BONAVIA-HUNT'S "REAL-QUALITY" CIRCUIT

Amateur Wireless and Radiovision

3d Every Wednesday

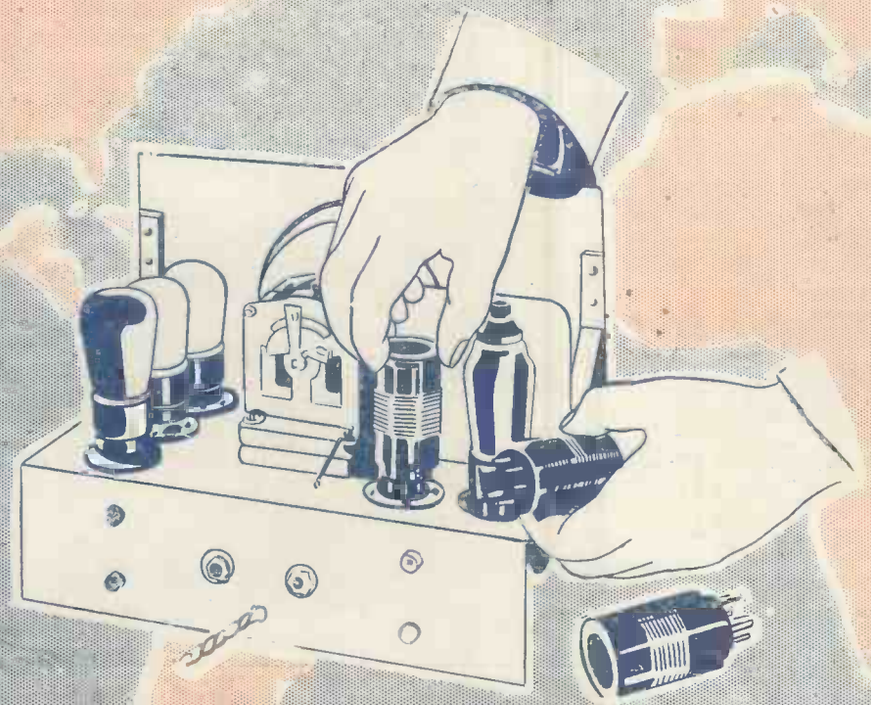
TUNE BY THE CLIMBING LIGHT!

WHITHER THIS TELEVISION?

TUNED GRID v. TRANSFORMER FOR H.F.

FOUR FEATURES for SHORT-WAVE FANS

The SHORT-WAVE WORLD-BEATER



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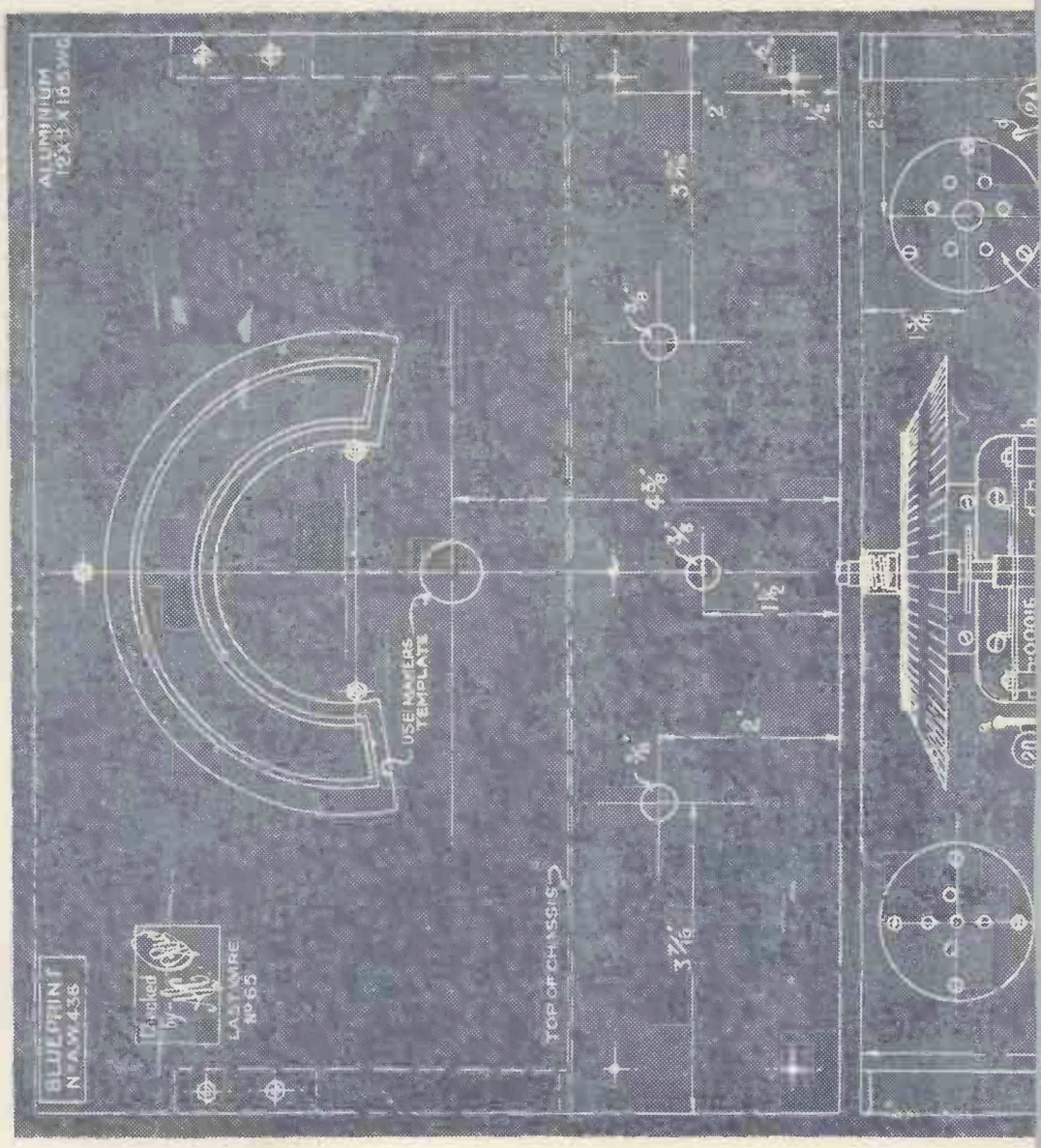
Half-scale Layout and Wiring Guide for the "A.W." SHORT-WAVE WORLD BEATER

(For full constructional details see pages 568-569 of this issue)



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News and Gossip of the Week

Filling Morning Gap

OUR whoop of joy at the B.B.C.'s belated decision to fill the glaring hiatus in its programmes from 11 to 12 in the mornings was premature.

Not because the gap will not be filled. But because it will be filled with the wrong sort of material. Lessons to schools from 11.30 to 11.55. Ghastly!

Q.E.D.

As if in answer to our silent reproach, a B.B.C. official tried hard to explain that set dealers could demonstrate just as well on a school lesson as on anything else.

How true! The urbane dealer will turn to his would-be—or won't-be!—customer thus: "Here you have the set in action, tuned to a typical B.B.C. programme—a talk to schools."

Which was to be proved, as *we* used to say at school.

B.B.C. Invalids

COLONEL DAWNAY, the programme controller, is away with a chill. Val Goldsmith, in charge of the business side of the B.B.C., has entered a nursing home for a second operation.

Let us all wish them a quick return to health.

Opening Droitwich

IT would have been a grand gesture if the B.B.C. could have arranged to open the new Droitwich station on the ninth anniversary of the birth of Daventry 5 X X, which falls on July 27.

But it can't be done. Droitwich is still in the hands of the wiring engineers. It looks as though early August will see the official opening, though we shall, of course, hear the new giant on the air long before that.

Marginal Note

LOOKING through our souvenir programme of 5 X X's opening, we see that the Rt. Hon. Sir William Mitchell-Thomson (now Lord Selsdon) performed the ceremony in his capacity of Postmaster-General.

You will recall that his lordship is the chairman of the present P.M.G.'s Television Committee.

Wavelength Re-shuffle

WHEN Droitwich does open there will begin an extensive re-shuffle of B.B.C. wavelengths. The majority of these will take place when Midland Regional moves over to Droitwich from its experimental site at Daventry.

To some extent the nature of these changes will depend on the International Broadcasting Union, which, by the way, meets in London on June 12.

Testing for Background

EVEN now, long before Droitwich has arrived, many listeners are hinting that they will suffer from much more background when the new long-waver usurps the function of their medium-wave Nationals.

To stifle such talk a B.B.C. engineer is at present roaming the country taking field-strength measurements. He is picking up Daventry on a frame aerial—turning it so to approximate about 5 millivolts per metre field strength.

Droitwich's Field Strength

AT this strength he is noting the degree of background. B.B.C. engineers freely opine that within the service areas of the three medium-wave nationals the Droitwich giant will give a field strength of at least 10 millivolts per metre—which should mean little or no background with normal amplification.

Down in Cornwall and north of Newcastle the strength will be up to 5 millivolts per metre, which is still quite a good signal.

Bottling Empire Day

BY the time you read this you will have heard the May 24 Empire Day relay by the B.B.C. from Australia. Post Office circuits were used to pick up the programme, which was then Blattnerphoned at Broadcasting House and re-transmitted on May 25 to Australia.

Our "down-under" kinsmen thus had the unique opportunity of hearing what sort of signal we picked up from their own country.

Against 24-hour Time

LETTERS of protest against the B.B.C.'s adoption of 24-hour time continue to arrive at Broadcasting House. The *cons* far outweigh the *pros*.

For once the B.B.C. is entirely neglecting the significance of these letters. What are a few hundred letters, they say, against the millions who mutely acquiesce?

[H.M.V. photo

A fine set in a fine setting! Listening to records being played on the cheapest automatic-changing radio gramophone yet produced

To us the most amusing part of the whole business is the way everyone is *ignoring* 24-hour time!

No More Protests!

STERN measures against would-be "protest" broadcasters are being adopted by the B.B.C. For Mr. Ferrie showed how peculiarly vulnerable the organisation was to sudden "show downs."

To prevent any repetition special headphone jacks are being let into the walls of the talks studios, so that directly anyone tries any tricks the B.B.C. eavesdropper can immediately put a stop to it.

New Orchestra

GOOD news about the Birmingham Studio Orchestra, isn't it? This combination of nine players is to join forces with twenty-one players of the City of Birmingham Orchestra to form what will be known as the Droitwich Spa Orchestra.

Frank Cantell will be the leader and Victor Hely-Hutchinson the conductor. It will broadcast once a fortnight.

Hotting Up Algiers

SOON the Algiers station will be rebuilt into a super-power giant, radiating 100 kilowatts, with facilities for increasing to 200 kilowatts without interrupting the programmes.

By the way, that wild rumour about a 1,200-kilowatt Russian station has been finally scotched. Nor is there any truth in the idea of even a 500-kilowatt Red.

WLW, of Cincinnati, Ohio, can rest on its 500-kilowatt laurels for quite a while yet.

O.B. Tie-up

HERE'S luck to Harry McMullan, the O.B. man of the Belfast station, who has just married Roberta Gardiner.

Major Gladstone Murray, B.B.C. chief of public relations, went over to see the knot spliced.

Readers' Views on This and That

Listeners' Letters

1934 CENTURY SUPER

To the Editor, AMATEUR WIRELESS:—

A FEW weeks ago I wrote you about the 1934 A.C. Century Super—complaints I had about the set in general. Well, dear sir, I apologise to you for the remarks I made, but after you hear of my troubles I am sure you will forgive me.

Well, in three weeks of wiring up and testing components, I have had to return three valves to the makers for replacement, which means I have had five valves for two positions on the set. Thermion talks about dud components; I don't know what he would say about dud valves.

Well sir, to brighten things, I congratulate you now on giving us a fine set. It does all and more than what you say for it, and it is the goods.

Thanking you again for the 1934 Century Super and wishing every success to "A.W." and "W.M."

W. BAXENDALE.

Blackburn. [1091

WAS 2LO BETTER?

IF Mr. W. H. Morris (letter 1084) means that the actual transmissions sent out by the old 2LO stations were superior to those given by Brookman's Park, he can hardly expect to be taken seriously, although most people will admit occasional lapses under present conditions.

But there is another sense in which the old transmissions did definitely give greater pleasure than their more powerful successors. A few years ago, when stations worked on fewer kilowatts, dwellers fairly near a station could generally count on at least one uninterrupted programme free from unwanted background noises. To-day, this is only possible if one either restricts one's listening to the daylight hours, or else decides to give up all hope of "real quality."

Here, within ten miles of Brookman's Park and in the month of May, the reception of a Symphony Concert was rendered quite intolerable by side-band heterodyning only a day or two ago; and I have little doubt that our neighbours on the Continent blame us quite as heartily as we do them when these continual collisions occur.

The whole trouble began a few years ago, when our and our neighbours' engineers, with the best will in the world, but with quite inadequate experience of high-power working, decided to risk the experiment of a nine-kilocycle separation between the stations of Europe. We know now that this is hopelessly insufficient. Of course, a receiving set can be made selective enough to separate the actual stations fairly easily, but it will not be a "real quality" set unless it will reproduce frequencies high enough to be interrupted by the 9,000-cycle continuous note which occurs when the carrier waves of two stations clash.

Sideband heterodyning occurs much lower down the scale than this, and to clean it out would probably mean a "cut-off" at about 4,000 cycles, a quite intolerable state of affairs for anyone with a critical ear. In all probability the future will be worse than the present in this respect, so long as anything like the Lausanne scheme remains in force. Twice the present separation is needed, which means half the number of stations on the medium wave-band.

I can only think of three possible lines of development: (*i*) That each country should voluntarily scrap one half of its stations. This is most improbable; (*ii*) That further means be explored of making use of common wavelengths in the hope that two wavelengths may one day be found enough for a country, one for all its "nationals," and the other for all its "regionals." This may or may not be one day possible, but it calls for very great accuracy; (*iii*) Far greater use of short waves. Unless some such solution can be evolved, we shall soon be driven to give up wireless listening and rely more and more on gramophone records.

Echo of the Whitsun rush to the sea and country—loud-speakers installed at Waterloo station to direct the holiday-making crowds for train departures

H. GARDNER.

Harrow-on-the-Hill. [1092

INDOOR AERIALS

I HAVE been amusing myself by looking through some old numbers of your publication, and I notice one outstanding point which seems very strange.

With few exceptions, you devise new sets from time to time and invariably choose those which require an outside aerial.

Even super-hets must be constructed to work efficiently on an open aerial—it seems that you avoid designing circuits for frame aerials as much as possible.

I wonder why it is so. I believe that the vast majority of wireless fans prefer indoor aerials to the old idea of a pole somewhere down the garden and a nail in the chimney stack. Why do you not use your great facilities to design a set which will work without an aerial?—the majority of amateur fans to-day are more satisfied by getting good reception on forty stations without elaborate aerials than on getting 140 stations on good outdoor aerials.

I have been playing with wireless since 1909 off and on, and I discarded outside aerials in 1920 or thereabouts when I built an American super-het with, I believe, Liberty transformers, and then the following year a Bowyer-Lowe set. I have never felt any urge to return to outdoor aerials, and my Bowyer-Lowe set to-day still gives good service to a friend.

The Super 60 was the cause of it being given away after many years' service, and an improved Super 60 will replace my present circuit.

R. ADAMS.

Chatham. [1093

"THANK YOU!"

EVERY Wednesday morning for several years I have said "Thank you!" to my newsagent for AMATEUR WIRELESS, and have only just realised that my appreciation of the "mid-week tonic" has its source in the "aerial" and "tuned circuits" which put the "quality" into the "loud-speaker" delivered at the door.

In the hope that you will forgive this belated admission of my indebtedness, I herewith send a very appreciative "Thank you" to you personally, Mr. Editor, and also to your excellent staff and contributors.

Apart altogether from the excellence of the technical matter "our paper" contains, I especially congratulate you on the "chummy" way it is served up.

All "A.W.'s" contributors, without exception, seem to possess the happy knack of imparting knowledge in a pleasant and oft-times humorous way, and I feel sure that this accounts in no small measure for the popularity of your interesting journal.

Having long since passed from the "novelty" to the "quality" stage of wireless reception, I am very appreciative of the articles under the latter title contributed by Mr. Bonavia-Hunt, and hope in due course to make practical use of the easy blueprint and constructional instructions, always associated with the good things that AMATEUR WIRELESS is constantly giving to its readers.

Good luck and "Cheerio!"

C. COCHRANE.

Ropsley, Grantham. [1094

FROM PITTSBURGH

I AM enclosing some details of my transmitter which may interest your readers.

The transmitter in use here consists of five stages and is crystal controlled. The crystal oscillator operates on 80 metres and uses a 247 tube with about 350 volts on the plate. This is followed by two frequency-doubling stages, also using 247 tubes, with 400 volts on their plates. A 210 amplifier operating on 20 metres follows the second doubler stage and the 210 is followed by a 203A operating as the final modulated amplifier. The 210 has about 500 volts on its plate and the 203A about 800 volts. The input to the 203A is 90 watts. The 203A is modulated by an 845, which is fed by a three-stage speech amplifier and a dynamic microphone. The input to the 845 is also 90 watts. The receiver in use here is an eleven-tube single-signal superheterodyne.

I hope that this information will be of interest to you and I would appreciate any reports on the reception of my signals.

WM. J. BROWN (W8AKU).

420 *South Pacific Avenue, Pittsburgh, Pa.*

[1095

THE OUTPUT STAGE

MAY I point out an error in my article on the "Output Stage" which appeared in your May 26 issue?

The Professor speaks of the "usual" method of working out the matching transformer ratio, and should have given the formula

$$\sqrt{\frac{\text{optimum load}}{\text{resistance of speech coil.}}}$$

This formula does not always lead to satisfactory matching, giving sometimes too high and sometimes too low a ratio.

NOEL BONAVIA-HUNT.

London, N.W.6. [1096

You May Be an Old Hand But—

Can YOU Tune a Set?

PERCY W. HARRIS, M.Inst.Rad.E., Discusses A Neglected Art

H.M.V. photo

"Every set works on the principle of resonance"—even this ultra-modern portable with-fluid light tuning

I HAVE taken the trouble recently to observe how different kinds of people tune their sets. I have watched experts tune simple sets, beginners play with multi-knob sets—old people, young people, bored people and tired people—just to see how they all do do it. And the result of it all is I have come to the conclusion that, because the average man thinks the tuning of a set is a simple matter, he does not trouble to do it properly.

Now, nothing could seem simpler than the tuning of a modern, commercial, multi-valve set fitted with a single tuning knob, particularly when such a receiver is fitted with self-adjusting volume control. If you want the London National you tune to the London National position on the dial, and if you want the Scottish Regional you turn to the Scottish Regional position—what can you do wrong there? You'd be surprised!

Every receiver works on the principle of resonance, with a maximum signal strength at the peak of the resonance curve. This peak

Marconiphone photo.

Never attempt to reduce the volume by de-tuning—always use the volume control

may be very sharp, or it may be flattened out somewhat, as when the band-pass principle of tuning is used. In all good modern sets the tuning is so sharp that a slight variation on either side of the correct point will bring you down the resonance curve, although the ear may not be able to detect very distinctly the changes in volume round about the peak.

If, however, the set is really sharp in tuning you will not get the proper quality the set is designed to give unless you are tuned to the correct point. This is often overlooked.

The reason for this is that you must include, as well as the carrier wave, the modulated frequencies, which spread up to about 5,000 cycles or more on each side, for you need the carrier and *both* of the side modulation strips to give you the best quality. If you tune, for example, to the left or right of this central point your proportionalities will go wrong and your tones will sound "edgy."

Try this out for yourself, if you have a sharp-tuned set, and notice that you do not get proper bass unless you are tuned to the *middle* of the signal and that the quality falls off on each side.

In practice what happens so often is this. The user of the set turns the dial to a point which he thinks is correct for the position of the station and then adjusts the volume to the strength he requires, taking it for granted that that is the quality he should get.

A very large number of people on all kinds of sets, flat and sharp tuned, have a habit of finding the central tuning position and then turning to one side or the other to reduce the strength, as the central position is too strong.

They think they can only get this reduction of strength by tuning to one side, and they can only do this at the expense of signal quality.

Yet I found this principle of tuning very widely adopted. I know it is a little more trouble to turn to the maximum strength of the signal by tuning and then to reduce the volume by means of the volume control, but this is the definitely preferable method.

With self-adjusting volume control, tuning is really more difficult, for instead of being able to judge the central position of the tuning curve by, so to speak, climbing to the peak and then reduce the volume gradually by the volume control, we are faced with the position that as we tune to the side of the resonance curve the volume increases only up to a certain point, whereupon we then travel across a flat "tableland" to the other side of the tuning curve, after which the signal will fall again.

This uniformity of strength, as if we had sliced off the top of the curve, makes it impossible to find the central point of the signal where best quality is obtained merely by judging the strength, and so we must listen carefully and tune-in to the point where we get the best bass notes.

"A.W." photo

In most modern sets, either constructor or home-built, the subsidiary controls are conveniently grouped around the main tuning control, which is nearly always at the centre

Ways You Can Go Wrong

When sets are fitted with reaction, sometimes marked on commercial sets as "volume" or "range," there are several ways we can go wrong in tuning. If the set has both a volume control and a reaction control we may forget that the volume control is turned down somewhat and bring up the signal by reaction in such a way that our higher modulation frequencies are badly attenuated by the sharper tuning we get due to reaction.

It is much better, so far as quality is concerned, and should always be done in a case where a signal seems weak, to turn up the volume control to fullest extent and *only then*, if the strength is not sufficient, to use reaction.

Other things being equal, and unless the set is fitted with compensating and adjustable tone control, a signal without reaction is better than one with, but as reaction brings about sharpness of tuning it may be necessary to use it in order to separate one station from another and in such a case the skilful use of controls can greatly improve the selectivity.

In some sets of the older type the tuning of the high-frequency stage and of the detector stage is controlled by separate condensers. There are two methods of tuning such a set to a loud signal, such as that from the local station. We can tune both circuits accurately and sharply to the signals getting a big voltage on the detector or we can de-tune each slightly, getting a band-pass effect.

If, however, we can do the slight de-tuning without losing too much of the signal, and provided one is de-tuned on one side of the carrier and the other on the other, the quality will be found to be better, and if you have such a receiver you might try this method of "staggering."

Little Components in the Making

Condensers—

Especially Wet and Dry Electrolytics!

By the "A.W." Technical Staff

Transmitting condensers of very high voltage are tested with this apparatus under actual working conditions. Note the large tapped tuning inductance coil on the left

WHEN we stepped into the factory of the Telegraph Condenser Company, Ltd., we were conscious of a pleasant feeling of anticipatory interest.

To every wireless amateur the initials "T.C.C." signify condenser reliability. To the more seasoned amateur these initials conjure up visions, more especially, of electrolytics—of both wet and dry varieties.

Thousands of Condensers

Untold thousands of low-voltage condensers of great capacity are made every day—for every conceivable part of radio equipment. Even motor cars are now incorporating T.C.C. electrolytics across the starter battery. It is extraordinary how electrolytic condensers have grown so popular in such a short space of time. It is only a matter of two or three years since this type of condenser was introduced to the home constructors.

There are two types of electrolytic condenser manufactured by T.C.C.; the original or aqueous type and later the dry type which now appears to be the more popular. The aqueous type consists of a drawn metal aluminium cylindrical container to which the negative connection is made.

At one end it is provided with a stout boss, enclosing a water-tight insulating bush through which passes an aluminium rod. This rod carries a coil spiral of prepared aluminium foil, suitably formed and covered by a liquid electrolyte.

By "formed" we mean the application to the surface of the foil, aluminium oxide, oxygen gas, or both. The aluminium film is actually passed through a bath of these chemicals having at the same time a high potential applied to it. Even after this potential has been withdrawn the film remains on the aluminium and subsequent application of high voltage, provided it does not exceed the original forming voltage, causes only a small current to pass.

Voltage and Current

Aluminium can be formed in this way to withstand a voltage as high as 500 and then only to pass 1 microampere per square centimetre of surface.

If the voltage is increased beyond this value the current increases very rapidly indeed and the condenser acts more as a low-value resistance.

The opening at the opposite end of the container carries a rubber valve, which releases the small amount of oxygen and hydrogen given off while the condenser is working. Naturally as the condenser has a liquid electrolyte it must always be used in an upright position.

Dry electrolytic condensers are very similar to the aqueous type except that the liquid electrolyte has been replaced by a semi-liquid paste. The positive electrode is still a thin aluminium foil and it is separated from a negative foil by a layer of fibrous material impregnated with the paste electrolyte.

Both positive and negative and the insulating material are then rolled up together and the final result is a very large capacity condenser in a small space. As with the aqueous type of condenser, the leakage current increases gradually according to the applied voltage, until the rated conditions are exceeded when the current goes up to a high figure.

As soon as the voltage is decreased the condenser again works in a normal manner and is quite unharmed by the excess voltage unless this has been applied for too long a period, causing the condenser to overheat.

These condensers undergo the most exhaustive tests, so that it is a physical impossibility for one to be supplied in a faulty condition. Each one is individually tested under actual working conditions while the period tests make quite sure that no fault will develop after the condenser has been fitted to a receiver.

You must not think that the T.C.C. manufacture only electrolytic condensers—far from it! They are world famous for their mica and paper condensers. We saw girl operatives making minute .00005-microfarad fixed condensers, as well as large 4- and 6-microfarad paper condensers. These are all tested for capacity, insulation and numerous other possible faults, which accounts for the high standard of efficiency one obtains with these small components.

Thorough Test Methods

The T.C.C. factory is extremely interesting, and it is quite obvious—even to anyone unconnected with wireless—that the exceptionally thorough test methods and the care that is taken to turn out a satisfactory product must result in reliability.

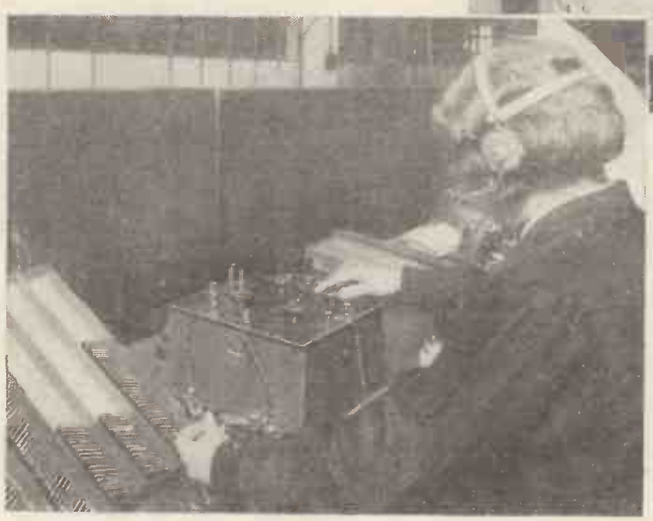
After our short visit to this factory, where we saw every phase of condenser manufacture, we shall never dream of suspecting a T.C.C. condenser of being the cause of a breakdown in *any* receiver.

With such competition as we know it to-day it is often the little things that place one firm far ahead of its competitors. Nothing could be more annoying to a home constructor than for some snag to develop in one of the components.

When we were being shown T.C.C. fixed condensers in the making, we paid special attention to all the constructional points, knowing full well that the condensers themselves were—like Caesar's wife—above suspicion.

We were pleased to see that every terminal connection had some special gadget or idea that prevented it from ever becoming loose. Shake-proof washers were fitted, or terminals with square heads fitted into slots in the moulding.

Winding and interleaving the paper and foil in the making of a typical T.C.C. condenser. The exact number of turns is noted on a revolution counter



This girl adjusts the capacity bridge until the constant note in the headphones disappears. She is then able to read off the exact value of the condenser under test from the calibrated bridge

Real-quality Series—12

The Real-quality Receiver

By NOEL BONAVIA-HUNT, M.A.

AMATEUR: At last, professor, we have reached the end of our discussion, and to-night will see the completion of our real-quality set. I am going to make it up as quickly as I can; as I am simply longing to have it in my home.

PROFESSOR: Naturally. However, before you start making up the set, I want to suggest one or two modifications in the circuit which I feel to be desirable in view of the fact that you will be using batteries only.

AMATEUR: Do you mean that you wish to make one or two alterations in the circuit?

PROFESSOR: Yes. I propose to run through the whole of the receiver circuit afresh, and I think it will be as well to avoid any undue switching complications until you have made

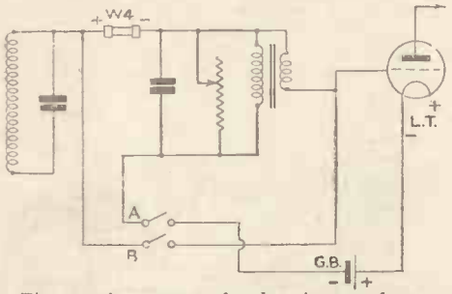


Fig. 1.—Arrangement for changing over from Westector to anode-bend detection

up the set in its essential form and thoroughly satisfied yourself as to the result.

AMATEUR: I see the wisdom of this suggestion. One needs to be extra careful over the design and construction of a new set.

PROFESSOR: That is very true. So let us begin at the beginning again and work our way through from the aerial to the loud-speaker. I must warn you at the outset that if you are going to employ a Westector for rectifying the signals, you will require a good outdoor aerial, even though you are providing yourself with a stage of high-frequency amplification. Otherwise, it is a choice between having two stages of high frequency or substituting a valve rectifier for the Westector.

AMATEUR: I should prefer, if possible, to do without the extra stage of high frequency, and as I have an outdoor aerial, I shall be pretty safe in using the metal detector. However, I have several friends who have to be content with indoor aerials. How shall we provide for their case? You will remember that we worked out a special switch to enable a change to be made over to a leaky-grid detector when required. Won't this solve the difficulty.

PROFESSOR: Undoubtedly: but I must be candid with you and say that I don't altogether like this rather complicated switching arrangement. I am more inclined to suggest a change over to anode bend rectification and to modify the low-frequency amplifier in one place in order to compensate for any possible high note attenuation caused by this form of detection.

Proposed Switching

AMATEUR: Well, I have no objection to your doing this, I am sure. What switching arrangement do you propose for this?

PROFESSOR: I suggest that we incorporate two independent switches of the "make- and break" type, so that, if it is required to change over from the Westector circuit to the anode bend circuit, all we have to do is to operate the two switches *in opposite directions.*

Here is a diagram of the circuit (*See Fig.* 1) in which the two switches are shown. For anode-bend working, you switch *A* to the off position, and *B* to the on position. To bring the Westector into operation you switch *A* on and *B* off.

AMATEUR: This is quite a simple plan, and there does not seem to be any great risk of poor contacts either. I must say I much prefer to try out this change over idea to that which we suggested in our original discussion on detectors.

PROFESSOR: Very good, we will decide on this arrangement and thus satisfy all parties, I hope. There next comes the question of the ganged tuning condenser. As you know, most people naturally insist on single tuning control, and this necessitates the use of a double-gang condenser.

Unfortunately for our special circuit the usual ganged tuner has a common earthed spindle. To break this common connection is not always feasible, and in any case it is as well to avoid having to do this. The best way out of the difficulty is to introduce another

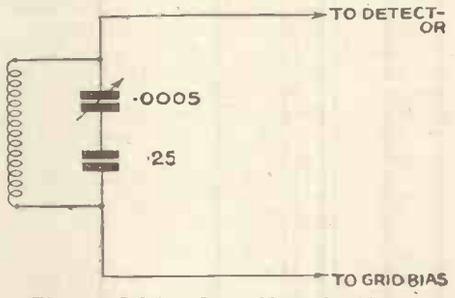


Fig. 2.—Solving the problem of taking the grid bias to a tuned coil when the tuning is effected by a ganged type of tuning condenser

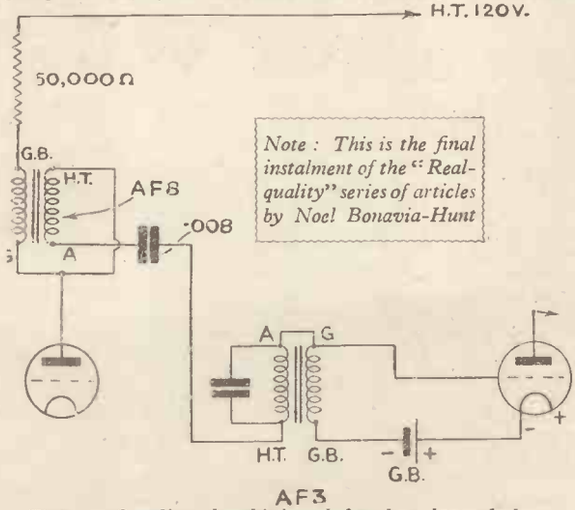
fixed condenser in series with the variable tuning condenser associated with the detector circuit.

See Fig. 2, where I show the bottom end of the coil connected to grid bias, and this extra fixed condenser placed between the tuner and the earthed spindle. The best value of condenser here is .25 microfarad, since this, placed in series with a .0005 microfarad condenser leaves the capacity of the .0005 microfarad condenser practically unaltered.

Changes for Reaction

AMATEUR: I am very glad *that* problem is solved. It worried me a bit. Have you any changes to suggest in the reaction circuit?

PROFESSOR: None whatever. Nor in the "spring-cleaning circuit" of the second stage of the low-frequency amplifier. This I consider

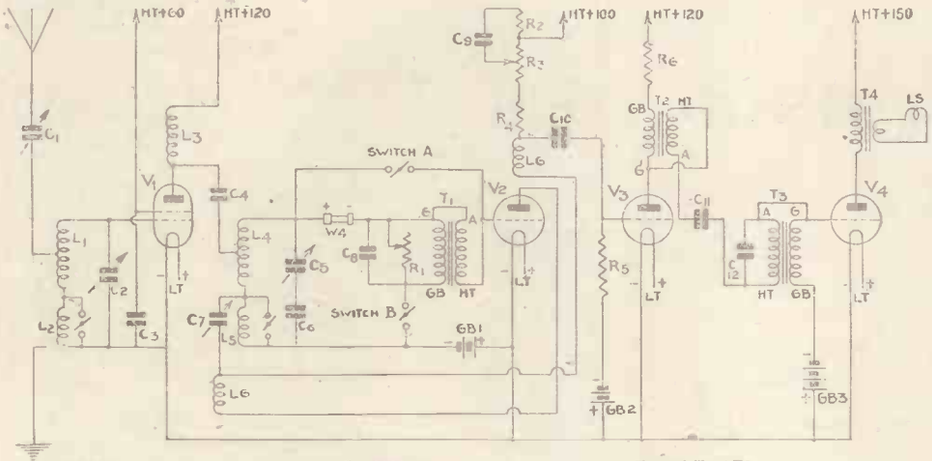


Note: This is the final instalment of the "Real-quality" series of articles by Noel Bonavia-Hunt

Fig. 3.—Coupling the third and fourth valves of the receiver. This arrangement extends the frequency response up to 9,000 cycles

[*Keystone photo*

Is this the "real-quality" home installation of the future? It consists of a combined radio-gramophone, talkie, and projector. The girl seen in this picture is fitting a spool of film into the talkie part of the equipment



V1 PM12
S23
V2 PM2DX
V3 PM2
P215
V4 PM2A
LP2
C1 .0003 var.
C2 and 5 .0005 ganged tuner
C3 0.1
C4 .0003
C6 .25
C7 .0003 var.
C8 .0001
C9 .004
C10 .02
C11 .008
R1 100,000 var.
R2 25,000.
R3 25,000 potentiometer
R4 3,500
R5 .5 megohm
R6 50,000
All 1-watt type.
T1 and T2 AF8
T3 AF3
T4 Output matching
L1 60 turns of 9/40 Litz
L4 60 turns of 28 d.c.c.
L6 20 turns of 28 d.c.c.
L2 and L5 140 turns of 36 d.c.c.
All wound on 2-in. formers.
L3 and L6 H.F. chokes
Varley Ni-core (or Wearite)
Grid biasing (1)=1½ volts
(2)=4½ volts
(3)=6 volts

Fig. 4.—Circuit diagram and component valves

resistance, for preference, such as the Ferranti M.1 or the Baker Super P.M.

To match the 15-ohm coil to the output valve (LP2 or PM2A) the ratio of the output transformer should be approximately 25-to-1. A 20-ohm coil requires a ratio of 22½-to-1. The inductance of the primary winding of the output transformer must not be less than 20 henries when 10 milliamperes are passed through it, and the D.C. resistance should be not more than 300 ohms. A good heater transformer will probably do as well as any special type.

Suiting Output Impedance

A really fine output transformer is the "Parmeko BOT," which is made to suit any output impedance required.

AMATEUR: What about fitting a pick-up to the amplifier for gramophone reproduction?

PROFESSOR: I prefer to give you the necessary particulars another time. It is advisable to get the radio receiver working satisfactorily first. Here (Fig. 4) is the diagram of the complete radio set which, I hope, will be sufficiently clear for your purpose. Get this made up first and let me know how you fare with it.

AMATEUR: Thank you very much. I will now bid you good-night.

PROFESSOR: Good-night, and the best of luck!

far too important a part of the amplifier to be touched.

AMATEUR: Then you propose to alter the last stage.

PROFESSOR: You will remember that I was almost over-anxious to keep down the total cost of our set as far as possible, and so I suggested a pure resistance of 100,000 ohms in the anode of the last valve but one. Now, if we have occasion at any time to switch over to anode-bend detection, it will be desirable to extend the treble response a little by way of compensation.

Incidentally, no harm will be done even when the Westector is used, since we are only extending our response curve and not endeavouring to introduce any peaks in this register. All we have to do is to scrap the 100,000 ohms resistance and in its place introduce a 50,000 ohm resistance and another transformer of the AF8 type.

Complete Coupling

These two components are connected as shown in Fig. 3, which gives the complete coupling between the third and fourth valves of the receiver. The frequency response of this coupling extends from 30 to 9,000 cycles.

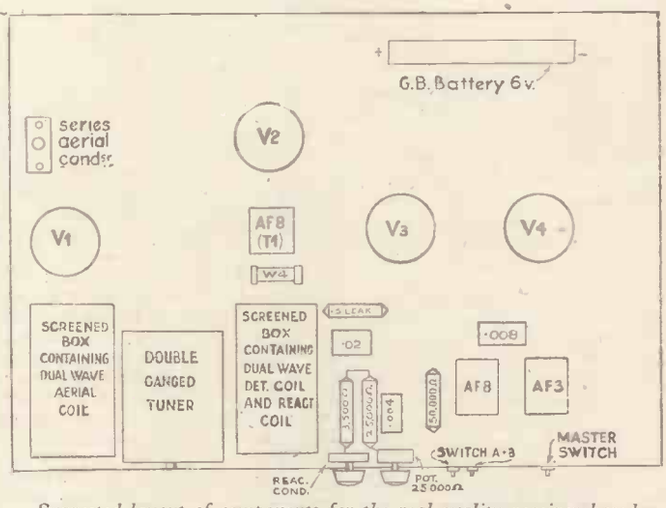
AMATEUR: My word! That *is* a proper coupler. I think it is well worth the cost of the extra transformer. We have now two really interesting and quite unusual forms of coupling in our set.

PROFESSOR: Yes, and I can assure you they *work*. No doubt we shall be subjected to some severe and not altogether unbiased criticism for breaking away from the orthodox couplings. But, as I have said before, *the proof of the pudding is in the eating*. Those who take the trouble to try out this receiver of ours and succeed in making it work (as, of course, they will succeed in doing) will turn a very deaf ear to any adverse criticism the circuit may happen to attract, and a very appreciative ear to the music this receiver will be capable of producing in their homes. And (don't forget) we are confined to the use of *dry batteries* for the whole of our current supply.

Not a Critic!

AMATEUR: You can make up your mind I shall not be one of the critics, whoever else is. I've heard one sample of your work, and I *know* good tone when I hear it. I haven't played in an orchestra for nothing, and I do appreciate good tone and balance. I am convinced that I shall not be the only one, even if I am the first, to make up this set. To think that I shall be able to get such results from an all-battery receiver makes me long to say good-bye and run home.

PROFESSOR: Right you are. But just one moment before you rush away. We must not forget the loud-speaker! I recommend a good permanent magnet type of moving-coil speaker, with a speech coil of, say, 15 to 20 ohms D.C.



Suggested layout of components for the real-quality receiver based upon Noel Bonavia-Hunt's recommended circuit arrangements

New Power-output Valve

A POWER-OUTPUT valve, interesting both to the receiving-set user and the amateur transmitter, is the Mullard T25D. This valve is primarily intended for use as a final high-frequency amplifier in moderate-power transmitters, although it will give quite a satisfactory output in a power amplifier.

It is a dull-emitter three-electrode valve with a 6-volt filament consuming 1.1 ampere. An interesting feature is that the filament, instead of being of the thoriated tungsten type, is oxide-coated, which allows for a very high emission with great mechanical strength.

With an anode voltage of 500, it is an ideal power output valve in a transmitter, its anode impedance is 5,000 ohms with a mutual conductance of 5 milliamperes per volt and an amplification factor of 25. If it is used on wavelengths over 100 metres the input may be as high as 40 watts, but on the 40-metre band the input should be restricted to 30 or 35 watts with a maximum anode voltage of 450.

It is interesting to note that on 20 metres the input can be as high as 30 watts with 400 volts on the anode. Even when running at full load the anode does not become visibly heated, due partially to the design of the valve and to the fact that it has been so conservatively rated that it can be over-run for large periods without damage. Owing to the electrodes being widely spaced the capacity is of a very low order—a vital point when used on very low wavelengths. At the price of 35s. it is a welcome addition to what we consider to be an already very wide range.

Mullard T25D

Whither This Television?

Asks ALAN HUNTER

NOW that a committee has been convened to consider the various systems of television and report upon them to the Postmaster-General, speculation is rife.

Ever since there has been any television there has been controversy, but this committee seems likely to bring matters to a head. Its task is not enviable or easy.

However unbiased one might begin an argument about television, one would very quickly have to take sides—and that is where the trouble would begin.

For with this television the stakes are so enormous and the potential capital and public interest so vast that a definite plunge in one direction or another is a risky business.

The Service Aspect

It might be a good idea to run over some of the points about television as it affects the B.B.C. from a service aspect.

For it is that aspect the B.B.C. is primarily concerned with. Not entirely, of course, since with its monopoly of the ether in this country it has a responsibility not only to fulfil its existing service of sound broadcasting, but also to develop and encourage British enterprise in any allied direction.

For a start, then, we have to ask ourselves how far any television system at present developed can offer the B.B.C. scope on a service basis. The answer is very hard to find.

The present 30-line television images are quite enjoyable to enthusiasts, yet open to criticism from those who do not care about the *modus operandi*—who think only in terms of entertainment, and who instantly compare unfavourably what they see on a television screen with what they are accustomed to see on a cinema screen.

On the other hand, wondrous tales of the clarity of the high-definition television systems on ultra-short waves have been recounted, although very few people have so far been privileged to look-in to them.

As soon as we bring in the ultra-short waves we have to ask ourselves whether the B.B.C. will be directly concerned at all.

Remember that in the beginning the B.B.C. was formed by a group of competitive radio manufacturers, who clearly saw the value of a single unit of broadcasting to further their own perfectly legitimate ends.

Orderly Use of Ether

When the old British Broadcasting Company was formed it was realised that one of the most potent reasons for its existence was the necessity for an orderly use of the ether.

But does that apply to the ultra-short waves? An almost unlimited number of stations could be accommodated between 5 and 7 metres without interference.

It may be a startling thought to some readers, but is it so very certain that the B.B.C. will retain its monopolistic grip, now tighter than ever on the medium waves, when we go down to the ultra-shorts?

From a technical point of view, there would be no reason for refusing permits to each development company now embroiled in the television race. Each could then concentrate on its own system regardless of fitting in with other demands, and if it considered the receivable images justified the sale of sets it might be allowed to sell them to keen television enthusiasts.

At present, if we regard the B.B.C. as the one and only source of television transmissions—irrespective of the system—we must face up to a stalemate.

For the B.B.C. really is in a very difficult position. Having started the 30-line transmissions, and thereby developed a quite considerable audience of lookers, it cannot easily stop them without causing something like a riot, which certain sections of the lay press would be only too pleased to foment.

[Fox photo

That many believe in the immediate future of television is demonstrated by this class of radio salesman at the Borough Polytechnic, where lessons in television have been given

Yet it might be contended that as the ultimate perfection of television seems certain to take place on ultra-short waves the present 30-line experiments are a waste of time and money.

Most of you who are interested in television must have wondered what this committee will recommend. On it there are members who are quite definitely *anti* 30-line—I will not specify their names, for obvious reasons.

If these technicians get their way, the 30-line transmissions might well be abandoned, and with them all the present efforts of amateurs over a large part of the country.

Assuming that ultra-short-wave television were adopted on an experimental basis the chances of the average amateur being able to make use of it—at any rate for some time—would be remote. The apparatus would be costly, the operation decidedly tricky.

[B.B.C. photo

Fred Douglas at the television scanner at the old Broadcasting House studio. Note the heavy black-and-white make-up—ideal for television images of low definition

Another point that must not be forgotten is that the present 30-line transmissions from London National will automatically cease when that station is closed down towards the end of the year—when, that is to say, Droitwich National takes over the medium-wave National stations' services.

Where can 30-lines go?

Immediately, then, the question arises as to where 30-line television could go, assuming it were kept on. London Regional would seem to be the only alternative, and on that only very late at night.

You can easily see, therefore, that those who want to get rid of the 30-line transmissions might take the closing of London National as a golden opportunity. But remember that this cannot happen until Droitwich is in full swing, and that will not be until at least the end of this year.

Meanwhile the committee under the chairmanship of Lord Selsdon will, no doubt, have issued its report, and that to a large extent must shape events.

The idea I would like to implant is that television in the future need not *of necessity* be a part of the B.B.C. service. Indeed, the more one thinks about the whole problem the less real reason there seems to be for the perpetuation of the monopoly when television does "arrive."

If, though, the committee decides that it would be in the public interest for the B.B.C. to take over all television, we must all hope that there will be no break in the continuity of development.

Such a break—as, for example, the closing of the 30-line transmissions and the experimental start of high-definition signals—would be a catastrophe to thousands of amateurs who have spent much time and no little money on helping to further the new science.

Debt to Strugglers

In the long run it is the great big public that matters, of course, but something is due in the meantime to those who have struggled against really overwhelming odds to resolve pictures from a thousand and one bands of flickering light.

It would, indeed, be a sad blow if, just when those pictures were becoming of real value, the whole source—the only source—of television transmission was stopped up.

That is an aspect of television that the Selsdon committee ought not to lose sight of. No better nucleus for television in this country could be cited than the admittedly small but growing band of enthusiasts who are now experimenting with 30-line apparatus.

These are the real "friends" of television—and they deserve to be considered.

Tune by the Climbing Light!

New Visual Indicator Explained by J. H. REYNER, B.Sc., A.M.I.E.E.

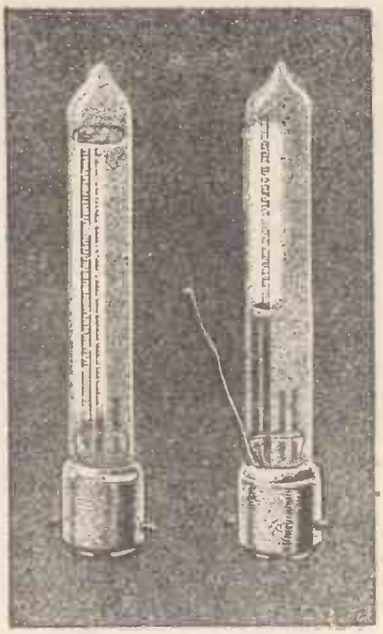


Fig. 1.—Here you see two Cossor neon-tube visual tuning indicators

A NEW and inexpensive form of visual tuning indicator has just been placed on the market by Cossor's. A small column of light climbs up to a height proportional to the strength of the carrier wave, so that when tuning in a powerful station the receiver is adjusted to give the maximum column height.

The device is actually a special form of neon tube, as at Fig. 1. In its simplest form it contains three electrodes, a long cathode, a short anode at one end and a small priming or "keep-alive" electrode.

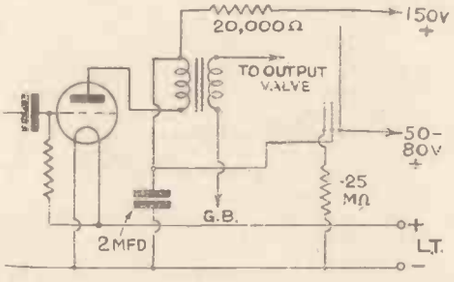


Fig. 3.—Application of neon tube to simple detector circuit

If a voltage is applied between the anode and cathode in the right direction so that the cathode is negative, a luminous glow surrounds the cathode itself. As the voltage is increased this glow mounts up the cathode which is the long electrode running up the tube, until ultimately the whole of the clectrode is glowing.

In practice the voltage across the tube is controlled by the carrier wave of the station being received and consequently as the station is tuned in the glow mounts higher and higher up the cathode until the resonant point is reached after which the glow begins to fall again, so that it is an easy matter to determine the exact tuning point.

The function of the keep-alive electrode is to prevent the discharge from going out. With the ordinary neon tube (or any gas-filled discharge tube for that matter) there is "backlash." If the voltage is increased until the discharge commences it then has to be reduced quite appreciably before it will stop again and there is usually a difference of 20 or 30 volts between the firing and extinction voltages.

Such a state of affairs is clearly unsuitable for the particular purpose in mind added to which it is not desired that the tube shall require any critical voltage to start it. The voltage developed from the carrier is usually anything from 20 to 50 volts according to the circuit and this in itself is quite insufficient to strike the discharge.

The third small electrode is introduced into the tube therefore, and this is maintained at such a potential relative either to the anode or the cathode that a permanent discharge takes place. This is located round the bottom of the tube and does not affect the operation of the climbing glow in any way.

One of the simplest ways of operating the device is to run it from the anode of the high-frequency or intermediate-frequency valve. This implies having a receiver with automatic volume control attached so that as the carrier voltage at the detector increases negative bias is applied to the grids of the high-frequency or intermediate-frequency valves. This reduces the sensitivity and at the same time decreases the anode current.

Consequently if the anode circuit of the valve contains a high resistance the voltage developed across this resistance will change and this alteration is made to operate the tube.

Fig. 2 illustrates a simple circuit for doing this. The anode of the intermediate-frequency valve is fed through a high resistance from the full high-tension point—about 250 volts. With the normal anode current flowing the voltage drop on the resistance is such as to reduce the anode voltage to about 180 volts. This voltage is applied across the glow tube, the anode being connected to the high-tension point and the cathode to a point about 50 volts positive. The priming electrode is connected to high-tension negative through a high resistance so that there is the full 200 volts between this and the anode, which is sufficient to maintain a small discharge.

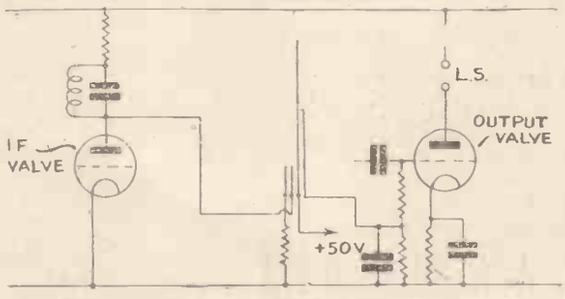


Fig. 4.—Noise-gate circuit using four-electrode tube

When the intermediate-frequency valve runs back due to the arrival of a signal the anode current decreases, the voltage drop on the anode resistance becomes less and hence the anode voltage itself rises. This causes an increase in the voltage difference between the cathode and anode of the glow tube and the glow discharge round the cathode begins to mount up the tube. The greater the change in the anode current—the stronger the signal, that is, the more does this climb up.

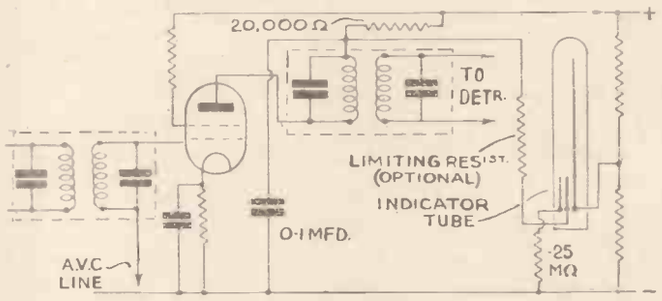


Fig. 2.—One method of connecting the indicator tube

The potentiometer to which the cathode is connected is adjusted so that the glow is just beginning to climb up the cathode with no signal applied. Then the glow climbs up the cathode proportional to the strength of the signal until on a strong signal it fills the tube completely.

If the automatic volume control is at all effective this will be found sufficient, because the signal developed at the detector will never be strong enough to send the glow "off the map." Should any difficulty be experienced on this score however, a resistance may be introduced in the lead from the operating point as shown on the diagram. This will exercise a limiting effect because as the glow mounts up the tube the discharge current increases and this causes a voltage drop on the limiting resistance which checks the effect.

Limited Usefulness?

It may be objected that using the tube off the A.V.C. line limits its usefulness. Actually one only really needs a visual indication of the tuning point when the automatic volume control is operating because if the signal is not strong enough to operate the gain control then it is quite easy to determine when the receiver is correctly tuned by adjusting to the loudest noise.

On more powerful stations, however, the automatic volume control limits the increase of noise so that the station appears to have much the same strength over quite a wide band of the tuning dial and it i possible for an inexperienced user to leave the receiver incorrectly adjusted in which case poor quality is obtained. This is the real purpose of a visual indication because it enables one to tune accurately to the carrier maximum.

It is quite possible, however, to

Continued on page 578

On Your Wavelength

By Thermion

Bank Holiday Fare

ON the whole, the Bank Holiday programmes were pretty well chosen, though I have one suggestion to make. It does seem to me that on national holidays, such as Whit-Monday, there should be broadcast entertainment before midday. On Bank Holidays heaps of people get a better chance of using their wireless sets than at any other time, and I am sure that some light orchestral music, or perhaps some gramophone records, during the morning would have been widely welcomed.

As it happened, Whit-Monday wasn't wet; but rainy Bank Holidays are not unknown, and the B.B.C. would do well to remember what a boon and a blessing broadcasting is when you are kept indoors on a holiday by those queer samples of weather that Dame Nature doles out to these islands.

◆ ◆ ◆

Television's Future

IT is good news that the Post Office has appointed such a strong committee to inquire into the best ways of developing a television service for the country. There is no question that high-definition television is ready to do its work on the ultra-short waves as soon as the necessary chain of transmitters can be provided.

As I have mentioned before, I have seen a good many demonstrations of the latest high-definition television and the results obtained are absolutely remarkable. One cannot say how long it will be before we have a regional scheme for television, but it is quite certain that a wonderful service could be provided and that combined looking-in and listening-in will one day be available for all. May that day be a not far-distant one!

◆ ◆ ◆

These Crocodiles Bite!

HAVE you, I wonder, discovered the extraordinary usefulness of that little gadget the crocodile clip? If you do any "hooking-up" or experimenting—as, no doubt, you do—the crocodile clip will save you any amount of time and trouble.

It is simply a spring clip rather like a miniature clothes-peg, with a pair of jaws and a terminal screw at one end. The joy of it is that you can make or unmake connections instantly and that you don't need any terminals or things of that kind. The crocodile clip will bite not you, but tags or bared wires or the metal parts of tubular condensers or the edge of a chassis or any kind of terminal.

If you want to try out one set against another, the crocodile makes matters simplicity itself. Connecting the earth terminals of both of them to earth, you can change over the aerial from one to the other in a moment.

◆ ◆ ◆

B.B.C. and Beer

THERE has been quite an outcry, I observe, because the poor old B.B.C. allowed a song telling of glorious beer to be broadcast. Those who control the programmes have indeed a hard life. Whatever they do or don't do, there is always somebody to raise a howl of execration.

One might imagine, from the things that some people say, that the very mention of the word beer on the wireless induces alcoholic longings amongst listeners. Actually, I should think the effect is precisely and exactly *nil*.

Now's the chance for the chappie who objects to the very mention of beer to write a rousing song "Water, Water, Glorious Water."

◆ ◆ ◆

The Battery Tests

THE tests on the five-bob batteries have now come to an end and I have prepared an article describing their doings. In case the draughtsman can't get the drawings finished in time for this week's issue of A.W., I will just mention that, though the batteries were a pair from the same batch and bear the same date, the performances were just about as different as they possibly could have been. At the end of the test, one of them had a voltage more than four times that of t'other!

◆ ◆ ◆

Fundamental Units

A CORRESPONDENT wants to know if there is any really fundamental unit in electricity. The answer is Yes and No, according to how critical you want to be. The nearest approach is the so-called C.G.S. system of units, which are based on the centimetre for length, the gramme for mass, and the second for time. It is possible to specify all—or nearly all—electric and magnetic quantities in terms of these three factors.

Unfortunately, there are two sets of C.G.S. units to be considered, one based on electromagnetic and the other on electrostatic action, and this is where the plot begins to thicken. I don't intend to delve deep into the question because, in the long run, even the centimetre, the gramme, and the second are not absolutely fundamental.

The first is the distance between two marks on a bar of platinum-iridium alloy, and the next the weight of a certain lump of metal, both preserved in the International Bureax of Weights and Measures. The third is supposed to be a certain fraction of the time of the earth's daily rotation—though it isn't really. The nearest approach to an absolutely fundamental unit that we know at present is the velocity of light.

◆ ◆ ◆

France's New Stations

THE French high-power stations now being built are coming along nicely. Two of them should be ready this year and a third next spring.

One of those nearing completion is at Rennes. This is a 60-kilowatter and, as the present 2.5-kilowatt transmitter at Rennes is often quite well heard, we should be sure of a good service from the new big fellow.

At Biot, near Nice, another 60-kilowatt station will be completed by the autumn. This will replace the 2-kilowatt Juan-les-Pins, which, like the small Rennes station, is by no means a bad signal on favourable nights.

France's finest station is being erected at Villejust. This has a 100-kilowatt transmitter and every single one of the most up-to-date improvements.

◆ ◆ ◆

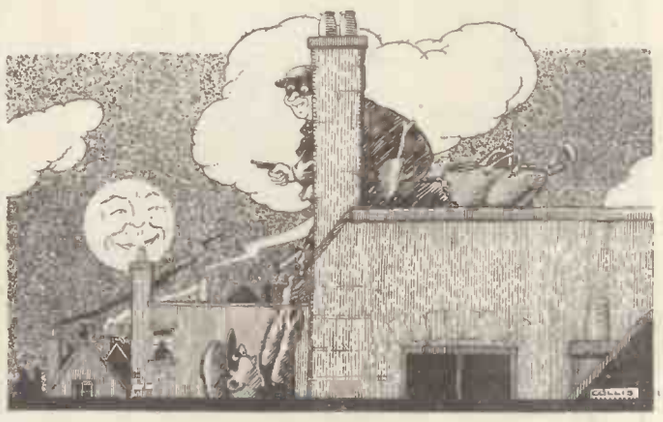
Anti-Parasiting

THAT is the French term for rendering electrical appliances incapable of pushing out interference. As you know, the French law on the subject comes into force on October 1, and it is expected that by that date interference will have been pretty well knocked on the head.

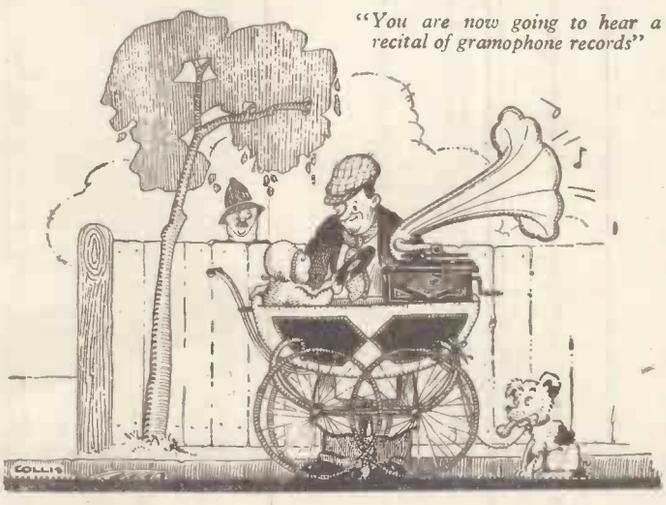
Meantime the French owner of electrical apparatus is not unduly hurrying himself. October, he says, is a long way off. He will see about his machinery some time soon.

Behind the Scenes at the B.B.C. . . :

"We are now going over to the Piccadilly Hotel"



"You are now going to hear a recital of gramophone records"



There will be the most unholy rush to fit "anti-parasiting" devices about next September, and not a few Frenchmen will probably find themselves up before the beak because they put things off till the last moment.

Switzerland is also introducing legislation against man-made interference. If we don't hurry up we shall be the only country in Europe that allows people to cause interference with wireless reception.

We are sure to do something about it soon, and if you are wise, you will make sure that any household appliances you purchase are innocuous. Make a point of this and you will save expense later on.

◆ ◆ ◆

Programmes for the Car

CAR radio has, I feel sure, come to stay, and it will bring with it a demand for better and brighter programme fare during the afternoons. We already have a pretty good afternoon National programme, but—and it's rather a big but—it comes from the Midland National only and not a few car wireless sets don't take in the long waves.

What we will have to have is a first-rate entertainment service between midday and 5 p.m. or so from the Regionals; or alternatively the medium-wave Nationals must be brought into action at these times.

Now's the B.B.C.'s chance to help both the industry and the listener by seeing that the fellow with wireless in his car can always be sure of something to entertain him.

◆ ◆ ◆

This Clock Business

DO we want the 24-hour clock or don't we? Nobody quite seems to know.

We are told that it has been adopted successfully in many Continental countries, and that's true—up to a point.

Abroad you will find the railway timetables printed on the 24-hour system and all armies use it. But nobody, except the B.B.C., has ever suggested that it should be employed for the ordinary affairs of everyday life.

In France, for instance, you may be told that your train goes at 2230, but nobody would dream of asking you to lunch at 13 hours or to tea at 17 o'clock.

The great use for the 24-hour clock is to prevent mistakes about a.m. and p.m. So far as I can see, there is no possibility of doing that with the broadcast programmes, for the very good reason that there is seldom anything to listen to before noon!

◆ ◆ ◆

Cologne Calling!

YOU may have noticed that Cologne has taken the place of Langenberg in the list of Continental wireless stations. Some years ago, the Langenberg programmes used to be relayed by a small transmitter at Cologne; now Cologne has become the central transmitter.

You will find it on 455.9 metres, just between the North Regional and Prague. Though the station's only a 17-kilowatter, it is well received, and your wireless set will show you that Cologne is just as good at broadcasting as it is at making scent.

◆ ◆ ◆

Designers' Problem

THOUGH the superhet is making big headway, the three-valver will for long continue to be one of the most popular of all receiving sets, particularly among battery folk. There is no harder set than the three-valver to design satisfactorily.

If every listener lived at exactly the same distance from his local station there wouldn't be much trouble. You could then strike exactly the right balance between sensitiveness adequate for the reception of distant stations and selectivity sufficient to confine the local to a conveniently small space on the tuning dial.

Variable Selectivity

AS it is, some listeners dwell within sight of the masts of their local station, whilst other's homes may be fifty or seventy-five or more miles away from it.

Unfortunately, you can't in the ordinary way increase selectivity without at the same time reducing sensitiveness—though every listener wants as much of both as he can get. The only solution seems to be to make the selectivity variable to some extent, so that the user can adjust it to suit his particular requirements. If I remember aright, "The Experimenters" have done some valuable work in this direction, and manufacturers might bear the point in mind when designing their three-valvers for the coming season.

Polarised Thermion!

THE other day, your Thermion had the novel experience of being turned into one plate of a condenser. No, I didn't meet a wicked witch or anything of that kind; the person I did meet was Mr. Poliakoff, the inventor of Deaf-Aid wireless.

He sat me down in a chair and proceeded to demonstrate his very latest development, the electrostatic telephone receiver. The principle is that the "subject" is polarised and becomes one plate of a condenser, the other being formed by the diaphragm of the receiver.

With my ears tightly plugged and big pads of cotton wool over them as well, I was instructed by signs to put the receiver against different parts of my head. The effects are amazing. You hear without using your ears, and what is even more surprising is that your head forms a kind of automatic tone control.

Put the receiver on your chin and the bass is enormously emphasised. If it is against your forehead you hear little bass, but lots of treble, whilst—in many cases, at any rate—the cheekbones give the best balanced reproduction.

Hearing is done not by means of sound waves, but by actual electrical impulses communicated to the nerves by the electrostatic device.

◆ ◆ ◆

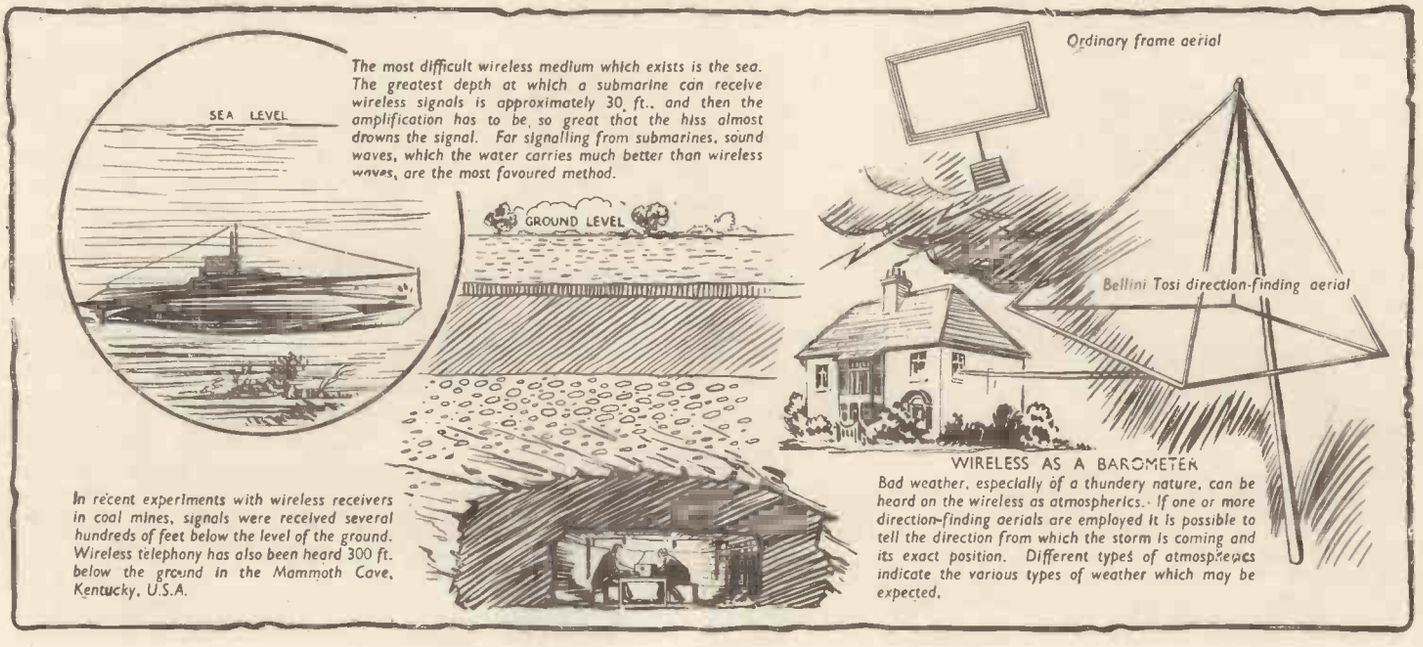
Long and Short

QUITE a lot of interest nowadays is concentrated on the short waves. Marconi is experimenting to see how far he can send metre waves around the curvature of the earth, while centimetre wavelets are doing useful work every day in the week across the English Channel. Then one hears talk of millimetre waves in the laboratories—which is getting down pretty close to ordinary light. Finally come the mysterious "cosmic" rays.

It makes one begin to wonder whether it isn't time something was done at the other end of the scale. In the old days waves of 20,000 and even 30,000 metres were pretty common. In fact, it is possible to radiate up to 50,000 metres, though, when rectified, these come within the audible range.

One might go a lot farther in the same direction than this, and although enormously long waves would not be suitable for ordinary wireless work, they may have other special virtues of their own. One never can tell.

Would You Believe It? . . . . . Asks G. H. DALY



The most difficult wireless medium which exists is the sea. The greatest depth at which a submarine can receive wireless signals is approximately 30 ft., and then the amplification has to be so great that the hiss almost drowns the signal. For signalling from submarines, sound waves, which the water carries much better than wireless waves, are the most favoured method.

In recent experiments with wireless receivers in coal mines, signals were received several hundreds of feet below the level of the ground. Wireless telephony has also been heard 300 ft. below the ground in the Mammoth Cave, Kentucky, U.S.A.

WIRELESS AS A BAROMETER

Bad weather, especially of a thundery nature, can be heard on the wireless as atmospherics. If one or more direction-finding aerials are employed it is possible to tell the direction from which the storm is coming and its exact position. Different types of atmospherics indicate the various types of weather which may be expected.

Has the Thrill Gone Out of Radio?

This refreshing little article by an amateur who prefers to be known as "Bart" may perhaps inspire beginners. It is a plea for the more widespread adoption among amateurs, of a "how it works" attitude to radio

IT is some few years since I first collected all available resources and invested in the parts for making a one-valve set, for in those days a multi-valve receiver was almost unknown. In fact, one had to fill up two sheets of foolscap with answers to pertinent questions for the purpose of obtaining a licence.

And the glow proceeding from the valve (sufficient to read the newspaper) was nothing to the glow felt when one heard a voice out of the ether announcing musical items in a strange tongue, and the listener realised that he had been successful in tuning-in The Hague, one of the first stations to broadcast.

Nowadays one only has to set the dial at the station of one's choice, switch on, and there you are!

The Thrill Has Gone

But, to my mind, the thrill has gone with the appearance of one-knob tuning, station names on dials, etc. Personally, if I were presented with a super one-knob, gold-plated, ball-bearing set, I should still keep a "hook-up" to try out the latest notion on, for that is the "meat and drink" of radio.

My advice to any young man to-day, who wants to learn something about radio and who desires a fascinating hobby, is to buy the "ingredients" for a simple one- or two-valver and *play with it*.

After a while he will begin to feel his feet and, progressing by easy stages, eventually

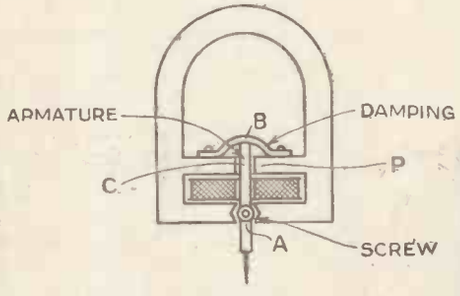


Diagram of pick-up construction to illustrate our contributor's hint

assemble some of the excellent multi-valve sets published in AMATEUR WIRELESS, at the same time being in the possession of the knowledge of "how it works" that will be ample recompense for the time and money spent.

When one has learnt "how it works," one is often asked to solve knotty problems for one's friends; in fact, one achieves a certain amount of popularity due to this. I will cite a case in point.

A friend of mine owned an expensive pick-up. One day the said pick-up was only delivering half the "goods," and after tapping it in a hopeful sort of way, to no purpose, he invested in a new one of another good make. Strange to say, he had only used the new one a fortnight when it "conked" in the same way as the other.

Considerably mystified, he approached me on the matter, at the same time voicing his opinions on the two makers of the respective pick-ups in rather an uncomplimentary way.

On examining both the pick-ups, I found the same thing *had* happened in each case, but I was able to exonerate both makers from blame. My friend looked still more mystified when I told him that I blamed his "grip."

What had happened was this: On inserting a new needle in the pick-up, he had always screwed the screw holding the needle up so tightly that in time the pressure had overcome the rubber "damping" in the pick-up, and as there is such a small clearance between the armature and polepieces, the armature had "stuck" to the magnet.

Turning the screw A in a clockwise direction had forced the armature at C over to the right, where it had stuck to P.

Universal photo

"My advice to any young man to-day . . . is to buy the ingredients for a simple one- or two-valver and play with it"

Readjusting the damping after freeing the armature was soon the means of preventing a re-occurrence of the trouble, and my friend is now the proud (?) possessor of two perfectly good pick-ups.

Moral: Don't be too hard on the needle screw!

Unpleasant Hum

As a sequel to some electrical alterations in the house, the writer's set suddenly developed an unpleasant mains hum (the set is fed with high tension from a mains unit).

Investigation showed that the electric cooker had been "earthed" on the water pipe, which was also the "earth" of the set. All the usual dodges failed to effect a cure, until, as the result of a "brain-wave," an "earth" for the set was tried on a tube in the garden.

Result: the hum has disappeared!

Another Lucerne Set Coming!

TO many readers the simple detector set with two stages of low-frequency amplification still appeals very strongly. That is why we know that the announcement of a straight three set with a Lucerne tuning coil will be most welcome.

Just before "The Experimenters" left for their summer vacation they entrusted the AMATEUR WIRELESS Technical Staff with the design of just such a set—and our men have now evolved a three that will nobly follow the famous Lucerne range.

It is a set with a leaky-grid detector, a resistance-capacity-coupled low-frequency amplifier, and a transformer-coupled power output stage.

Selectivity is well maintained by the use of the single Lucerne tuning coil, which, in conjunction with a series aerial condenser and a suitable adjustment of the aerial tapping will adequately cope with present-day conditions.

A simple layout has been obtained, with controls for tuning, on-off, wave-changing, selectivity and reaction.

A panel-and-baseboard layout has been adopted for maximum simplicity. The Lucerne Straight Three is not only simple—it is cheap to build and very economical to run. *Look out for full details in our next issue!*

H.M.V. photo

Are there fairies at the bottom of the garden? Looks almost like it from this picture of pigmies playing cards while they listen to music from a modern portable!

Building the "A.W." Short-u

A Chassis-built Screen-grid Four : : Designed

Connecting the flexible lead from the coil holder to the terminal on the top of the high-frequency pentode

WHY a metal chassis? We can hear many of you asking that when you see all the illustrations of our World Beater. So let us right away tell you just why the set has been fashioned along what must seem "commercial" lines.

Remember that we are thinking mostly of reception below 100 metres—though with suitable extra coils you can of course tune up to the normal broadcasting bands. For short-wave reception you need *absolute mechanical rigidity*.

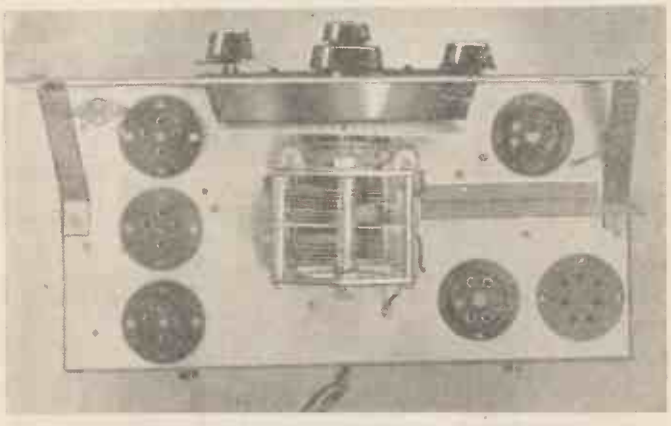
The slightest variation in the relative positions of the components may throw out the adjustments—more especially below about 30 metres.

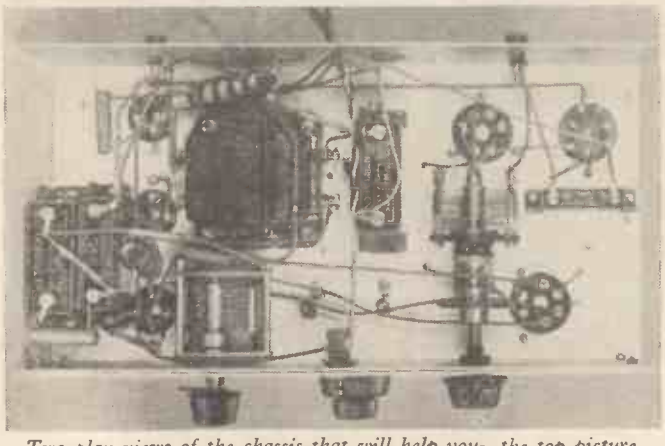
Secondly, in dealing with such high frequencies you must guard against instability, particularly if, as in this design, there is a "hot" high-frequency pentode stage.

Bearing in mind these two paramount needs of mechanical rigidity and electrical stability, the reason for the metal chassis becomes glaringly obvious.

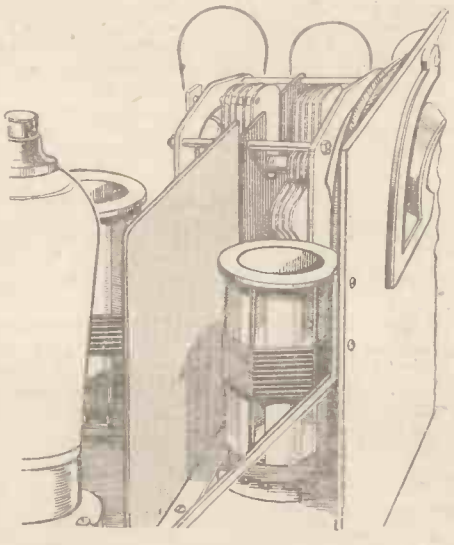
There is, moreover, a third very good reason why a metal chassis should be used. What are known as *hand-capacity effects* are prone to arise on short waves—variations in the tuning and reaction caused by the capacity effect of your hands as they approach the control knobs.

Experience shows that this trouble can be greatly ameliorated by erecting a metal panel between the control knobs and the components connected to them—the metal being earthed to neutralise the capacity effects.





Two plan views of the chassis that will help you—the top picture is of the top of the chassis. Below you see what the underneath of the chassis arrangement is like



Note how the small vertical metal screen forms a continuation of the plate between the two sections of the two-gang condenser

From the blueprint on the inside covers this week, and from a good look at all the pictures, you can easily see how we have fashioned the chassis. It is rather like a chair in shape, with the panel as the back of the chair and the baseplate as the seat.

Actually the baseplate is quite independent of the control panel, having a horizontal section and two right angle bend runners at the back and front.

The panel is bolted to the front runner of the baseplate and additional support is obtained with two bent panel brackets bolted to the panel and the baseplate as shown. An extremely rigid chassis results. Upon this we have assembled all the components.

Although most of the layout is perfectly clear from the illustrations a few notes will be of interest. On the baseplate, for example, are mounted the two six-pin coil holders and the four-valve holders, one of which is a seven-pin type for the high-frequency pentode, the others being the ordinary four-pin type.

As you can see from the plan views, the detector and two low-frequency valve holders are mounted in line along the right hand end of the chassis, while the two coil-holders and pentode valve holder are arranged at the other end.

You will see that between the two coils comes a small vertical metal screen. It is important for you to realise that this screen must be in line with the centre screening plate of the two-gang condenser. It continues the screening externally, in other words. About the two-gang condenser there is another important point. Small pieces of wood raise this component above the metal baseplate. This is done in order to clear the slow-motion drive from the baseplate, as you can see from the blueprint.

There is not much more need be said about the layout of the baseplate—although we might add that specially resilient valve holders have been chosen to avoid any possibility of microphony, to which of course the short waves are peculiarly liable.

Now for a few words on the control panel. The slow-motion drive is of course mounted on the condenser and fits into the hole already drilled by the suppliers of the chassis. The other controls are mounted below the level of the baseplate, so that their connections are the more easily made to the rest of the components sub chassis mounted.

Looking from the front of the chassis, the reaction condenser—of the slow-motion type—is mounted on the right, with the toggle switch for on off at the centre and the series aerial condenser on the left.

Still bearing in mind the special needs on short waves, you should note that this aerial condenser is arranged with an extension drive—also insulated.

How the Bracket Is Used

A metal bracket actually holds the component to the underneath of the baseplate but the control knob spindle is insulated from it as shown by the detailed drawing. Note too, that the condenser fixing is bushed so as to keep it electrically insulated from its fixing bracket—this being essential as it is in the aerial circuit.

You might ask why we have not placed the condenser close behind the panel and

vave World Beater

by the AMATEUR WIRELESS Technical Staff

thus saved all the bracket and extension business. The reason is simple, really. We did not want unduly to extend the leads. By taking the condenser back the leads are kept efficiently short.

All the rest of the components are mounted underneath with bolts. The two high-frequency chokes, the little tubular condenser and the fixed resistances are not actually bolted but are held in position by the connecting wires.

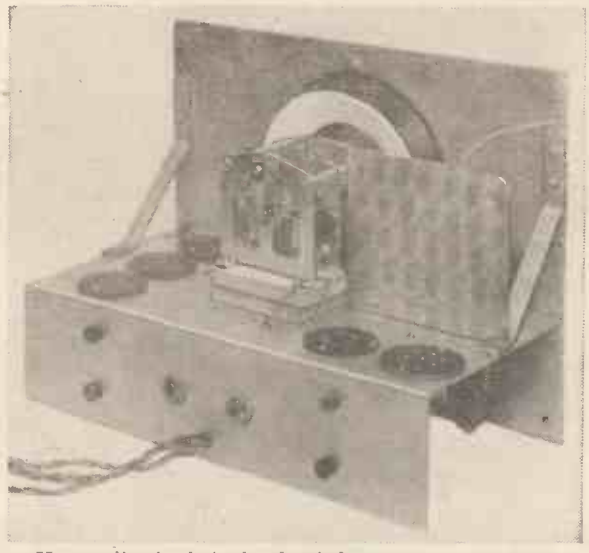
Two Jacks

At the back of the chassis are two jacks, one for loud-speaker working and the other for phones. The phones jack takes you into the first low-frequency amplifier circuit, the loud speaker jack coming in the anode circuit of the output valve. Aerial, earth and pick-up sockets are mounted at the back also.

No special order of assembly is insisted upon, but perhaps it would be as well to mount the holders, condenser and screen on the baseplate first. Then you can add the brackets before mounting the panel components on the front.

In such a set, the use of a full-size blueprint is most strongly urged. Our reduced reproduction on the inside covers this week will help but the 1s. 6d. full size blueprint is well worth the money. It can be obtained post paid from AMATEUR WIRELESS, 58 to 61, Fetter Lane, E.C.4.

When wiring up the components, the blue-



How really simple is the chassis layout can be seen from this view. Note the vertical screen

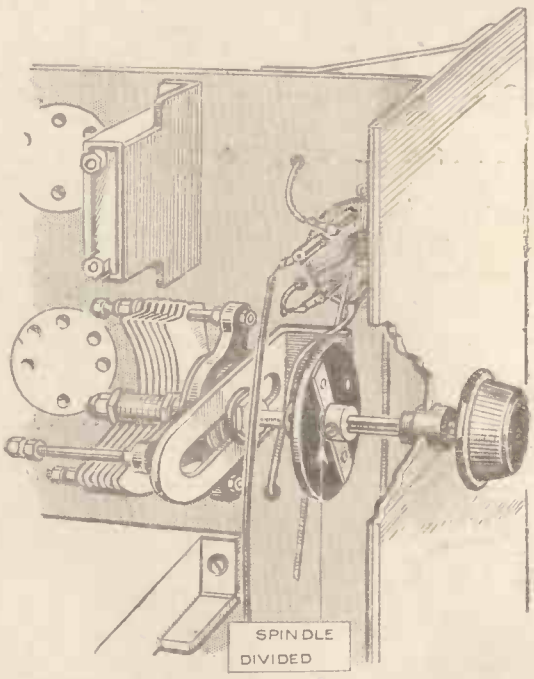
print will more than pay for itself, as it gives the point-to-point connections *in numbered sequence*. It also clearly shows which leads go from one side of the chassis to the other—in a way that cannot possibly be put to you by any other means.

Flexible wires go to the various components for the battery connections, these being lead out neatly through a hole at the centre of the back of the chassis.

Operation of this set is really almost as simple as with a broadcast set. The two-gang condenser tunes the two plug-in short-wave coils, and the aerial condenser acts as a trimmer to keep the two circuits accurately in tune over the whole of each waveband. Remember when you rotate the gang condenser to adjust the aerial condenser a little—otherwise you may miss many signals altogether, or bring in signals at a strength far below their possible maximum amplitude.

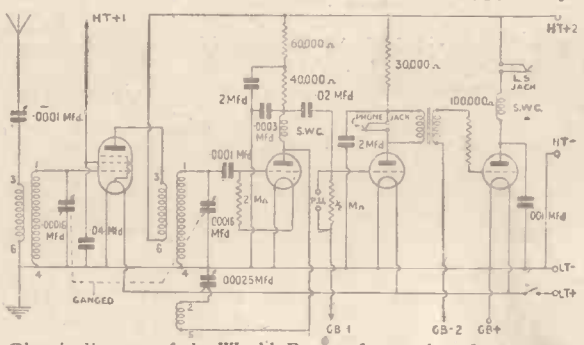
Reaction should be used sparingly. By this we mean that when you oscillate don't overdo it. For searching the most efficient condition is *just* oscillating and for resolving carrier waves located in this way the best position is just on the *threshold* of oscillation. If you find reaction at all "ploppy" try reducing the screen volts on the pentode.

Next week we will give you some further notes on the operation, so that you can do justice to the possibilities of the set.



Detailed drawing of the arrangement of the insulated coupling for the condenser spindle

With the valves already in position, the set is being completed by the insertion of the plug-in coils



Circuit diagram of the World Beater four-valve short-waver

Components Needed for the Short-wave World Beater

CHASSIS
1—Peto Scott aluminium, 12 in. by 6 in. by 3 in. with aluminium panel 12 in. by 9 in.

CHOKES, HIGH-FREQUENCY
2—Eddystone, type 948.

COILS
2—Sets Eddystone, types 6LB (2), 6Y (2), 6R (2), 6W (2), with two bases, type 964.

CONDENSERS, FIXED
3—Telsen, type tubular, values: .0001-, .0003-.001- microfarad (or British Radiophone).
4—Telsen type 250-volt working, values: .02-, .04-, 2-microfarad (2) (or Dubilier, T.C.C.).

CONDENSERS, VARIABLE
1—British Radiophone .00016-microfarad two-gang, type 612.
1—Eddystone .00025-microfarad with slow-motion drive, type 957.
1—Eddystone .0001-microfarad, type 900.

DIAL, SLOW MOTION
1—Polar, type Micro-drive Semi-circular.

HOLDERS, VALVE
1—Clix seven-pin, type chassis mounting.
3—Clix four-pin, type Airsprung chassis mounting.

PLUGS, TERMINALS, ETC.
6 Belling-Lee wander plugs, marked: H.T.+1, H.T.+2, H.T.—, G.B.—1, G.B.—2, G.B.+ (or Clix, Eelex).
2—Belling-Lee spade terminals, marked: L.T.+, L.T.— (or Clix, Eelex).
4—Belling-Lee sockets with wander plugs, type 1077, marked: Aerial, Earth, Pick-up (2).

RESISTANCES, FIXED
6—Siemens-Schukert, type SS½-watt, values: 30,000-, 40,000-, 60,000-, 100,000-ohm, ½-, 2-megohm (or Telsen, Erie).

SUNDRIES
1—Peto Scott aluminium screen, 4½ in. by 4 in.
1 ft. brass strip ½ in. by 3/32 in.
5 plywood 3 in. by 2¾ in.
2—Bulgin single circuit jacks, type J2.
2—Bulgin plugs, type P15.
1—J. B. coupler, type 2003.
1—Insulated bush to take ¼ in. spindle, 2 in. length ¼ in. diameter rod.
1—British Radiogram 2 in. metal mounting bracket.
Connecting wire and sleeving.
4 yds. thin flex.

SWITCH
1—Bulgin on-off toggle, type S8OT.

TRANSFORMER, LOW-FREQUENCY
1—Telsen, type Radiogrand (or Varley, Lissen).

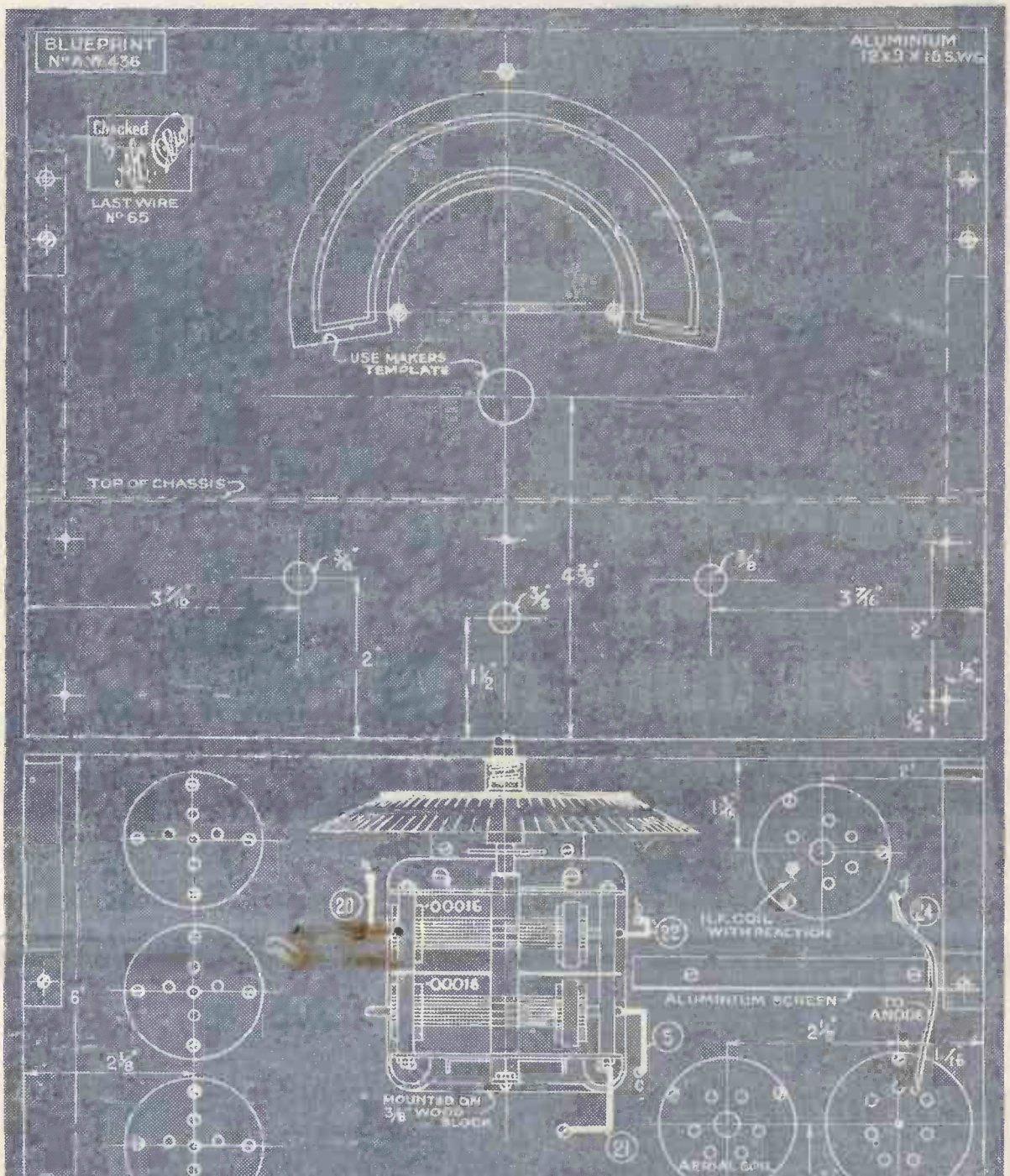
ACCESSORIES

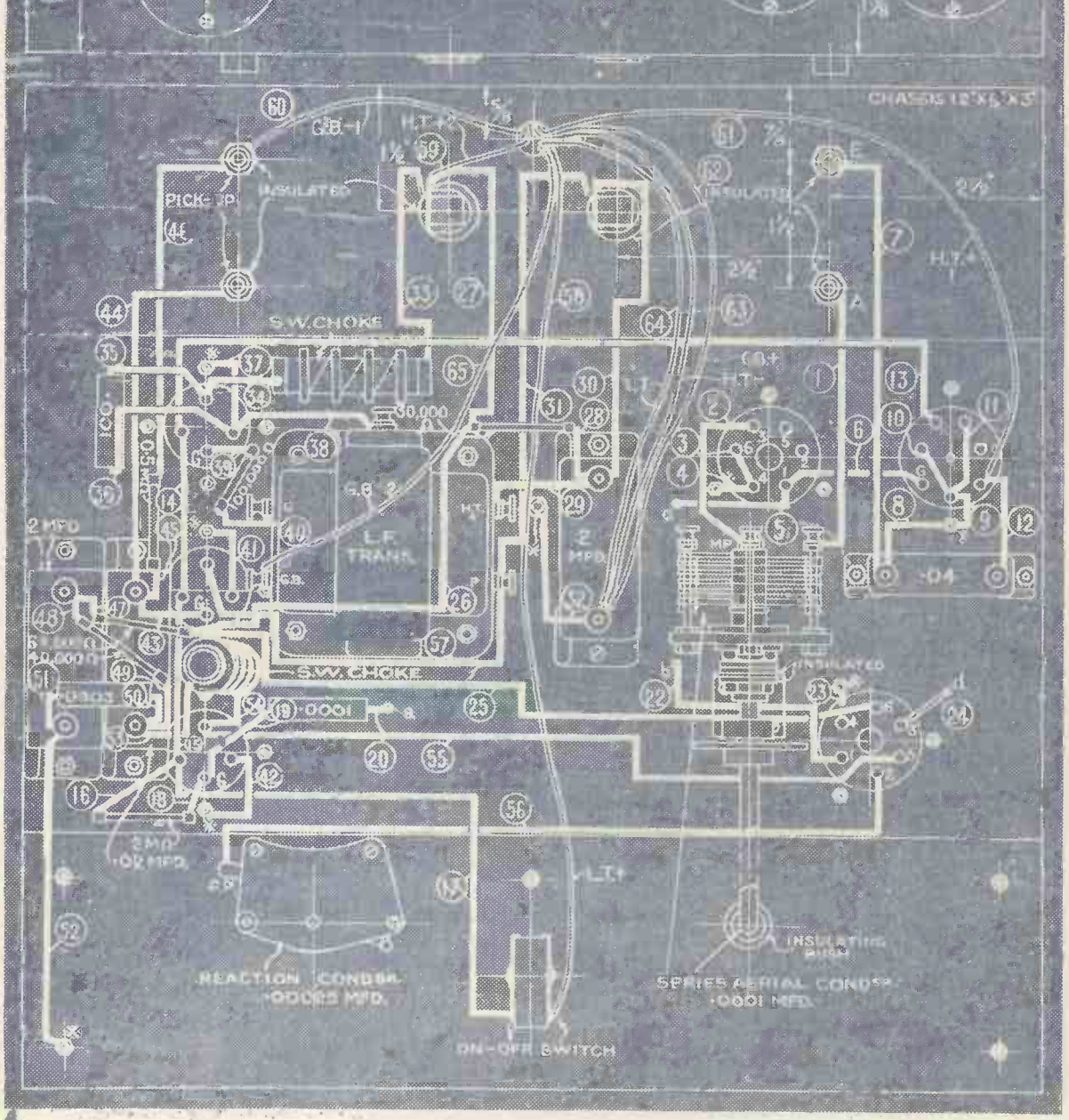
BATTERIES
1—Lissen 120-volt high-tension, type LN539 (or Drydex, Ever Ready).
1—Lissen 9-volt grid-bias, type LN758 (or Drydex, Ever Ready).
1—Lissen 2-volt accumulator (or Exide, Fuller).

LOUD-SPEAKER
1—Blue Spot, type 44R.

Half-scale Layout and Wiring Guide for the "A.W." SHORT-WAVE WORLD BEATER

(For full constructional details see pages 568-569 of this issue)




CHASSIS 12"x8"x3"
PICK UP
INSULATED
S.W. CHOKE
L.F. TRANS.
H.T.+
H.T.-
L.T.+
2 MFD
·02 MFD.
·0002 MFD.
·0001
30,000
REACTION CONDSR.
·00005 MFD.
SPECIES AERIAL CONDSR.
·0001 MFD.
INSULATING BUSH
ON-OFF SWITCH

Sets of the Season Tested

H.M.V. Fluid-light Six

WITH the introduction of the multi-electrode type of valve and other modern components, the familiar external aerial is slowly but surely becoming less necessary. Even so, receivers with internal aerials are almost invariably battery operated which, to a certain extent, limits their popularity. Far-seeing set designers, after the introduction of the H.M.V. battery-operated portable last year, realised that in 1934 one of the most popular sets would be a mains-operated one that could be carried about from room to room.

This H.M.V. set is a mains portable with an energised loud-speaker. The mains unit is specially shielded to avoid hum

This meant that it had to be entirely portable, including the aerial. The H.M.V. Fluid-light Six, as it has been called, is now available and is, as far as possible, fundamentally similar to the battery portable model, except that it embodies many refinements that are not practicable in a battery set.

The receiver is housed in a walnut cabinet 15 in. wide, 18 in. high and 8½ in. deep—a real portable. All of the controls are conveniently grouped in one escutcheon. The outer right-hand ring or knob drives the illuminated wavelength scale, which is calibrated in wavelengths between 200 and 550 metres on the medium waves and 900 to 2,000 on the long waves.

Arrows of Light

A fluid-light tuning indicator operates in the form of two arrows of light projected on to the tuning scale. This indicator gives the name to the receiver.

It consists of an electro-magnet controlled by the anode current of the intermediate-frequency valve which, in turn, controls the position of a floating metal shutter. This shutter floats in front of an opening on a glass tube covering up more or less of the opening, according to its position. A small bulb is fitted behind the shutter so that as the shutter moves, so it varies the amount of light that is allowed to reach the glass tube.

Actually, the signal input varies the amount of light seen through the glass. When tuning in the stronger the signal the less light is seen, so all you have to do is to vary the tuning to give the correct degree of light.

The left-hand knob is a combined switch and volume control. It controls the gramophone pick-up connections and brings into circuit long or medium waves as required. Around the base of the switch is the volume control, which operates on both radio and gramophone.

In the centre of the tuning control is a local-distance switch, which is very useful for cutting down the volume of the local or more powerful foreign stations. A master mains switch is at the back of the cabinet above the power plug and, by the way, the back of the cabinet cannot be opened without automatically disconnecting the receiver from the mains.

A look at the chassis should prove of more than usual interest. It is of workmanlike design and compact without being crammed up with odd components. The first valve, just behind the tuning condenser, is the pre-first detector high-frequency stage. This stage makes quite sure of the daylight range and general sensitivity of the receiver. It is followed by a combined first detector and oscillator which feeds into a variable-mu screen-grid intermediate-frequency stage.

A three-in-one valve is used to provide second detection, automatic volume control voltage and extra low-frequency amplification. Although this valve is only resistance-capacity coupled to the output valve the quality is exceptionally good, while the amplification is sufficient fully to load an MPT4 pentode so as to give an output of a little over 2 watts.

The moving-coil loud-speaker is of the energised type, which gives good quality and is very sensitive. Provision has been made for using external loud-speakers of the low-resistance type, as well as for a gramophone pick-up.

A noticeable feature is an entire absence of hum or mains noises of any kind. This is perhaps due to the fact that the mains unit is entirely suited to the receiver and housed in a metal container. Alternative mains-supply tappings are fitted to the container so that the receiver is suitable for all voltages between 200 and 250 in steps of 20.

The portability and general usefulness of this type of receiver, which can be plugged into any A.C. power point, cannot be over-emphasised.

This hospital patient found the new H.M.V. portable a real blessing. He has already been in bed for sixteen weeks—and may be there for a good many weeks yet

IN A NUTSHELL

Makers : The Gramophone Company.

Model : 463 Fluid Light Portable Six.

Price : £16 16s.

Valve Specification : High-frequency stage (Marconi VMS4B), combined detector oscillator (Marconi MS4B), single intermediate-frequency stage (Marconi VMS4B), double-diode-triode second detector (Marconi MHD4), pentode output (Marconi PT4), full-wave valve rectifier.

Type : Self-contained all-mains trans-portable.

Power Supply : A.C. mains, 200-250 volts, 40 to 100 cycles.

As an example of what we mean, a friend of ours, Norman Butcher, who is in Letchworth Hospital, has been unable to move for sixteen weeks. Radio is, of course, available to all the patients in the ward and helps to while away the time. With the fine weather, however, the patients are moved out into the open air and consequently the radio cannot be heard.

Radio Does Help!

We lent Mr. Butcher the H.M.V. transportable so that he could have radio without worrying about an aerial or earth, simply plugging into the nearest power point by means of a long lead. Mr. Butcher doesn't seem to worry very much now if he is there another sixteen weeks. Radio certainly does help!

The receiver under quite normal conditions is capable of picking up round about sixty or seventy stations without any aerial or earth attachment. We cannot venture to say how many stations it will pick up with an aerial. On medium waves, stations 9 kilocycles apart could be separated without any trouble. At the bottom of the long waves selectivity is about 10 kilocycles, improving to 9 kilocycles over 1,600 metres.

Frame-aerial Function

This selectivity can be improved upon by using the directional properties of the frame. Quite often stations on the same wavelength could be separated if they were not in the same direction.

Automatic volume control worked exceptionally well, so that the amount of fading was negligible. Some of the weaker stations which we knew were prone to fading remained level in volume over long periods. We can confidently recommend this receiver to anyone who requires thirty or forty stations at good loud-speaker strength, particularly if an external aerial and earth are not available.

Flat dwellers should be most interested in this set, which is of a type long overdue in this country. The admirable action of the set without any external aerial or earth makes it a set in a thousand.

By its successful action this latest H.M.V. product ought to set quite a new fashion in self-contained radio. Although not the first of its kind, it would seem to embody all the makings of a new trend. There must be thousands of people who have a mains supply but no means of erecting an external aerial and earth. This set certainly comes to the rescue of such listeners.

At sixteen guineas it is a very good proposition and with the name of H.M.V. behind it one can rely upon getting good service should it be necessary.

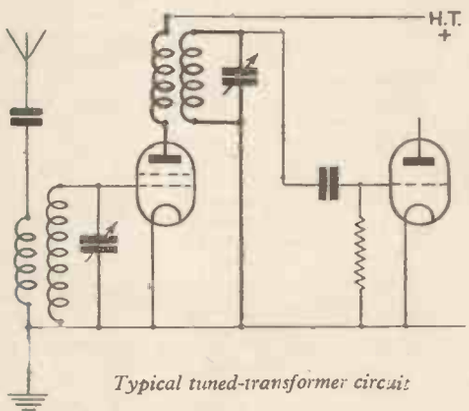
Tuned Grid Versus Transformer for High-frequency Couplings

In the embryonic days of wireless, say ten years ago, controversy over valve couplings raged furiously. Wireless societies and clubs fought out the relative merits of resistance-capacity, choke-capacity, and transformer coupling for low-frequency amplification. No less controversial was the question of the high-frequency coupling. On the one hand there were the exponents of tuned-anode coupling, and ranged against them those who pinned their faith in transformer coupling. At that time the now popular choke-fed tuned-grid system had not been developed. This little article does not seek to revive controversies of the dead past, but it does draw attention to a question that receives very little attention from modern set designers. Curves are produced from actual laboratory measurements showing the superiority of high-frequency transformer coupling for really selective tuning. We shall be pleased to hear from readers who have tried out these rival systems in the light of present-day reception requirements

THE methods of coupling high-frequency and detector valves have passed through several phases of fashion.

Before the advent of the screen-grid valve it was necessary to neutralise the internal grid-to-plate capacity of the valve and the split-primary high-frequency transformer was almost universally employed by means of which it was possible to feed back into the grid of the valve voltages which neutralised this internal valve capacity and thus gave stability.

When the screen-grid valve was introduced in 1928, on account of its high internal impedance it was at first considered that the tuned-anode circuit would be ideal, but owing to its lack of selectivity such a circuit was soon replaced by a high-frequency transformer, but having a primary impedance considerably greater than that used with the triode valve.



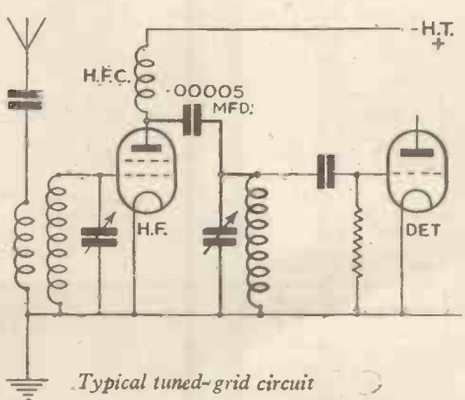
Typical tuned-transformer circuit

The high-frequency transformer was in turn replaced by the tuned-grid circuit, a type of circuit which had the merit of simplicity and which permitted dual-range switching for the medium and long wavebands to be easily carried out.

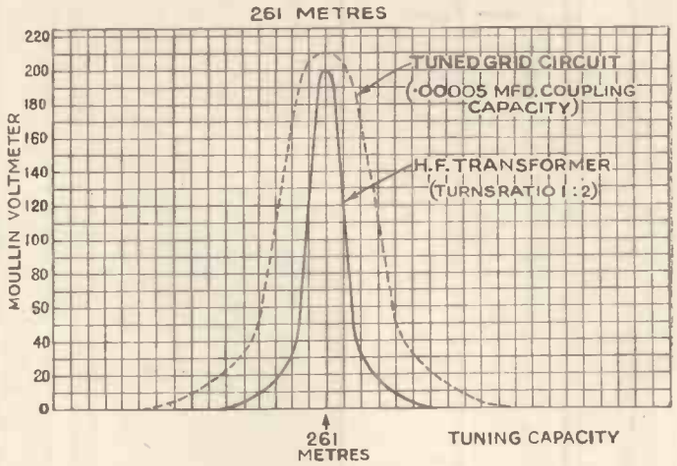
The tuned-grid circuit, however, is not selective enough for modern conditions and requirements and the tendency nowadays is to swing back to high-frequency transformers.

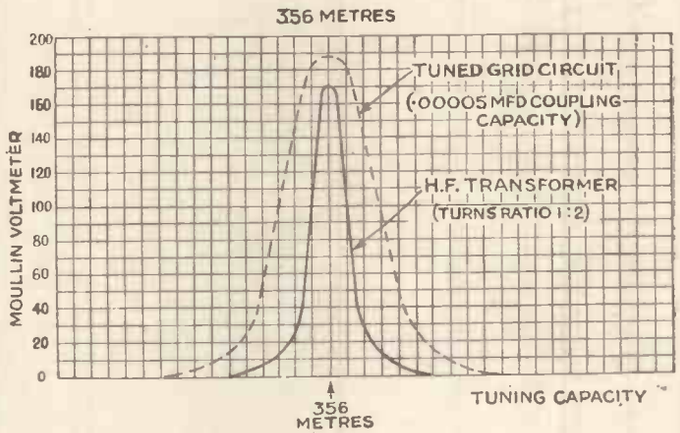
The introduction of iron-core coils permits this to be carried out in a manner which caters very satisfactorily for the congested state of the ether, since it is possible to give greater efficiency than with the original air-core transformer and thus work with smaller primary windings, thus retaining an equal energy transference with considerably greater selectivity.

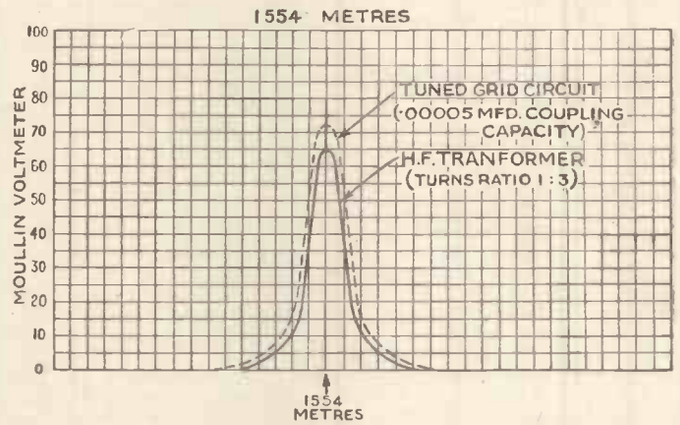
The curves given show a comparison between tuned-grid and high-frequency transformer circuits, using identical coils and tested under identical conditions. They demonstrate that although the energy transference is very little less than the tuned-grid circuit, the selectivity is increased considerably.



Typical tuned-grid circuit







Comparative resonance curves of tuned-grid and transformer couplings at 261, 356, and 1,554 metres

The tuned-grid circuit is working under its most favourable condition as regards selectivity, since it will be noticed that a coupling condenser of only .00005 microfarad is used.

Since comparison only is required definite values in volts have not been given, the vertical scale of the curves representing the degrees of a sensitive instrument connected to a screened-grid A.C. valve voltmeter.

In the case of the readings at 261 metres the loss in energy of the high-frequency transformer as compared with the tuned-grid coil is only 5 per cent, whilst the selectivity taken at 1/10 maximum deflection is 2.3 times greater. And now for your many retorts!

AMATEUR TELEVISION

Conducted by H. CORBISHLEY

Enlarging Television Images

By G. PARR

IT is not difficult to enlarge a television image, any more than it is difficult to enlarge a photographic negative—both are a question of choosing the right lenses and mounting them in the right place!

Everyone is familiar with the magnifying glass used for reading small print, and this type of lens can be used for magnifying a television image with a few trials to get the right position, but better results are obtained with a pair of lenses chosen to give the best results at a definite distance from the scanning disc.

Fig. 1. How the eye sees a pebble in a pond. Due to the bending of the light rays the pebble appears nearer the surface

The magnifying action of a lens depends on the effect known as *refraction*, which is simply the bending of a ray of light as it passes through a piece of glass. Other substances will refract light, in fact anything which is transparent and which differs in its nature from air. We know that light travels in straight lines—if it didn't, we should be able to see round corners! Now we will have to modify this statement and say that light travels in a straight line as long as it is passing through one particular substance, or "medium." As soon as another substance is interposed in its path the ray of light is bent from its original direction and takes up a fresh line of travel. The amount of bending of the ray depends on the nature of the medium.

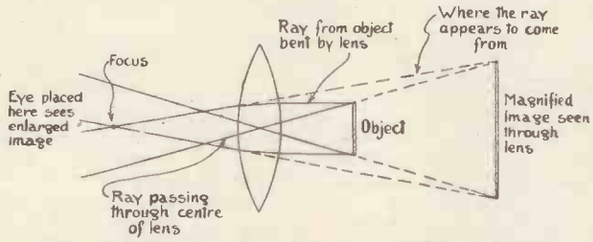


Fig. 3. How the rays of light from an illuminated image are bent by a lens to form an enlarged image

The simplest example of the refraction of light is that which makes a pebble at the bottom of a pond appear nearer to the surface than it really is. The sketch of Fig. 1 shows a ray of light proceeding from the pebble and bending as soon as it leaves the water. The eye, situated at a little distance, cannot tell that the direction of travel has changed, and so the ray appears to come from the point P higher up in the water.

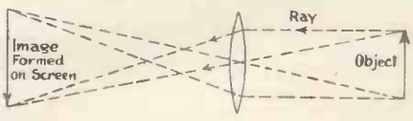


Fig. 4. How a lens forms an inverted image on an opaque screen

Now if we look at a luminous spot through a prism, the ray from the light will be bent in a similar manner and will appear to come from a totally different direction to that of the light source. A convex lens, or one which has both sides "bulging outwards" is really a kind of prism (Figs. 2 and 2a) although actually the glass is a smooth unbroken curve forming part of a circle.

A ray of light passing through a convex lens is bent towards the centre line, and if a bundle of rays from any object passes through the lens, each ray will be bent in to the centre so that they all meet at a point on the other side of the glass. This point is called the *focus* point of the lens, and the *focal length* of a lens is a measure of the distance at which all rays passing through it meet on the other side.

Enlarging the Image

Now, remembering the previous case of a pebble in a pond, we can understand how a lens can be used to magnify. Fig. 3 shows the eye looking through a lens at a thick line. The rays from the line pass through the lens and are re-bent in to the focal point with the exception of two which are shown passing right through the centre of the glass. The eye placed at a little distance the other side sees the rays as though they came directly from an imaginary object placed at a little distance behind the real one. Thus an enlarged image of the original black line appears, but to see it correctly the eye must be between the focal point and the lens.

If the same type of lens is used to project an image on to a screen, the image will come out upside down! This can be seen in Fig. 4, which shows the rays continued through the focus and crossing the centre line of the lens. Where they meet at the screen the projected image of the top of the arrow is now on the lower side of the centre line and the whole picture is inverted.

The magnifying power of a lens is the ratio between the size of the image and the size of the object to be magnified, and since it is related to the focal length of the lens used, we can say that in general we require a lens of short focal length to magnify a television image without taking up too much room on the mounting board. This means a thick lens, since the focal length depends on the radius of the curved surface of the glass.

Minimising Distortion

It was said above that all rays passing through a lens meet at a point on the other side, but actually this is not strictly true, particularly if the lens is thick. There will be a tendency for the rays passing through the extreme edges of the glass to meet at a point slightly different from those passing through the centre. This means that an object of large dimensions viewed through a thick lens will appear distorted round its edges, and to minimise this effect the lens should always be large in diameter compared with the object it is desired to magnify.

However, there is another way of securing good magnification without blurring or without unduly increasing the size of lens, and that is by using a pair of convex lenses in combination.

This is shown in Fig. 5 and it will be seen that the two lenses behave as one large lens so far as the rays of light passing through them are concerned. The formula concerned in the focal length of two lenses is rather like that of two condensers in parallel—the reciprocal of the focal length is equal to the sum of the reciprocals of the focal lengths of the two single lenses, or

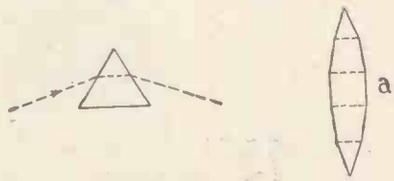


Fig. 2. The bending of a ray by a prism and (a) how a convex lens can be considered as a prism

$$\frac{1}{F} = \frac{1}{f_1} + \frac{1}{f_2}$$

where F is the combined focal length and f_1 and f_2 are the focal lengths of each of the lenses.

If the lenses are placed too far apart the enlarged image will be inverted in a similar manner to that shown in Fig. 4—in fact, they will form a simple telescope.

To calculate the size of an image produced by a lens, the following formula is used:—

$$\frac{1}{F} = \frac{1}{v} - \frac{1}{u}$$

Where F is the focal length of the lens, u is the distance of the object from the lens and v is the distance of the image from the lens.

As an example, suppose a lens of 20 cm. focal length is placed in front of a scanning disc giving an area of picture 3½ cm. high. If the lens is mounted 10 cm. away from the disc, then F in the formula above is 20, u is 10 and v works out to 20 approximately; that is, the image appears 20 cm. from the lens and behind the picture. The magnification is found as follows:

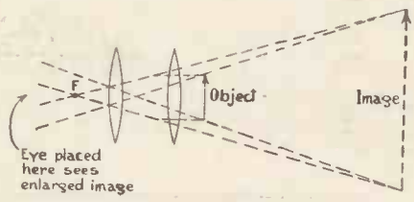


Fig. 5. Using two lenses to magnify an image. They act as one convex lens

$$\frac{\text{Size of image}}{\text{Size of object}} = \frac{v}{u}$$

From which the image appears to be twice the size of the actual picture.

In practice a lens combination of shorter focal length would be used to give increased magnification, but the calculation is the same, combined with the formula for the length of two lenses given at the commencement.

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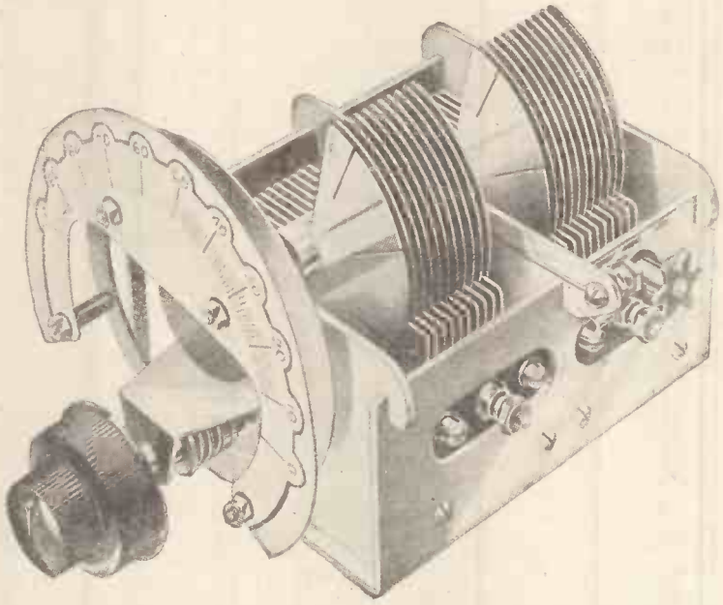

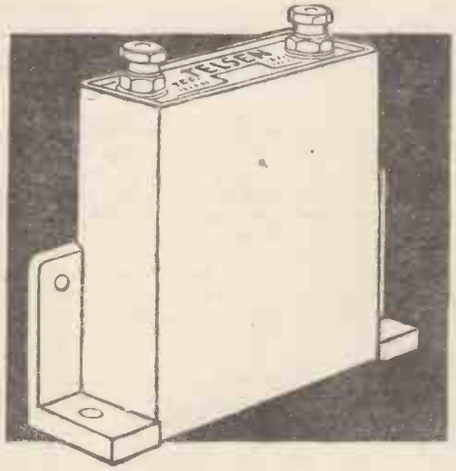

TELSEN GANGED CONDENSERS

For use where accurate and simultaneous tuning of two or three circuits is obtained by the rotation of one dial. A pressed-steel frame of great rigidity eliminates distortion, the rotor and stator vanes being let into one-piece, high-pressure die castings to ensure accurate spacing. All sections are very carefully matched by means of split end vanes, and trimmers are provided. Complete with knob, pilot light escutcheon and two alternative tuning scales. *Single Unit, Price* 8/6

Twin Ganged - - 16/6 *Triple Ganged* - - 22/6

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Self-sealing, non-inductive and hermetically sealed. Give the highest insulation with complete freedom from breakdown. 500 volt test.

Capacity		Price
.01	mfd.	1/6
.04	,,	1/9
.1	,,	1/9
.25	,,	2/-
.5	,,	2/3
1	,,	2/3
2	,,	3/-

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Very rigid construction, with high-grade dielectric, ensuring permanently accurate spacing with minimum losses. Exceptionally compact. Complete with knob.

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.0003 mfd.	2/6
.0005 ,,	2/6

TELSEN VARIABLE CONDENSERS

The frame is braced by three solid pillars, the vanes clamped at three points, making distortion impossible. Generous bearings prevent backlash or end-play.

Capacity	Price
.00025 mfd.	2/6
.00035 ,,	3/6
.0005 ,,	3/6

TELSEN REACTION CONDENSERS

Incorporate several valuable improvements, the whole unit being enclosed in a strong dustproof bakelite case. Supplied complete with knob.

Capacity	Price
.0003 mfd.	2/6
.00015 ,,	2/6
.0001 ,,	2/6
.00075 ,,	2/6
.0005 ,,	2/6

TELSEN DIFFERENTIAL CONDENSERS

Similar in design and construction to the reaction condensers. Supplied complete with knob.

Capacity	Price
.0003 mfd.	2/6
.00015 ,,	2/6
.0001 ,,	2/6

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With switch. Built on similar lines to the reaction condensers, providing an ideal selectivity and volume control. Supplied complete with knob.

Max. Cap.	Price
.0003 mfd.	2/6

TELSEN FOR EVERYTHING IN RADIO

Announcement of THE TELSEN ELECTRIC COMPANY LIMITED, ASTON, BIRMINGHAM

Short-wave Broadcasters

By J. GODCHAUX ABRAHAMS

IF you are interested in hearing the conversations held by amateurs you must limit your search to signals on six bands, namely, on channels between 5 to 5.36 metres (60,000 to 56,000 kilocycles), between 10 to 10.71 metres (30,000 to 28,000 kilocycles), 20.83 to 21.43 metres (14,400 to 14,000 kilocycles), 41.10 to 42.9 metres (7,300 to 7,000 kilocycles), 75 to 85.7 metres (4,000 to 3,500 kilocycles), and 150 to 175 metres (2,000 to 1,715 kilocycles).

It is usual, for the sake of brevify, to refer to the bands in terms of megacycles, as an example, 14 megs. for the 20-metre band, 7 megs. for the 41-metre band, 3.5 megs. for the 75-metre band, and so on.

Not Amateurs!

You may, in consequence, assume that any calls or signals tuned in on other channels than those specified do *not* emanate from amateur experimental transmitters.

The next lot of frequencies which interest us—in fact possibly of greater interest to the bulk of listeners on short waves—are those allocated internationally for the sole use of short-wave broadcasters or stations giving out more or less regular programmes, either from their own studios or as relays of an entertainment from a main station in the medium or long-wave band.

They will be found within the following limits: 50 to 48.8 metres (6,000 to 6,150 kilocycles), 31.6 to 31.2 metres (9,500 to 9,600 kilocycles), 25.6 to 25.2 metres (11,700 to 11,900 kilocycles), 19.85 to 19.55 metres (15,110 to 15,350 kilocycles), 16.9 to 16.85 metres (17,750 to 17,800 kilocycles), and to a much lesser degree on channels between 14.0 and 13.9 metres (21,450 to 21,550 kilocycles) and 11.7 to 11.27 metres (25,600 to 26,600 kilocycles).

The noting of these sections of the condenser dial is a particularly useful one, as if the receiver has been calibrated and a log started, it is an easy matter to find the settings immediately for one of these "brackets" and thus curtail, in a great measure, the search for any given station whose frequency is included in one of them.

Listen at Right Time!

This means actually that knowing the position of the condenser dial which will coincide with, say, roughly 19.50 to 19.85 metres, it will be no difficult task, if listening is done at the right time, to tune in transmissions from, for instance, W2XAD, Schenectady on 19.56 metres. It will not entail violent twiddling of the condenser knob, but a move of only a few degrees either way from the reading previously registered for that batch of frequencies.

You may have heard some odd references to *fixed* and *mobile* services; some explanation may be necessary. Fixed stations are officially recognised as permanent transmitters effecting point-to-point traffic, i.e. carrying out wireless communication with an opposite number either in the same or in a foreign country. Such stations, for instance, would ensure a radio telegraphy or telephony service between Great Britain and the U.S.A. or Canada, and *vice-versa*. Mobile transmitters cover ships, coastal stations, aircraft, aerodromes, and so on; in fact, practically all those which do not carry out a point-to-point service.

There are, of course, many sub-divisions, such as land stations established for life-saving purposes, and those performing special functions as direction finding; radio beacons of various descriptions; transmitters of which duties include the broadcast of time signals, meteorological bulletins, weather forecasts, storm warnings, and other information of assistance to certain classes of the community on land, on sea, or in the air.

Great Development

To all these respective sections and sub-sections of wireless activities, specific wave bands have been allotted, and it is interesting to note that throughout the short-wave band, from 10 metres (30,000 kilocycles) to 20 metres (15,000 kilocycles), there are practically no vacancies for other services, so great has been the development of radio telegraphy and telephony during the past few years. It is easy to realise that the band could not be distributed in chunks to the various services as—the matter was explained in a previous article—the reliable range covered by the different classes of wavelengths varies not only according to the season of the year, but is also closely affected by such factors as daylight and darkness, in both the transmitting and receiving areas.

For this reason the services have been given a number of alternative channels in different portions of the waveband, and the wavelengths used vary according to the time of day at which the stations are called to carry out their particular duties.

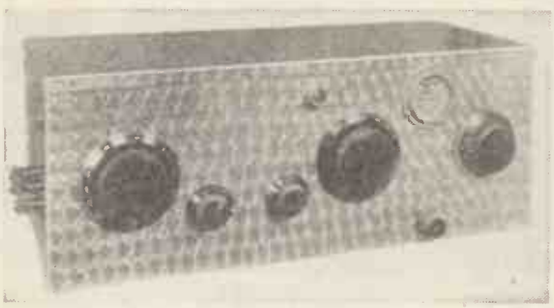
Mention must here be made of the 5-metre waveband which, originally considered useless by the authorities and generously handed over by them to the amateurs, has now been invaded by the post office in this country. A regular service of wireless telephony on these ultra-short channels is being carried out between Cardiff and Weston-Super-Mare by means of directional aerials. In view of the successful results achieved, it is very probable that similar installations will crop up elsewhere.

—and with the Amateurs

By KENNETH JOWERS

REPORTS that have come in from different parts of the country indicate quite clearly that conditions on the 20-metre band are at the present time better than they have been for a year or so. Instead of there being wide variations in conditions in different parts of the country, all listeners appear to be able to log twenty-five to thirty 20-metre American phone stations on even single-valve receivers.

The outstanding station has been K4SA, of Porto Rico, who has been heard on the loud-speaker at R8 to R9 from 2100 onwards. There is no reason to account for the exceptional reliability of the station, for it has been on the air consistently for the last eighteen months, but not until two months ago was it heard in this country at anything like its present strength.



Kenneth Jowers' short-wave receiver

This station can be logged by every short-wave fan who cares to listen between 2200 and midnight. I mention 2200 as being the earliest, because before this, signal strength sometimes is down to R4.

I have been able to hear GSH and GSG as late as 2300. These stations are scheduled to close down quite early in the day, so I cannot quite account for the reception. As I am using a new superhet, it may be that what I think to be fundamental frequencies are actually harmonics, but so far I have not been able to check this point.

Anyone who has heard either of these stations during the latter part of the evening might drop me a card. I shall be very glad to hear from him.

I believe that W2XAD has started a summer schedule, for at the present time it is on every evening between 2000 and midnight. Funnily enough, signal strength, although it averages as much as R7, is rarely as good as that of W8XK on the same band, which is always R7 to R9 from quite early on in the evening.

The local amateurs on the higher wave-bands are coming in very well indeed, particularly the Dutchman, PA0SD on 80 metres, who is always good. But a station that I have not heard before is PA0DG. On Thursday evening he put out some gramophone records which were really excellent quality. Signal strength was R8.

◆ ◆ ◆

Amongst the English amateurs that have been logged in various parts of the country are G5RL calling G6YP on the 160 metre band at R8, and G2DQ, the chappie who wins all the medals and cups, has also been logged at average strength of R7 to R9, QSA5. Other stations which should be picked up with ease are G6UT on 160 metres, G6RO, G6PA, G6SG, G6BS, G2XV, G2GL, all on the same wave-band.

One or two French stations have been coming over and providing good entertainment. Unlike the majority of French amateurs the modulation of F8BR and F8BS has been very fine indeed, and the strength about R8. Both of these stations are on the 40-metre band. The Belgian station ON4BLA has been working some Canadian phone stations at good strength and has been picked up in this country at R6, this time on the 80-metre band.

◆ ◆ ◆

P. Trezise, of Southampton, reports reception of W3QV, W2TZO, HC1FT of Rio Bamba, Equador, W2KR, WQYR, and the Argentine LU8VR, all on the 20-metre band. These stations are usually heard between 2300 and 2400. He has also logged SU1EC of Cairo, W3EDQ and W3PRG. All of these stations were on the loud-speaker.

◆ ◆ ◆

Bernard Shaw, of Sheffield, reports that he has heard a station in Habana, Cuba, call sign COC at R7. This station was on the 50-metre band at 2330. Mr. Shaw only uses a two-valve receiver with a poor outdoor aerial fifteen feet high and no earth connection.

◆ ◆ ◆

William W. Warner (BRS836) has so far received 135 verifications, which include amateurs, short-wave broadcasts, two commercials and 25 medium-wave American, Canadian, and South American stations. The receiver in use is again a detector and low-frequency, battery operated. Mr. Warner has also heard COC, Habana, on 50 metres and CN2WZ of Cuba on 20 metres. The only station in Nicaragua that he has heard is the Government station YNA on 20.69 metres.

The "A.W." World Beater in Lanarkshire

By JACK WILSON (BRS 1374)

BEFORE giving my log for different periods over twenty-four hours, ending 0100 Monday, May 21, I would like to offer my thanks to AMATEUR WIRELESS for giving me the opportunity to test their new four-valve short-wave receiver, which I received on Saturday afternoon, May 19, and to give a brief outline on its general behaviour.

When the set arrived I got batteries, etc., attached and switched on, and much to my dismay with no results. After a few hours trouble tracking, two loose connections were found (due to transit) which were duly soldered and tried again with results such as one hears about but seldom experiences.

After calibrating the set with the various coils I found that using the two smallest coils, the 16-metre band came in about 58 degrees, 20 metres 95 degrees, and 25 metres 148 degrees.

Using the next size, 25 metres was again found about 26 degrees, 31 metres 65 degrees, and the 42-metre amateur band around 140 degrees.

The third size covered the 50-metre band up to the 80-metre amateur band; 50 metres coming in about 30 degrees and 80 metres 125 degrees.

Using the final and largest coils, reaction was a bit fierce, thus making it difficult for me to say wavebands covered in this instance.

The receiver worked all stations with no hand-capacity effects whatever. Signal strength was amazing; at 0330 I heard about a dozen American Broadcasters between 25 and 50 metres all R8 to R9.

At 0745 VK2ME was coming in R6 on phones (bird call and cricket scores) and at 1710 on loud-speaker R7 to R8 (organ solo by Reginald Foort).

Before concluding these few remarks I must add that the single tuning control makes tuning very simple—in fact anyone could sit down and tune in VK2ME as easy as a medium-waver.

I append my log, which covers almost every corner of the world, under conditions that were not up to standard, and which gives the receiver and designers full credit. This log does not include U.S.A. broadcast stations logged on 25 metres upwards.

Here you see Jack Wilson testing out the "A.W." World Beater at his officially recognized receiving station in Lanarkshire, Scotland

What Jack Wilson Logged in Two Nights

Station	Metres	Strength	Station	Metres	Strength
W2MB	20	R6	OM4MAD... ...	42	R9
W6EHN	20	R7	PAOVP	80	R8
W2AMD	20	R6	LA1G	20	R6
W2BYP	20	R7	Maroc	37	R4
W2AKK	20	R8	PAOPN	80	R8
VE1BV	20	R5	CT1GU	20	R8
U.S.A. broadcasters		R8 to R9	W3NK	20	R8
DJB	19	R8	W8CTZ	20	R6
Empire	25	R9	G5NW	80	R9
VK2ME	31	R6	PAOAP	80	R8
Vatican	19	R8	PAOWV	80	R9
Moscow	25	R5	K4SA	20	R9
OH2NE	20	R6	VE2CA	20	R5
W3XAL	16	R8	CM2WV	20	R6/7
FYA	19	R6	HJ4ABB	42	R4
VK2ME	31	R7	YV5BMO	49.42	R7

Below 10 Metres

IF ever we start to make extensive use of the waveband below 10 metres—and there are many indications which point that way—lots of other people besides motorists will have to become more radio-minded as regards the use of "static-producing" apparatus. As a matter of fact, the Postmaster General has already power to forbid unauthorised radio transmission, and in one sense all static-producers come under this heading, though many of them still manage to get away with it at the expense of the poor listener.—T.S.

Medium-wave Broadcasters

This week we give details of all the important European medium-wave stations.
Next week we shall publish a list of short- and long-wave transmitters.

Metres	Kilocycles	Station and Call Sign	Country	Power (Kw.)
203.5	1,474	Flymouth	Great Britain	.3
203.5	1.474	Bournemouth	Great Britain	1
204.7	1,465.9	Pecs	Hungary	1.25
206	1,456	Fecamp	France	20
208.6	1,438	Miskolez	Hungary	1.25
209.4	1,432.5	Beziers	France	1.5
209.9	1,429	Newcastle	Great Britain	1
211.3	1,420	Tampere	Finland	1.2
214	1,402	Sofia	Bulgaria	5
215	1,395.4	Radio Lyon	France	.7
216.8	1,384	Warsaw (2)	Poland	2
218.2	1,375	Basle, Berne	Switzerland	.5
221.1	1,357	Turin (2)	Italy	.2
222	1,351	Dublin (2)	Irish Free State	1.2
222.2	1,354	Milan Vigentino (2)	Italy	7
222.6	1,348	Koenigsberg	Germany	.5
222.6	1,348	Bordeaux S.O.	France	3
224	1,339	Montpellier	France	.8
224.2	1,338	Lodz	Poland	1.7
225.6	1,330	Hanover and other Hamburg relays	Germany	1.5
227.6	1318.5	Magyarovar	Hungary	1.25
230.2	1,303	Danzig	Germany	.5
231.8	1,294	Linz and other Vienna relays	Austria	.5
233.5	1,285	Aberdeen	Great Britain	1
234.3	1,280	Dresden	Germany	1.5
235.1	1,276	Stavanger	Norway	5
236.8	1,267	Nurnberg	Germany	2
238.5	1,258	San Sebastian (EAJ8)	Spain	.6
238.5	1,258	Rome (III)	Italy	1
240.2	1,249	Juan-les-Pins	France	2
241.9	1,240	Cork	Irish Free State	1
243.7	1,231	Gleiwitz	Germany	5
245.5	1,222	Trieste	Italy	10
247.3	1,213	Lille PTT	France	1.4
249.2	1,204	Prague Strasnice (2)	Czechoslovakia	3
251	1,195	Frankfurt-am-Main and relays	Germany	17
253.2	1,185	Kharkov (2)	U.S.S.R.	35
255.1	1,176	Copenhagen	Denmark	10
257.1	1,167	Monte Ceneri	Switzerland	15
259.1	1,158	Moravska-Ostrava	Czechoslovakia	11
261.1	1,149	London National	Great Britain	50
261.1	1,149	West National	Great Britain	50
263.2	1,140	Turin (I)	Italy	7
265.3	1,131	Hoerby	Sweden	10
267.4	1,122	Belfast	N. Ireland	1
267.4	1,122	Nyiregyhaza	Hungary	6.25
269.5	1,113	Kosice	Czechoslovakia	2.5
269.5	1,113	Radio Vitus (Paris)	France	1
271.7	1,104	Naples	Italy	1.5
271.7	1,104	Madona	Latvia	15
274	1,095	Madrid EAJ7	Spain	3
276.2	1,086	Falun	Sweden	.5
277.2	1,082	Zagreb	Yugoslavia	.75
278	1,079	Bordeaux PTT	France	13
280.9	1,068	Tiraspol	U.S.S.R.	10
283.3	1,059	Bari	Italy	20
285.7	1,050	Scottish National	Great Britain	50
288.6	1,040	Leningrad (2)	U.S.S.R.	100
288.6	1,040	Rennes PTT	France	1.3
291	1,031	Heilsberg	Germany	60
291.7	1,028.5	Parede	Portugal	5
293.5	1,022	Barcelona (EAJ15)	Spain	2
296.2	1,013	North National	Great Britain	50
298.8	1,004	Bratislava	Czechoslovakia	14
301.5	995	Huizen (Hilv. prog.)	Holland	20
304.3	986	Genoa	Italy	10
304.3	986	Cracow	Poland	1.7
307.1	977	West Regional	Great Britain	50
312	962	Grenoble PTT	France	3
312.8	959	Poste Parisien, Paris	France	60
315.8	950	Breslau	Germany	60
318.8	941	Algiers	North Africa	13
318.8	941	Goteborg	Sweden	10
321.9	932	Brussels (2)	Belgium	15
325.4	922	Brno	Czechoslovakia	35
328.6	913	Radio Toulouse	France	60
331.9	904	Hamburg	Germany	100
335.2	895	Limoges PTT	France	.7
335.2	895	Helsinki	Finland	10
338.6	886	Graz	Austria	7
342.1	877	London Regional	Great Britain	50
345.6	868	Poznan	Poland	17
345.6	868	Agen	France	.4
347.2	864	Sofia	Bulgaria	.3
349.2	859	Strasbourg	France	15
350	857	Bergen	Norway	1
352.9	850	Valencia	Spain	3
356.7	841	Berlin	Germany	100
360.6	832	Moscow (4)	U.S.S.R.	100
362.8	827	Radio LL, Paris	France	1.2
364.5	823	Bucharest	Roumania	12
368.6	814	Milan	Italy	50
373.1	804	Scottish Regional	Great Britain	50
377.4	795	Lwow	Poland	21.5
378.8	792	Barcelona (EAJ1)	Spain	8
382.2	785	Leipzig	Germany	120
386.6	776	Fredriksstad	Norway	.7
386.6	776	Toulouse PTT	France	.7
391.1	767	Midland Regional	Great Britain	25
395.8	758	Katowice	Poland	16
400.5	749	Marseilles PTT	France	2.5
405.4	740	Munich	Germany	100
410.4	731	Seville	Spain	1.5
410.4	731	Tallinn	Estonia	11
414.4	724	Madrid (Espana)	Spain	1
417.2	719	Kiev	U.S.S.R.	36
420.8	713	Rome	Italy	50
426.1	704	Stockholm	Sweden	55
431.7	695	Paris PTT	France	7
434.8	690	Fredriksstad	Norway	.7
435	683.9	Belgrade	Yugoslavia	2.8
443.1	677	Sottens	Switzerland	25
449.1	668	North Regional	Great Britain	50
455.9	658	Langenberg	Germany	60
463	648	Lyons PTT	France	15
470.2	638	Prague (I)	Czechoslovakia	120
476.9	629	Trondheim	Norway	1.2
476.9	629	Lisbon (tests)	Portugal	20
483.9	620	Brussels (I)	Belgium	15
483.9	620	Cairo (tests)	Egypt	20
491.8	610	Florence	Italy	20
499.2	601	Sundsvall	Sweden	10
499.2	601	Rabat	Morocco	6
506.8	592	Vienna	Austria	100
514.6	583.2	Riga	Latvia	15
514.6	583	Agen	France	5
522.9	574	Muhlacker	Germany	100
531	565	Athlone	Irish Free State	60
539.6	556	Beromunster	Switzerland	60
550.5	545	Budapest	Hungary	120
559.7	536	Wilno	Poland	16
569.3	527	Viipuri	Finland	13
569.3	527	Ljubljana	Yugoslavia	7
578	519	Innsbrueck	Austria	5
696	431	Oulu	Finland	1.2
724.8	413.9	Ostersund	Sweden	.6
748	401	Geneva	Switzerland	1.5
748	401	Moscow	U.S.S.R.	20
775.2	387	Boden	Sweden	.6
824	364	Smolensk	U.S.S.R.	10
833.4	360	Budapest (II)	Hungary	3
845	355	Vadso	Norway	10

NOTE:—The following wavelengths are common to several transmitters: 206 m. (1,456 kcs.); 207.3 m. (1,447 kcs.); 208.6 m. (1,438 kcs.); 211.3 m. (1,420 kcs.); 218.2 m. (1,375 kcs.); 221.1m. (1,357 kcs.); 225.6 m. (1,330 kcs.); 228.7 m. (1,312 kcs.); 235.1 m. (1,276 kcs.); 236.8 m. (1,267 kcs.); 251 m. (1,195 kcs.).

Notes and Jottings

READERS in the Cheshire and South West Lancashire district who are interested in television will welcome the news of the formation of a television society.

Details of the society and how to become a member are available from the secretary, c/o Messrs. Jensen & Base, 223 Seaview Road, Wallasey.

◆ ◇ ◆

The new Electradix catalogue contains some unique lines which are unobtainable elsewhere. Numerous types of meters, relays, morse keys, resistances, microphones, and hundreds of gadgets and components are also described in this catalogue, which every reader should possess. You can obtain one from Electradix Radio of 218 Upper Thames Street, London, E.C.4, for 4d. post free.

Public-address apparatus is being installed at Runnymead by Philips Lamps, Ltd., for the Pageant to be held next month. The microphones and loud-speakers are concealed from the eye of the audience.

With the aid of the public-address apparatus the 4,000 performers and audience will be able to hear the voice of the Pageant Master.

◆ ◆ ◆

In the blueprint list published in AMATEUR WIRELESS last week, the valve sequence of the Lucerne Major was mis-stated as being S.G., Det., R.C., Trans. This set has, of course, two high-frequency stages, and the valve sequence is 2 H.F., Det., Trans.

The blueprint is available from our Blueprint Dept. price 1s. 6d., post paid.

Criticisms by WHITAKER-WILSON

My Broadcasting Diary

Sunday

STARTED the week well by hearing part of *The Merchant of Venice*. Very difficult to get it into an hour and a half, though. Still—a brilliant performance. Patric Curwen's *Antonio*, Abraham Sofaer's *Shylock*, Leonard Henry's *Gobbo*, Celia Johnson's *Portia*, and Gwendolen Evans's *Jessica* appealed to me most, I think. But there was no bad playing anywhere.

Collins photo
Enid Cruickshank

◆ ◆ ◆

Liked the Boyd Nele String Orchestra immensely. May Blyth sang her Gluck well, but I liked her better in the three songs of William Walton. The songs themselves attracted me. Also Angus Morrison in a piano concerto of Friedmann Bach I had not heard before. Nice tone.

Monday

TROISE and his Mandoliers good in the broadcasting sense. The instruments came through surprisingly well. So did Don Carlos's words. He has a distinctly pleasing method of singing his songs.

◆ ◆ ◆

Heard a little of Callender's Band—enough to consider it worth hearing more often, but wanted to hear the Queen's Hall concert so had to leave it early. Bruno Walter managed to play the Mozart concerto and conduct at the same time, but there is a risk in doing that with so large an orchestra. *Ensemble* good on the whole, but I detected flaws which would probably not have occurred had he been conducting in the ordinary way.

Bruckner's *Te Deum*, which I wanted to hear more than anything, gave me great pleasure. The chorus sang splendidly, and a word must be said for the four soloists—Isobel Baillie, Enid Cruickshank (whom I always like because she sustains her tone so well), Heddle Nash, and Arthur Fear.

Tuesday

A FAIRLY good variety to-night. I liked Mario Lorenzi's harp solos. Also Leonard Henry's broadcast from the transmitter. I made him promise me months ago he would do it again. He has altered a good deal of it, I notice. Very funny.

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Peggy Cochrane, broadcasting at the rate of a tune a minute, left me wondering whether there ought to be a speed limit. Quite attractive, though.

◆ ◆ ◆

While waiting for Great Tom to waft the witching hour of twenty-four, I listened for a few minutes to Roy Fox. Liked him. Another time I shall turn him on earlier, but it has to be done quietly. Family gone to roost. (Radio critics never get to bed the same day they get up.)

Wednesday

A VOCAL quartet made up of Vera Siddons, Gladys Palmer, Tom Purvis and George Pizzey, sang two song cycles to-night which I liked immensely. The first was by Arthur Somervell and called *Wind Flowers*. Very charming, and a fitting prelude to the *Eight Nursery Rhymes* of Walford Davies which proved more charming still.

An ideal form of broadcast. Sheer charm and a relief from the average tripe we get so often in these early evening programmes.

◆ ◆ ◆

Leonard Henry

The Theatre Orchestra is quite one of the most successful of the smaller combinations. A good little programme to-night, to which Beryl Orde contributed an amazing number of first-rate imitations within the space of ten minutes. She really *can* imitate; she doesn't merely plagiarise.

◆ ◆ ◆

The B-flat piano concerto of Brahms, a fine performance. So also the ever-popular Beethoven C Minor Symphony under Herr Weingartner. I have never known the B.B.C. Orchestra in better trim than this season.

Thursday

I HEARD the Fol-de-Rols from the B.B.C. listening hall. Very smart show, particularly the sketch where three men were supposed to have a tea-party while their wives were at the office.

Saturday

S. P. B. MAIS, on the outer Hebrides, very interesting.

[*Barratt's photo*
Peggy Cochrane

◆ ◆ ◆

In Town To-night good in parts. I liked the cab-driver's story of the woman who rifled the gas-meter to pay him her husband's fare.

◆ ◆ ◆

The Variety good, but too much jazz singing in it. Max and Harry Nesbit very original, and Bertha Willmott very characteristic; also in good voice.

The Seven Singing Sisters ought to be heard more often. They are a cut above most singing-groups we have here.

Hal Swain's saxophone playing attracted me. The best, I thought, was Will Hay. His humour is unlike anyone else's.

The Mills Brothers exceedingly clever, but why put them in a show in which there is any other singing? They should be allowed to stand entirely by themselves.

◆ ◆ ◆

Looking at the week, especially with reference to Whitsuntide and the sudden advent of summer, there seems a definite attempt on the part of the B.B.C. to provide light programmes.

Taking to-day as an example, Howard Marshall talked about the Australians, S. P. B. Mais about the Hebrides, the topical *In Town To-night*, a variety, and plenty of dance music Also a very pleasing Dvorak concert.

Good enough for one day!

Tune by the Climbing Light!

Continued from page 564

arrange circuits operated by the detector but without employing A.V.C. Under suitable conditions the actual change in the current of the detector valve itself may be made to generate sufficient voltage to operate the tube and Fig. 3 illustrates one particular arrangement.

Another very interesting application of this tube arises from the introduction of a fourth electrode. This is located about half an inch up the cathode and is insulated except at the tip. As long as the glow on the cathode is below the tip of this electrode nothing happens, but once the glow reaches this point some of the discharge is drained away through this auxiliary electrode. This action can be utilised to provide quiet A.V.C. or "squelch" as it is often called. The output valve of the receiver is over biased so that no signal is heard until the carrier attains sufficient strength for the climbing glow to reach this fourth electrode. The discharge produces a positive bias which knocks off the over bias and allows the output valve to work normally.

Thus any station which is not of good programme value does not operate the set and for the same reason the background between the stations is dead quiet and mush is absolutely eliminated.

Fig. 4 shows one way in which the squelching action may be obtained but there are various others.

The tube is inexpensive—costing only 4s. 6d. It is fitted with a standard S.B.C. (small bayonet cap) as used for motor lamps, and can therefore be fitted up with the minimum of trouble. While its use is principally for mains sets, it is not impracticable for battery sets, as it only takes 2 or 3 milliamperes when fully lit up and less than 1 milliampere when "idling." Hence it puts little extra drain on the high-tension battery, and it should find its way into many of next season's receivers.

The King's First Broadcast

IT is just ten years since His Majesty the King made his first broadcast. I wonder how many of you can name the occasion before reading further.

Had your guess? Well, here's the answer. The King's first wireless speech was at the opening of the great Exhibition at Wembley in 1924. And do you know that it was actually "short-waved" across to the United States and relayed by some of the big stations there? Not a bad effort on the part of the B.B.C. for those early days. The King wasn't the first member of the Royal Family to broadcast. And now you can have another guess. Who was, and when did he do it?

The first Royal broadcaster was the Prince of Wales, who spoke from York House *via* 2LO to Boy Scouts throughout our country on October 7, 1922. I remember I had quite a crowd in to hear his address reproduced by my funny old set with general-purpose valves throughout and an old Brown horn-type loud-speaker.

R. W. H.

Plenty of Foreigners in Daylight!

By JAY COOTE

ALTHOUGH at this period of the year it appears customary to say that there is a general falling off in the number of foreign broadcasters received on medium and long waves, the statement is liable to be misunderstood.

Doubtless, the advent of Summer Time affects our log in a certain degree, inasmuch as many transmitters working in the 200-550 metre band are only heard at a later hour, but if the listener cares to turn to his receiver even during the sunniest daylight period he will be surprised to find the number of transmissions which can be tuned in at good volume.

Changed Conditions

It must not be forgotten that conditions have changed since last summer as within the twelve months the power of a large number of stations has been increased—in some instances more than doubled. Moreover, in the meantime new super-power stations have been launched, masts have been raised, and in consequence the energy of the signals broadcast is much greater than at the corresponding period in 1933.

Trying out a superhet a day or so ago, I found no difficulty in listening on the loudspeaker to some twenty medium-wave stations, and to another six on the long-wave band; from 9 p.m.—or should I say 2100?—a further thirty-five were easily logged. In some instances atmospherics were more persistent than in winter, but, on the whole, for the majority they did not detract from the entertainment offered.

Further tests demonstrated that the extra power used by stations to-day considerably increased the range of the portable, which, if we are favoured with a respectable summer, should again come into its own.

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Notwithstanding the fact that, barring Frankfurt, all German main transmitters are to be 100 kilowatters, the authorities have now decided to extend the network by installing a number of small relays of a power varying between 250 and 500 watts. Work is to be started on some of them during the autumn, and will be carried on next year. They will work, according to their district, on a wavelength common to the nearest main provincial station.

Munich, which you may already be hearing well, has been operating since May 1 on 100 kilowatts, but with a temporary aerial; from June onwards the aerial tower will be brought into action. It has already reached a height of 541 feet!

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Apparently the French authorities have relented towards Radio Toulouse and may agree to raise the veto which precluded the use of the new 60-kilowatt transmitter. We may now expect to hear the broadcasts from this station in the near future with a much bigger punch, especially as it no longer shares a channel with Helsinki (335.2 metres) but has been permitted to exchange wavelengths with PTT Limoges (328.6 metres).

It is already radiating in this position of the wave-band. With the new plant at its disposal the *Radiophonie du Midi* promises to give some of the best programmes put out by any French studio.

If you listen to the French stations you may notice that the *Poste Parisien* does not strictly adhere to the excerpt of the opera *Louise* as an interval or opening signal. The studio offers more variety by opening up the day's work at B.S.T. 0710 with a fanfare of trumpets and by closing down at 2230 (10.30 p.m.) with a bugle call of the French army equivalent of "lights out."

For the midday and 1845 transmissions a march, *Entre Sambre et Meuse*, is played, and at all times during intervals in the programme or at the end of a broadcast concert or play, a gong may be heard. *Louise* has not found favour with Parisian listeners.

◆ ◆ ◆

I do not know whether your receiver will tune down to about 830 metres, but you can test it by ascertaining whether you can hear the Air Ministry weather reports from Heston Aerodrome or not. If it does, try for a broadcast from the new Norwegian transmitter at Vadsö which was formally opened to celebrate that country's National Day recently. It works on 845 metres (355 kilocycles) and relays its programmes from Oslo, not by landline but *via ether*.

For Short-wave Fans

Short-wave fans may pick it up direct from Jeloy which has been operating on 42.92 metres. Apparently a new channel is being tested out, as I now hear these transmissions just under Skamlebaek (Denmark) or on about 49.2 metres. Vadsö is Europe's farthest north as a broadcaster, and is destined to brighten the lives of a goodly population which, in winter, is cut off from the rest of the country.

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Here "Observer" reviews the latest booklets and folders issued by well-known manufacturers. If you want copies of any or all of them FREE OF CHARGE, just send a postcard giving the index numbers of the catalogues required (shown at the end of each paragraph) to "Postcard Radio Literature," AMATEUR WIRELESS, 58/61 Fetter Lane, E.C.4. "Observer" will see that you get all the literature you desire. Please write your name and address in block letters.

Milnes Units

THE new booklet about Milnes high-tension supply units has been written with the object of showing that of all forms of high-tension supply the Milnes is the most efficient, convenient, simple, and economical.

The booklet explains what the Milnes system is, how it works, how to connect a unit to your set, and the prices.

Also included are some very convincing letters from users of these units.

The units are suitable for all types of battery operated receivers including those with class-B or Q.P.P. output stages. **164**

Magnum Coils and Switches

ALL keen home constructors will be interested in the new Magnum screened and unscreened midget coils, and multi-contact switches. A leaflet giving details of these new products has just been produced. **165**

Unit Radio For Short Waves

READERS who have not yet tasted the thrills of the short waves should send for a leaflet of Unit Radio's universal short-wave unit and learn how inexpensive it is to adapt your receiver for short-wave reception.

The unit is suitable for any receiver, whether A.C. or D.C. mains or battery operated, and can be used as a complete detector unit or as a super-heterodyne converter. **166**

Needle Armature Pick-up

AN addition to the B.T.H. range of radio accessories is the new needle armature pick-up and tone arm.

It is claimed for this pick-up that it has adequate voltage output, freedom from distortion and resonances, negligible record wear and true reproduction of recordings.

The folder gives a curve of the output of the pick-up at frequencies from 30 to 9,000 cycles.

The head of the pick-up is pivoted to facilitate needle changing. **167**

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Lucerne Ranger (SG, Det, Trans)	AW422
P.W.H. Mascot (Det, R.C, Trans)	AW337A
Cossor Melody Maker with Lucerne coils	AW423
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2 H.F. Four (2SG, Det, Pen)	AW421
Lucerne Major (2 H.F., Det, Trans)	AW433

Copies of the "Wireless Magazine" and of "Amateur Wireless" containing descriptions of most of these sets can be obtained at 1s. 3d. and 4d. respectively, post free. Index letters "A.W." refer to "Amateur Wireless" sets and "W.M." to "Wireless Magazine." Address letters:

Amateur Wireless Blueprint Dept., 58-61 Fetter Lane London, E.C.4

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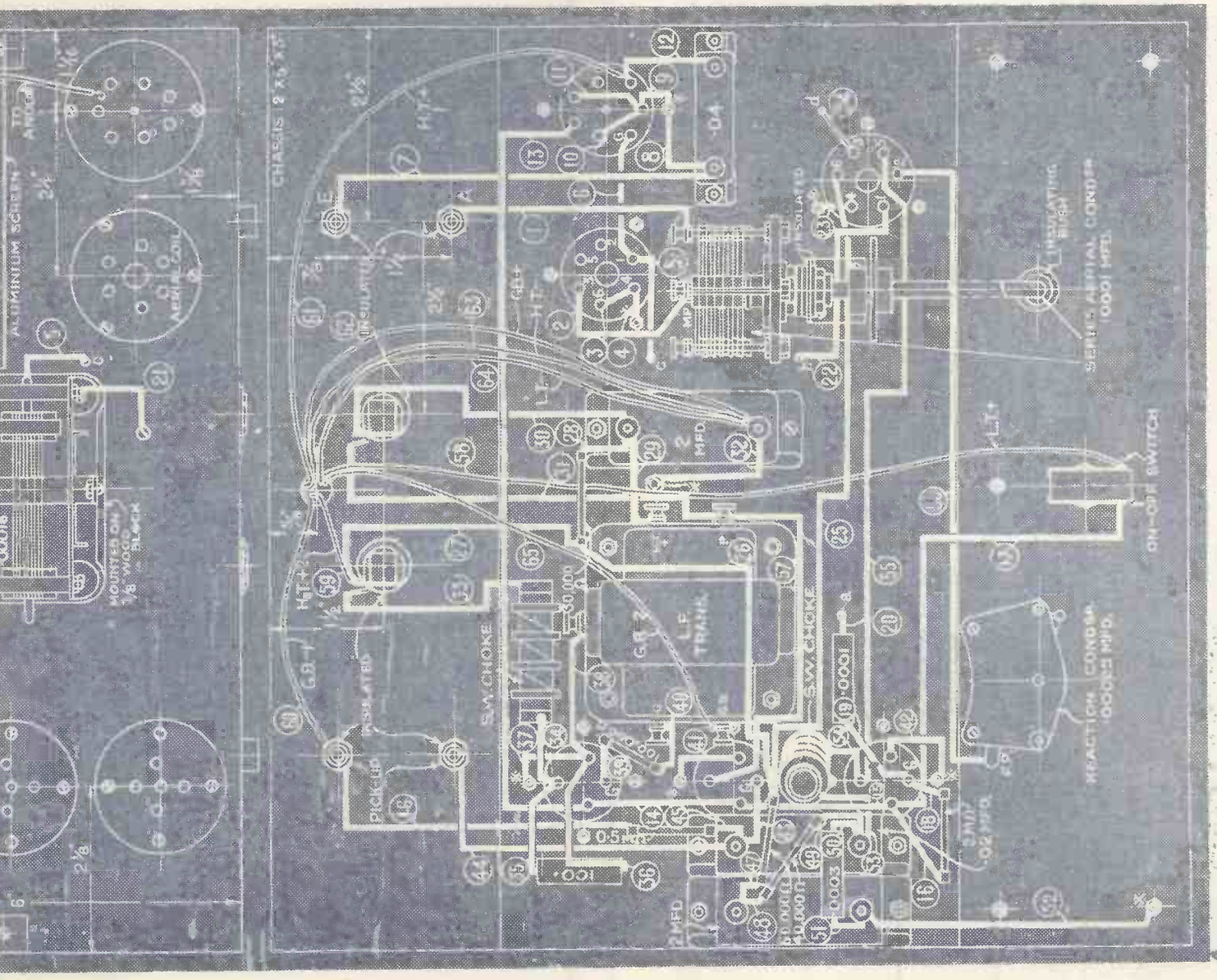

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