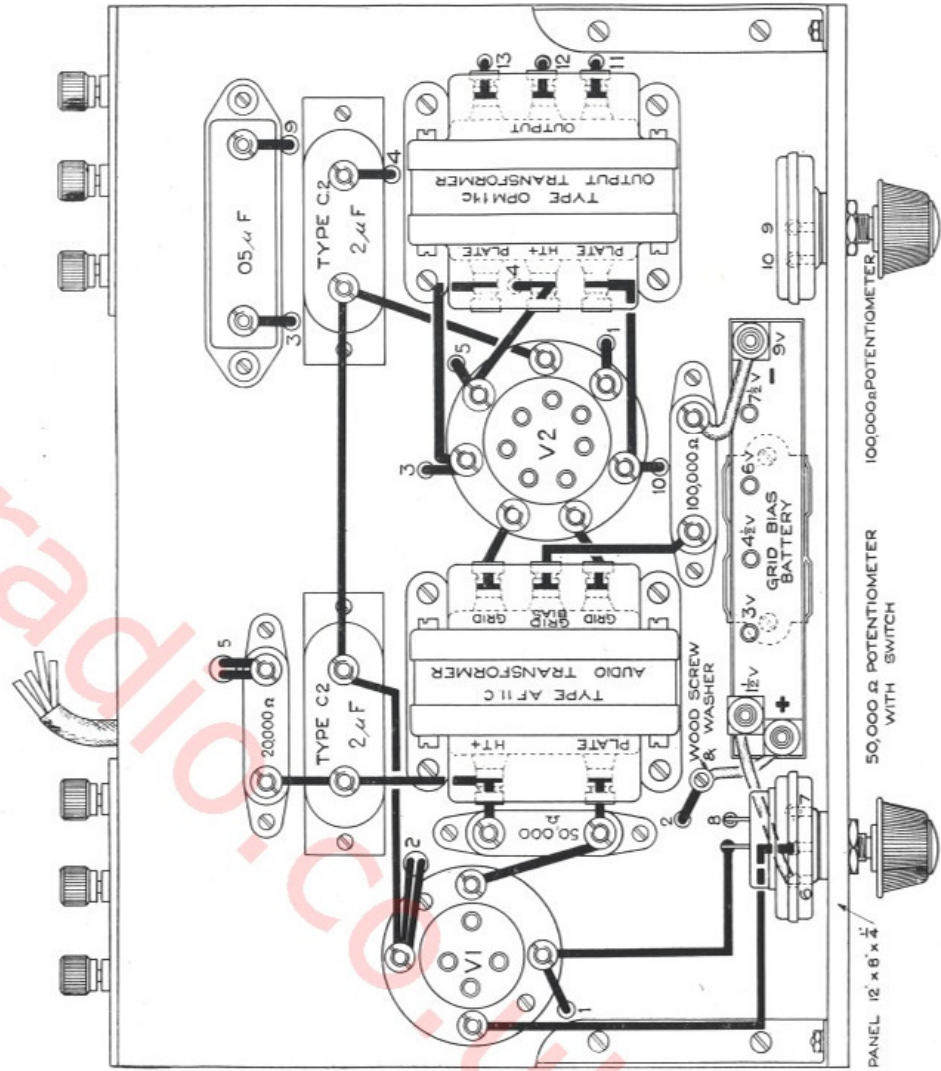


Fig. 4. The layout and above baseboard wiring of the components of the Q.P.P. Amplifier.

TYPE Q.P.P. AMPLIFIER—(continued).

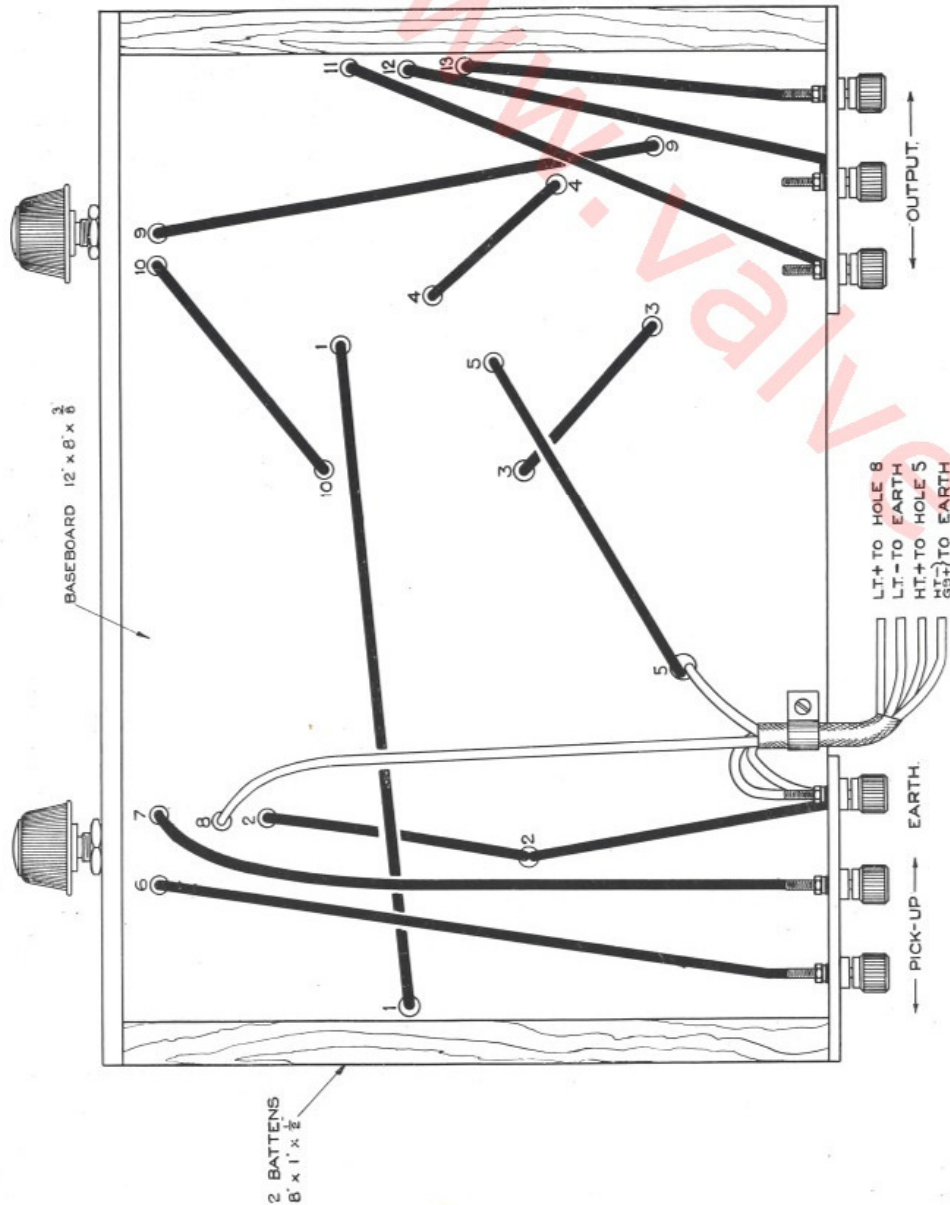


Fig. 5. Below baseboard wiring of the Q.P.P. Amplifier.

TYPE Q.P.P. AMPLIFIER—(continued).

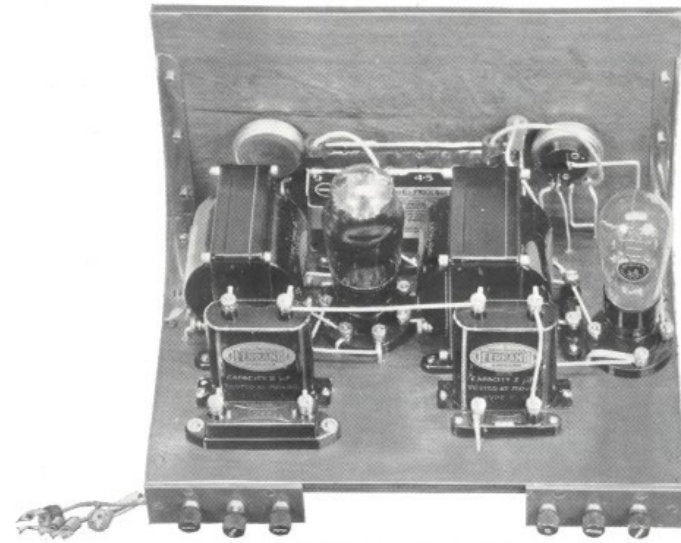


Fig. 6. General View of Q.P.P. Amplifier.

LIST OF PARTS FOR TYPE Q.P.P. AMPLIFIER.

	£	s.	d.
1 - FERRANTI AF11c Transformer	1	14	0
1 - FERRANTI OPM11c Transformer (or OPM13c)	1	6	6
2 - FERRANTI C.2 Condensers @ 3/9 each	7	6	
1 - FERRANTI 1/2 Watt Resistance GH.5, 100,000 ohms @ 1/- each	1	0	
1 - FERRANTI 1/2 Watt Resistance GH.5, 20,000 ohms @ 1/- each	1	0	
1 - FERRANTI 1/2 Watt Resistance GH.5, 50,000 ohms @ 1/- each	1	0	
1 - FERRANTI 4-Pin Valve Holder, Type BB @ 1/3 each	1	3	
1 - FERRANTI 7-Pin Valve Holder, Type BB @ 2/9 each	2	9	
1 - FERRANTI Type "P" Potentiometer, 100,000 ohms	3	9	
1 - FERRANTI Type "PG" Potentiometer, with Switch, 50,000 ohms	4	6	
1 - FERRANTI C.37F Condenser	1	6	
1 - FERRANTI L2 Valve	7	0	
1 - Marconi or Osram QP21 Valve	1	2	6
6 - Terminals @ 2d. each	1	0	
1 - Pair Panel Brackets	4		
3 - Wander Plugs @ 3d. each	9		
1 - 9V Grid Bias Battery	1	0	
1 - Grid Bias Battery Clip	6		
1 - Baseboard, 12" x 8" x 1/16"	} say	1	6
2 - Battens, 8" x 1" x 1/2"			
1 - Panel, 12" x 8" x 1/4"			
Total	£5	19	4

VALVES.

VI.	V2.
FERRANTI L2	Marconi-Osram QP21

TYPE A.C.2-5C AMPLIFIER : FOR A.C. MAINS OPERATION.

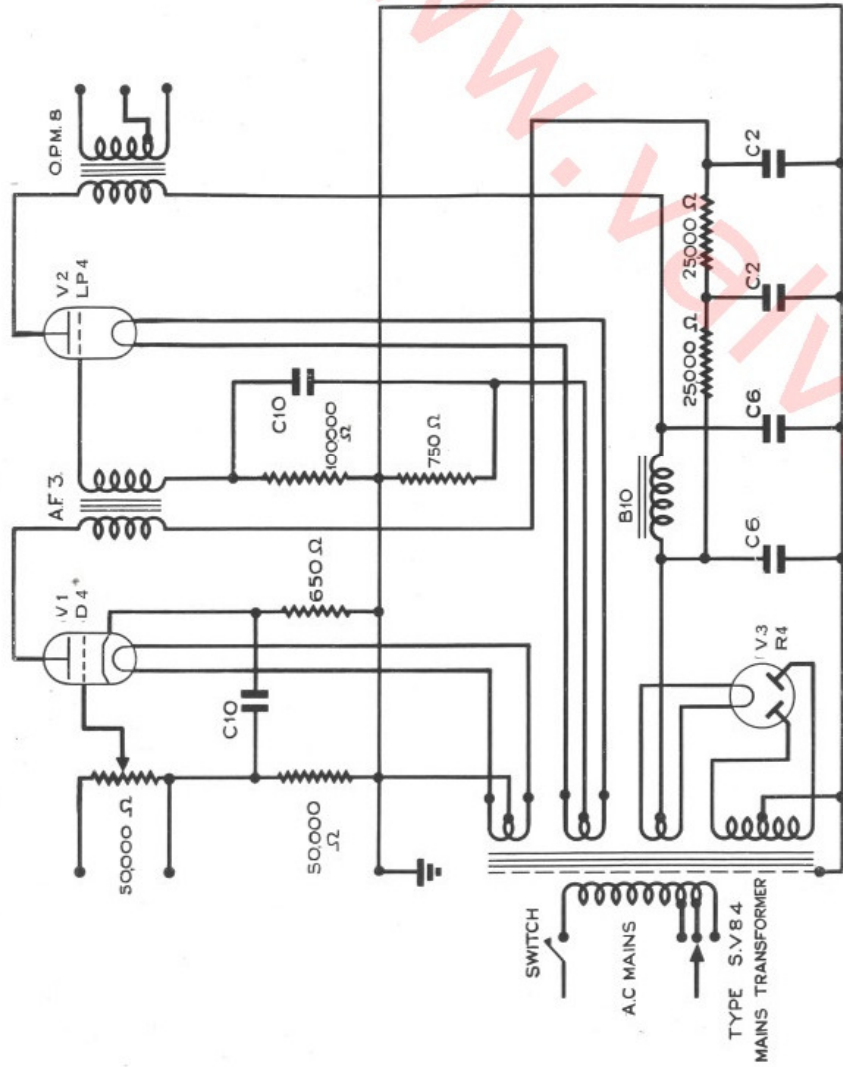


Fig. 7. Theoretical Circuit of A.C.2-5C Amplifier.

TYPE A.C.2-5C AMPLIFIER—(continued).

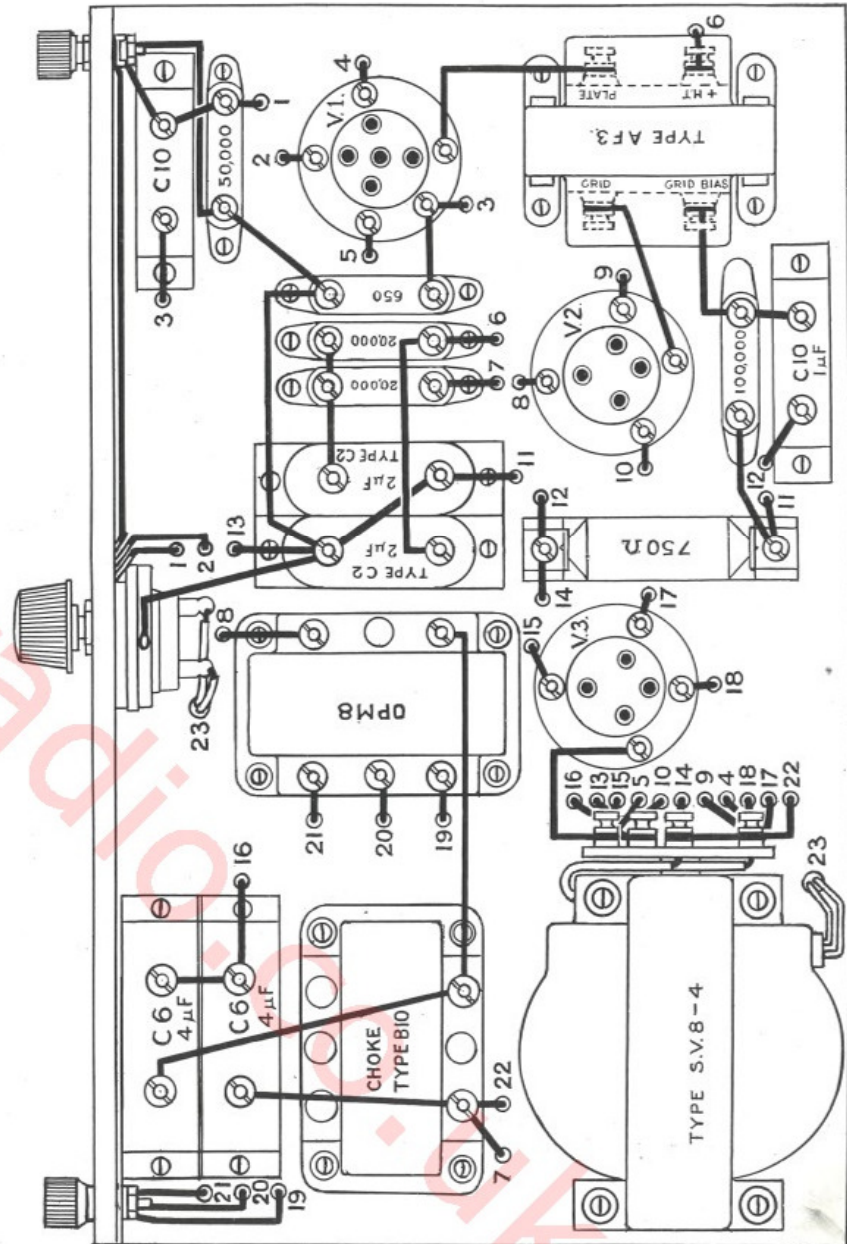


Fig. 8. Above-Baseboard layout for A.C.2-5C Amplifier.

TYPE A.C.2-5C AMPLIFIER—(continued).

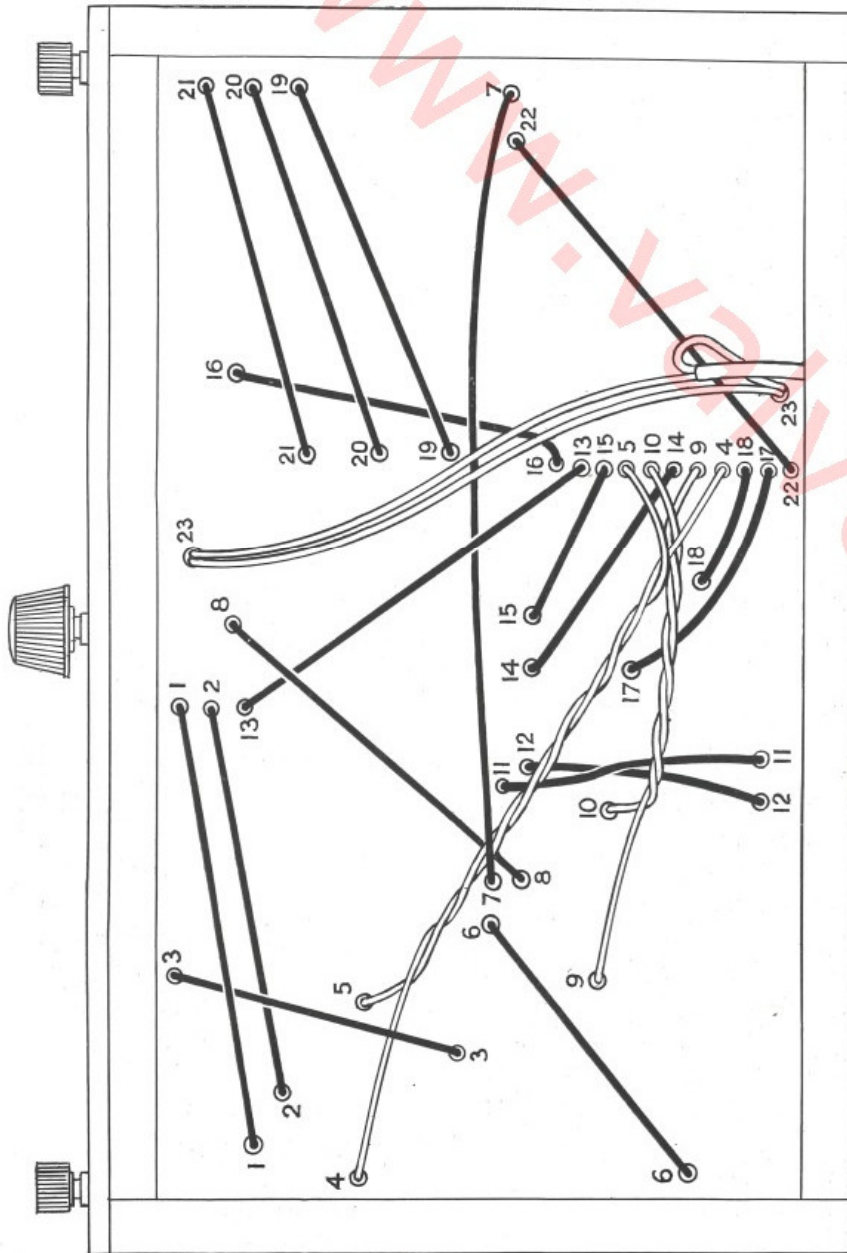


Fig. 9. Below-Baseboard wiring of A.C.2-5 C Amplifier.

TYPE A.C.2-5C AMPLIFIER—(continued).

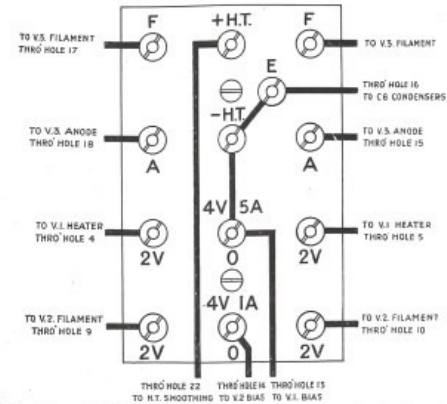


Fig. 10. Type SV84 Mains Transformer Secondary Panel Connections.

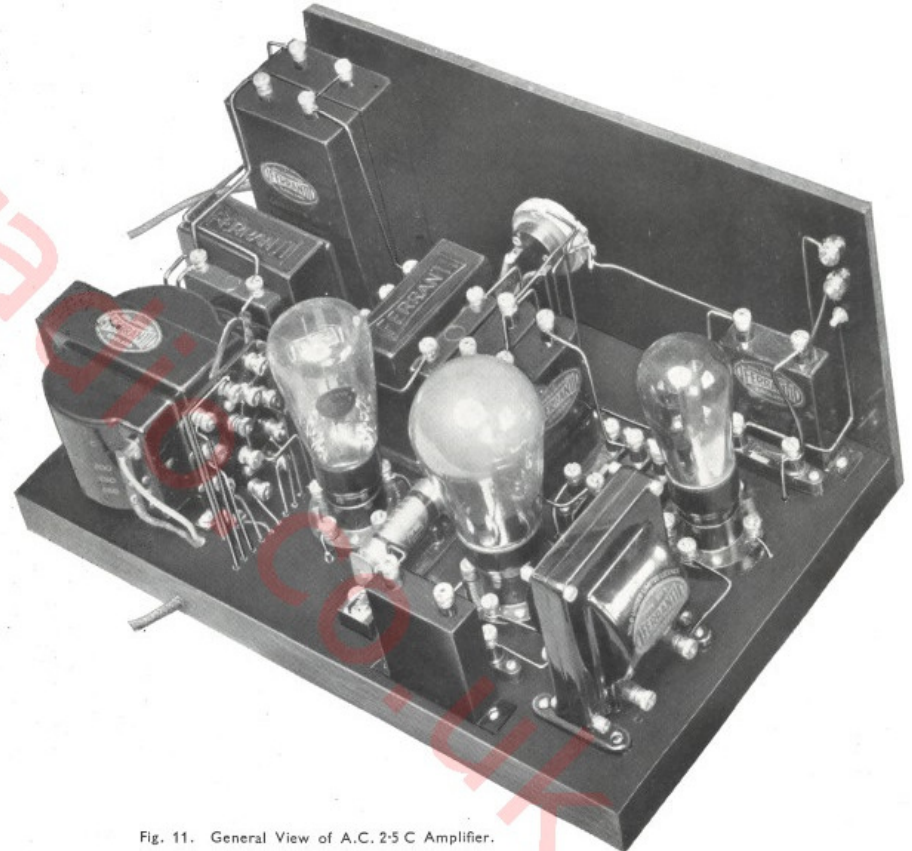


Fig. 11. General View of A.C.2-5 C Amplifier.

FERRANTI CONSTRUCTIONAL POWER AMPLIFIERS.

TYPE A.C.2-5C AMPLIFIER—(continued).

LIST OF PARTS FOR THE A.C.2-5C AMPLIFIER.

	£	s.	d.
1 - FERRANTI Mains Transformer, S.V.84	1	15	0
1 - FERRANTI AF3 Transformer	1	5	0
1 - FERRANTI OPM8 Transformer	12	6	
1 - FERRANTI B.10 Choke	11	0	
2 - FERRANTI C.6 Condensers @ 7/6 each	15	0	
2 - FERRANTI C.10 Condensers @ 3/- each	6	0	
2 - FERRANTI C.2 Condensers @ 3/9 each	7	6	
2 - FERRANTI 1 Watt Resistances GH.1, 25,000 ohms @ 1/6 each	3	0	
1 - FERRANTI 1/2 Watt Resistance GH.5, 50,000 ohms @ 1/-	1	0	
1 - FERRANTI 1/2 Watt Resistance GH.5, 100,000 ohms @ 1/-	1	0	
1 - FERRANTI 1/2 Watt Resistance GH.5, 650 ohms @ 1/-	1	0	
1 - FERRANTI W.W. Resistance with Holder, 750 ohms @ 3/10	3	10	
1 - FERRANTI Type "PS" Potentiometer, 50,000 ohms	4	6	
2 - FERRANTI 4-Pin Valve Holders @ 1/3 each	2	6	
1 - FERRANTI 5-Pin Valve Holder @ 1/6	1	6	
1 - FERRANTI Valve, Type D4	13	6	
1 - FERRANTI Valve, Type LP4	16	6	
1 - FERRANTI Valve, Type R4	15	0	
6 - Belling Lee Terminals @ 2d. each	1	0	
Baseboard, 15" × 9" × 1/2"			
Panel, 15" × 7" × 1/4"			
2 - Battens, 9" × 3/8" × 3/8"	}	say	2 0
2 - Battens, 13 1/4" × 3/8" × 3/8"			
Screws			
Wire			
Sleeving			
Total	£8	18	4

VALVES.

V1.	V2.	V3.
FERRANTI D4	FERRANTI LP4	FERRANTI R4

TYPE A.C.6C AMPLIFIER : FOR A.C. MAINS OPERATION.

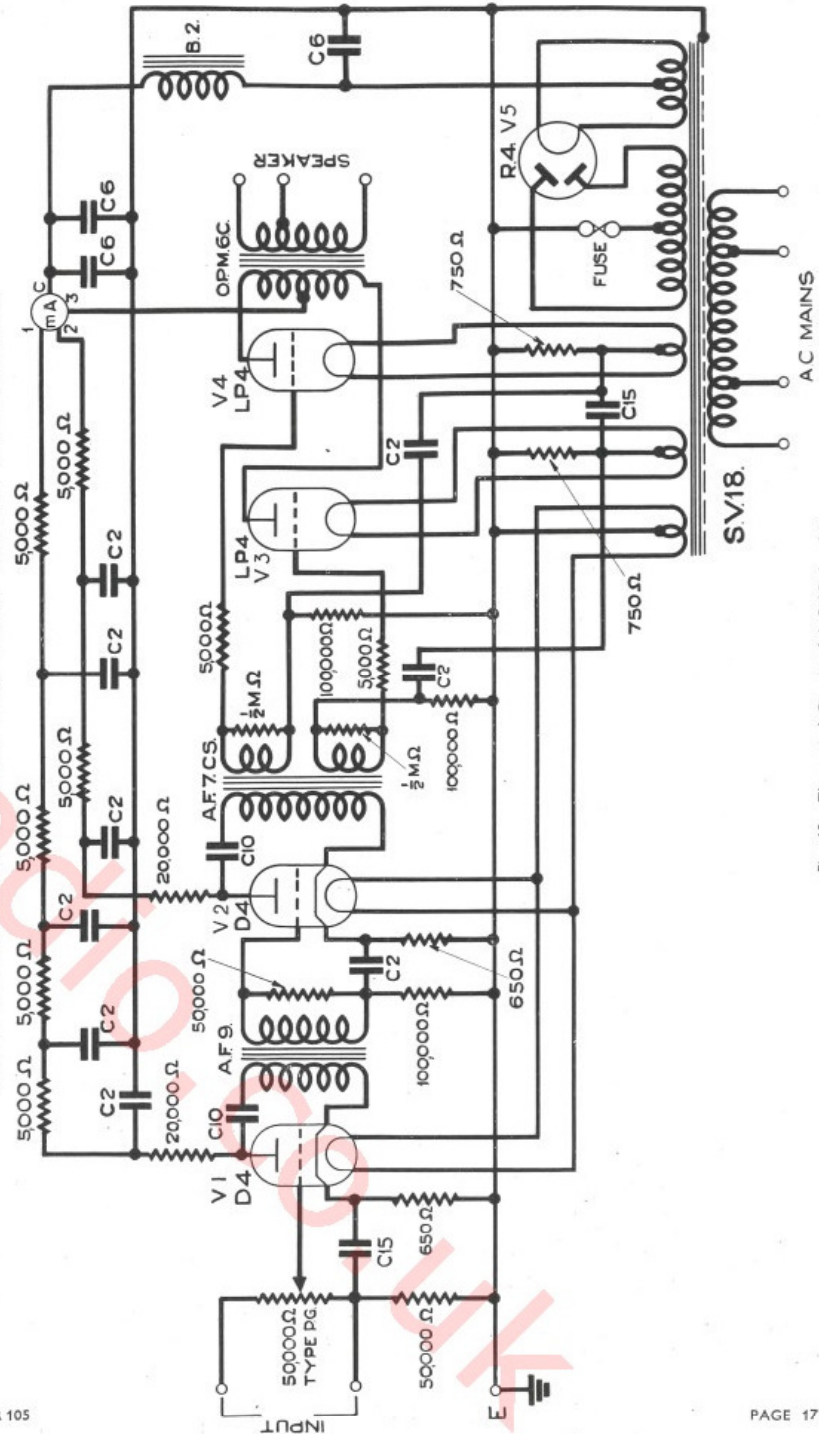


Fig. 12. Theoretical Circuit of A.C.6C Amplifier.

TYPE A.C.6C AMPLIFIER—(continued).

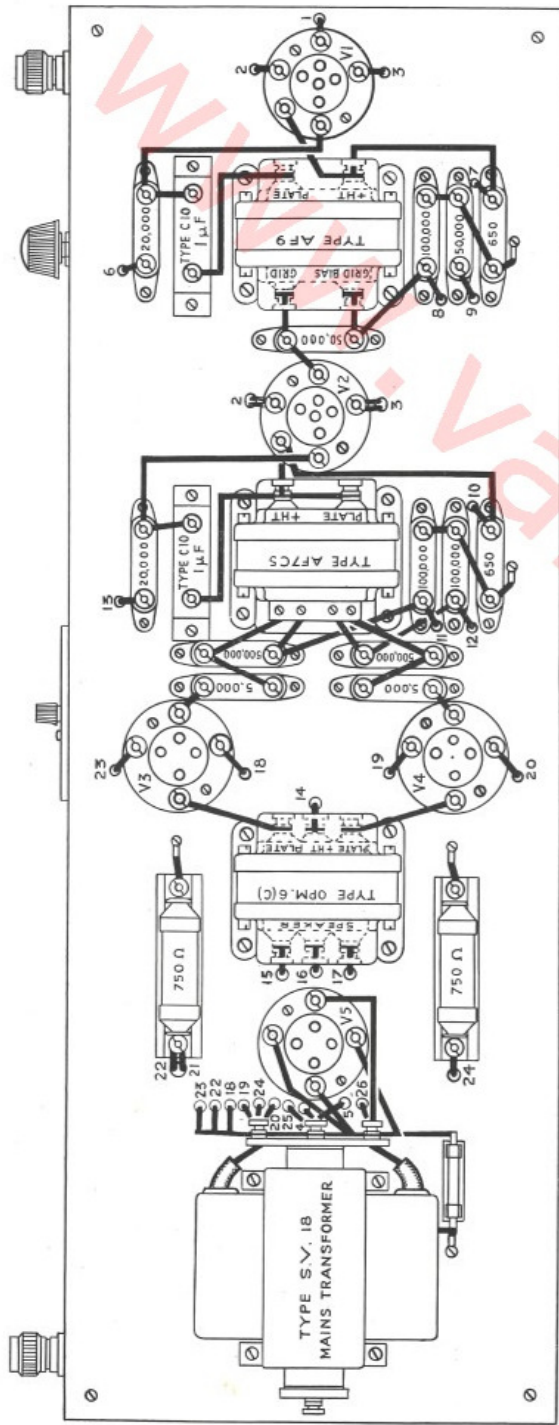
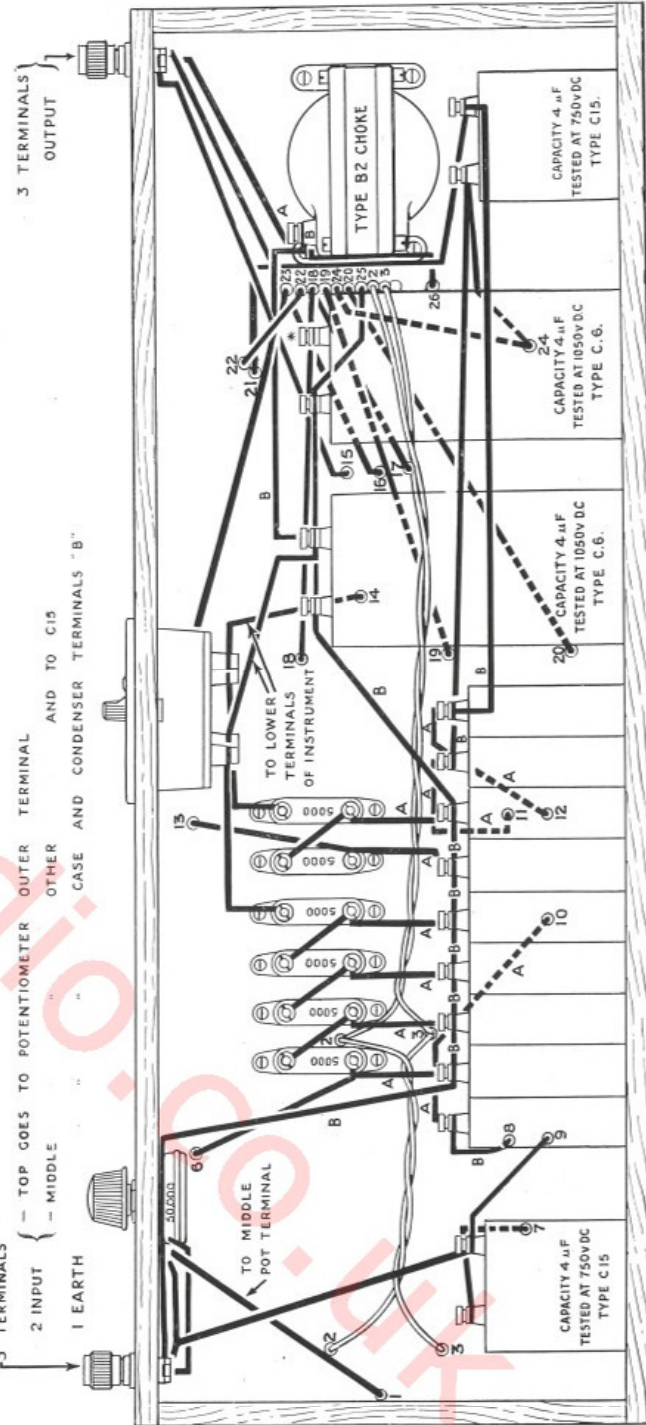


Fig. 13. Above-Baseboard Layout of A.C.6C Amplifier.

TYPE A.C.6C AMPLIFIER—(continued).

3 TERMINALS }
 2 INPUT { — TOP GOES TO POTENTIOMETER OUTER TERMINAL AND TO C15
 — MIDDLE OTHER CASE AND CONDENSER TERMINALS "B"
 1 EARTH



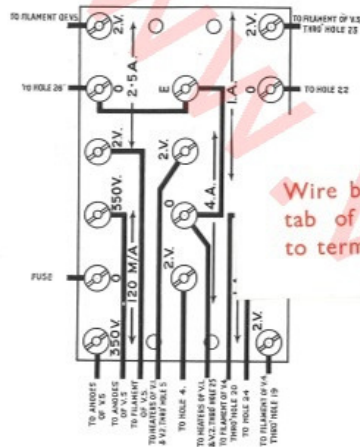
A = CONNECTIONS TO INNER TERMINALS
 B = " " OUTER

2 C6. CONDENSERS IN PARALLEL

* C6. TERMINAL CONNECTED TO INNER B2 TERMINAL "A"

Fig. 14. Below-Baseboard wiring of A.C.6C Amplifier.

TYPE A.C.6C AMPLIFIER—(continued).



ERRATA.
Wire between terminal 0 centre tab of 4-volt 2.5 amp. joining to terminal E should be omitted.

Fig. 15. Type SV18 Mains Transformer Secondary Panel Connections.

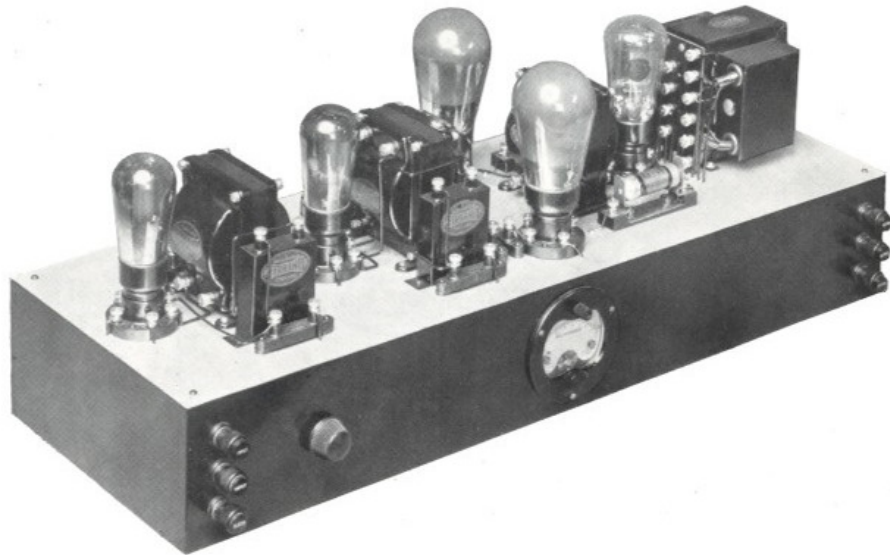


Fig. 16. General View of A.C. 6 C Amplifier.

TYPE A.C.6C. AMPLIFIER—(continued)

LIST OF PARTS FOR A.C.6C AMPLIFIER.

	£	s.	d.
1 - FERRANTI Mains Transformer, S.V.18	2	2	6
1 - FERRANTI AF9 Transformer	1	10	0
1 - FERRANTI AF7cs Transformer	1	14	0
1 - FERRANTI OPM6c Transformer	1	6	6
1 - FERRANTI B.2 Choke	1	1	0
9 - FERRANTI C.2 Condensers	@ 3/9	each	1 13 9
3 - FERRANTI C.6 Condensers	@ 7/6	each	1 2 6
2 - FERRANTI C.10 Condensers	@ 3/-	each	6 0
2 - FERRANTI C.15 Condensers	@ 6/9	each	13 6
2 - FERRANTI W.W. Resistances with Holders, 500 ohms	@ 3/10	each	7 8
8 - FERRANTI 1/2 Watt Resistances GH.5, 5,000 ohms	@ 1/-	each	8 0
2 - FERRANTI 1/2 Watt Resistances GH.5, 650 ohms	@ 1/-	each	2 0
2 - FERRANTI 1/2 Watt Resistances GH.5, 50,000 ohms	@ 1/-	each	2 0
3 - FERRANTI 1/2 Watt Resistances GH.5, 100,000 ohms	@ 1/-	each	3 0
2 - FERRANTI 1/2 Watt Resistances GH.5, 500,000 ohms	@ 1/-	each	2 0
2 - FERRANTI 1 Watt Resistances GH.1, 20,000 ohms	@ 1/6	each	3 0
3 - FERRANTI 4-Pin Valve Holders	@ 1/3	each	3 9
2 - FERRANTI 5-Pin Valve Holders	@ 1/6	each	3 0
1 - FERRANTI Type "PG" Potentiometer, 50,000 ohms			4 9
1 - FERRANTI 3-Way Milliammeter, List No. 153 SF.			2 15 0
2 - FERRANTI Valves, Type D4	@ 13/6	each	1 7 0
2 - FERRANTI Valves, Type LP4	@ 16/6	each	1 13 0
1 - FERRANTI Valve, Type R4	@ 15/-		15 0
6 - Belling Lee Terminals			3 0
1 - Belling Lee Fuse			9
Baseboard.—Wood :	1 Piece, 25 1/4" x 8 1/4" x 3/8"		
	2 Pieces, 26" x 4" x 3/8"		
	2 Pieces, 8 1/2" x 4" x 3/8"		
Aluminium :	1 Piece, 26" x 9" x .040"		
Quantity of Screws, Wire, and Sleeving			say 5 0
Total			£20 7 8

VALVES.

V1.	V2.	V3 and V4.	V5.
FERRANTI D4	FERRANTI D4	2 FERRANTI LP4's	FERRANTI R4

TYPE A.C.12C AMPLIFIER: FOR MAINS OPERATION.

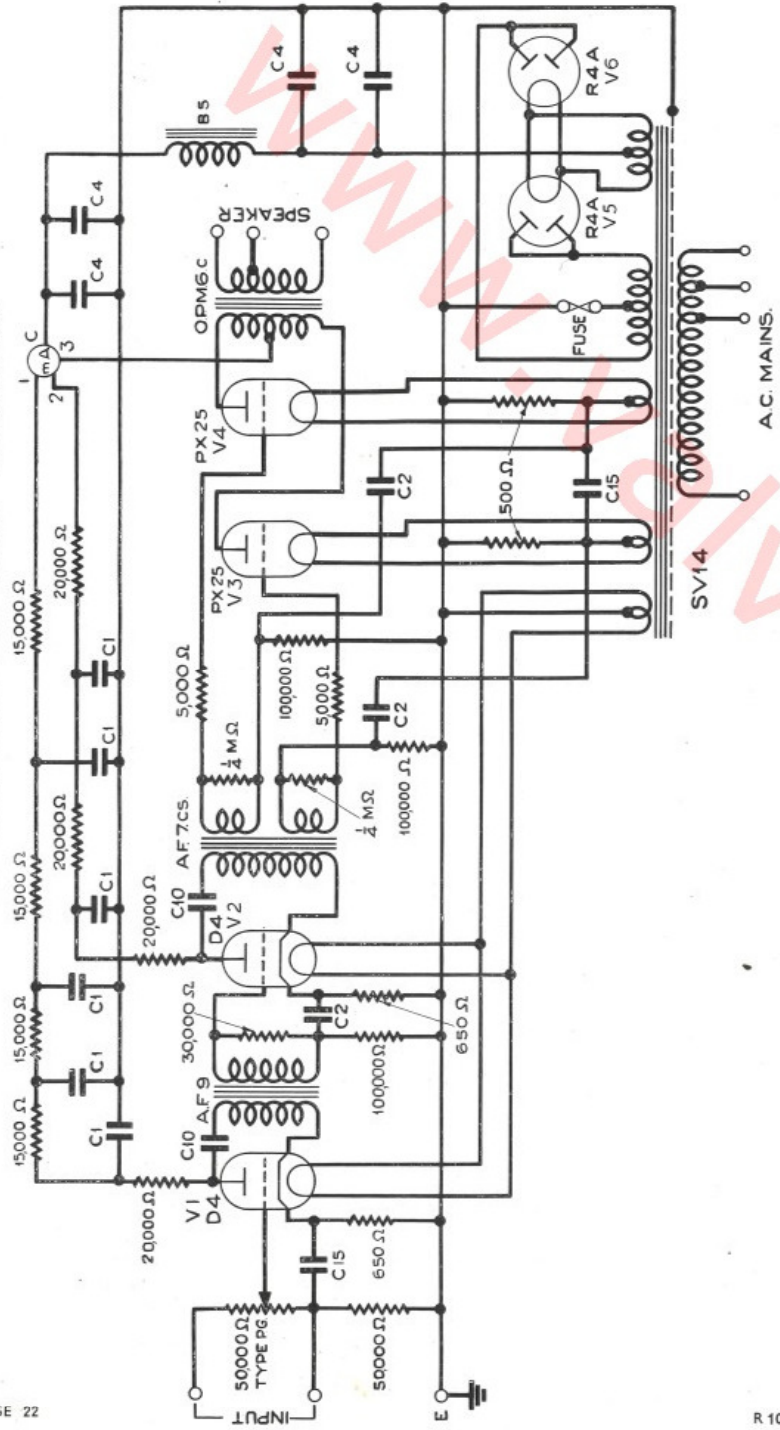


Fig. 17. Theoretical Circuit of A.C.12C Amplifier

TYPE A.C.12C AMPLIFIER—(continued).

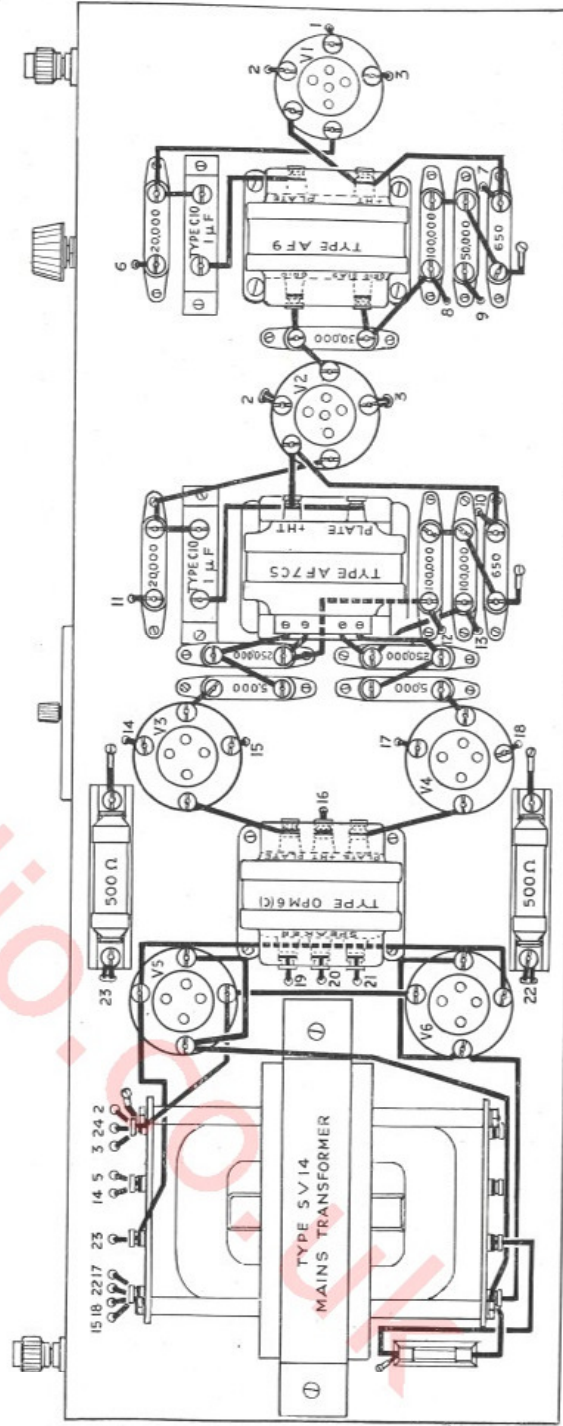


Fig. 18. Above-Baseboard Layout of A.C.12C Amplifier.

TYPE A.C.12C AMPLIFIER—(continued).

TYPE A.C.12C AMPLIFIER—(continued).

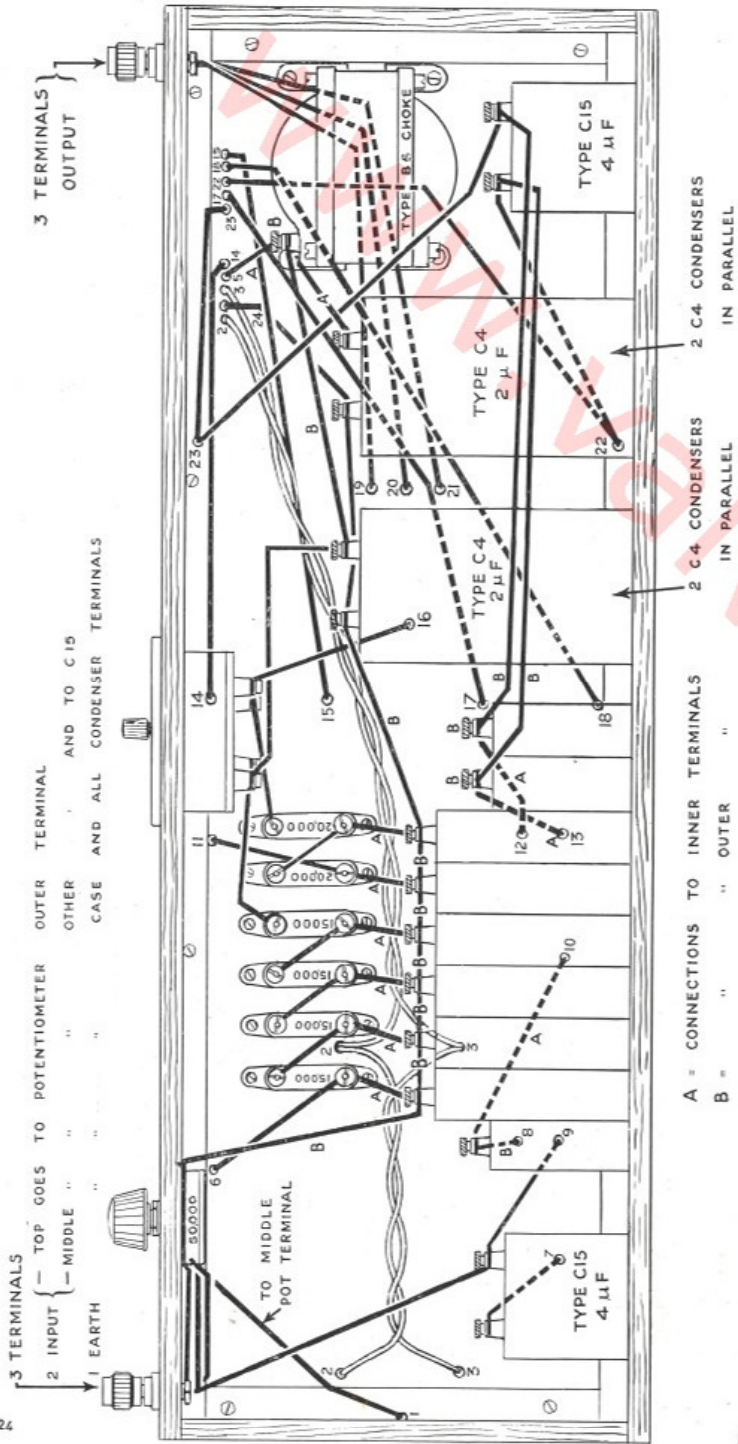


Fig. 19. Below-Baseboard wiring of A.C.12B Amplifier.

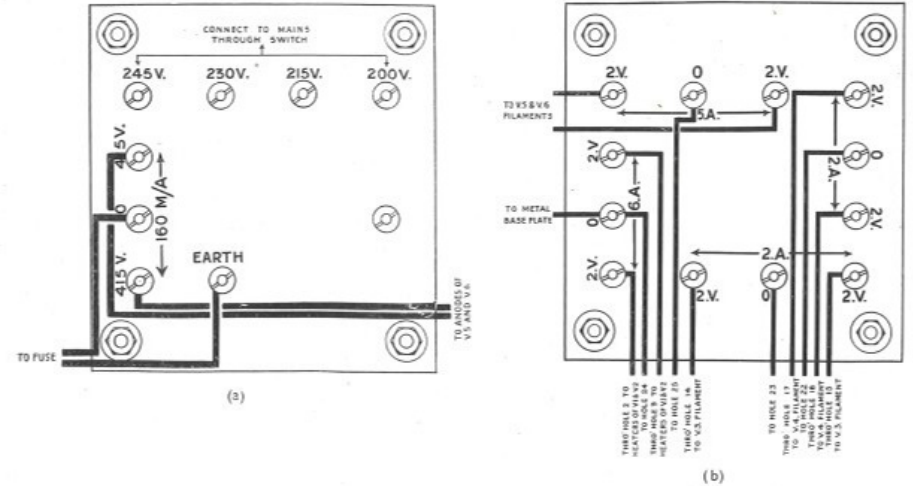


Fig. 20. Type SV14 Mains Transformer Panel Connections.
(a) Mains Input Panel. (b) Rectifier and Output Panel.

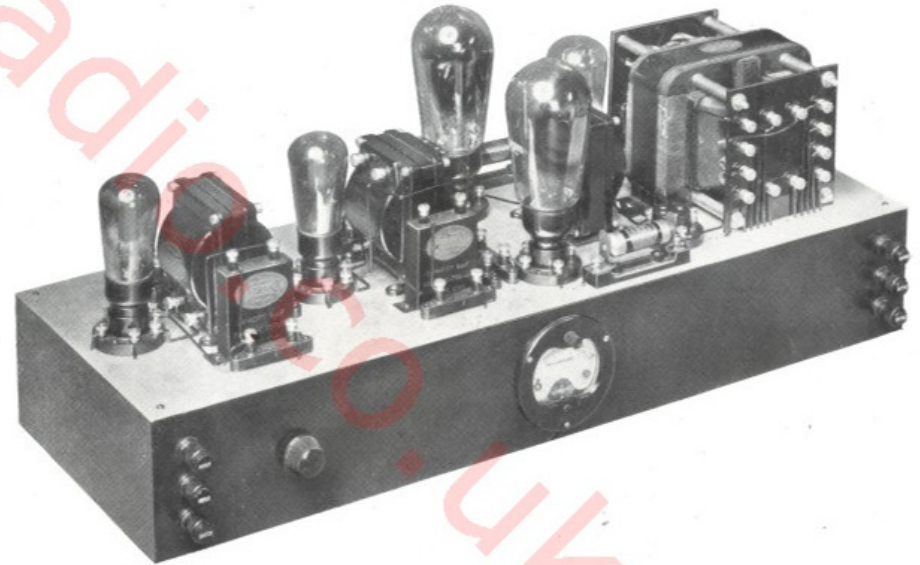


Fig. 21. General View of A.C.12C Amplifier.

FERRANTI CONSTRUCTIONAL POWER AMPLIFIERS.

TYPE A.C.12C. AMPLIFIER—(continued).

LIST OF PARTS FOR THE A.C.12C AMPLIFIER.

	£	s.	d.
1 - FERRANTI Mains Transformer, S.V.14	4	18	6
1 - FERRANTI AF9 Transformer	1	10	0
1 - FERRANTI AF7cs Transformer	1	14	0
1 - FERRANTI OPM6c Transformer	1	6	6
1 - FERRANTI B.5 Choke	1	7	6
6 - FERRANTI C.1 Condensers @ 4/6 each	1	7	0
3 - FERRANTI C.2 Condensers @ 3/9 each	11	3	
4 - FERRANTI C.4 Condensers @ 9/6 each	1	18	0
2 - FERRANTI C.10 Condensers @ 3/- each	6	0	
2 - FERRANTI C.15 Condensers @ 6/9 each	13	6	
2 - FERRANTI W.W. Resistances with Holders, 500 ohms @ 3/10 each	7	8	
4 - FERRANTI 1/2 Watt Resistances GH.5, 15,000 ohms @ 1/- each	4	0	
2 - FERRANTI 1/2 Watt Resistances GH.5, 650 ohms @ 1/- each	2	0	
3 - FERRANTI 1/2 Watt Resistances GH.5, 100,000 ohms @ 1/- each	3	0	
2 - FERRANTI 1/2 Watt Resistances GH.5, 250,000 ohms @ 1/- each	2	0	
2 - FERRANTI 1/2 Watt Resistances GH.5, 5,000 ohms @ 1/- each	2	0	
1 - FERRANTI 1/2 Watt Resistance GH.5, 30,000 ohms @ 1/- each	1	0	
1 - FERRANTI 1/2 Watt Resistance GH.5, 50,000 ohms @ 1/- each	1	0	
4 - FERRANTI 1 Watt Resistances GH.1, 20,000 ohms @ 1/6 each	6	0	
4 - FERRANTI 4-Pin Valve Holders @ 1/3 each	5	0	
2 - FERRANTI 5-Pin Valve Holders @ 1/6 each	3	0	
1 - FERRANTI Type "PG" Potentiometer, 50,000 ohms	4	9	
1 - FERRANTI 3-Way Milliammeter, List No. 153 SF.	2	15	0
2 - FERRANTI Valves, Type D4 @ 13/6 each	1	7	0
2 - FERRANTI Valves, Type R4A @ 20/- each	2	0	0
2 - Marconi-Osram Valves, Type PX25 @ 25/- each	2	10	0
6 - Belling Lee Terminals	3	0	
1 - Belling Lee Fuse	9		
Baseboard.—Wood:			
1 Piece, 25 1/4" x 8 1/4" x 3/16"			
2 Pieces, 26" x 4" x 3/16"			
2 Pieces, 8 1/4" x 4" x 3/16"			
Aluminium: 1 Piece, 26" x 9" x .040"			
Quantity of Screws, Wire, and Sleeving			
Total	£26	14	5

VALVES.

V1.	V2.	V3 and V4.	V5 and V6.
FERRANTI D4	FERRANTI D4	2 Marconi-Osram PX25's	2 FERRANTI R4A's

FERRANTI

CONSTRUCTIONAL POWER AMPLIFIER

TYPE AC 32C

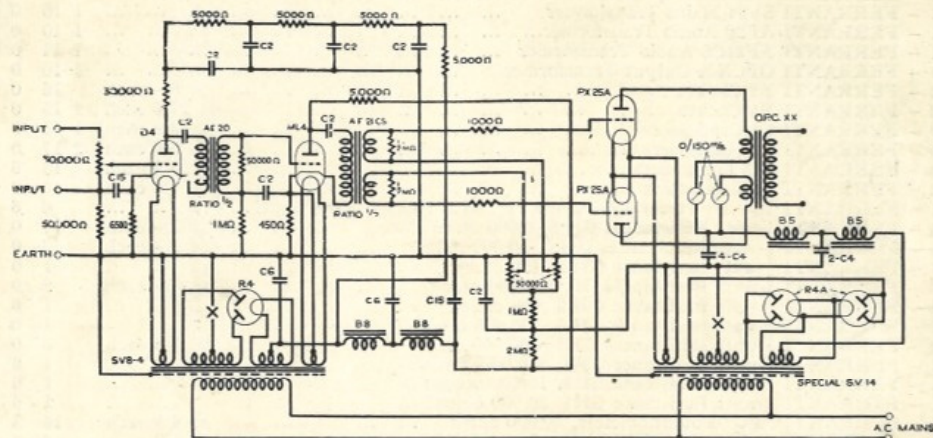


Fig. 1. Theoretical Circuit of AC32C Amplifier.

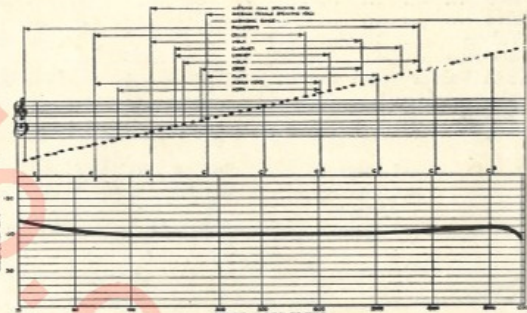


Fig. 2 shows the overall amplification curve of the AC32C Amplifier. If drawn on a decibel scale the maximum deviation from perfection is within 1 1/2 db including output transformer.

The AC32C Amplifier has been developed from the AC12C and AC6C Amplifiers, as described in a separate booklet R105 (Price 6d.), by designing the output stage for the condition known as low-loading push-pull. This stage, though requiring only 110 mA on small signals, will take twice this current on peak swings, and the H.T. feed circuit is fully capable of dealing with this while maintaining almost constant voltage. Bias for the output stage is arranged from a separate circuit, which also forms the anode supply for the other two stages.

The available undistorted output is 32 watts, using an anode supply of only 400 volts, with valves having a filament consumption no greater than those of the 12 watt Amplifier. This Amplifier is quite free from the distortion often found in high efficiency output stages on small volume, and can be fully recommended.

This Amplifier can be loaded fully with an input signal of the order of 0.05 volts R.M.S. It is essentially of the type to feed several speakers simultaneously and will do full justice to the highest quality speakers. It is suitable for either gramophone or microphone operation. When using a microphone it is advisable to employ a microphone transformer.

The AC32C Amplifier is specially suitable for use in large halls, holding, say, 500 to 1,000 people.

LIST OF PARTS FOR THE AC 32C AMPLIFIER.

Type	Price
	£ s. d.
1 - FERRANTI Special SV14 Mains Transformer	4 18 6
1 - FERRANTI SV84 Mains Transformer	1 15 0
1 - FERRANTI AF20 Audio Transformer	1 10 0
1 - FERRANTI AF21CS Audio Transformer	1 14 0
1 - FERRANTI OPCXX Output Transformer	3 10 0
2 - FERRANTI B8 Chokes	@ 8/- each 16 0
2 - FERRANTI B5 Chokes	@ 27/6 each 2 15 0
9 - FERRANTI C2 Condensers	@ 3/9 each 1 13 0
6 - FERRANTI C4 Condensers	@ 9/6 each 2 17 0
2 - FERRANTI C15 Condensers	@ 6/9 each 13 0
2 - FERRANTI C6 Condensers	@ 7/6 each 15 0
1 - FERRANTI 10-watt Power Resistance "P" with Holder, 5,000 ohms	6 0
4 - FERRANTI 1/2-watt Resistances GH-5, 5,000 ohms	@ 1/- each 4 0
2 - FERRANTI 1/2-watt Resistances GH-5, 50,000 ohms	@ 1/- each 2 0
1 - FERRANTI 1/2-watt Resistance GH-5, 450 ohms	1 0
2 - FERRANTI 1/2-watt Resistances GH-5, 1,000 ohms	@ 1/- each 2 0
1 - FERRANTI 1/2-watt Resistance GH-5, 650 ohms	1 0
1 - FERRANTI 1/2-watt Resistance GH-5, 100,000 ohms	1 0
2 - FERRANTI 1/2-watt Resistances GH1, 500,000 ohms	@ 1/6 each 3 0
1 - FERRANTI 1-watt Resistance GH1, 200,000 ohms	1 6 0
1 - FERRANTI 1-watt Resistance GH1, 100,000 ohms	1 6 0
1 - FERRANTI 1-watt Resistance GH1, 30,000 ohms	1 6 0
3 - FERRANTI "PG" Potentiometers, 50,000 ohms	@ 4/9 each 14 3 0
5 - FERRANTI 4-pin Valve Holders	@ 1/3 each 6 3 0
2 - FERRANTI 5-pin Valve Holders	@ 1/6 each 3 0
2 - FERRANTI Type 4F Milliammeters	@ 35/- each 3 10 0
1 - FERRANTI D4 Valve	9 6 0
1 - FERRANTI R4 Valve	10 6 0
2 - FERRANTI R4A Valves	@ 15/- each 1 10 0
1 - Marconi-Osram ML4 Valve	10 0
2 - Marconi-Osram PX25A Valves	@ 25/- each 2 10 0
5 - Belling Lee Terminals	@ 6d. each 2 6 0
2 - Belling Lee Fuses, 1-amp.	@ 9d. each 1 6 0

Baseboard :-

Wood	1 Piece	26 1/2" x 9 1/4" x 3/8"	} say	5 0
	2 Pieces	27 1/4" x 4" x 3/8"		
	2 Pieces	9 1/4" x 4" x 3/8"		
Aluminium	1 Piece	27 1/4" x 10" x .040"		

£34 15 3

V1.	V2.	V3.	V4 and V5.	V6 and V7.
FERRANTI D4	FERRANTI R4	Marconi-Osram ML4	2 Marconi-Osram PX25a's	2 FERRANTI R4a's.

FERRANTI LTD.

RADIO WORKS, MOSTON, MANCHESTER, 10.

Telephone : Failsworth 2271. Telegrams : "Ferranti, Manchester."

Interconnected by Teletypewriter with Office and Depot :

BUSH HOUSE, ALDWYCH, LONDON, W.C.2.

Telephone :
Temple Bar 8666.

Telegrams :
"Ferranti, Bush, London."

FERRANTI CONSTRUCTIONAL POWER AMPLIFIERS.

CABINETS.

The general design of the Cabinets of the various Amplifiers is left to the Constructor, but he is reminded that, particularly in the case of the Mains Amplifiers, such Cabinets should, as far as possible, be fireproof, and should be arranged so that no one can get into accidental contact with the live parts.

It is also essential to provide adequate ventilation, as by virtue of the powerful nature of these Amplifiers, a considerable amount of heat is developed. The ventilation should be such that the temperature within the Cabinet is not higher than 50 degrees centigrade, and preferably lower.

The woodwork used for the Cabinet should preferably be of a hard, non-inflammable type, such as English Oak or Teak.

Metal Cabinets may be used if preferred, provided that all the metal work is permanently earthed.

The construction of any of these Amplifiers is very simple, but we shall be pleased to advise constructors in the unlikely event of trouble being experienced, on receipt of clear details regarding it, as we require every piece of FERRANTI apparatus, wherever installed, to be a lasting advertisement to the goodness of all gear bearing that name.

The whole of the parts for the construction of the apparatus described in this book may be obtained through the usual trade channels, but in case of difficulty we shall be pleased to supply direct C.O.D. or cash with order, as preferred.

OUTPUT TRANSFORMERS REQUIRED.

The output transformer is the only component which is likely to vary in the case of individual constructors, as the ratio of this naturally depends on the speaker or speakers used. In general, the following recommendations may be followed :-

Amplifier.	High-Resistance Speaker, or Low-Resistance Speaker with existing Output Transformer.	Low-Resistance Speaker without Output Transformer.
Q.P.P., Class B A.C. 2.5 C A.C. 6 C A.C. 12 C	OPM 13 c OPM 8 OPM 1 c OPM 1 c	OPM 11 c OPM 8 OPM 6 c OPM 6 c

Further details of these Transformers are given in List R 104.

TYPE A.C.6C AMPLIFIER—(continued).

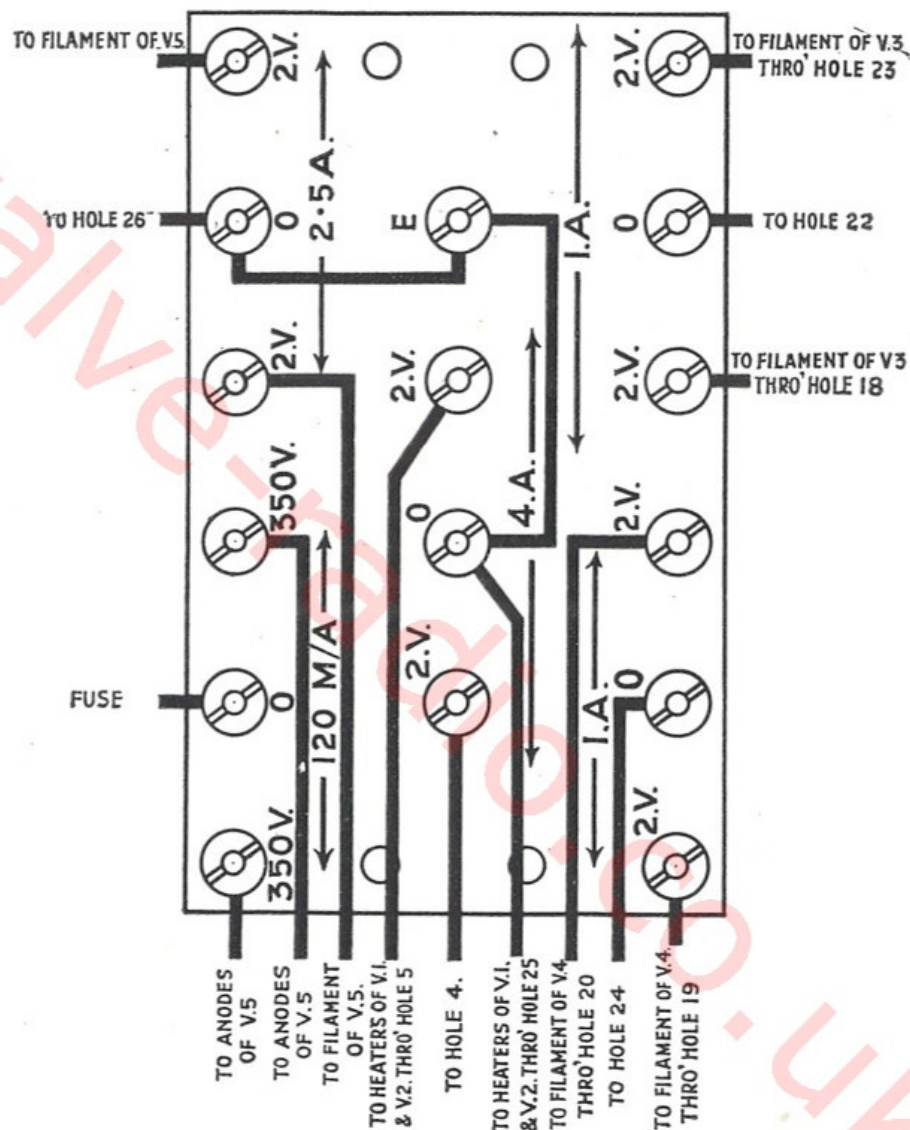


Fig. 15. Type SV18 Mains Transformer Secondary Panel Connections.