Visual Tuning Indicator

Practical Notes on the Micromesh "Tunograph"

THE tuning of a receiver fitted with A.V.C. is apt to be more difficult than that of a set not so equipped, for the automatic volume control appears to flatten the tuning, and a precise setting for optimum signal strength cannot readily be distinguished. It is the usual practice, therefore, to tune a receiver of this type for minimum background hiss, or for the best quality of reproduction, instead of for maximum signal strength. There is no real difficulty in this, once the operation has become familiar, and after a little practice it is quite possible to tune as accurately as with the aid of an indicator.

There is no doubt, however, that a visual tuning indicator is a help, particularly when the receiver is to be handled by unskilled members of the family. Various methods of visual tuning are possible, but methods depending upon the movement of a light or a shadow are probably the most popular. The Micromesh "Tunograph" comes under the former of these headings, for the position of a spot of light on a screen is made to vary with the strength of the signal.

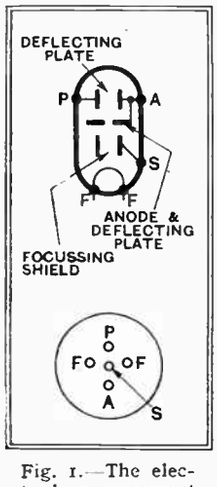


Fig. 1.—The electrode arrangement and base connections of the "Tunograph."

The "Tunograph" is really a miniature cathode-ray oscillograph, and some idea of its structure can be gained from the photograph and from the drawing of Fig. 1. The heated cathode emits electrons which are drawn away by the positive anode and concentrated into a beam by the focussing shield. The beam of electrons passes through an opening in the anode and then between the deflecting plates until it finally strikes a fluorescent screen mounted at the upper end of the bulb. One focussing plate is connected internally to the anode, and the other is available for external connection. If both are maintained at the same potential, the beam of electrons strikes the screen at the extreme right-hand side, with the tube mounted vertically, and gives the characteristic green spot of a cathode-ray tube.

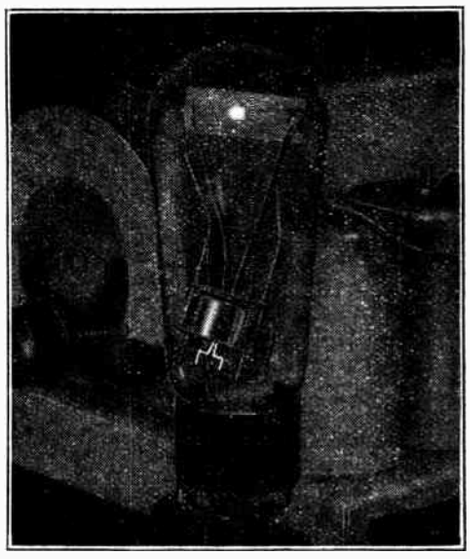
If the free focussing plate be now biased negatively with respect to the other, the spot of light moves towards the left by an amount which depends upon the bias, and some 40 volts is needed to bring it to the extreme left-hand side of the screen. In practice, therefore, the change of anode current with grid bias on a controlled valve is made to deflect the spot of light, and, since the change of current increases with signal strength, the deflection of the spot is greatest for a strong signal.

The indicator is not confined to an arrangement of this nature, however, for, being practically free from inertia, the electron beam can follow the alternating signal potentials. If the deflecting plates be maintained at the same steady potential, therefore, in the absence of a signal, the spot of light will appear at the right-hand side of the screen. The application of signal potentials between the plates will then cause the spot of light to vibrate backwards and forwards in a straight line, with the visible result of a line of light the length of which is dependent upon the strength of the applied signal.

Line Indication

The circuit connections for this arrangement are shown in Fig. 2, and it will be seen that the "Tunograph" is connected across the last tuned circuit of the receiver. Since the tube has a certain capacity, this circuit will require retrimming after fitting the indicator, but this should present little difficulty. It will be found that the line of light spreads to the left with increasing signal strength, and tuning is carried out for maximum length of line.

This method of indication, while very



Tne "Tunograph" indicator, showing the light spot on the screen. As the tuning is varied to bring the set into resonance with the signal, the light spot moves to the right.

attractive from some points of view, is open to two objections in practice. In the first place, a very strong signal is necessary to give any decided line, about 13 volts for a length of 1 cm., and very few receivers are designed to operate with a detector input greater than one-tenth of this. Secondly, there is a reduction in visibility when the spot spreads out into a line, and on a very strong signal the line itself may be barely visible, and it is possible to see only a faint line with a blob at each end.

Spot Tuning

For general use, therefore, the alternative circuit, Fig. 3, is preferable, although

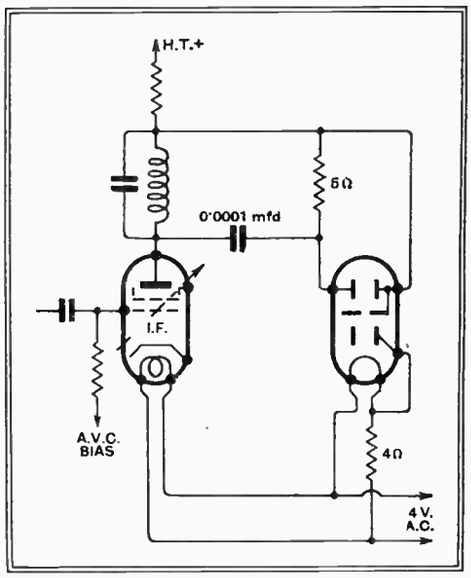


Fig. 2.—The connections for a line indication are shown here, and it will be observed that the "Tunograph" is fed from the last H.F. or I.F. tuned circuit.

this necessitates slightly more alteration to the set. A resistance of some 10,000 ohms must be included in the anode circuit of one of the controlled valves. The anode of the "Tunograph" is connected to the positive H.T. side of this, and the free deflecting plate to the other. Assuming an anode current with no signal of 4 mA., the free deflecting plate is then biased negatively with respect to the other plate by 40 volts, so that the spot of light comes to rest at the extreme left-hand side of the screen. When a signal is tuned in, and A.V.C. comes into action, the anode current of the controlled valve drops by an amount which is dependent upon the signal strength, with the result that the voltage drop across the 10,000 ohms resistance falls proportionately, and the free deflecting plate becomes less negatively biased, so that the spot of light moves to the right. Tuning, therefore, is carried out for a maximum movement of the spot of light.

The disadvantage of this method, when the tube is to be fitted to an existing set, is that the necessity for including a re-

Visual Tuning Indicator—

sistance in the controlled valve anode circuit means that its anode voltage is reduced. The value of 10,000/20,000 ohms marked on the circuit diagram is suggested by the makers; it will, however, obviously depend upon the type of valve used. Since, with no signal, a voltage drop across it of 40 volts is required, 10,000 ohms is correct for a valve taking 4 mA., and 20,000 ohms for one taking 2 mA. Some variable-mu valves, however, require 8 mA., and then the requirements are met by a resistance of 5,000 ohms. In practice, the resistance value is best determined by selecting a value such that with no signal the spot of light settles at the extreme left of the screen. When adding the indicator to a set, it will probably be best included in the anode circuit of the earliest controlled valve, for the reduction of 40 volts in its H.T. supply will probably be least felt here.

The anode potential of the "Tunograph" must be at least 180 volts, and care should be taken to see that the mains transformer is capable of supplying an additional ampere of current for the filament without an excessive drop in heater voltage on the valves. Since the filament

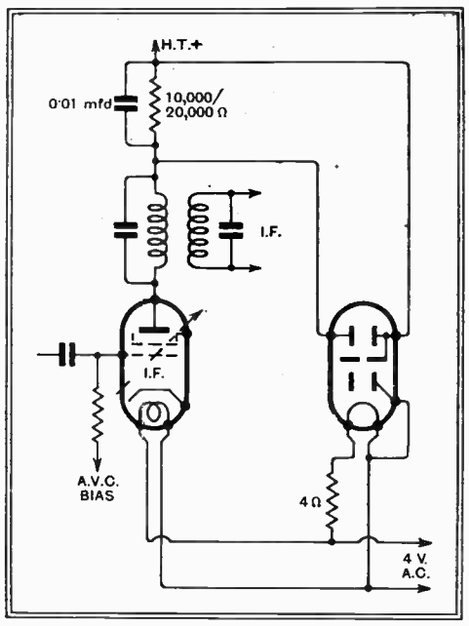


Fig. 3.—With these connections, the position of the light spot varies with the bias on the controlled valve, and hence with signal strength.

of the indicator is rated for only 0.5/0.6 volt, it must be run from the 4-volts A.C. lines through a 4-ohms resistance rated to carry one ampere.

It should be noted that the spot of light is not readily visible in a bright light unless the tube be enclosed in a light-proof box with a viewing window. It is suggested that the tube be mounted inside the cabinet in any convenient position and a small hole cut in a suitable position on the panel for viewing. In general, it will be best to mount the tube horizontally, with the left-hand side of the plate at the bottom when using a spot indication, and the right-hand side at the bottom when using a line indication, for the spot or line will then move vertically on tuning in a signal, and the operation of tuning will be carried out for maximum height of spot or line.

It should be pointed out that the spot can be deflected by external magnetic or electrostatic fields, and a small deflection will be observed on touching the glass bulb with the finger, due to the dissipation of the charge which accumulates on the glass. It is not improbable, therefore, that the spot might move right off the screen if the tube be mounted in close proximity to a loud speaker, mains transformer, or smoothing choke.

News of the Week

Current Events in Brief Review

Despite the Depression

NEW ZEALAND receiving licences have now reached the 100,000 mark.

An Acoustic "Find"

VIENNA'S finest studio from an acoustical point of view is the small hall of the Municipal Concert Building. This has been hired by the broadcasting company for use at frequent intervals for important musical programmes.

Medium Wave Freaks

AMONG letters reporting reception received by the Brussels broadcasting stations have been reports from members of the New Zealand DX Club. It is also interesting to note that Athlone has been picked up by the same club.

Good News for Dealers

WIRELESS dealers need have no scruples in giving public demonstrations on loud speakers, despite the decision of the Court of Appeal that the public reproduction of broadcast music is an infringement of the composer's copyright. In a statement made last week, Mr. C. F. James, General Manager of the Performing Rights Society, said that the Society did not contemplate any departure from the policy hitherto followed in the matter of performances given in dealers' shops solely for the purpose of demonstrating wireless apparatus with a view to sale.

These performances, said Mr. James, were "public" for the purpose of the Copyright Act, but the Society had never concerned itself with cases of this kind and did not propose to do so now.

Changes at Munich

THE Munich high-power transmitter is to close down temporarily for constructional changes made necessary by the adoption of a new wavelength and an increase in power from 60 to 100 kW. Until January 15th next the old Munich 1.5 kW. transmitter at Stadelheim will be used.

No Pompous Oratory

ACCORDING to an interview given by M. Laurant-Eynac, the French Postmaster-General, politics will be absent in the new French broadcasting scheme.

"Polemics are out of place," said the P.M.G., "in programmes intended for the world; we shall seek a broadcasting style without pompous oratory.

Merciless war will be waged on man-made static, and by the end of November anti-interference devices will become compulsory.

Graceful Tribute from U.S.

"Q.S.T." the American amateur journal, is high in its praises of the experimenters, Messrs. O'Heffernan and Myatt, who secured the world's record for ultra-short wave communication when the former transmitted from the top of Snowdon in August last, and was heard at Hoddesdon on a *Wireless World* "Ultra S.W. Two," 200 miles away.

"If any U.S. amateur has done comparable DX from such an altitude," says "Q.S.T.," "we have yet to hear about it. Even our honest-to-goodness *mountains* have yet to notice such things happening around them."

Stage *v.* Studio

THE traditional warfare between broadcasting and the theatre assumes a new complexion with the news from Prague of an enterprising theatrical manager there, who, hearing an unusually good bass broadcasting from Warsaw, "stole" him for the purpose of his next production.

Tokio Listeners Aid Air Force

BROADCAST listeners were asked to participate in the recent aerial manœuvres at Tokio. They were formally requested to intercept the planes' signals on their loud speakers as the squadrons passed overhead and to convey these messages "by all possible means" to headquarters.

Slower Wireless Waves?

TESTS on the actual speed of wireless waves have just been completed by MM. Stoyko and Jouanst, of the Paris Academy of Science. Despite the theoretical assumption that the wireless wave, having the same speed as that of light, travels at a rate of 300,000 km./sec., the French scientists have discovered that short waves travelling between Buenos Aires and Paris have a speed of only 270,000 km./sec. The difference of ten per cent between the theoretical and practical values may be explained by the number of reflections which the waves undergo, which would tend to lengthen the distance covered and slow down the wave. Long waves, the scientists state, travel at the speed of only 245,000 km./sec.

The Three Best

DURING the past year Belgium has registered the third highest percentage amount of listeners to density of population, her figure of 69.3 per thousand being exceeded only by Spain (108.3) and Greece (72.3). There are now in Belgium 409,000 French and Flemish-speaking listeners.

Superhet as "Also Ran"

THE Copenhagen Radio Exhibition opened with a startling declaration by the Danish Premier, M. Stauning, that the Lucerne Conference had been a failure.

As to the exhibition itself, our Danish correspondent reports that the superheterodyne receiver was not nearly so popular in Northern Europe as it appears to be in the south. Straight receivers were much in evidence, the most popular being three- and four-valve arrangements. Many British sets and components were displayed.

Banning the "Gyp"

ONE of the by-products of America's National Recovery movement will be the elimination of the so-called "Gyp" radio service men, and those who will take their place are being organised to outlaw "the vulturous class" with which the radio service field is infested.

Among the unfair practices the new code will ban are: Stealing good radio valves and replacing them with damaged ones; malicious destruction of equipment under inspection to create additional work or justify charges; use of radio service as a pretext for gaining entry into a home for illegitimate purposes; charging for services not rendered; and, finally, misrepresentation of ability.