Servicing Radio Receivers

THE GOBLIN MODEL S.25

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THIS is a five-valve—including the rectifier—all-wave superhet incorporating a synchronous electric clock and time-switch, which enable the receiver automatically to be switched on at any predetermined time ; this model is often known as the Goblin Time Spot Radio.

The main controls are " wavechange," " tuning," " tone " and " on/off-auto " ; the " volume " and " auto timeset " are in the form of thumb controls situated in the centre of the control panel.

The Clock Circuit

From the complete circuit at Fig. 1 it may be seen that the A.C. input passes to the primary of the mains transformer T2 via the " on/off-auto " switch S2. In the " off " position the switch is open, in the " on " position the switch is closed and the input goes direct to the transformer, and in the " auto " position the mains input circuit is either closed or open, depending on the setting of the clock switch S3.

This switch is controlled by the timing mechanism in the clock ; it closes, and thus switches on the receiver, at the time selected by the " auto timeset " control, and without further attention will also automatically switch off the receiver after approximately two hours.

As the clock movement is connected directly to the mains supply, it continues working even when S2 is set at the " off " position.

Circuit Description

The aerial signal is fed across an I.F. filter circuit comprising T1 and L1. From here it is taken to the primary winding of the long, medium or short-wave aerial coil as selected by switch S1A, and then on to the signal grid of the hexode section of the frequency changer valve V1, via the secondary winding of the aerial coil as selected by S1B.

The triode section of V1 operates as an oscillator, the associated inductively coupled oscillator coils being selected by switches S1C and S1D—switch S1 is, of course, a ganged Yaxley wafer type.

An intermediate frequency of 465 kc/s is developed in the first I.F. transformer (I.F.T.1) and is passed on for amplification to the signal grid (grid 1) of V2, which is a variable-mu R.F. pentode.

The amplified signal is developed in the second I.F. transformer (I.F.T.2) and is taken to the signal diode in the double-diode-triode valve V3 for demodulation. The demodulated A.F. signal develops across the volume-control R1, and is fed via the coupling capacitor C7 to the grid of V3 for amplification at A.F. R2, C5 and C6 are the components used for I.F. filtering. Pick-up terminals brought out to the rear of the chassis permit the application of a pick-up signal across R1. The volume-control thus permits adjustment of the pick-up signal, but when using this facility it is necessary either to remove the aerial or tune the receiver to a quiet part of the broadcast band.

The A.F. signal amplified by the triode section of V3 develops across R4, and is passed via the A.F. coupling capacitor C7 to the control grid of the output valve V4. The output stage is quite conventional as will be seen ; capacitor C8 and the variable resistor R3 constitutes a " top-cut " type tone-control circuit. A facility is provided for using an extension loudspeaker, the internal loudspeaker being disconnected by removing a plug from a socket at the rear of the cabinet.

Automatic Volume-control

It will be noticed that the signal diode is strapped direct to the A.V.C. diode in V3. A separate diode is thus not used for A.V.C. on this receiver, but the negative voltage appearing at the junction of R2 and C5 in the I.F. filter circuit rises and falls with signal level. This voltage is, therefore, quite suitable for varying automatically the gain of the first two valves. It is fed back through R5 and decoupled by C9 ; it will be observed that only the fixed bias, developed across R6 in the cathode circuit of V1, is applied to the frequency changer on short-waves.

The Power Supply

H.T. power is supplied by the full-wave rectifier valve V5, and the lower secondary winding on T2

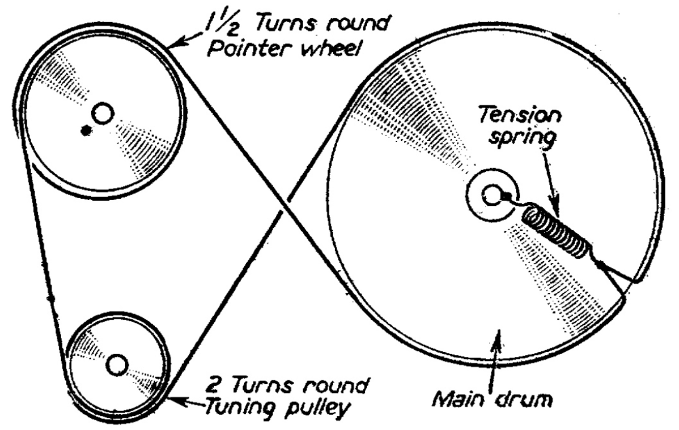

Fig. 3.—Drive cord details.

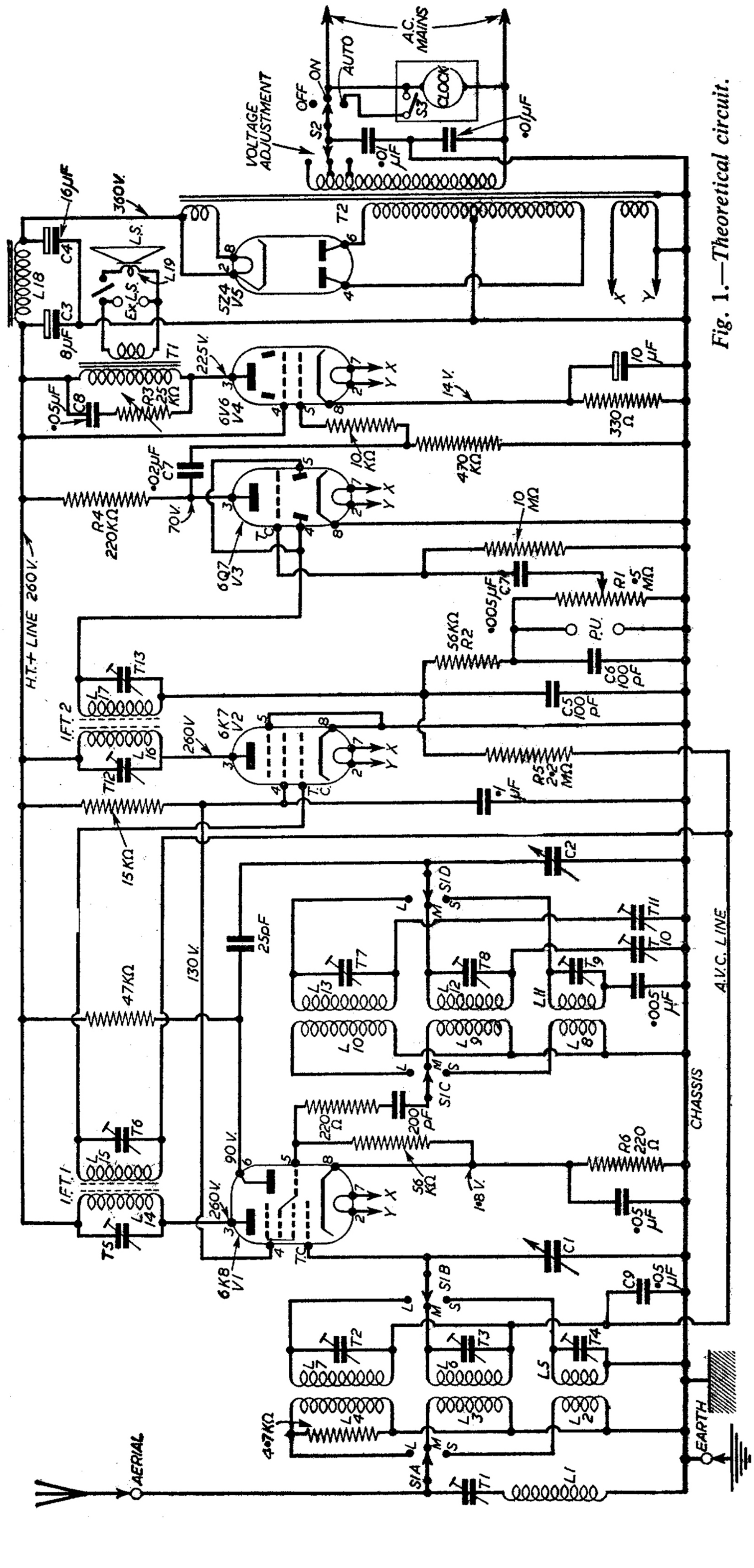

Fig. 1.—Theoretical circuit.

supplies the valves V1 to V4 with L.T.—V5, of course, has its own L.T. winding. Power for the pilot bulbs is also taken from across the lower L.T. winding on T2.

H.T. smoothing is performed in part by the loudspeaker field winding L18 and part by the two electrolytic capacitors C3 and C4, these being in single unit form.

Mechanical Arrangements

Removal of the chassis from the cabinet of this receiver is quite a simple matter. It involves simply removal of the back of the cabinet, removal of the loudspeaker chassis and baffle which is effected by extracting the small screw positioned at the centre edge of the baffle board and extracting the chassis fixing screws located beneath the cabinet.

In order to remove the clock it is necessary first to disconnect the associated leads from beneath the receiver chassis, unscrew the handset knob and shaft from the rear of the clock by depressing and turning against the arrow marked on the knob, unclip the pilot bulb holder, and finally removing the clock unit complete by removing the nuts and bolts which secure the mounting plate to the chassis and releasing the back support bracket by extracting the screw situated at the back of the clock.

The Dial Drive

A diagram illustrating the cord-drive arrangement is depicted at Fig. 3. If it becomes necessary to replace this flax-braided cord, No. 40 or equivalent nylon drive cord only should be used. Before the cord can be replaced, however, it is necessary to remove the tuning pointer and scale mounting plate.

On re-assembling, the tuning gang C1, C2 should be adjusted to maximum capacitance and the pointer replaced to coincide with the scale limiting marks at the low-frequency end of the scales. It is quite normal for the pointer to overrun the scale by approximately ⅛in. when the gang is turned to minimum capacitance.

Alignment Procedure

For accurate alignment a closely calibrated modulated

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service oscillator and an output meter are essential. The output meter should be loaded to 3 ohms and connected across the extension loudspeaker sockets, and the internal speaker disconnected. Alternatively, an A.C. voltmeter could be connected through an 0.1 μF 500 v.w. isolating capacitor between pin 3 of V4 and chassis.

In either case it is essential to maintain the minimum of input signal from the oscillator consistent with a readable deflection on the output meter. A high input will give rise to false readings as the result of the A.V.C. action. For the same reason the oscillator signal should progressively be reduced as the various circuits approach correct alignment.

As is general practice, the I.F. stages should first be aligned. This is carried out by shorting the oscillator section of the tuning gang C2, and applying the oscillator signal (465 kc/s (645 metres) modulated) between the top-cap of V1 and chassis. The volume control should be turned to maximum and the tone control turned to the minimum top-cut position. Trimmers T13, T12, T6 and T5 should then be adjusted, in that order, for maximum indication on the output meter. The positions of the trimmers on the chassis are shown in Fig. 2. As this concludes I.F. alignment, the short across C2 should be removed, the signal generator leads taken from V1 and the top-cap reconnected.

Before commencing alignment of the R.F. and oscillator sections care should be taken to ensure that the tuning pointer coincides with the radial marks at the low-frequency end of the scale when the tuning gang is at maximum capacitance—fully meshed. The signal generator output should be connected across the receiver aerial and earth terminals, via a suitable dummy aerial and an output meter, as for I.F. alignment, should be employed.

For medium-wave alignment inject a modulated 1,450 kc/s signal, tune the receiver to 207 metres and adjust the medium-wave oscillator trimmer T8 then the aerial trimmer T3 (Fig. 2) for maximum indication on the output meter.

Inject a modulated 600 kc/s signal, tune the receiver to 500 metres and adjust the medium-wave padder T10 (Fig. 3) for maximum output while rocking the tuning slightly either way for optimum tracking. Finally, repeat alignment at 207 metres.

For long-wave alignment inject a modulated 300 kc/s signal, tune the receiver to 1,000 metres and adjust the long-wave oscillator trimmer T7, then the aerial trimmer T2 (Fig. 3) for maximum output.

Inject a modulated 175 kc/s signal, tune the receiver to 1,714 metres and adjust the long-wave padder T11 (Fig. 2) for maximum output while rocking the tuning for optimum results. It may be necessary to repeat this procedure several times to secure good long-wave tracking.

For short-wave alignment inject modulated 20 Mc/s signal, tune the receiver to 15 metres and adjust the short-wave oscillator trimmer T9 (Fig. 2) for maximum output (if it is found that the signal can be tuned at two settings of this trimmer, the one of lesser capacitance is correct). Finally, adjust the short-wave aerial trimmer T4 (Fig. 2) for maximum output after having established the correct setting for T9.

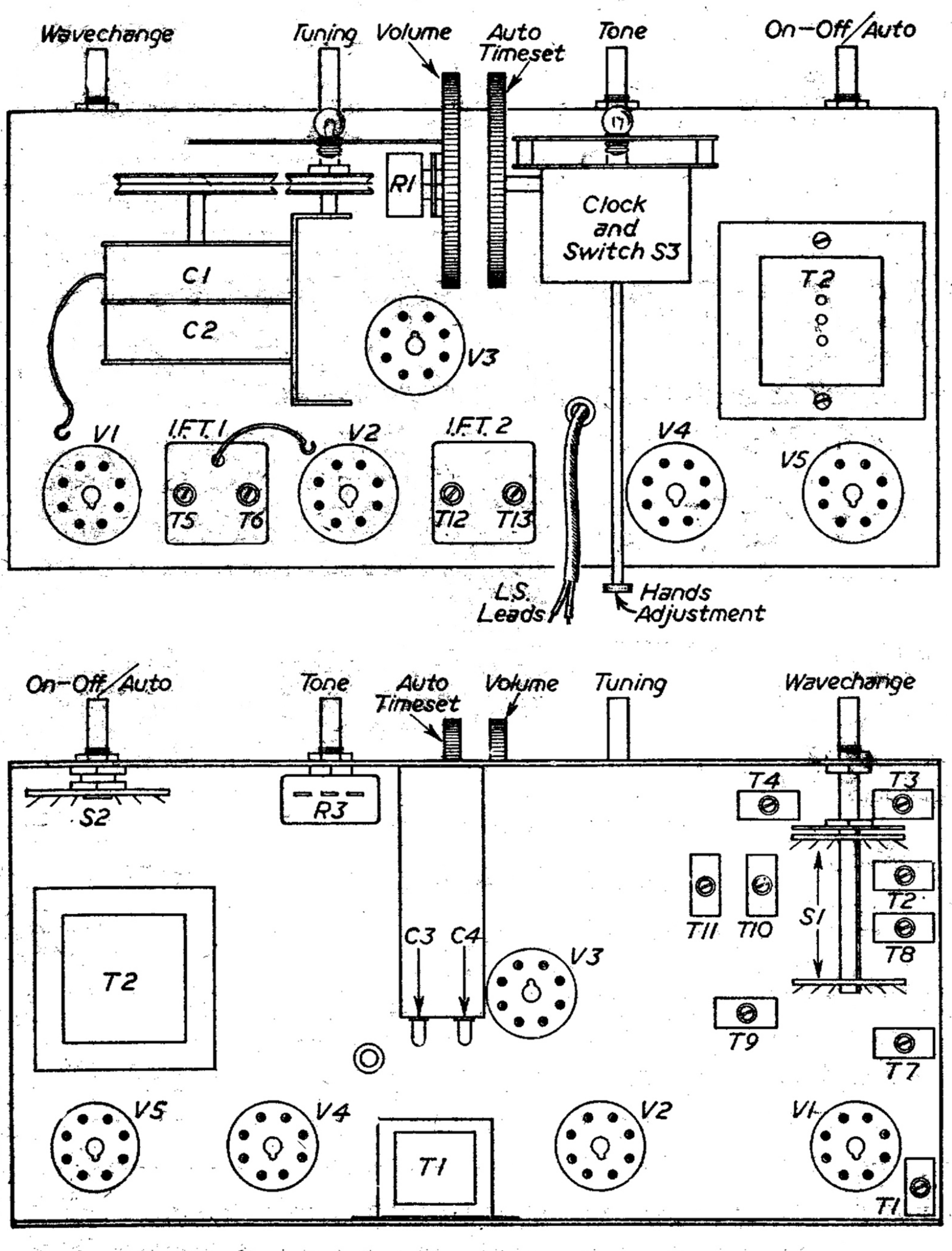

Fig. 3.—Top and bottom chassis details.

The I.F. Filter

If the I.F. filter is incorrectly adjusted heterodyning (whistling) and breakthrough of morse may be experienced on all stations. This is adjusted by applying a very powerful modulated signal at 465 kc/s across the aerial and earth terminals, via a dummy aerial, and adjusting T1 (Fig. 2) for *minimum* output. In order to be certain that the filter is adjusted precisely at the intermediate frequency, the service oscillator should be tuned in the region of 465 kc/s for maximum output before actually adjusting T1.

General Servicing Notes

If the receiver fails completely the stage at fault can often be located quickly, first by touching the top-connection of V3. If the triode section of V3, V4, the associated coupling circuits, the loudspeaker and H.T. section are operating a fairly loud 50 c.p.s. hum will emit from the loudspeaker.

If this does not happen, then, after the receiver has been on for about 10 minutes, the temperature of V4 should be tested with the hand. If working properly, this valve should be more than uncomfortably hot ; if it is open-circuit or low in emission, or if H.T. is lacking, then it will be relatively cool.

If it is cool the rectifier valve V5 should be observed carefully to ascertain that its filament is alight. Assuming that the filament is alight, the temperature of this valve should be checked with the hand. Should it be very hot indeed and exhibiting a blue glow in the vicinity of the anodes, a high-tension short is probably responsible, and C3/4 should be checked for insulation.

If a test meter is available, at this stage it would be desirable to check the voltages on V4. If the anode voltage is lacking the primary winding of T1 is most likely open-circuit, though this generally shows in V4 by the screen grid glowing bright red.

If no voltage is present on the H.T. rail a check for voltage should be made on the filament of V5. 360 volts or more here and no H.T. line voltage almost certainly indicates that the loudspeake. field winding L18 is open-circuit. If the voltage is less than 360 at V5 cathode, a short in C3 is possibly responsible, though this would be revealed by L18 overheating.

Assuming now that a hum can be obtained by touching the top connection of V3 the trouble most likely lies somewhere in the stages V1 and V2. The valves should first be suspected, of course, and initially an attempt should be made to ascertain whether or not they are glowing.

If a heavy click results from the loudspeaker on touching the top connection of V2 with a screwdriver blade, this valve may tentatively be assumed in order and V1 and associated circuit should come under immediate attention. If the same effect occurs on touching the top connection of V1, the faulty component is almost certainly associated with the triode section. A check of anode voltage would help and the anode and grid coupling capacitors should be checked by substitution.

Excessive distortion accompanied by V4 becoming very hot generally means that C7 has turned into a resistor. This can be proved fairly conclusively by checking the cathode voltage of V4, which will be considerably higher than 14 volts if C7 is leaky. Should no voltage at all be measured at V4 cathode, the 10μF cathode decoupling capacitor should be replaced.