

up, and the effect of enclosing the detector together with its grid leak and condenser in an earthed metal box should certainly be tried. In this connection it must not be forgotten that interaction between the valve electrodes themselves can occur, and the writer once traced a persistent hum to interaction between the electrodes of the H.T. rectifier and the detector valves, which were rather close together; the trouble was cured by screening.

The H.F. Stage.

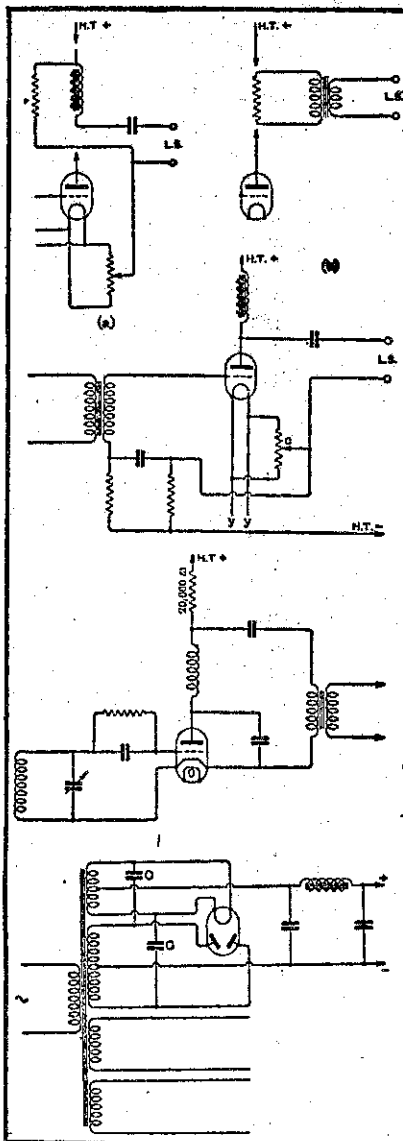
HAVING cured hum as far as the grid circuit of the detector, the short-circuit between the points e, f, should be removed. There should still be no hum, and in the very rare case when it is found that this alteration introduces it, it can be cured by rotating the tuning coil itself. Next reconnect the condenser C4 to the tuning circuit, and test for hum. During this test the set must be so tuned that no signal is audible, for this may give rise to modulation hum, which will mask other effects. Any hum which can now be heard must be due to the H.T. supply to the H.F. valve, and appropriate additions should be made to its smoothing circuit, and also to the grid-circuit bias resistance by-pass condenser C5. In the absence of a signal, the set should now be perfectly quiet, and with no trace of hum, beyond, perhaps, one foot from the loud-speaker cone.

Modulation Hum.

NOW it may quite possibly be found that when a station is tuned in, a fairly strong hum becomes evident. This is known as modulation hum, since the hum actually modulates the carrier of the incoming signal, and it is often difficult to cure. There are several causes of modulation hum, and each has its own remedy. In the first place, it may be caused by insufficient smoothing of the grid bias and H.T. supplies to the H.F. valve. The former is the more prevalent source of trouble, and it may be necessary to use a total capacity for C5 of Fig. 1 of about 4 mfd. before the hum can be cured. Extra capacity across the other H.F. by-pass condensers should also be tried.

Another source of trouble lies in the H.T. rectifier valve; this may generate H.F. oscillations which are modulated by the A.C. mains. This state of affairs can be cured by adopting the rectifier circuit shown in Fig. 5, where the valve is prevented from oscillating by the two condensers C, which should have a capacity of 0.1 mfd. and be tested to at least 1000 volts.

In the writer's experience, however, the most troublesome source of modulation hum is the supply mains; and this particular form can occur even when no H.F. stage is used. The cause of this type of hum is rather obscure, but it is apparently due to the presence of H.F. currents in the mains leads. The cure is simple and satisfactory; a condenser C6 (shown dotted in Fig. 1) should be connected between one of the mains leads and earth. The best capacity must be found by experiment, but a value of 0.0005 mfd. is often sufficient; in some cases, however, a capacity of 0.001 mfd. or 0.002 mfd. may be found necessary. The full mains voltage is connected across this condenser, and so it is very important that it should be rated for continuous work on not less than 1000 volts A.C.



Figs. 2, 3, 4 and 5.

Fig. 5.—The addition of the two condensers C to the H.T. rectifier prevents the valve from generating H.F. oscillations, which would be modulated by the mains and cause hum.

It will usually be found possible to eliminate all traces of hum by a systematic search conducted on the above lines, and the whole principle lies in working backward from the loud-speaker, and checking each point in turn. During this process a watch should be kept for high-resistance connections, since these are a prolific source of hum from electro-static pick-up; apart from badly soldered joints, they will be found most frequently in valve holders and plug-in coils. There is always the chance of a faulty valve, and this is the most likely source if the strength of the hum is variable. In obstinate cases the effect of using a potentiometer for the connection between the cathodes and heaters of the indirectly heated valves should be tried, as recommended for an output valve.

HAVE you renewed your subscription to the—

"Radio Record and Home Journal"?

12/6 in Advance; 15/- Booked.

Booksellers and Dealers.

An Interesting Phenomenon Correspondent's Experience

I WOULD like with your permission to give readers, more particularly those interested in construction, a very interesting result of one of my experiments, and as I frankly admit that it has me puzzled, I have no doubt some of your more experienced readers will try the thing out and give an explanation thereof.

My set is a battery model six-valve factory-made job, and is recognised as a very efficient set. However, since purchasing this set, the screen grid valve made its appearance, and in order to get the benefit of S.G. amplification without interfering with the set, I constructed a S.G. Booster. This gave the set an extra kick, and satisfied me that the screen grid valve was a decided improvement. I then constructed the crystal set and wave trap described in the 1929 "Radio Guide." This gave me wonderful reception on the local station on two valves by plugging into the detector socket of the big set.

One evening while "listening-in" to 2FC with the booster attached, the local 2YA was heard in the background with too much volume, so I decided to try hooking up the wave trap as well, with the result that 2YA disappeared. So far so good. The following evening our old friend static was on the war-path, and in disgust I decided to give it the full possession of the ether and go to bed. At this time the apparatus on the table was connected up as follows:—

Static can be accentuated by the action of the crystal in this circuit, where it is acting as absorption tuned circuit in series with the aerial there by sharply tuning the aerial circuit.

By disconnecting the earth selectivity is increased. As the mains were acting as an aerial, and the unwanted signal was absorbed by the previously tuned circuit the crystal, you were able to add to your signal strength.

This may seem a fearsome hook-up to tune in a station on, but I was getting some fun out of it, so why worry? I disconnected the aerial from the crystal set in preparation of closing up for the evening, but instead of the music ceasing as I expected, it came in louder, and what was more, old man static must also have been surprised, as he was decidedly less noisy. I then disconnected the earth from the main set, and the result was that 2FC, Sydney, came in as loudly as 2YA, and static was not heard—2YA was also cut right out.

Now, according to all the text books on radio, a good earth and aerial are the first essentials to good reception, and here was I getting a Sydney station without aerial or earth. Needless to say, I did not go to bed as I intended, but sat up till the early hours. I was able to tune-in all the A class Australians and quite a number of "Japs," and also about 15 B class stations in New Zealand and Australia. But what impressed me more than anything was the absence of static and background noises that were apparent with the aerial and earth connected up.

I should have explained earlier that I use a "B" eliminator. The only as-

sumption I can arrive at is that the coil of the crystal set was acting as an aerial, and that the mains were earthing the whole hook-up. Incidentally the tuning is extremely selective, about two degrees of the booster dial being sufficient to cut out any station.—A Comfort (Wellington).

We Suggest.

YOUR experience is quite a common one, except that the crystal set acted in a different manner from what it was constructed for, and by way of a change became an absorption wave trap. The mains acted as aerial and ground. This is a feature in some localities that is quite objectionable, resulting in unwanted signals impinging on those that the set is tuned to, with the result that special circuits have to be devised in the main heads to reject them. Otherwise the set would be blamed for being unselective.

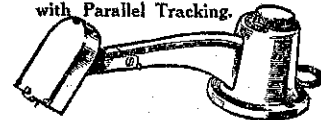
Here is another peculiar and interesting method: Connect aerial and earth to crystal set. Place the other set in a slightly oscillating condition. Now carefully tune crystal set a little distance away from the other set (but do not place phones in crystal set) and note effects. In some cases signals tuned in on the crystal set will be reproduced in the other set, although



MR. BILLY HART,
a popular 2YA vocalist.

not audible on the crystal set. Remember, that in playing with sets great discoveries may be made accidentally, so pass them along for the benefit of others. Armstrong discovered reaction by playing with a coil of wire while receiving signals.—Tec. Ed.

New *Harlie*
Gramophone Pick-up
with Parallel Tracking.



Reproduces Clear, Lifelike
Speech and Music.
Moderately Priced.

South Island Agents:—

ROYDS-HOWARD CO.,

553 Colombo St., CHRISTCHURCH