The CONNOISSEUR

"Critical Judge of the Fine Arts" — Dictionary

IN keeping with Aegis policy of being the first with the latest we have much pleasure in presenting some new features in receiver design. We have studied the

By

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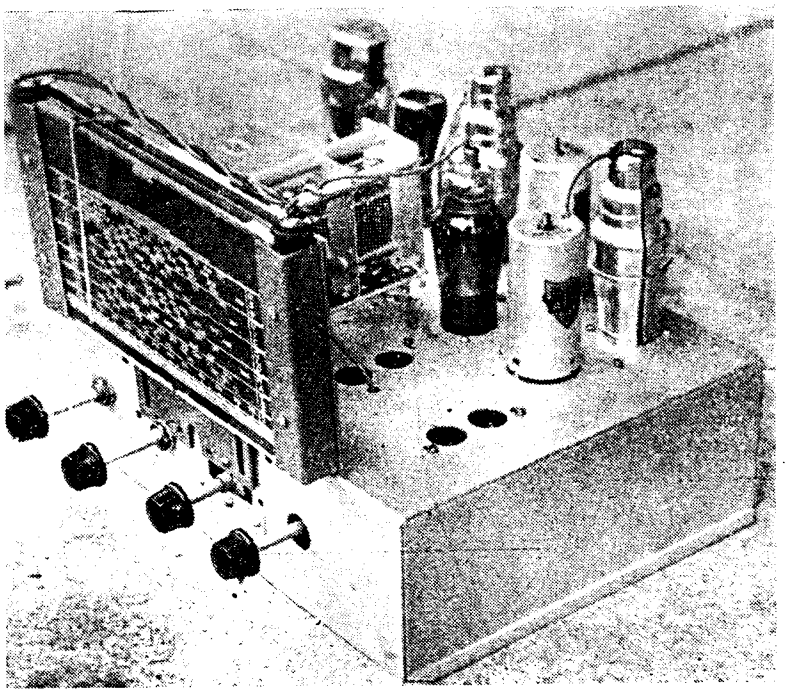
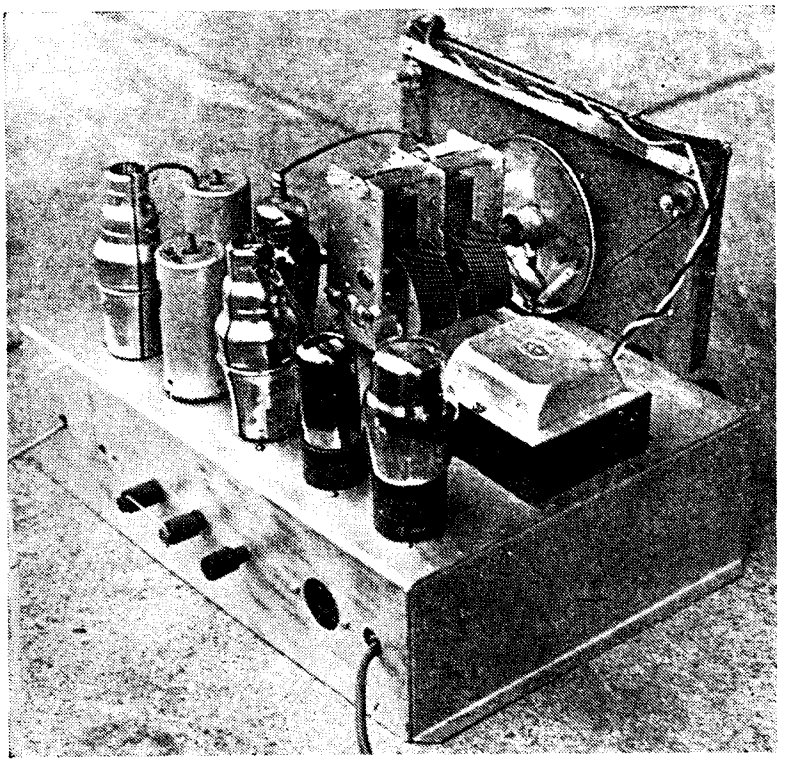
Aegis Manufacturing Co.
MELBOURNE

popularity of the various types of receiver amongst our large and appreciative group of customers and have found that by far the most popular is the 5 valve variety in which there are no unnecessary complications to make it difficult to get going. With this in mind we have developed this new 5 valve receiver which, in conjunction with our latest designs in I.F.T.'s





Above—Front view of the chassis built from the "Connoisseur" kit.

Below—Rear view of the chassis.

Aegis type J9 and J10 and coils type K1, will prove a worthy addition to the field of radio receiver design.

Requirements of a Receiver

The demand for a better than average receiver calls for good sensitivity, good selectivity, dual-wave operation, excellent tonal qualities and most of all be reasonably priced. From the point of view of sensitivity a 5 valve receiver using the modern developments in high performance coils and I.F.T.'s can produce sensitivities of better than 10 microvolts at signal-to-noise ratios of 15 DB. Practical tests have shown that receivers in this class,

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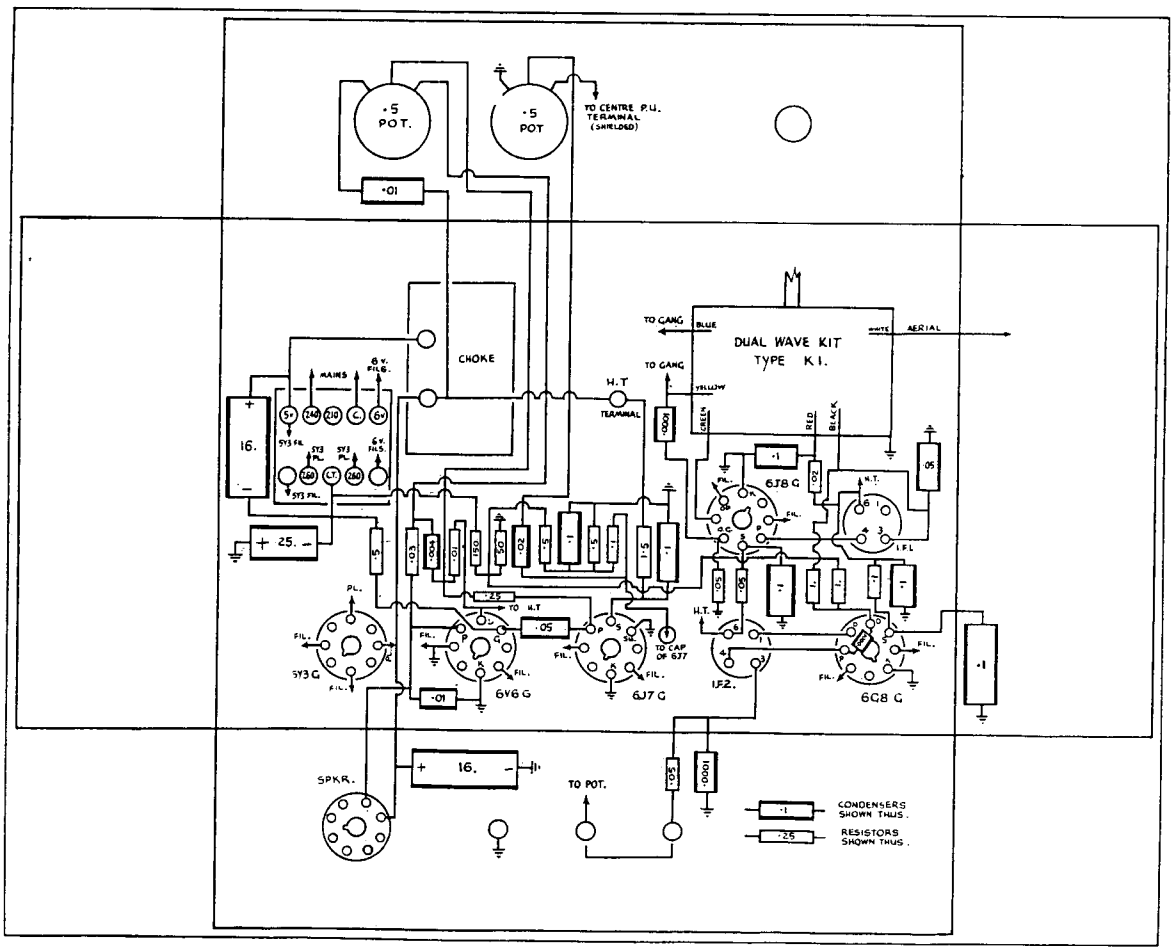
while not being "communication receivers" have a very high degree of performance and are a source of constant enjoyment from both "broadcast" and "shortwave" listening.

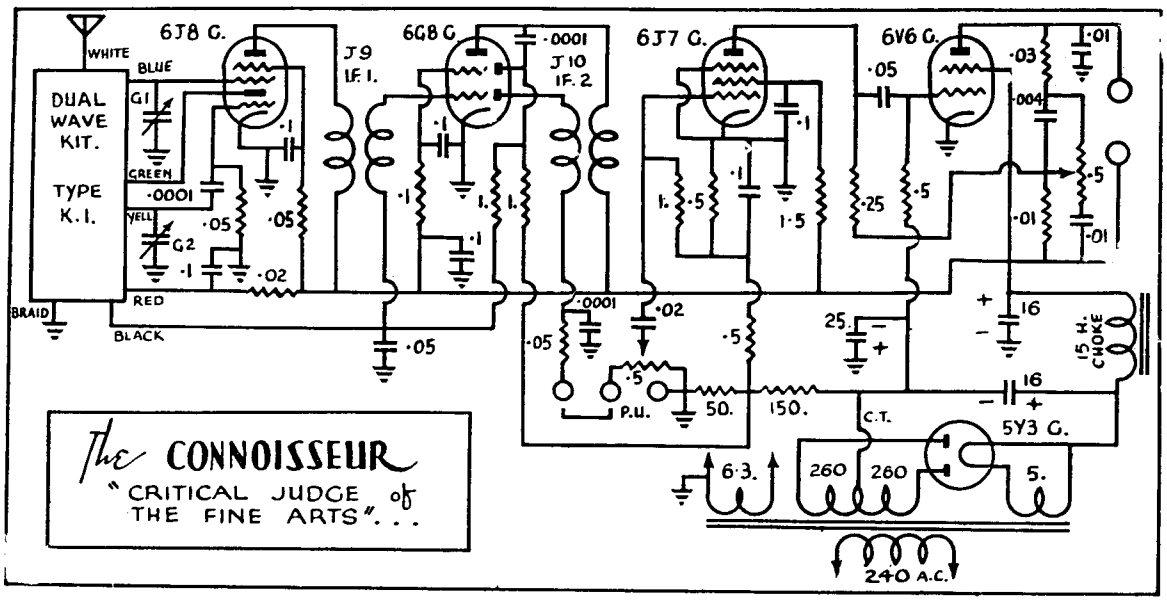
The selectivity and tonal qualities are somewhat dependent on each other as the shape of the I.F. selectivity curve affects the ability of the I.F. amplifier to pass the higher frequencies in the modulation. We have therefore developed a new 455 kc. I.F.T. which combine high gain with the ability to handle modulation frequencies up to 4000 cps. with no attenuation and yet have an adjacent channel selectivity of 26 DB at 10 ks. off resonance and 50 DB at 20 kc. This is sufficient to give reasonable rejection of even strong "locals" only 20 kc away from country and interstate stations and 10 kc separation of stataions of similar signal strength. We therefore recommend these Aegis I.F.T.'s for thei rimproved audio capabilities without sacrificing selectivity.

Having dealt with the aspect of the I.F. channel in regards to the audio response we now come to the audio amplifier itself. This section of a receiver possibly comes in for more comment and argument and a greater divergency of ideas than the rest. We have on the one hand the "hi-fi" experts who believe in the amplifier with a flat frequency response and on the other we have the person who likes to "jiggle" with the frequency response. Without wishing to enter the argument of the pros and cons of either we at least have found that individual listeners have widely divergent opinions of what to them is "good tone." These fall into two broad groups, first those who like a set with a mellow tone — in other words increased bass response — and second those who like a set which is brilliant — increased high frequency response. We have also found that where pentodes and beam tetrodes are used as output tubes inverse feedback is essential. Therefore we have designed a tone control incorporated in the feedback circuit which will give a wide selection of audio response to suit the individual taste without sacrificing the quality, as often happens with tone control circuits.

The Tone Control Circuit

What is required of the tone control is first to give various degrees of bass boost and second various degrees of treble boost. Experience has shown that the application of treble boost without in-





creased bass response is not very desirable so we have designed the tone control to give first bass boost and then also treble boost. Examination of Fig. 1 will show the normal series feedback, but with values giving somewhat higher percentage feedback than normally used — 25 per cent as against 17 per cent. Now the inclusion of an appropriate sized condenser in series with R1 will modify the feedback voltage at the lower frequencies. The voltage which will be reduced and changed in phase will cause the feedback at the lower frequencies to be less, thus giving an increase in amplification and output. This constitutes bass boost and is shown in Fig. 2.

By shunting capacity across R2 the feedbcak voltages at the high frequencies can be modified in the same way so giving treble boost—Fig. 3. These features are now incorporated with a control to give the finished "Feedbacq Tone Control Circuit" as shown in Fig. 4. When the tone control is turned to the maximum position the condenser C1 is shorted out and the condenser C2 has sufficient resistance in series with it to eliminate its effect. This results in the standard series feedback circuit as shown in Fig. 1 and the response is "flat" within certain limits. As the tone control is turned down the effect of condenser C1 is brought to bear on the feedbcak circuit in varying amounts, thus giving various degrees of bass boost. As the amount of resistance across C1 becomes sufficiently large it ceases to have any further effect. This happens when the control is about half way down, i.e., in position not resistance with the usual tapered pot. — and from there to the low end of the control the condenser C2 is brought into effect in varying degrees, thus giving treble boost. Condenser C3 is the usual high frequency by-pass across the output to prevent overall feedback and this causes attenuation of the frequencies above 6000 cps. This is desirable in preventing excessive rise in noise level with treble boost. The audio characteris-

LIST OF PARTS

1—Dial.
1—2 gang Tuning Condenser.
1—Dual Wave Kit.
1—I.F.T. No. 1.
1—I.F.T. No. 2
1—8-inch Permag. Rola Speaker 5000 ohms.
1—Chassis.
1—Power Transformer 285-0-285 V at 60 mA. 6.3 v at 3 A. 5 v at 2 A.
1—15 H. at 60 mA. Filter Choke.
1—6J8G Valve
1—6G8G ,,
1—6J7G ,,
1—6V6G ,,
1—5Y3G ,,
2—Va'ves shields.
6—Octal Sockets.
1—Octal Speaker Plug.
1—Power Flex and Plug.
2—6.3 v. Pilot Lamps.
4—Knobs. Marquis.
3—Terminals. Red.
2—Terminals. Black.
3—Miniature Grid Clips.
Resistor Strip 18 in.
Bolts, Nuts, Solder Lugs, etc.
3—.0001 mfd. Mica Condensers.
1—.004 mfd. Mica Condensers.
2—.01 mfd. Mica Condensers
1—.02 mfd. Mica Condensers.
2—.05 mfd. Paper Condensers.
6—.1 mfd. Paper Condensers.
2—16. mfd. Electro Condensers, 525 V.
1—25 mfd. Electro Condenser, 40 V.
1—50 ohm 1 W Carbon Resistor.
1—150 ohm 1 W Carbon Resistor.
1—.01 meg. .5 W Carbon Resistor.
1—.02 meg 1 W Carbon Resistor.
1—.03 meg.5 W Carbon Resistor.
2—.05 meg .5 W Carbon Resistors.
1—.05 meg. 1 W Carbon Resistor.
1—.1 meg. .5 W Carbon Resistor.
1—.25 meg. 5. W Carbon Resistor.
3—.5 meg. .5 W Carbon Resistors.
3—1. meg. .5 W Carbon Resistors.
1—1.5 meg. .5 W Carbon Resistor.
2—.5 meg. Potentiometers.
1—½-in. Rubber Grommet.
9—¾-in. Spacers.
Hook-up Wire, Several Colours.
Shie'ded Hook-up Wire.
Tinned Copper Wire 20 G.

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tics show a maximum bass boost of 9 DB at 150 cps and 9 DB at 5500 cps. when measured into a resistive load at the secondary of the output transformer. These characteristics are shown in Fig. 5 with resistive load and Fig. 6 with speaker load. It would be well to mention that these characteristics have been worked out to suit an 8-inch speaker with reasonable baffling — we used a 3-ft. 6-in. sq. baffle on initial tests, but have since used it on somewhat smaller baffles — but would recommend a baffle comparable to a console cabinet, otherwise the feedback circuit might require some variation in component sizes to suit other conditions.

As the boost in each case is true boost and not obtained by actually attenuating the other frequencies, the tone control can be used without requiring much adjustment of the volume control; in fact in most cases it does not require any adjusting, thus giving a very effective and desirable tone control and as at no time the negative feedback entirey eliminated, tthe quality of reproduction does not suffer at any stage.

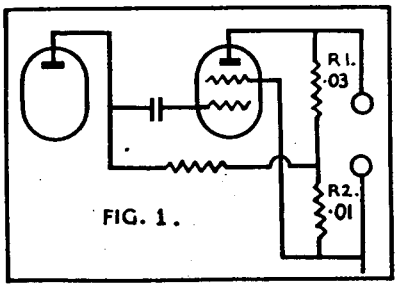


FIG. 1.

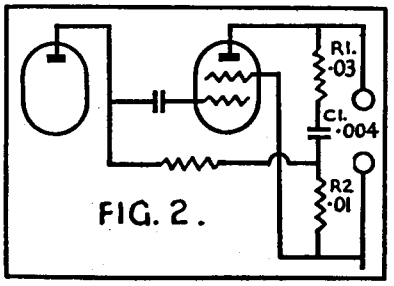


FIG. 2.

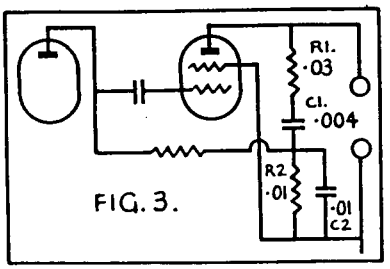


FIG. 3.

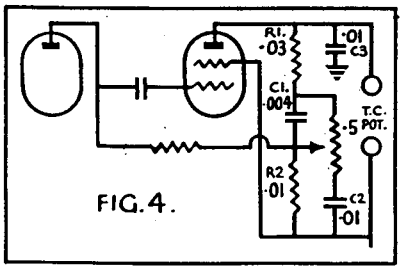
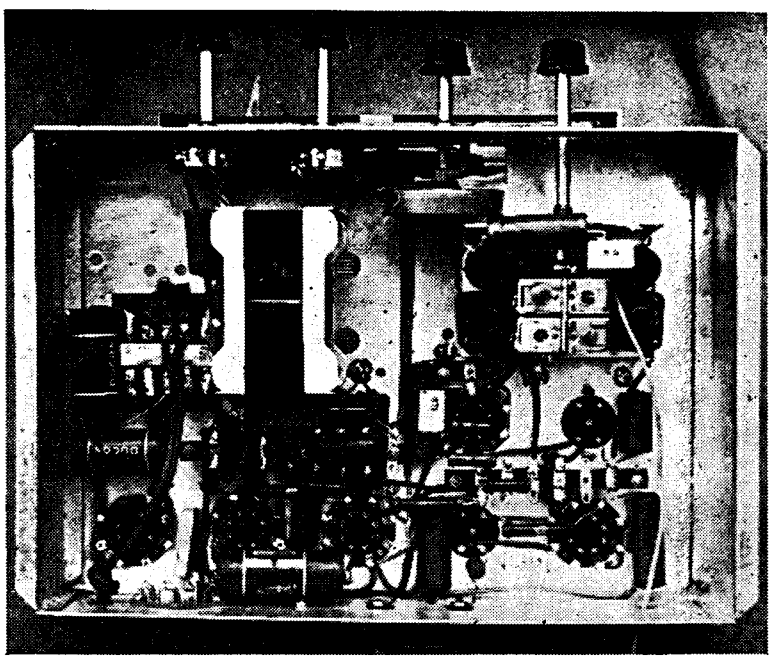


FIG. 4.

The R.F. Section

The R.F. end of this receiver is more or less perfectly straight forward. The use of back-bias throughout, results in the elimination of the usual cathode resistors and condensers thus making the R.F. section cleaner and giving improved performance and greater stability. The mixer is the usual reliable 6J8G and is built round our dual-wave coil kit Type K1 which has been improved in performance, while the I.F. channel uses a 6G8G as combined I.F. amplifier, second detector and delayed A.V.C. tube. This set-up is preferred to the 6U7G and combined detector and first audio as the diode leads which are at high R.F. potential can be kept short and compact and further improve the R.F. stability. This is preferable and outweighs any loss in gain due to the slightly lower "gm" of the 6G8G as compared with the 6U7G. Also this loss in gain—about 4DB—is made up by a similar increase in gain in the use of a 6J7G as the audio amplifier as against a 6G8G or 6B8G as detector-audio. The screens of the two R.F. tubes are fed separately from resistors to keep down modulation rise with increased A.V.C. voltage on strong signals from "locals" to further enhance the quality of reproduction.



Audio Section & Power Supply

The output stage has been dealt with to some length, there only remains the audio driver and power supply. The audio amplifier is a 6J7G resistance coupled and the bias is derived from a network across the back-bias resistor used

to supply the 3 volts for the R.F. tubes. This network serves to supply 1.5 volts to he grid of the 6J7G and also to decouple the bias source to prevent motor-boating.

As the speaker is a permag. the filter section of the power supply uses a 15 henry filter choke and 16mFD. electrolytics. Due to the use of bass boost in the audio amplifier the filtering of the power pack must be good and under certain conditions it might be found desirable to use a two section filter in the power supply.

Lining Procedure

The lining of the receiver is quite straight-forward but for the sake of clarity we will repeat it. Due to the use of back-bias when using a test oscillator to line the I.F. channel leave the grid connections on the tubes and feed the oscillator through a condenser — about .01 mFD.—to the grid of each tube. Line the I|F.T.'s to 455 KCS. using as low an input level as possible. For those without the use of a test oscillator it is first necessary to get the receiver operating and then relying on the factory setting of the I.F.Ts to give the approximate frequency setting to adjust the cores to give maximum output using as weak a signal as possible. Having aligned the I.F. channel the R.F. section is lined as follows. For those with a test oscillator on the broadcast band, connect the oscillator to the aerial through a standard dummy antenna or a 100—200 pFD. condenser. Adjust the oscillator iron core to bring 600 KC. to its correct position on the dial, adjust the oscillator trimmer to bring 1400 K.C. to its correct position and repeat these two adjustments until both are correct finishing at 1400 KC. Adjust the aerial iron core to give maximum output at 600 KC. and the aerial trimmer to give maximum output at 1400 K.C. Repeat these two adjustments until both are correct making the final adjustment with the trimmer and making sure the input signal is as low as possible.

On the short-wave use a 400 ohm carbon resistor as a dummy antenna and a procedure similar to the broadcast band. The iron cores are used to adjust the low frequency end and the trimmers the high frequency tween the actual signal and the image signal as they are close together at these frequencies. The image is the higher of the two, so use the lower frequency from the test oscillator.

For those without the use of an oscillator the procedure is as follows. On the broadcast band connect a long aerial to the set preferably the longest aerial which will be used on it, and identify two stations—as weak as possible—one on or near 600 KC. and the other on or near 1400 KC. Adjust oscillator trimmer to bring the 1400 KC. station to its correct position on the dial and the ments until both are correct. Then adjust the aerial iron core for maximum output on the 1400 Kc. station and the aerial trimmer for maximum output on the 1400 KC. station. Repeat these two adjustments until both are correct. It might be found

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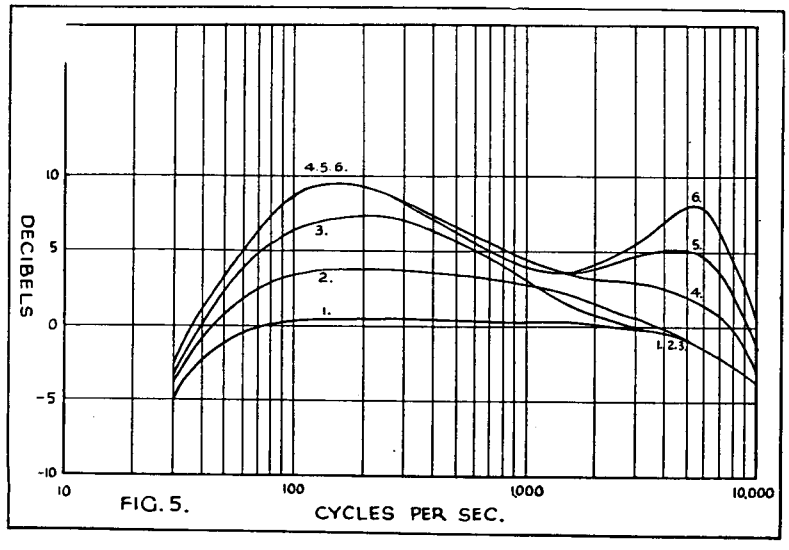

FIG. 5.

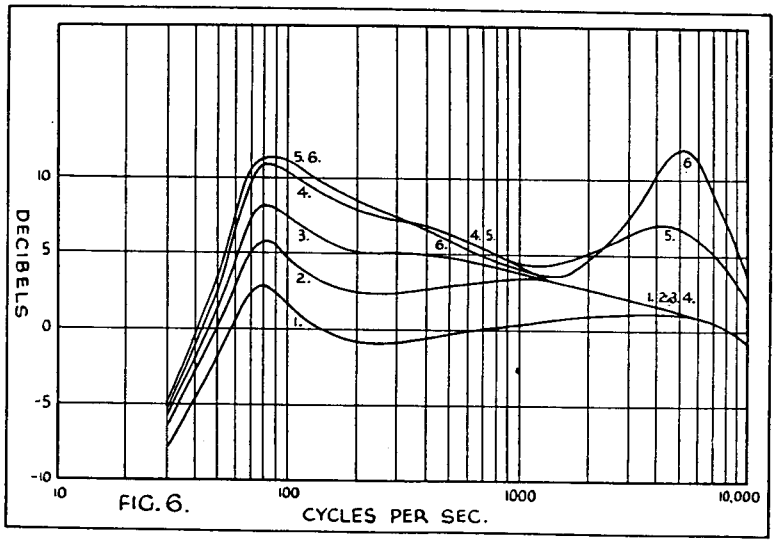

FIG. 6.

Curves showing the variations in frequency response which can be obtained by the unique tone control circuit.

Speedy Query Service

N.E.S. (Toowoomba) enquires about about a circuit for a one-vave signal tracer?

A.—Yes, a circuit of the kind you describe appeared in our issue for February last. Back numbers are available direct from this office at 1/- each, post free.

* * *

T.C. (Drouin, Vic.) enquiers about loudspeaker matching to a 500 ohm line.

A.—The turns ratio should be according to the square root of the impedance ratios. Since the voice coil is rated 3.7 ohms, the impedance ratio will be 500 divided by 3.7, which is about 13½, and the turns ratio you need is the square root of this number, which is about 3.6.

* * *

P.C.S. (Adelaide) asks about the 6SJ7G valves, now being offered in place of 6J7G.

A.—The 6SJ7G is the new single-ended style of valve and is similar to the 6J7 as regards characteristics, but the socket connections are entirely different. Provided that you take these into consideration the valve is equally suitable for all audio purposes. The socket pins run: (1) metal screen to be earthed; (2) Heater; (3) Suppressor grid; (4) Control grid; (5) Cathode; (6) Screen grid; (7) Heater; (8) Plate. There is no cap to the valve.

D.M. (Inverloch) asks whether it is now necessary to get a permit in order to set up in business as a radio serviceman.

A.—So far as we can find out, the regulations covering this matter were scrapped some time ago and all ylou have to do is hang out the shingle and wait for the customers to pour in the door.

Time and time again there has been talk of the licensing of radio mechanics, radio dealers and so on, but there does not appear to be any restrictive regulations actually in force at present.

P.E.D. (Vaucluse) is worried about speaker field energising.

A.—If you are out after maximum performance the only rule is to put as many watts into the field as it can take without getting overheated. The more watts in the field the better will be its performance up to the stage where the heat warps the voice coil so that it fouls the pole piece or something like that . A happy medium is to have the field coil housing comfortably hot after a couple of hours running. It is quite useless to feed more audio watts into the voice coil than you have watts of power in the field.

P.L. (Western Australia) complains about slow delivery.

A.—Sorry, but there is no easy way of speeding up delivery and distribution except by placing your subscription order direct with us. We will then see that your issue is posted the same day that it comes off the press.

W.A.S. (Cooma) is having trouble in cutting valve socket holes in an aluminium base.

A.—To avoid the ragged edges it is only necessary to use a suitable lubricant on the cutting bit. Turpentine is one of the best, but even light oil, such as sewing machine oil is better than nothing at all.

M.P.L. (Ballarat) asks about cathode ray tubes.

A.—We would strongly recommend the 902 or the 906 type. The 913 is quite O.K., too, but a bit on the small side. The other type you mention was specially developed for one of the radar applications and is entirely unsuitable for use in an oscilloscope for ordinary radio use.

N.K. (Essendon) enquires about a folded horn with twin channels.

A.—The article would be in the December, 943 issue, and covers a folded horn type of acoustic labyrinth with separate openings for lows and highs. As detailed it was suitable for the Rola 10" range of speakers. A few copies of this issue are still available at 1/-, post free, direct from this office.

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necessary to do the dial setting and preliminary adjustment of the aerial circuit using the more powerful "locals" but for best results the final aerial alignment should be made using a weak station as there is less error from "Miller Effect" detuning and it is on weak stations that correct alignment is required.

On the short-waves screw the oscillator trimmer right out and adjust the aerial trimmer for maximum output on a station on the 16 metre band—or align for maximum noise level on this band. The aerial iron core can be adjusted in a similar manner somewhere between the 31 and 42 metre bands.

SKY-HAWK

(*Continued*)

speaker, the volume control can be advanced and the tuning dial slowly rotated. A station should soon be picked up.

To align the receiver, set the two trimmers on top of the gang about half-way out, and tune in a station near the middle of the band — preferably one that requires a fair amount of reaction to bring it up to quiet room volume. Then adjust the trimmer on aerial section of the gang until volume is loudest.

Unit Should Not Oscillate

When the unit is switched in or out of circuit, it may be necessary with some receivers to make a slight adjustment to the main tuning control.

It will be found that the booster operates best, giving greatest gain and selectivity, with the regeneration control set just *below* the oscillation point.