Suggested Circuits

The Circuits presented in this series have been designed by G. A. FRENCH, specially for the enthusiast who needs only the circuit and essential data

No. 122. A 2-Valve AM Tuner

IT IS USUAL FOR HIGH FIDELITY ENTHUSIASTS to confine their radio listening to the programmes provided by an f.m. tuner, since a tuner of this type enables a higher standard of reproduction to be achieved than is possible with an a.m. receiver operating on Medium and Long waves. Unfortunately, the only transmissions available on f.m. are those broadcast by the B.B.C. Many programmes of interest and value are broadcast on the Medium and Long wave bands by Continental transmitters, and it is frequently desirable to have facilities available for the reception of these programmes, despite their inevitably limited fidelity.

This month's contribution describes a simple two-valve tuner which has been especially designed to meet the requirement just stated. By the use of currently employed commercial techniques, economy of components has been achieved wherever possible. An attractive feature of the circuit is that, with the aid of an inexpensive mains transformer of the type initially introduced for Band III television converters, the tuner can be made completely self-contained whilst still having a fully isolated chassis. Alternatively, the tuner may receive its heater and h.t. supplies from the following amplifier.

The frequency-changer section employs a straightforward coil circuit which, at the expense of a little extra complexity in waveband switching, should be capable of offering the maximum protection against second channel interference which is possible with a single aerial tuned circuit. The selectivity of the tuner is governed by the composite response curve of the two i.f. transformers employed.

The Circuit

In the circuit, which accompanies this article, the aerial is applied to $S_{1(a)}$, this switch selecting either coupling coil L_1 or L_3. L_1 and L_3 couple respectively to the tuned coils L_2 and L_4, the latter being trimmed by C_1 and C_3. Whichever coil is selected by $S_{1(b)}$ is tuned by C_4.

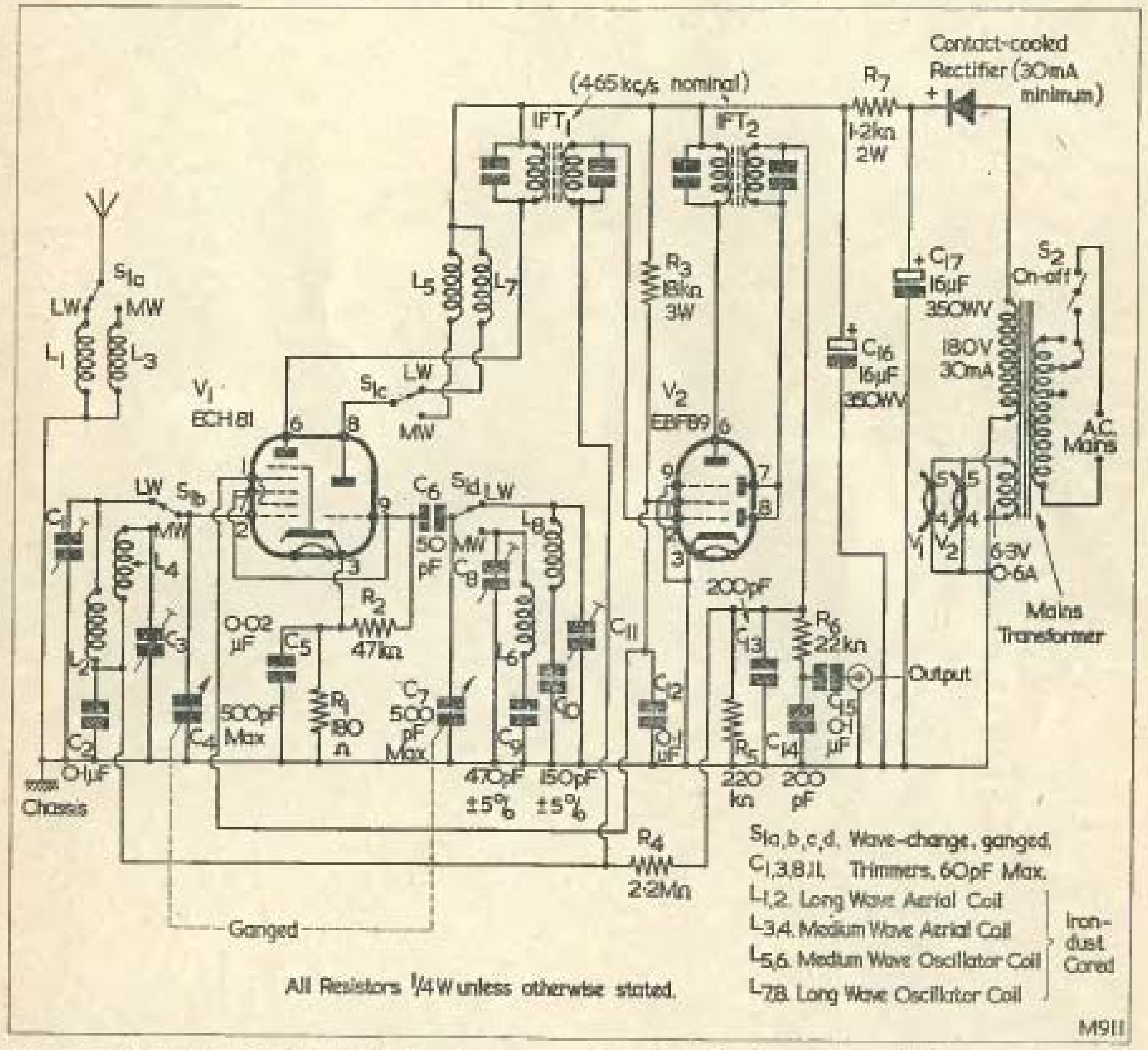
Switches $S_{1(c)}$ and $S_{1(d)}$ select the oscillator coupling coils, L_5, L_7, and the oscillator tuned coils, L_6, L_8. The coupling coils are connected directly between V_1 triode anode and the h.t. positive rail. Whichever tuned coil is selected by $S_{1(d)}$ is tuned by C_7, fixed condensers C_9 and C_{10} functioning as padders. L_6 and L_8 are trimmed by C_8 and C_{11} respectively.

V_1 triode is the oscillator, and its grid leak is returned to cathode in conventional fashion. The triode grid is connected to G_3 of the heptode section, the signal input being applied to G_1.

The i.f. signal available at the anode of the heptode is fed to i.f.t.$_1$ and, thence, to the grid of the double diode pentode V_2. The pentode section of V_2 amplifies the i.f. signal, applying it to i.f.t.$_2$. The secondary of i.f.t.$_2$ couples into the detector circuit, which is completed by the two strapped diodes of V_2, and the diode load, R_5, shunted by C_{13}. The detected a.f. signal appearing across R_5 is applied to the low-pass filter R_6, C_{14}, and thence, via C_{15}, to the output socket. C_{15} is a blocking condenser which prevents the d.c. component of the detected signal being fed to the subsequent amplifier. An a.g.c. voltage is also taken from R_5, this being applied to the grid circuits of V_2 and the heptode section of V_1 via R_4. A single condenser, C_2, bypasses the a.g.c. voltage for both grid circuits.

The mains transformer provides an isolated source of supply. Its heater winding feeds the heaters of the two valves, whilst the single-phase h.t. secondary connects to the half-wave contact-cooled rectifier. The rectified voltage from the rectifier is smoothed by C_{17}, R_7 and C_{16}. Condenser C_{16} provides an h.t. bypass for all the anode circuits in the tuner; there are no separate anode decoupling circuits.

Economies in the circuit are achieved in several ways. Firstly, the screen grids of V_1 and V_2 are connected together, being supplied via a single resistor and decoupled by a single condenser. Secondly, the cathode of V_2 is returned direct to chassis instead of via a cathode bias resistor and parallel condenser. In the absence of signal the pentode section of V_2 is then biased by contact potential in the diodes, together with any voltage which may be dropped across R_4 due to grid current in the pentode. In practice the negative voltage on the pentode grid may be increased by rectified noise picked up on the aerial or generated in the heptode stage. When a signal is received the pentode section of V_2 is biased in normal fashion by the resulting a.g.c. voltage. A third economy is effected in the oscillator circuit by returning the anode coupling coils direct to the h.t. positive rail instead of employing a resistance-capacity feed.



Design Considerations

When the idea of a *Suggested Circuit* covering an a.m. tuner was initially conceived, a number of decisions were made concerning the form in which it would finally appear. The first question to be decided was whether transistors or valves were to be used. Since the fact that the tuner was intended to feed into a subsequent amplifier would infer the presence of a mains supply or, possibly, heater and h.t. supplies, there was little advantage in running costs to be gained from the use of a transistorised unit. Furthermore it is possible, by using well tried circuit techniques, to obtain a reasonably good a.m. performance with two valves only, whereas three or more transistors would be needed in a transistorised version to obtain the same results. Also, the transistorised version would probably cost more than its valve equivalent. The final factor in favour of valves was that, due to the availability of low-cost "converter" mains transformers, the provision of an isolated power supply was a relatively simple and inexpensive matter.

R7 5kΩ 5W
with 240V transformer.