POPULAR WIRELESS, May 4th, 1935.

REGISTERED AT THE G.P.O. AS A NEWSPAPER.

THE TRIUMPH OF THE "SILVER KING"

Popular Wireless 3D

AND TELEVISION TIMES

Our Special JUBILEE NUMBER

MANY OUTSTANDING ARTICLES Including

MODERNISING the "MAGIC"

Radio in the KING'S REIGN

A CAVALCADE of PIONEERS

MASTERPIECES of RADIO

"I would never have believed it was possible to produce a DC/AC superhet for 11½ gns. with such good tone and performance *but* 'H.M.V.' *have certainly done it!*"

"SPEAKING as a man who knows something about radio, I must say that this new 'H.M.V.' set is really a splendid bit of work in every way. It's got A.V.C. and all that sort of thing of course—and as for the performance—well, it has certainly made me revise my ideas of what you can get for 11½ guineas in a DC/AC set . . . I know what to recommend when my non-technical friends ask me which set they should buy. You might remind me to write to "His Master's Voice" for a folder about this set. I'd like to keep it by me."

'HIS MASTER'S VOICE'

UNIVERSAL (DC/AC) SUPERHET FOUR MODEL 340

"HIS MASTER'S VOICE," THE GRAMOPHONE COMPANY LTD., 98–108 CLERKENWELL ROAD, LONDON, E.C.1.

POPULAR WIRELESS AND TELEVISION TIMES

MANAGING EDITOR: N. F. EDWARDS. TECHNICAL EDITOR: G. V. DOWDING ASSOC. I.E.E

BETTER BROADCASTS
MARKING THE SPOT
A RADIO RECORD?
CRYSTAL RESULTS

RADIO NOTES & NEWS

BETTER THAN BOMB!
THE DEAD MIKE
THE "SURPRISE 3"
ROUND THE WORLD

China on Short Waves.

THERE must be much truth in the idea of Economic Interdependence, for I see that people in China have been getting up early, as a consequence of which people in Chelmsford are working late.

The Chinese early risers were the staff of the Ministry of Communications. They realised that their huge country needed better interlinking between its cities, and finally they decided on ordering seven short-wave stations as a part of a new national wireless network.

The contract is now in hand at Marconi's Chelmsford works, and the transmitters are all to be capable of working both telegraphy and telephony.

Empire Improvements.

EMPIRE listeners have recently been more than a little bucked to find their short-wave programmes getting over better than ever before.

The B.B.C.'s Chief Engineer, Mr. Noel Ashbridge, reveals in the "Daily Telegraph" that one reason for this is the use of improved beam aerials. Experiments are going on continuously at Daventry, where fourteen different aerial arrays are now suspended on the 500-ft. masts of the old long-waver, 5 X X, and on two new 350-footers.

There is a possibility that more concentrated beams will be employed, and also that the power, which now ranges from 10 to 20 kilowatts, will be increased.

Historical Note.

THE Royal Australian Historical Society, taking time by the forelock, has erected a memorial commemorating the first wireless message sent from Britain to Australia in 1918.

The memorial was unveiled in Sydney, as near as possible to the actual place of reception, and it will settle for all time the question of when and where.

I admire this nail-it-down-at-once spirit, and I only wish that the Elizabethans had been possessed with it. They allowed their queen to sleep at the Black Bull (or was it the White Horse?) in this village (or was it that?), to the confusion of the historian and enrichment of many later landlords.

A Hard Life.

FAIR words and compliments meet my eye in perusing a letter from S. E., of Cambridge, until I come to the last page, where he gets business-like and says: "My boy wants to be a journalist. What are the necessary qualifications for this?"

Apart from any natural gift that way, the young man must have an iron constitution, an equine digestion, good eyesight and a stout heart.

His skin must be thick, or he will die of shame. He should have no domestic ties whatever, for the girl who loves a journalist is condemned to keep the hours of the ungodly and to hear telephone—rather than wedding—bells.

Finally, he wants public spirit and private means: the former as an ideal; the latter to keep body and soul close coupled while waiting for the first cheques!

Wireless Families.

WHEN a Plymouth reader wants to know if it is a record for three people in one family to hold radio-transmitting licences I answer "No." For there was the case in New Zealand of a family that "went radio" with a vengeance.

To begin with there were three sisters fully qualified and operating their own stations. Then one of them went off the air for one day and married Ewen Cameron. Mr. Cameron owned a short-wave station known to every New Zealand amateur; and in addition there was a young brother, also radio minded.

Possibly some other country can beat this achievement, but it looks to me like a record.

Europe's Radio Audience.

SOME rather awe-inspiring conclusions emerge from a study of Europe's listening during the 1934-35 season now ended. Apart from the fact that every country continues to increase the number of listeners, there is the encouraging fact that the rate of increase has in many instances been accelerated.

Holland hopes to reach the 1,000,000 mark in the next six months; Belgium jumped up nearly 139,000; and little Switzerland aims to have 400,000 sets in use before next Christmas.

The total number of wireless receivers registered in Europe at the end of 1934 was 23,556,712.

Distance on Crystal Sets.

THE coming of summer time should theoretically herald a little slackening of interest in radio, but I find my post unusually large and varied this week. Two readers report the reception of foreigners on crystal sets. And S. H., of Tollington Park, wants me to tell him "the longest *authenticated* distance over which a crystal set has operated."

Honestly, I don't think the point has ever been settled. But I do know that I myself once heard a station 2,986 miles away—and it's no good burbling to me about "must have been a valve near by," because

(*Continued on next page.*)

A RADIOGRAM FOR THE KING'S HOUSE

Those who visited the Ideal Home Exhibition at Olympia will remember seeing this fine 15-valve "H.M.V." autoradiogram in the hall of the replica of the King's House. This receiver is to be installed in the actual house at Burhill and will operate seven loudspeakers in the different rooms.]

WILL JUBILEE ILLUMINATIONS CAUSE INTERFERENCE?

that was in the days when valves were virtually unknown and I knew every wireless set within thirty miles of my own aerial.

Possibly some of my readers can beat this distance, but, anyway, it serves to show that valves aren't essential to *really* long-distance reception.

Plain English.

TRANSPORTS of delight are reflected in a letter from Belfast which tells me of a short-wave adaptor built by E. S. It was not the adaptor, however, that uplifted E. S.'s soul, but the first programme he received on it from the U.S.A.! Being Oirish, E. S. loves a bit of "an up-and-a-downer"; and the U.S. broadcast he picked up on his first try-out was the verbal slaughter of three opponents by Huey P. Long, of Louisiana—a talker on the radio who believes in calling a spade a spade.

The word picture Huey painted of the said opponents left nothing to the imagination, and E. S. does not know when he has heard anything so invigorating. In a P.S. he says: "I am delighted with the adaptor. If Huey keeps on broadcasting it will be as good as having a bomb in the house!"

No Need to Worry.

WRITING from Peacehaven—*Peace*haven, mark you—R. W. wants to know why the B.B.C. does not erect a powerful station designed to jam foreign programmes which contain anti-British propaganda.

Obvious objections to this bellicose idea are the following: (1) Such jamming can never completely prevent reception. (2) It would often spoil our own reception of desired programmes. (3) It is illegal.

And, what is more, it is *unnecessary*. Our ears are not so tender as all that, R. W. And we are not obliged to do everything that a wireless speaker urges us to do, are we?

When Speech is Vain.

TO look through a control-room window and behold a fellow citizen earnestly addressing a microphone: to realise that he thinks the whole world is listening to his oratory; and to know that some humorist has long ago switched off that microphone, so not one word is being radiated—that is very amusing.

I once had the luck to see such an incident, and am reminded of it by the joke played on the town councillors of Nelson, N.Z. At the approach of the elections the Mayor agreed to allow the Council to be broadcast, so mikes and amplifiers were fitted, and six councillors representing the leading factions were chosen to broadcast.

They told the ratepayers some resounding home truths; they called upon their fellow citizens; they exposed this and promised that right forcefully. And when it was all over somebody explained that the mike into which they had spoken was "dead." The subsequent language sounded depths compared to which all the eloquence that had been "broadcast" was a mere conversational ripple!

The French Programmes.

WHEN I referred recently to Eiffel Tower's change-over to medium waves I omitted to say that his power is reduced. The old warrior has to be content with a mere 5 kilowatts now he works on 206 metres, so please do not expect him to thump in as in days of yore.

BROADCASTING BREVITIES

A programme of "Songs of the King's Reign" will be broadcast to Northern listeners by Harry Hopewell on May 6th. The songs will be divided into three distinct groups—pre-war, wartime and post-war.

* * *

The B.B.C. Outside Broadcast Dept. is making arrangements to broadcast the song of the nightingale at various suitable times during the week beginning May 13th. The relays will take place from Southern England, as usual.

* * *

A few months ago Joan Wellings was doing some research work on local history in the Birmingham Reference Library when she came across a play with the title "Gentle Gertrude; or, Drugged and Drowned in Digbeth." Finding it rich in burlesque of the old-fashioned melodrama, she introduced it to the attention of Martyn Webster, producer at the Birmingham station. As a result it is to be acted on May 16th.

* * *

A commentary on the visit of the Duke and Duchess of York to inspect the parade on the Rugby Union Ground, Murrayfield, of the Boy Scouts, Boys' Brigade, Girl Guides, Girls' Guildry and other youth organisations will be broadcast in the Scottish programme on May 11th.

To cheer up those who would like to listen more to Paris I gladly spread the good news that Radio Paris is going to double his power this summer. Add that to the better reception accruing from France's new Regional stations and everybody will agree that, from being insufficiently represented, France has now blossomed out as one of Europe's most promising sources of entertainment.

Prize for Peace.

SINCERE congratulations to "Radio Nations," the short-wave broadcasting station of the League of Nations, on being awarded the Wateler Peace Prize. The value is nineteen thousand Dutch florins.

I understand that this unexpected windfall will come in remarkably handy, for the station has been feeling the need of up-to-date recording apparatus. "Radio Nations" aims to serve short-wave listeners all over the world, and the ability to bottle a programme and release it at the most suitable hour for reception is therefore a necessity. Nineteen thousand Dutch florins should help to preserve both the programmes and the cause of peace.

Strange Interlude.

NOT since I was stricken with letters from the Man with the Iron Bedstead—do you remember *him*, old-timers?—have I had such an incomprehensible screed as one I have recently received from Cardiff.

So far as I can make out—and I admit that I have read it only about sixty times as yet—this communiqué is a plea that wireless stations should be put underground for fear of attack from the air. But there is a lot about the entrance to Barry Dock (or Docks), and also an impassioned appeal to Mr. Scott-Taggart to "bring out another."

Most puzzling of all, there is a sort of picture diagram which looks as though lightning had struck somebody's junk box, and this is labelled "Try this. Surprise 3." Developments, if any, will be recorded, but I am in hopes of losing this letter, for if a Technical Hound sees it that "circuit" will prove irresistible!

Silencers Required.

BROADCASTING HOUSE is getting a little perturbed about the Jubilee celebrations. Some first-class broadcasts have been planned, but the technicians are wondering how many people will not be able to receive them owing to interference from the illuminations in which flashing lights are used.

Those lovely neon and other gas-discharge lamps are chromatic marvels, but should behave like the Victorian small boy—they should be seen and not heard. Bitter experience suggests they may wipe out radio reception on an unprecedented scale.

Universal Bark.

IF you are one of those fellows who like a tail wagging about the house you will be glad to meet Short.

Short is a wire-haired terrier owned by one of the engineers at the Schenectady station. While his master is busy Short often takes a look round on his own, and the other day he happened to bark in front of an "open" microphone. Short didn't know it, but that bark travelled right round the world on short waves, and a moment later it barked at Short from a loudspeaker standing behind him.

You can guess what happened! A yapping and barking match, "while all the world wondered." The circuit was from Schenectady to Holland, thence to Java, thence to Sydney and finally back to Schenectady. Twenty-four thousand miles in all—a long bark for Short!

ARIEL.

Radio in the KING'S REIGN

THE King is dead. Long live the King! In far-away Cornwall, Poldhu, the world's first high-power wireless station, is thundering forth the news to the ships far out at sea on that May evening in the year of Our Lord 1910. Edward the Seventh is dead and George the Fifth is now King of Great Britain and Ireland, Emperor of India and Defender of the Faith.

Crystal Detector Progress.

Even at that early date in wireless history several hundreds of British ships are fitted with the new scientific marvel—wireless telegraphy; telephony is as yet undreamed of. The news is flashed from ship to ship until all the ether of the seven seas is vibrating with the tidings—The King is dead. God save the King!

A year passes and many improvements have taken place in wireless. It is 1911, and a young engineer has produced a new balanced crystal detector which is far superior to such former apparatus as the coherer and magnetic detector for picking up wireless signals. But, most important of all, intensive research is being carried out on a device which is destined to have such far-reaching effects. This work concerns the thermionic valve and great strides are soon to be made. But still another miracle has been accomplished at Clifton, for real wireless photographs have been sent from there across the Atlantic to America—this is in 1912.

The scene changes to the North Atlantic. The time is just before midnight on April the 14th, 1912. The Titanic, greatest and most magnificent liner which the world has seen, is making her stately way towards New York—it is her maiden voyage. Port holes are agleam with the lights from a thousand lamps; the band is playing in her beautiful ball-room; nobles and millionaires, beautiful women and famous men are enjoying themselves in her costly lounges, decks and palm courts—the vessel is a "Grand Hotel" of the high seas.

Two Disasters at Sea.

Suddenly there is a slight shock—nothing very extraordinary, but something unusual has undoubtedly happened.

Rumour spreads like wildfire—the huge vessel has struck an iceberg; wireless distress signals are being sent out. Once again the ether is alive with great and fateful tidings—the greatest ship in the world, the unsinkable, is sinking.

Other great liners pick up the call—the Carpathia and Caronia; the Titanic's sister ships, Baltic and Olympic, also hurry to the rescue of their younger sister. The first to arrive is the Carpathia, but only to find floating wreckage, for the great palace of the sea has gone, sunk with over 1,500 persons on board. Lifeboats are spotted, however, and more than 700 people are brought aboard, saved by the miracle of wireless.

Still the North Atlantic, but over a year has gone by. It is October 10th, 1913, and another great vessel, the emigrant ship Volturno, is in trouble. But this time it is the most terrible of all calamities which can occur at sea—fire. She is on fire almost from stem to stern, and the flames are shooting up as high as the foremast. Explosion after explosion takes place, and it is clear that the ship is doomed. Efforts are made to launch the lifeboats, but the sea is too rough and the boats are shattered against the sides of the ship.

But wireless distress signals have gone forth and eleven ships have responded, but they are helpless in the face of the high sea. Presently, however, the wireless appeal brings up an oil tanker; oil is literally poured on the troubled waters and the sea is calmed sufficiently to lower boats. Of the 654 persons on board, 520 are saved—another triumph for wireless in the King's reign.

And now a small group of young men destined to play an important part in wireless have banded themselves together and formed a society which they have called the Wireless Society of London—these enthusiasts are popularly known as wireless amateurs. They are destined to be makers of wireless history.

The fateful year 1914 dawns. Wireless is coming more and more into its own; more and more ships are fitted; many coastal stations are erected. There is talk of a chain of great Empire wireless stations which will link up colonies, dependencies, dominions and other parts of the mighty Empire with the Mother Country.

And then catastrophe. It is midnight of August 4th, 1914. Every wireless station in the world is on the alert, waiting to send and receive momentous instructions. In London Big Ben sounds the fatal hour—England is at war!

Wireless to the Fore.

Once again Poldhu thunders forth the news to the seven seas; once more the ether of the world is tense with expectancy. The wireless cabin on all ships great and small is the focal point around which all gather—sleep is out of the question.

In a single night wireless takes a huge stride forward. Previously it has had an uphill fight against long odds and old-established rivals and enemies. But August the Fourth changes all that, for, lo and behold, wireless is now a weapon of war, a vital need of all the fighting forces. Wireless, wireless and still more wireless is the cry; sea, land and air services demand this new device; there is neither enough apparatus nor sufficient men to meet the needs of the War God. Factories begin to hum; instructors study their text-books. Tiny sets for aircraft for the war in the air; portable sets for the new armies in France and the East; giant sets for the great grey battleships in the North Sea.

Almost unbelievably soon a great war wireless service is organised; the

(*Continued on next page.*)

TWENTY-FIVE YEARS OF RADIO! A REVIEW OF WIRELESS PROGRESS FROM THE ACCESSION OF HIS MAJESTY UNTIL THE JUBILEE

By "Radiat"

A HIGH-POWER PIONEER

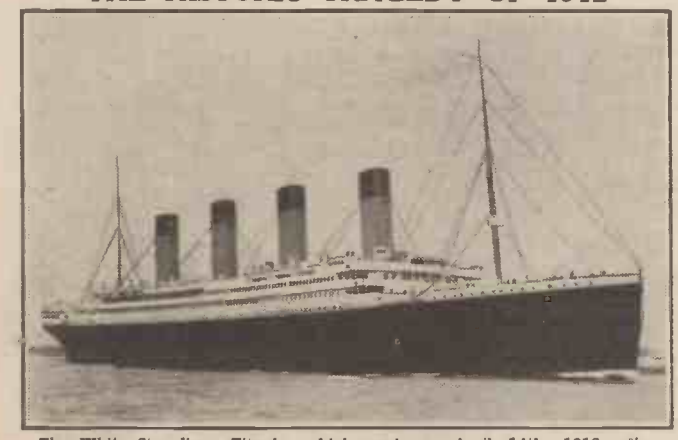
A glimpse inside that pioneer of high-power radio—Poldhu. Many old wireless operators will recall their struggles to receive Press news from MPD, as he was known, when well out into the Atlantic. The station has only recently been dismantled.

RADIO IN THE KING'S REIGN

(Continued from previous page.)

great grey battleships are shaking the ether in every corner of the earth; aeroplanes on the Western Front are wirelessing information to the artillery; seaplanes and airships are using their sets effectively on North Sea patrols; and in France the trench sets are of immense value when the wire communication breaks down.

THE HISTORIC TRAGEDY OF 1912



The White Star liner Titanic, which sank on April 14th, 1912, after striking an iceberg. It was this tragedy more than anything else which led to a stiffening up of the regulations regarding the watch kept on sea-going vessels carrying wireless gear.

Wireless plays its part in all the great battles of the Western Front—Marne, Somme, Loos, Aisne, Cambrai and a hundred others. But from Russia comes the news of disaster: treachery in the Russian wireless service loses the battle of Tannenberg to the Germans; a whole Russian army is destroyed, due to carelessly transmitted wireless messages. Inadvertent wireless signals from German Zeppelins give warning to the British that in a few hours London will be bombed. The new marvel of wireless-direction-finding stations have reported that there is a large movement of German warships into the North Sea; a great naval battle is imminent. The British Grand Fleet puts to sea—the greatest fleet which the world has seen. The ether is again tense and expectant; it is the eve of Jutland.

America Joins the Allies.

In the Mediterranean the Dardanelles tragedy is running its course; wireless is there amidst the shambles on the beaches. Wireless is everywhere, on earth and sea and in the air, even under the sea, for the dreaded submarine finds wireless essential to its dark purpose.

And then a wireless message brings America into the war on the side of the Allies; it is probably one of wireless's outstanding achievements. A famous telegram from Germany to Mexico is overheard on the ether; it is treacherous to America, and that country declares war.

And then, when death and disaster have run their course, Poldhu is once more on the air with peaceful tidings. It is November 11th, 1918. "Armistice signed," thunders forth Poldhu in quite its old style, and the war-weary wireless men lift the headphones from their ears for a moment and murmur a prayer of thankfulness. Three hundred and forty-eight wireless operators have died at their posts through the war.

Hardly has the war ended when wireless again gives the world a shock. From the other side of the Atlantic come stories of a new development, the peace-time application of a war-time wireless invention. There is talk of music by wireless; in short, broadcasting. By 1920 the Western Company of America has opened the world's first regular broadcasting station at East Pittsburg. The English Marconi Company is interested, and an experimental station is opened at Writtle in 1921. Concerts and operatic efforts are broadcast, and the station amuses and amazes all who hear the new marvel.

Broadcasting Starts.

Broadcasting in Britain is born officially on November 14th, 1922; there are music and voices from Marconi House. The newspapers and other periodicals come out in headlines and queer drawings, telling and showing the reader all about this modern miracle. Thousands of people hitherto only remotely interested in wireless suddenly become bitten with this new hobby. Crystal sets are the rage; kitchen tables and suburban workshops are strewn with queer-looking gadgets, condensers and coils of wire: always plenty of wire, despite the name wireless. Wives complain of a state of widowhood—wireless widowhood—and the conversation in tram, train and bus is wireless, wireless and wireless. Verily a new hobby has come to earth!

Stations are erected in twenty of the principal towns, and more and more people become interested.

A large headquarters is required for the new and thriving concern called broadcasting, and the Savoy Hill premises of the B.B.C. are opened in May, 1923.

And again in the history of wireless great factories are set in action: a new and important industry is in the process of being born. At first listeners are content with headphones, but these are inconvenient and uncomfortable — the loudspeaker is born. At first it produces queer and distorted noises, but the cry goes forth for quality, and vast improvements take place. Valves are developed, and while becoming more complicated are yet marvellously efficient. The whole wireless set is similar in its improvement. From a crude box of clumsy components and criss-cross wires it grows into a first-class instrument and a neat and presentable piece of furniture giving forth speech and music scarcely different from the original.

The Erection of Daventry.

July, 1925, sees the erection of Britain's first high-power regular broadcasting station, Daventry 5XX; it is the equivalent of that old-timer Poldhu, which is still going strong. Shortly afterwards comes the great general strike, when broadcasting takes the place of the newspapers. There is a frantic demand for wireless sets; the demand exceeds the supply; the number of listeners increases by leaps and bounds; whereas, in 1923, they were numbered in thousands, now they are numbered in millions.

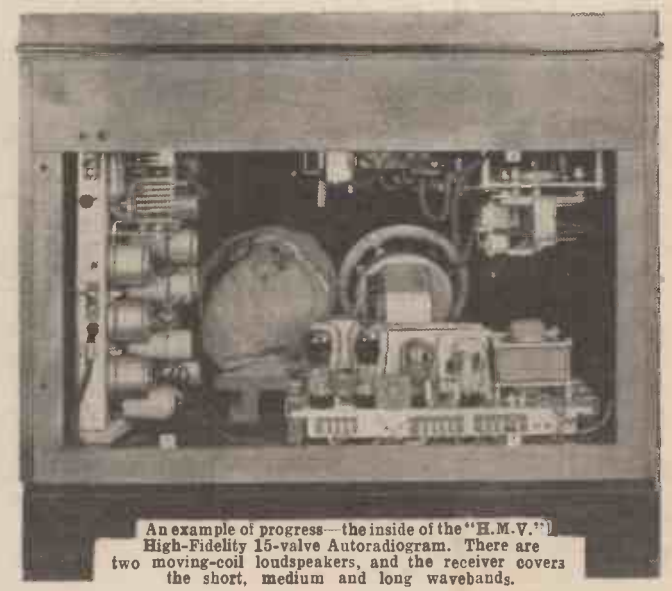
And then another wireless marvel begins to appear over the horizon, for the year 1926 sees the first demonstration of television—seeing by wireless. In addition to this, Rugby, the greatest and most up-to-date wireless station in the world, is opened for commercial traffic. Telephone subscribers in England are now able to phone to the United States.

By 1928 television has spanned the Atlantic; the new marvel is growing up. Sound broadcasting is also going ahead faster than ever, for the first of a series of high-power broadcasting stations, which are to give the majority of British listeners at least two alternative and reliable programmes, is opened at Brookmans Park. It is the commencement of the famous Regional Scheme.

But wireless is not confined to communication; by now it has branched out in all directions. Control of battleships by wireless, photography by wireless, the location of minerals buried in the earth, the preservation of foodstuffs and the improvement in plant growth by wireless, the guidance of aeroplanes and ships through fog—these

(Continued on page 235.)

A 1935 DE-LUXE RECEIVER



An example of progress—the inside of the "H.M.V." High-Fidelity 15-valve Autoradiogram. There are two moving-coil loudspeakers, and the receiver covers the short, medium and long wavebands.

MASTERPIECES of RADIO

JUBILEE SETS THAT WILL MAKE HISTORY

MAY 6th, 1935. Jubilee Day! A day that will go down in capital letters in the annals of history. It will soon be with us now, and already there are signs of the tremendously important part radio is to play.

Throughout the British Empire—in fact, throughout the world—people will be listening-in on this momentous occasion. Never before will the demand on radio receivers have been so great.

And what about you? Will you hear the broadcasts and relays in all their moving grandeur? Or will you have to put up with a thin travesty of the real thing?

It all depends on you! The set manufacturers have done their part. They have done it well. They have produced special Jubilee designs at specially low prices.

And the attractive deferred-payment terms bring these sets within the reach of everyone. There is no reason why everybody should not hear the Jubilee programmes with real quality and ample volume.

After the Jubilee you will then have a set which will give you lasting entertainment for many years to come. So why not mark the occasion by buying that new set you have been thinking about for so long?

To help you in your choice of a Jubilee receiver, and to give you some idea of the magnificent value and fine performance which they make available, we are describing in the following pages some of the more outstanding of the special designs. You will find they represent the finest and most up-to-date practice in radio technique.

MARCONIPHONE MODEL "264"

"A glance through the specification leaves one literally amazed."

MARCONIPHONE, appreciating early the important part radio was destined to play in the Jubilee celebrations, were one of the first set-making firms to announce a special set programme in connection with it, and they very appropriately designated the new models with the word "Jubilee."

The one which will find the widest appeal among our readers, and the one we have illustrated on this page, is the "Jubilee" Table Grand, and goes under the model number of "264." It is a five-valve receiver for operation on A.C. mains.

A glance through the specification leaves one literally amazed. The price is only 12½ guineas, and after reading about the wonderful features incorporated in this receiver you might think this figure was a misprint if we did not assure you that it is quite correct.

Talking about features, the "25-Feature Radio" is how the Marconiphone Company describe their new chassis design; and the twenty-five items listed are all valuable points, not one of them being describable as a "trumped-up" advantage. We will deal with some of them in a minute; in the meantime, a few words about the general design.

Circuit Details.

A seven-stage non-radiating super-heterodyne circuit with electron-coupled oscillator valve is employed. The valves start with the heptode frequency changer, followed by a multi-mu intermediate-frequency amplifier. Then comes a double-diode triode, which acts as second detector, A.V.C. valve and first L.F. amplifier. This is resistance coupled to the output pentode, and all these valves are supplied with H.T. by an indirectly-heated heavy-duty rectifier valve.

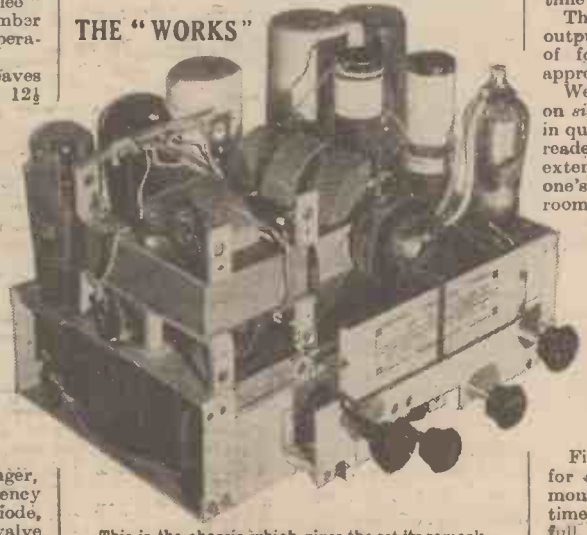
As you can see from the photograph, there are only four controls, and the operation of the set is absolute simplicity itself. The four knobs serve for tuning, volume, tone and switching adjustments, all the latter being carried out by the movement of one knob.

The special band-pass schemes really do give a proper 9-kilocycle separation, and not only does the receiver deal ably with present wavelength conditions, but, from our tests, we feel convinced that it is capable of holding its own for many years to come.

The "quiet tuning" has to be heard to be fully appreciated. Between stations the set is so silent that it might be switched right off, for all one can tell. The volume level at which the set accepts a station or rejects it entirely is most fully under control.

To anyone who purchases one of these magnificent receivers, fading on any station which is a worth-while programme provider is entirely eliminated. Our impression was that the "264" had completely changed the nature of the Heaviside Layer, ironing out the bumps until it gave absolutely constant reflection!

THE "WORKS"



This is the chassis which gives the set its remarkable sensitivity and selectivity.

ATTRACTIVE APPEARANCE

The appearance has everything to recommend it.

And this is not the only feature which makes listening to all stations a real treat; there is the tone-compensated volume control. Tonal balance does not vary with the volume. For instance, if you like to listen to your dance music with the power turned down, so as not to disturb those who have retired early, it will not be spoilt by a lack of bass upsetting the time emphasis.

The makers say: "The 2-watt undistorted output and low-loss speaker transformer allow of four extra speakers being used without appreciable diminution of volume."

Well, we tried a little experiment and put on *six* extra loudspeakers, and they all worked in quite a passable manner. I don't suppose any readers will actually desire to run even four extension speakers, but it's nice to know that one's set is capable of giving reception in every room that counts, if it should ever be wanted.

Hear One Yourself.

And so we could go on, giving details of our experiences with this magnificent modern masterpiece which more than lives up to the traditions of a firm that is noted for the super-set designs that it turns out. But, after all, the best advice we can give you is to recommend you to hear one in operation for yourself at your local Marconi-man's store. This is an opportunity you must not miss.

Finally, let us add that the set can be yours for a deposit of thirty shillings, and twelve monthly payments of one guinea. Get one in time to enjoy the Jubilee programmes to the full.

A. S. C.

THE EKCO MODEL "AD36"

"We had a pleasant surprise when we turned the controls of this Ekco receiver."

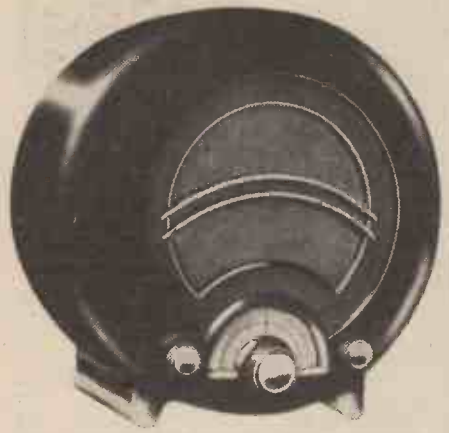
JUST as the Jubilee of His Majesty the King is an outstanding event in the history of the country, so the introduction of the Ekco AD36 receiver is a high-light in the history of radio. It is, perhaps, more than that: it marks the beginning of a new era, an era of magnificent value for money.

For just about 3s. 6d. a week—less than the cost of a couple of good seats at the films—you get hours and hours and hours of the finest quality entertainment imaginable. And you have a magnificently wide choice of programmes, too.

After becoming thoroughly used to superheterodyne circuits we had a pleasant surprise when we turned the controls of this Ekco receiver. Foreign stations were received with an ease and strength that would make the average three-valver and rectifier look silly.

But then the AD36 is in no way average; it is a stage, nay, many stages, above the usual receiver of its type. And having

A GOOD LOOKER



The set is available in two finishes: figured walnut or black and chromium.

arrived at the question of type, let's have a look at the specification.

You can get an idea of the handsome appearance of the instrument from the photograph. The cabinet is a moulded one and is available in two finishes, namely figured walnut or black and chromium. The latter is a particularly fine style for which Ekco receivers have become distinctive everywhere, and is well worth the extra half-guinea charged for it.

And while on the question of prices, no doubt you will be anxious to know just what this receiver costs. It is a mere eight guineas, and credit terms are available as follows: Initial payment of 14s. 6d. and twelve monthly payments of 14s. 6d. It is from these figures that the approximate cost of 3s. 6d. per week is worked out.

In the case of the black and chromium model, which, as we have already indicated, costs another half-guinea, the terms are 15s. 6d. down followed by twelve monthly payments of 15s. 6d.

An interesting feature of the circuit is the different types of coupling that are provided between the H.F. stage and the detector, on medium and long waves. On medium waves the multi-mu H.F. pentode is choke-capacity coupled to the tuned-grid circuit of the detector, while on long waves it is tuned-transformer coupled.

This change of coupling methods is bound up in a feature of the design which provides constant sensitivity on all wave-bands, and for which purpose a special compensator circuit is included.

Tuning is of the single-knob variety, of course, and the full-vision scale provides direct tuning by station names and wave-lengths on an illuminated scale. An energised moving-coil loudspeaker is incorporated, which enables full advantage to be taken of the powerful undistorted output from the final pentode valve.

And now we come to a feature that must always be considered by those who have to study economy. And who does not, these days?

For A.C. or D.C. Mains.

It concerns the rapid spread of the grid system of supplying electricity and the consequent changes that are cropping up in so many districts in the type of electricity supply. The possibility of having their mains changed can be entirely forgotten by the possessor or prospective purchaser of an Ekco Model AD36, because it is a universal receiver. It will work from A.C. or D.C. mains of voltages varying between 200 and 250, tapping adjustments being available for matching to the exact voltage.

THE FAMOUS SOUTHEND WORKS

An aerial view of the factory where Ekco receivers are turned out in their thousands.

So you see that no matter from what angle you consider this Ekco receiver, it represents extraordinarily good value for money. And knowing the famous factory at Southend from which it emanates, you thus have an assurance that it will continue to give its excellent results without those annoying and all-too-often breakdowns to which so many of the less well-conceived designs of to-day are prone.

Not only were we satisfied by the ample sensitivity of this receiver when it was put through its paces, but the quality was of a most convincingly clear and well-balanced nature.

THE K.B. "CAVALCADE"

"This receiver has been specially produced to mark the occasion of the Royal Jubilee."

WHEN the time comes to listen to the special Jubilee programmes sent out by the B.B.C. you will not be able to choose a more attractive set than the K.B. "Cavalcade" superhet. We say this in all sincerity after having had one of these receivers through our hands and after having given it a really thorough test.

Our verdict is, "Excellent in every respect." As a matter of fact, this receiver has been specially produced to mark the occasion of the Royal Jubilee.

A Particularly Good Set.

When this course was decided upon Kolster-Brandes also decided that the set should be a particularly good one and really worthy of this great event in history. They also decided that it should be offered at a price which would bring it within the means of many thousands of listeners.

That it fulfils the first we can assure you after personal experience. It is more than a particularly good receiver. On the second count you can judge for yourself—its price is only 11½ guineas.

But you will want to know more about it before being qualified to agree with us that it is also a proposition that is worthy of every consideration.

Technical points calling for mention include the fact that an 8-inch moving-coil loud-speaker is incorporated, which appeared to us to be particularly sensitive and which has a very good transient response. The latter, of course, gives life and atmosphere to reproduction in a way which no other property can.

Mains Filter Incorporated.

An effective mains filter is also to be found in the circuit, and this accounts to a large extent for the extremely quiet background and freedom from those annoying splutters and crackles. There is certainly no call with the K.B. "Cavalcade" for an interference suppressor in the mains lead.

The receiver is of the universal pattern—that is to say, it will work on both A.C. and D.C. mains without any change-over alterations being necessary. An advanced form of superhet circuit, with five valves in all, is employed, one of the valves being the rectifier.

But, as most readers will be aware, you cannot judge a modern circuit by the number of valves, in the way it used to be possible. With the present-day high-efficiency valves and the many multi-valves now available, four valves

(Continued on next page.)

THE COSSOR MODEL "369"

"A true representative of the best in radio design."

IF there ever was a year in which it behoved listeners to look to their radio sets and to replace out-of-date designs with new receivers that year is this one. With the tremendous peak in programmes that we are promised by the B.B.C. during the Jubilee celebrations it is particularly important that we should have the best sets at our disposal.

Good quality reproduction and a good reserve of output power are essentials for true enjoyment of full-blooded programmes. Military bands, choral singing, orchestral items and the like need plenty of reserve power if realistic reproduction is to be obtained, and that is where the mains receiver of the type illustrated comes in.

Cossor are among the pioneers of radio, and as past masters of valve manufacture they ought to know how to design a set to give the very best performance. They do, and the result is to be heard in the universal mains receiver, Model 369, which sells at the amazingly low price of £8 18s. 6d., or on hire-purchase terms at 20s. deposit and eleven monthly payments of 16s. 6d.

Uses Iron-Cored Coils.

This set makes use of the new super-selective iron-cored coils, and contains a variable-mu H.F. pentode amplifier, H.F. pentode detector and a super-power output valve. This latter is most important, for in our opinion it has a great deal to do with the remarkably fine quality of reproduction of which the receiver is capable.

Single-knob dual-pointer tuning is adopted with a full-vision scale marked in wavelengths, and illuminated according to the wave-band in use. An 8-inch permanent-magnet moving-coil speaker is incorporated and provision for a pick-up is included in the design.

The fact that the makers have included also the means for the attachment of an external speaker is an important one when one bears the Jubilee programmes in mind, for with the set it is possible to "relay" the programme to any points in the house, and it is obvious that the "demand" for radio entertainment will be greater than ever during the next few months.

Simple Voltage Adjustment.

The set will operate on either D.C. or A.C. mains, and on any voltage between 200 and 250, a simple adjustment for voltage being provided in the receiver.

Its appearance well supports the quality of reproduction, for the cabinet work is such that the set can hold its own against any furnishing scheme and the excellence of its external workmanship makes it a particularly handsome adjunct to any room.

But it must not be thought by the foregoing that we consider this Cossor receiver to be ideal only for the reception of the British Jubilee programmes. If you want to tour the Continent by radio the means to do so are at your disposal if you are the owner of Model "369," for its selectivity and sensitivity are points worthy of the closest attention of every prospective set buyer.

When we tested this set we were astonished at the number of stations that we were able to bring in under quite ordinary home conditions of aerial and in a locality that is by no means famed for good radio receptive powers.

WORTH LISTENING TO

The Houston Sisters, popular broadcasters, are here seen listening to a Cossor Model "369."

The Cossor set seemed to scorn normal local conditions that we considered rather poor, and in a short time we had roamed round the main European stations with a certainty and ease that were most gratifying.

The Model "369" is certainly a set of which to take note; it is a true representative of the best in radio design, and at the low price is a particularly attractive proposition.

The Gramophone Side.

Let us hark back to the use of a pick-up with the set, which is a feature that we consider worthy of special notice. The fact that the wave-change switch also controls the pick-up change-over from radio is a very valuable one. It means that the pick-up can be left connected to the set, so except that the gramophone part of the outfit is separate from the radio the Cossor Model "369" can be regarded as a complete radiogramophone when connected to a pick-up and gramophone motor.

In regard to the motor, one of the well-known makes can be used, and a universal type will enable the set to be used on either D.C. or A.C. mains, as far as the gramophone is concerned, thereby retaining the universality of the set on radio as well as gramophone.

With a pick-up the quality of reproduction of the set still retains its very high standard, though it is essential that a good pick-up should be used in order that the set may show off its qualities to the best advantage.

(*Continued from previous page.*)

can equal eight ordinary ones, a fact which certainly seems to apply to the K.B. "Cavalcade."

The sensitivity and selectivity are all that can be desired, a phrase which is also applicable to the quality of reproduction, a point to which we have already made appreciative reference. In fact, it is difficult to pick out one particular item as being the best in this receiver, because it is such an excellent all-round design.

The Royal Jubilee will be an occasion of rejoicing by all Britons throughout the world; you will also make it an occasion of personal rejoicing in your home if you decide to get a K.B. "Cavalcade" receiver to listen to the Jubilee programmes. No matter what the item being broadcast is, a speech, choir rendering, massed bands or O.B., you will hear it to the fullest advantage on your K.B. "Cavalcade" receiver.

And now a word about two points of which we made a note when trying out this receiver.

First, the tone control.

This control is continuously variable and has a usefully wide range. It makes sufficient difference for one to feel that it is really possible to adjust the reproduction to suit different tastes and circumstances.

The other item is the way in which the automatic volume control performs its function of preventing fading. This control is very effective indeed.

What we have said is no doubt ample to make you want to hear this new "K.B."; and we advise you to do so. Ask your local dealer to oblige. For those who desire, deferred terms of purchase are available. These are a first payment of 28s. (including 3s. insurance) and twelve monthly payments of 21s.

HEAR IT YOURSELF

The K.B. "Cavalcade" is a receiver you should make a point of hearing at your dealer's.

THE H.M.V. MODEL "340"

"Listening is a real pleasure on such a set."

"HIS MASTER'S VOICE" have long been famous for high-grade radio receivers and radiograms, so that, in discussing their latest model, brought out for the Jubilee, it is not sufficient to say that it is a magnificent receiver, it gives perfect quality and so forth. Such statements pertaining to an H.M.V. design are synonymous with the name of the manufacturer.

What, then, shall be said about this newcomer to the list of the famous? Chiefly that it is a design that has been produced to benefit as many people as possible—it is a universal model, operating equally well on A.C. or D.C. mains. Further, this model, the "Universal Superhet Four" (Model 340) makes use of the very latest circuit developments, so that, although the receiver has only four valves, including rectifier, those valves are equal to seven, for some of the valves do the tasks of several.

Absence of Cabinet Resonance.

Automatic volume control ensures that all distant programmes—and there are scores of them for the asking on this receiver—are received with the minimum of fading, and the constant level at which all stations can be received, automatically controlled by the A.V.C., is primarily determined by the hand volume control.

An energised field loudspeaker is incorporated, which has been specially designed in conjunction with the cabinet structure to give full volume without cabinet resonance. The absence of "drumminess" is, in fact, a most noticeable feature when one is trying out this remarkable set. H.M.V. are specially to be congratulated on this feature, which to our mind is one of the most important. Too many otherwise excellent sets are spoiled by the box resonance their makers have allowed.

Those who are a little dubious about the safety of mains sets—and there are still not a few people who look askance at a mains plug and flex—need have no qualms where the "340" is concerned. It is perfectly safe. You cannot get a shock from it, not even if the back is removed by any chance, for its removal immediately breaks the circuit and cuts off the power. The back cannot come off unless the power plug in the set is withdrawn.

FOR A.C. OR D.C. MAINS

The H.M.V. "340" has a universal mains four-valve superhet circuit.

The cost of the "340" is 11½ guineas, a remarkably low price for such a fine receiver. Fine looking, too, for the walnut cabinet of specially picked wood and macassar ebony is a most handsome piece of work, and its size and colour make it fit in with any furnishing scheme.

A Useful Refinement.

A refinement on the technical side that we must mention is the Morse acceptor circuit that effectively removes to a very great extent the Morse interference round about 456 kc. In addition, the method of coupling the aerial coil and grid-tuning circuit ensures constant sensitivity on all wavelengths.

The Model "340" is certainly well thought out. It is a set with a purpose—to give the utmost satisfaction to the greatest number of people—and it should abundantly fulfil that purpose.

An unusual range of mains voltages and frequency is covered by the "340," for it is suitable for 195–255 volts and any periodicity between 25 and 60 cycles.

A heptode mixer valve (X 30) is used in the first stage, followed by a WD 30 double-diode-pentode valve. This valve operates as I.F. amplifier, detector and A.V.C. valve, in addition to L.F. amplifier. Finally, in the chain comes an N 30, a pentode-output valve which is resistance-capacity coupled to the WD 30. The rectifier is in circuit for D.C. or A.C. and is a D 30.

Low Running Costs.

The power consumption of the set is 90 watts, comparing favourably with the ordinary electric lamp used in a big room, so that the cost of running the receiver is not high.

A single-knob tuning control adjusts the receiver to the wavelength of the station it is desired to receive, and the station names are clearly marked on the illuminated scale.

As would be expected with a superhet, the range of reception of the Model "340" is to all intents and purposes unlimited.

Selectivity is high, so that the principal transmissions are completely separated. Listening is a real pleasure on such a set, and with its ease of tuning, its powerful reproduction and good quality it is an ideal set for the coming Jubilee programmes.

THE BURNDEPT MODELS "218" and "229"

"In these two sets the quality is particularly high."

"FOR the King's Jubilee." Such are the words that greet you on the cover of the latest Burndept folder describing their A.C. mains superhet Model "226," the battery and the universal portable models and the new "Ethodyne."

"Special occasions demand special efforts," says the catalogue. "Model '226' is Burndept's new receiver produced in honour of the King's Jubilee . . .," and at the price of 12½ guineas, and with the specification that has been accomplished, the set is certainly worthy of the great occasion. Incidentally, the set can be obtained on H.P. at £1 down and thirteen monthly instalments of £1 1s. 6d.

An Outstanding Design.

With its variable tone control, visual tuning, A.V.C., high-fidelity speaker, 3½-watt pentode output and its striking walnut cabinet Model "226" is a most outstanding design.

Then for the battery or D.C. mains user there are the battery and universal portable superhets priced at 11 and 13½ guineas respectively (Models 218 and 229). These designs are particularly ingenious in the provision made for carrying them.

At first sight each cabinet appears to be quite standard in type, though it is unusually attractive in design. Closer examination, however, reveals a small socket on either side which takes a couple of studs on the ends of a leather carrying strip. Thus the handle to make the set portable can be fitted in a second or two and removed just as rapidly. A good idea well carried out.

In these two sets the quality is particularly high, the output being substantially level between 50 and 6,000 cycles. Nine-kilocycle separation on both wavebands is provided by the tuning circuits, which consist of an incorporated frame aerial feeding into an H.F. amplifier, H.F. transformer coupled to the heptode, followed by an I.F. band-pass transformer.

When the carrying strap is removed, the set becomes an attractive table model.

A Westector is used to supply full automatic volume control, and the second detector is resistance coupled to a steep-slope output pentode.

The battery set can, of course, be used anywhere—in the car, at picnics, on the beach or at home; while the universal model can be plugged into any mains and practically any voltage supply.

We ourselves have testified to the handiness of the former model in outdoor tests during a run in a car round the home counties, and were agreeably surprised at the constancy with which a large "bag" of stations was brought in at full volume. It is certainly an outstanding design.

In each set the tuning scale is set at an angle to provide easy reading and is calibrated in wavelengths with station names and wavelengths marked on it. The H.-P. terms of Model "218" are £1 down and 13 payments of 19s.; and of "229" 25s. down and 12 payments of 25s.

TRIUMPH of the SILVER KING

IT is great fun publishing a set of the calibre of the "Silver King." Less outstanding receiver designs go out into the world through the pages of POPULAR WIRELESS and often are not heard much of for a long time, when perhaps readers who are in trouble through faults that have developed write in to the Query Department and ask for aid. Others may write and say that they are pleased with the results they are getting, but for the most part we hear comparatively little about our "everyday" sets after they have been published.

There is a very simple reason for this. The Britisher is not prone to put pen to paper unless he is in trouble or has a grouse of some sort, and usually it means a pretty big grouse before he will spend the energy to write and complain. So of ordinary sets we do not expect to hear much after they have "left" Tallis House.

With star designs like the "Silver King" we do expect to hear of results, criticisms, suggestions and the like almost from the day on which the first details are made public; and our expectations are not unfulfilled, as our daily postbags witness.

Again there is a reason. In cases of star sets the public imagination is whetted its enthusiasm is kindled and an interest that is often world wide is born. The postbag is not an infallible gauge of public interest or acclaim, but it is a pretty good one, and we always await the mail with particular eagerness after we have published an outstanding set.

Someone will surely ask if we do not consider all our sets are good enough to result in a large post. Certainly they are, but it is only with the extra-special designs that the post grows from the mere hundreds a week to the thousands.

Of the Utmost Interest.

It is only natural that the extra "hot" designs should come along at irregular intervals. Peak points cannot be reached to order; they must inevitably be the result of much research and thought into the character of the design and into the possibility of readers' requirements.

The "everyday" sets must be built and described to fulfil the needs of many, but that many is inevitably comparatively few. Thus we go on publishing sets of a wide variety of design and purpose, so that everyone shall be catered for in the course of the year.

Every now and then, however, we develop a design that we feel will be of the utmost interest to *everybody*,

Two-channel reception has whetted the imagination of readers all over the country, and the "Silver King" has already become a household word among set constructors.

and when that is published our postbags immediately react in no uncertain measure.

And that is what has happened with the "Silver King"; we are being flooded with letters and postcards from all over the country asking for more information on this point—for details of alternative components, valves, the use of a pick-up with the set and a hundred and one other questions that only a widespread public could possibly think of.

Real Proof of Success.

It is amazing, the variety of requests that we get in the course of only a week; but when the mail goes on unabated for a matter of months, as there is every indication that the post concerning the "Silver King" will do, the ground covered by the questions is stupendous.

Not all are questions, however; many—a great many—are reports of results that have been obtained with the set: results that prove that the "Silver King" is a triumph throughout the length and breadth of the land.

Aberdeen reports Australia in the early morning, and by the same post comes a letter from the Isle of Wight saying that "the American broadcasters on the medium waves are a regular occurrence after 12 midnight."

South Africa has just answered the early announcements of the "Silver King" with a query as to whether the set is going to be any good for the Cape Colony. By now they will have received their answer, not only by post, but by the receipt of the later copies of POPULAR WIRELESS.

And even America, the land of sets of all sorts and descriptions, has sat up and taken notice. Several letters have reached us asking for (1) details of an all-mains model, (2) details of the set using American valves and (3) for various parts to be sent out. These letters range from Long Island to Ohio and from Florida to the Canadian border. So far we have not had a letter from the West Coast, but no doubt that will come in due course.

You will see by the foregoing the difficult requests that some people make. How can we give a design for American valves when the J240 is the key piece of the whole set? But we welcome all those letters, not because they can be answered easily—they obviously cannot—but because they show interest. They show that the set has "gone over," and to the technical journalist that is the greatest reward he can have.

It does not matter if your Scotsman in Killiecrankie wants to use his old Mullard "Ora" valve in the set; he is interested in it and will eventually build it and get the magnificent results for which (by his query) he obviously has been waiting these last ten years.

The Greatest Satisfaction.

It does not matter that the Welshman in Tonypandy says he has heard the Baird television on 7 metres on the set. He may exaggerate, but he has built it, and you know that his exaggeration is a form of expression of greatest satisfaction with the design.

And so we could go on quoting and describing the remarks made in the thousands of letters that have to be dealt with after a star design has "gone over"; and the "Silver King" is more than a star design: it is a complete revolution in home-constructor sets, and the postbags more than prove its worth!

But don't be put off by our huge correspondence. If you have some point to query or some remark to make, rest assured that your letter will receive prompt attention.

BRITAIN'S LEADING SET DESIGN

Throughout the length and breadth of the country people are talking about and building the "Silver King."

YOUR JUBILEE PROGRAMMES

Alan Hunter discusses future broadcasts with the programme builders of the B.B.C.

KING GEORGE THE FIFTH'S Jubilee marks not only the nation's thanks to its Sovereign's twenty-five years of arduous and wise reign; it brings home in vivid fashion the momentous part that radio broadcasting has come to play in the lives of all his subjects.

By now you must all know roughly what the plans are for the Jubilee, as well as having a very good idea of the part that the B.B.C. programme chiefs are going to play.

I will not restate what you already know. Instead, I will give you some exclusive statements from the four of the most important departments at Broadcasting House: Music, represented by Dr. Adrian Boult; Outside Broadcasts, as represented by Mr. Gerald Cock; Variety, as represented by Mr. Eric Maschwitz; and the Empire link, as represented by J. Beresford Clark.

A Very Busy Day.

I went first to Gerald Cock. His arrangements for the Jubilee are in the nature of a swan song to outside broadcasting as far as he himself is concerned—for, as you know, he is due to take over the Television Directorship of the B.B.C. in the autumn.

Outside broadcasting plays perhaps the most spectacular part of all the B.B.C.'s plans for the Jubilee. This is inevitable, since the aim is to give listeners in this country and all over the world a sound picture of pageantry and London life, with His Majesty the King as its focal point.

"The Outside Broadcast Department is doing its bit with the Jubilee celebrations," modestly admitted Mr. Cock. "Take May 6th, for example. The Thanksgiving Service at St. Paul's Cathedral, with a description of the scene and ceremonial at Temple Bar and outside St. Paul's.

"And then, at 8 p.m., *the* event of the day—the King's message to the Empire—this time from Buckingham Palace. A short interval and then an all-star variety show from Brighton—a big job for the O.B. men, this.

Relay From Parliament.

"Then Rudyard Kipling from the dinner of the Royal Society of St. George at the Connaught Rooms. This certainly ought not to be missed, I think. And so back again to Brighton for Jack Payne and his band until 1 a.m. After that I think you will agree we might call it a day!"

Yes, I think so. But there are other days in which the O.B. brigade will be equally busy. Take May 9th. The King visits Westminster Hall to receive addresses from both Houses of Parliament. The whole ceremony, with a description by Commander Stephen King-Hall, will be broadcast.

"On May 12th there will be a stirring relay of part of the Jubilee Thanksgiving Service in Hyde Park," added Mr. Cock, "not forgetting the massed bands and choirs."

Actually the Jubilee conception of broadcasting will permeate the programmes long after Jubilee Week.

"Later in the summer," explained Mr. Cock, to illustrate this important point, "descriptions of Naval, Military and Air Force Reviews will be broadcast from the spot. Plans are also under way, with Admiralty co-operation, for the Naval Review to be transmitted from a big battleship at Spithead—with appropriate and lively effects!"

A Musical Festival.

Music plays an exceptionally strong part in Radio Jubilee. As Dr. Boult says:

"Listeners who appreciate symphonic music will certainly find the Jubilee programmes of outstanding interest. The London Music Festival, organised by the B.B.C. and taking place in May and June, will consist of a Bach Celebration Programme, three concerts conducted by Serge Koussevitzky and four by Arturo Toscanini—the first occasion on which this great conductor directs a British orchestra.

"For opera lovers the relays from the International Season at Covent Garden have been ambitiously planned. They will include the complete broadcast of Rossini's 'La Cenerentola' (Cinderella), as well as acts from many other operas."

Jubilee Week itself, as Dr. Boult reminded me, would be marked by the appearance of many celebrated British artists, including Albert Sammons, Harriet Cohen, Solomon, Ben Davies and Peter Dawson.

"Music by British composers," emphasised the doctor, "will take pride of place—from the most serious to the lightest possible style. A concert conducted by Sir Henry Wood will consist of important British works produced at the Promenade Concerts during the past twenty-five years. Among lighter works Eric Coates will conduct a programme of his own delightful music, including a new piece he has specially composed for the occasion. Joseph Lewis will conduct a popular community-singing programme by the Wireless Chorus. It is doubtful whether so many broadcast favourites, both artists and musical works, have ever before been assembled in one week's programmes."

Variety is, of course, the most widely popular type of sheer entertainment, commanding perhaps at any given time the biggest audience, except for such special events as the King's broadcasts.

Musical Comedy Broadcasts.

It is not surprising, therefore, that Eric Maschwitz, the tireless chief of variety at Broadcasting House, should have produced some really bumper programmes for the Jubilee.

"Particular prominence will be given to musical works by British composers," said Mr. Maschwitz. "The main titles so far announced include 'The Geisha' and Noel Coward's 'Bitter Sweet'—perhaps the most successful British musical plays of the pre-war and post-war years respectively.

"A play with music, dealing with the theatrical history of the reign, is in preparation by Mr. Compton Mackenzie, and this will be broadcast some time in July.

"In the vaudeville field the Jubilee will be celebrated with five large-scale Music-Hall shows of ninety minutes each. Other productions include 'Royal Box'—a programme of songs from all the musical shows seen by the King personally during his reign, many of these being sung by the original stars.

World-Famed Artists.

"Don't forget to listen to Jubilee Gala on May 11th, for this is a real all-star studio variety show featuring theatrical and musical stars of international reputation."

And then there is the Empire. Mr. J. Beresford Clark, the Empire Programme Director, says:

"The Jubilee gives us another chance for co-operation between the B.B.C. and the various broadcasting organisations within the Empire overseas.

"In particular I would cite the contributions that have been made by Dominion and Colonial Governments to the May 6th Jubilee programme. Without their help the bonds of Empire could not be maintained. We are naturally hoping that the May 6th programme and all the other special shows will be well heard in all parts of the world via our Daventry Empire stations.

"If they are not all heard directly there is every chance that they will be picked up and re-broadcast, or electrically recorded and subsequently re-broadcast."

So there you have a cross-section of the sentiment that is permeating the B.B.C. Staff in its preparations for making the Jubilee a memorable radio event in the history of broadcasting.

ACCESSION DAY BROADCAST

His Majesty the King, who will broadcast to the Empire from Buckingham Palace on May 6th at 8 p.m.

A Set for every purpose

VARIABLE-MU SCREENED GRID CIRCUIT

●

SUPER - SELECTIVE IRON CORED COILS

●

SINGLE KNOB TUNING

●

FULL VISION SCALE

●

COSSOR

'SUPER-FERRODYNE' RECEIVERS

Regd.

for Battery, A.C. or D.C. Mains

Whatever the source of your supply—Battery, A.C. or D.C. mains—you can now enjoy the advantages which the Cossor 'Super-Ferrodyne' developments bring . . . . better selectivity and wider range. With any one of these models you can enjoy the best of Europe's Wireless fare — free from interference.

Ask your dealer about their modern Variable-Mu Screened Grid Circuit — the Super Selective Iron-Cored Coils and the many other special features. Most important, ask for a demonstration.

COUPON

To A. C. Cossor Ltd., Melody Department, Highbury Grove, London, N.5.

Please send me free of charge literature giving full particulars of Cossor 'Super-Ferrodyne' Receivers.

* Please state model required.

Name.....

Address.....

* Model No.....

P.W. 4/5/35.

SEND THIS COUPON FOR FULL DETAILS

BATTERY MODELS

Model 350

3 Cossor Valves (Variable-Mu Screened Grid, Triode Detector, Power Output), Matched Moving Iron Loud Speaker. In handsome walnut finished cabinet similar to illustration **£5.12.6** (Exclusive of Batteries)

Hire Purchase Terms: 10/- deposit and 12 monthly payments of 10/-.

Model 353

3 Cossor Valves (Variable-Mu Screened Grid, H.F. Pentode Det., and Economy Pentode Output), 8" Permanent Magnet M.C. Speaker. In handsome walnut finished cabinet similar to illustration. **£6.17.6** (Exclusive of Batteries)

Hire Purchase Terms: 15/- deposit and 10 monthly payments of 14/-.

ALL - ELECTRIC MODELS

Model 358 for A.C. Mains

As Model 353 but with 4 Cossor Mains Valves (including Mains Power Output and Rectifier), 8" Energised Moving Coil Speaker. Illuminated dial. In handsome walnut finished cabinet. For A.C. 200/250 v. (adjust.) 40/100 cycles. Similar to Illustration. **£8.15.0**

Hire Purchase Terms: 16/6 deposit and 11 monthly payments of 16/6.

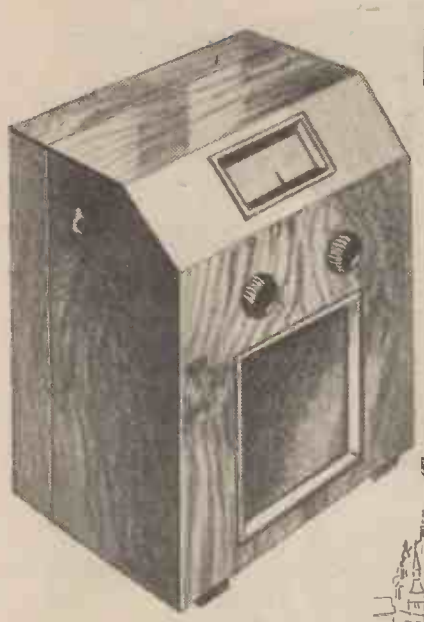
Model 369. Universal Model for D.C. and A.C. Mains

With 4 Cossor Valves (Variable-Mu H.F. Screened Pen., H.F. Pentode Det., Super-Power Output and Rectifier), 8" Permanent Magnet M.C. Speaker, Dial illuminated according to waveband in use. In handsome walnut finished cabinet (as illustrated). For D.C. 200/250 v. (adjust.) and A.C. 200/250 v. (adjust.) 50/100 cycles. **£8.18.6**

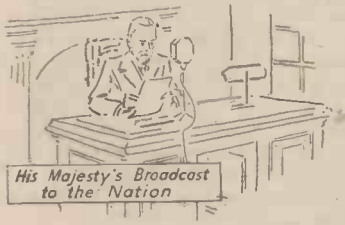
Hire Purchase Terms: 20/- deposit and 11 monthly payments of 16/6.

Prices do not apply in I.F.S

6797 CA



HEAR THE HIGH SPOTS of the KING'S JUBILEE



ON THE NEW BURNDEPT PORTABLE RADIO

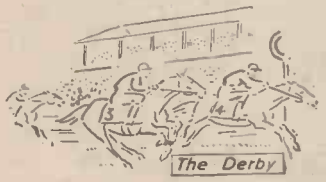
Burndept designers — concentrating for a time upon the problems of the portable—have achieved at last full superheterodyne efficiency in a portable receiver. The results Burndept present for the special occasion of the King's Jubilee—The Burndept Battery Superheterodyne Portable,

price 11 guineas.

—and the Burndept Universal Superheterodyne Portable,

price 13½ guineas.

These two receivers give a performance at least equivalent in unrestricted station range, in quality of reproduction and output power to that of a receiver requiring an aerial and earth. Both are equipped with fully automatic anti-fading devices.



BURNDEPT BATTERY PORTABLE RECEIVER

Four-valve Superheterodyne with full A.V.C. Concert type Moving Coil Speaker. Complete with batteries—

price 11 guineas.

BURNDEPT UNIVERSAL PORTABLE RECEIVER

Five-valve plus barretter Superheterodyne. Full A.V.C. Concert type Moving Coil Speaker. For any mains, any voltage over 160 volts—

price 13½ guineas.

BURNDEPT

RADIO RECEIVERS

BURNDEPT LTD., ERITH, KENT

Modernise your "Magic" for the Jubilee—

Do not let indifferent reception spoil your enjoyment of the King's Speech and other Jubilee broadcasts, bring your "Magic Three" right up to date now, using the Varley Nicore Two. If you do not possess a "Magic" build this, the most popular set in years, from the specification given in full with this issue of "Popular Wireless."

Write now for free catalogue.

NICORE TWO 11/6

L.F. Transformer (List No. DP2)

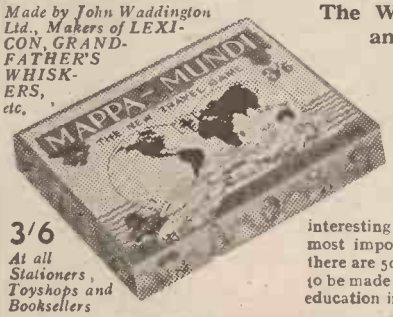
Varley

(Proprietors: Oliver Pell Control, Ltd.)

Bloomfield Road, Woolwich, S.E.18. *Telephone: Woolwich 2345*

THE GAME OF THE CENTURY!

Made by John Waddington Ltd., Makers of LEXICON, GRANDFATHER'S WHISKERS, etc.



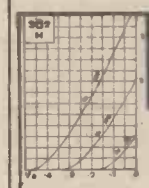
3/6

At all Stationers, Toyshops and Booksellers

The World's Biggest Jig-Saw and the World's Greatest Travel Game

Thrilling! Exciting! Enthralling! Instructive! This jolly game is all that and more. It takes you round the world, to lands of romance and mysticism, gives you hours of fun and entertainment and teaches you all sorts of interesting things about the positions of the most important places of the globe. In all there are 500 square inches of Jig-Saw puzzle to be made into a Map of the World. It is an education in itself.

MAPPA-MUNDI



QUALITY above ALL ELSE

Instal 362 and obtain the best possible results from your set (BATTERY OR MAINS). 362 will give you the best of which your set is capable and at far less cost than the next best. Entirely British, Non-Microphonic and No Mains Hum!

Battery Prices.		Mains Prices.	
H, HL and L,	3/6;	ACHL4,	7/6;
Power,	4/-;	Super	ACPX4, 9/-;
Power,	4/6;	SG and	and ACVS4, 12/6;
VS,	7/6;	VP2,	9/-;
Pentode Type,	10/-;		13/-;
BA and BX,	9/-.		

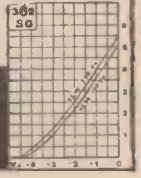
ACME and ACHM, RB41, 7/6; RB42, 10/-.

HL2, 3/6

SG, 7/6

If your dealer is not an appointed 362 Agent, do not be persuaded to buy the next best. Post free direct from makers, cash with order.

THE 362 RADIO VALVE CO., LTD. (Dept. X), Stoneham Road, London, E.5. *'Phone:* Clissold 1294



THE ONLY VALVE WITH A 6 MONTHS' GUARANTEE

A CAVALCADE of PIONEERS

THE King's Jubilee—and next Monday millions of listeners throughout the length and breadth of the land will, in the seclusion of their own homes, hear the voice of His Majesty as clearly as if he were in the same room.

And what is it that has made this modern wonder possible? Broadcasting, you will probably say, just leaving it at that, because taking things for granted is one of the characteristics of our race.

How often, when you are sitting contentedly listening to the radio, do you pause to think of the vast amount of technical research that has been necessary to enable you, in the comfort of your own home, to be all but present in the broadcasting studio? Of the pioneers who have made it possible for you to own a set capable of reaching out to the farthermost ends of the earth—to hear voices and music from other lands just whenever you wish?

How Did it All Start?

It all sounds so very easy, and costs so little, too.

A few pounds buys a set; a few pence a week covers the running costs; and ten shillings a year pays for the licence.

Broadcasting as a public service started in 1922—not quite thirteen years ago—but the story of radio goes back to many years before then.

How many people, for instance, know the origin of the modern valve? How many could go back more than a few years in the history of any of the components or accessories with which we are familiar to-day? Who are these pioneer firms who have done so much to bring entertainment and knowledge into our homes—to make it possible for us to hear the voices of our King and Queen?

Pioneer Firms.

Let me tell you something about these pioneer firms. Where shall we start? That is a problem, because it is impossible to single out any one firm and to say "Here is *the pioneer*." One particular component part is not a complete receiver, but on the other hand, if that particular component did not exist, where should we be?

Take the valve, for example. If there were no valves how would the B.B.C. send out their programmes? And how would we listeners be able to pick up programmes sent out many hundreds of miles away?

How often, when you are tuning-in programmes from stations near or far, do you pause to think of those firms which made radio what it is to-day? It is only through the courage, initiative and foresight of these firms that you are enabled to enjoy the wide variety of programmes which your set will pick up. Let us tell you something of these pioneers of radio.

Fifty-five years ago a brilliant young engineer was carrying out some experiments in the laboratories of a young and ambitious company—known as the Edison & Swan United Electric Light Co., Ltd. His research concerned the peculiarities of a new lamp he had constructed, and his experiments were centred around a curious phenomenon called the Edison Effect.

The name of this young research worker was Fleming—now Sir Ambrose Fleming, F.R.S.—and fourteen years afterwards the first valve detector saw the light of day. The Fleming two-electrode valve—the forerunner of the modern valve—owed its origin to these researches into the Edison Effect.

Pioneers in every sense of the word, the Edison Swan Electric Co., Ltd., as the company is now called, has a history of which it may well be proud. Ever since the culmination of these early researches it has been responsible for an almost unbroken chain of valuable contributions to radio. During the war it supplied valves to the Government, and shortly after produced the famous Ediswan A.R. valve.

To-day the firm is carrying on the good work with its Mazda super-valves and a host of other vital accessories such as H.T. batteries and accumulators.

And we must not forget television—cathode-ray research is another side of Ediswan's activities—and so the pioneer work goes on.

"Do you remember . . ."

Speaking of valves brings to mind other great pioneer names in the radio industry, among them Cossor, G.E.C., Marconi.

Do you remember those fine Cossor bright-emitter valves, one with a plain bulb, the others known as the "red top" and "green top"? Splendid specimens of their type, ideal for detecting and H.F. and L.F. work respectively. That's a good many years ago now; valve design has passed through a variety of stages since, but the Cossor valve is still amongst the leaders, and is likely to remain so.

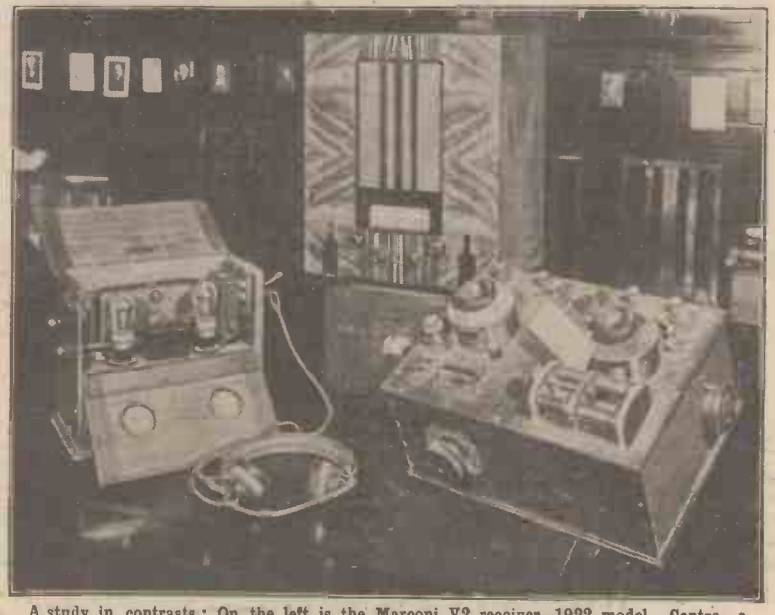
Constant factory expansion is a sure proof of the efficiency of a firm's products. Suffice it to say that Cossor's Highbury factories have been enlarged time after time. The present factory is the fifth one erected at Highbury by this progressive firm! What greater proof is needed?

Other Activities.

Cossor's activities have broadened. In addition to valves they make complete sets in both battery and mains types. Such is the result of progress, my friends.

(*Continued on next page.*)

THE OLD AND THE NEW



A study in contrasts: On the left is the Marconi V2 receiver, 1922 model. Centre—a Marconiphone Jubilee model "264," which the firm introduced in February of this year. Right—a Fleming Diode receiver which used two valves. This is a real veteran and is probably one of the oldest wireless receivers in existence, dating back many years before the beginning of broadcasting.

A CAVALCADE OF PIONEERS

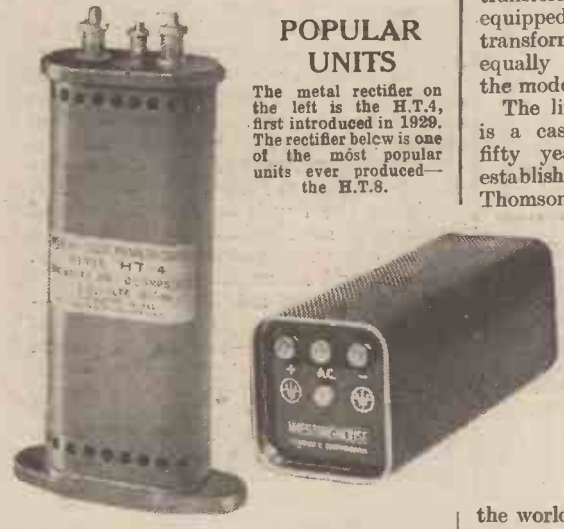
(*Continued from previous page.*)

But I must carry on with this cavalcade of pioneers. Valves and radio sets—Marconi and G.E.C.

I met my first G.E.C. valve during the war. It was a curious-looking object with a screw base, and had fragile leads sticking out from the bulb. Installed in an aircraft receiver, it was an eye-opener to those of us who had grown to look upon the crystal as the most sensitive detector in existence.

And somewhere about that time—it seems so very long ago now—there was yet another unique valve, the Marconi-Round, which you "tickled" occasionally by applying a lighted match to a projection on the top of the bulb.

POPULAR UNITS



The metal rectifier on the left is the H.T.4, first introduced in 1929. The rectifier below is one of the most popular units ever produced—the H.T.8.

I link these two great firms together, because in much of their development work they have marched hand in hand. The Catkin all-metal valve is an instance.

Both names have been actively identified with broadcasting since its inception.

When 2 L O first started transmitting from Marconi House a two-valve set was the last word in luxury listening. Most people had crystal sets, and it is interesting to look up old catalogues to compare these early sets with those available to-day. For instance, in 1923, if you wanted a two-valver, you paid £25 or so; and you listened on phones unless you felt extravagant and purchased a horn-type loudspeaker, which was virtually a large headphone with a horn attached.

The Marconi two-valve receiver with spade tuning and the G.E.C. cabinet set with "R" type valves were undoubtedly two of the finest commercial designs procurable in the early days of broadcasting. Small wonder when you bear in mind the vast experience and technical resources of the two firms.

And this holds good to-day. When you read the name Marconiphone or G.E.C. you know that what you are getting is backed up by the results of years of research and experiment.

A Branch of Electrical Engineering.

All radio pioneer work had as its beginning electrical engineering in the broad sense. Radio is really a branch of electrical engineering, and the brain behind the large transformers used in power stations is equipped technically to design first-class transformers for radio. This applies equally to other essential components in the modern receiver.

The life story of the Ferranti company is a case in point. Rather more than fifty years ago the late Dr. Ferranti established the company of Ferranti, Thomson & Ince, a company destined to become one of the most respected names in the electrical industry.

From its small beginnings in the late nineteenth century the firm has steadily progressed, until to-day it is one of the most gigantic organisations of its kind in the world, with a vast factory area at Hollinwood employing some 5,000 workpeople.

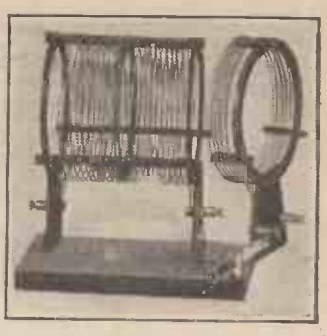
On the radio side, to Ferranti goes the credit of having consistently championed the cause of quality of reproduction. From the time when broadcasting was an established fact their long experience in power-transformer design was turned to good account. Although the low-frequency transformer used in radio has vastly different technical requirements from the power transformer, it did not take the Ferranti specialists long to produce a component in keeping with the firm's highest traditions. Fidelity was the watchword, and fidelity was achieved.

In addition to transformer design Ferranti activities cover a wide field. Complete receivers, valves, loudspeakers, condensers, chokes and sundry other components are included in their range.

Every item manufactured is treated with the same care as is given to the more ambitious products of the firm. Quality is the keynote of each and every component part emanating from the Ferranti factory—the hallmark of fifty years of tradition.

And what of some of these other pioneers whose products form vital links in the radio chain—those who are specialists in condensers, tuning coils, loudspeakers, mains transformers, mains units for H.T., batteries, metal rectifiers and so on?

ELEVEN YEARS AGO



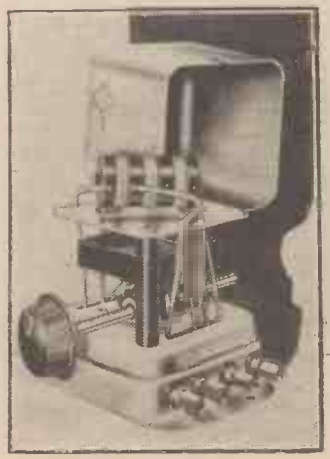
One of the Wearite 1924 tuning coils. It is a short-wave type, but judging by the number of turns, not quite what we regard as short waves to-day.

DUBILIER PROGRESS

An old-type Dubilier condenser (above) beside one of the latest oil-filled type 951 models. These photographs give a good idea of the big improvements that have taken place in design.

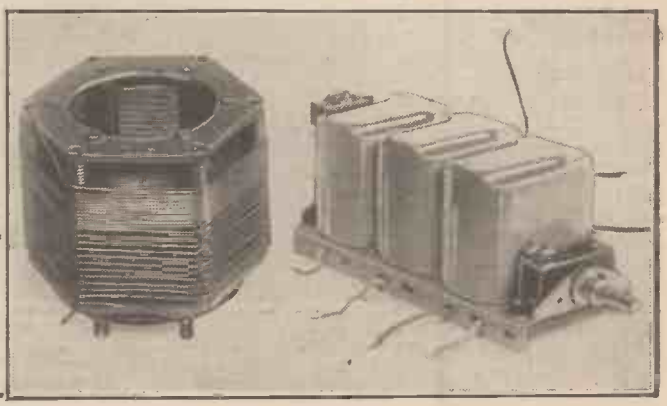
What names the mention of these components conjures up! Variable condensers—Polar, J.B.; fixed condensers—Dubilier, T.C.C., T.M.C.–Hydra; loudspeakers—W.B., Blue Spot; tuning coils—Colvern, Varley, Wearite; mains transformers—Heayberd, Varley and Wearite again; Ekco mains units; Exide and Ever Ready

(*Continued on page 237.*)



WELL SCREENED

Here is an up-to-date Wearite screened-coil unit complete with wave-change switching, all ready to connect into a modern set.



1927—1935

Colvern coils contrasted. On the left a 1927 Reinartz coil, and, right, the latest Colvern "Ferrocart" unit for ganged tuning.

MODERNISING the "MAGIC"

BRINGING THE MOST FAMOUS SET OF THE PAST UP-TO-DATE

THE "Magic" Three set was the most popular home-constructor receiver ever introduced to the public. This is no mere expression of opinion, but an undeniable fact. From time to time attempts have been made to calculate the number of "Magics" which have been built.

It is known that over a quarter of a million were constructed from certain definite makes of components, but a huge number over and above that were assembled with parts which could not be checked for numbers.

Tremendous Increase in Trade.

So colossal was the demand that all existing stocks of some components specified for the "Magic" were completely wiped out, and numerous small firms sprang up opportunely endeavouring to fill the breach with "pirate" alternatives.

It is a sobering thought that this one POPULAR WIRELESS design created at least several million pounds' worth of radio trade. The reasons for its terrific popularity were three. In the first place, it was the precursor of all-wave reception. For the first time short waves, with all their glamorous potentialities, were brought within the reach of the average listener.

Also the "Magic" was an exceptionally easy set to build. It followed a straightforward panel and baseboard layout with simple wiring, and it was almost impossible to go wrong in its assembly.

Lastly, it was simple to operate. Anyone could handle it and be sure of getting very good results, and we fear that that is the last thing which could have been said about some of the sets of the day.

Thus it was that the "P.W." "Magic" Three achieved its record success largely through the enthusiastic recommendations of highly satisfied builders. The reverberations of these practical plaudits are still to be heard. Although the "Magic" is now almost a hoary old relic as radio designs go—for five years is a long stretch of time in the cavalcade of radio progress—there is still a large number in active use and there are still people who want to build the original "Magic."

Not a large number of the latter, perhaps, but hardly a week goes by without at least one or two letters being received at Tallis House asking for blue prints of the original "Magic" Three. Of course, we are unable to supply them, for the "Magic" blue print went out of stock very quickly after its publication.

"I still have my good old 'Magic' working, and I have yet to hear a set to beat it." We get numerous letters starting like that. Naturally, we are delighted to hear of such excellent service, and while deeply appreciative of and sympathetic to the substance of such letters we must face the fact that the original "P.W." "Magic" Three is now technically behind the times.

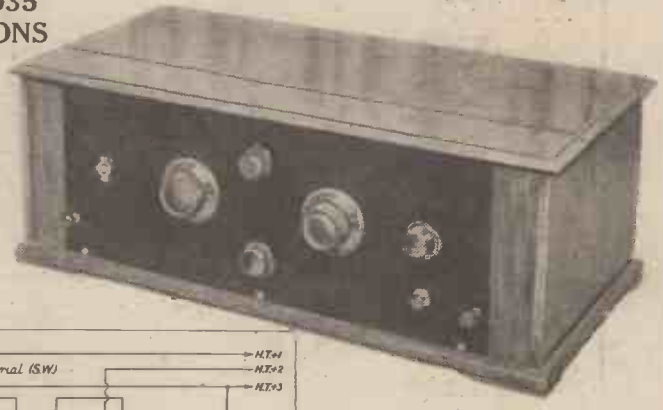
It had a jolly good run, and for years held its own against all comers; but it is not now "the best three-valver," and you could not reasonably expect it to be. It is even to this day a quite good set, but it was designed for entirely different conditions from those which exist to-day. For example, its selectivity was then adequate, and remained so for a long time; but as the years produced ever-increasing ether congestion, some "Magic" owners found that they could not continue to separate the stations with as great a facility.

Thousands in Use.

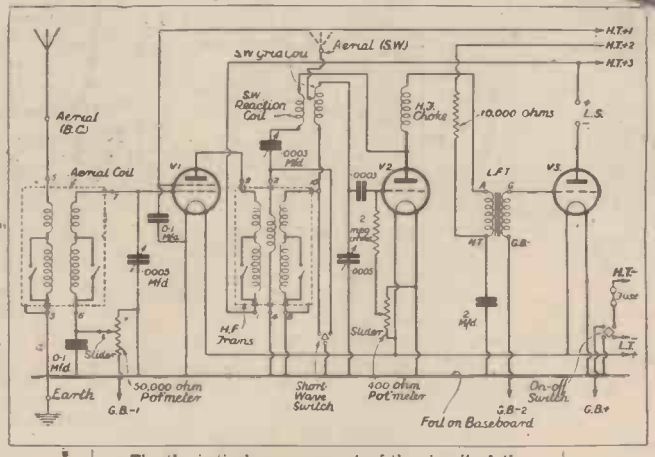
However, the fact remains that thousands of "Magics" are still in use, and so we have decided to show the owners of these how they

(*Continued on next page.*)

READY FOR 1935 RADIO CONDITIONS



The 1935 "Magic" utilises a screened-grid H.F. valve, detector and one L.F. instead of a detector followed by two L.F. stages, as in the original version.



The theoretical arrangement of the circuit of the modernised "Magic" Three. An iron-cored coil unit has been used in place of the original plug-in coils for medium and long-wave tuning.

EXISTING PARTS THAT CAN BE USED AGAIN

1 .0005-mfd. tuning condenser, with slow-motion dial. (Polar No. 2 S.M.)
3 4-pin valve holders. (Benjamin.)
2 2-pin coil holders. (B.T.S.)
1 200-ohm or 400-ohm baseboard-mounting potentiometer. (B.T.S.)
1 H.F. choke. (Wearite.)
1 L.F. transformer. (Varley.)
1 .0003-mfd. fixed condenser. (Dubilier.)
1 2-mfd. fixed condenser. (T.M.C.-Hydra.)
1 2-meg. grid leak and holder. (Graham Farish.)
1 resistance holder. (Dubilier "Dumetohm.")
1 baseboard, 18 in. x 10 in. (Peto-Scott.)
1 panel, 18 in. x 7 in. (Peto-Scott.)
1 terminal strip. (Peto-Scott.)
5 terminals. (Belling & Lee.)
Wander-plugs and accumulator spades. (Clix.)
Wire, screws, flex, etc.

NOTE.—Makes are given for the benefit of readers building up the entire set. Therefore the above list, together with the list of extra parts, constitutes a complete kit of components for a 1935 "Magic" Three. Of course, in the case of many original "Magic" Threes the components which can be used again will be of different types, or even makes from the above list, but none the less suitable for the purpose.

EXTRA COMPONENTS REQUIRED

1 Polar No. 2 S.M. tuning condenser.
1 Formo two-gang coil unit, type A.H.
1 Polar .0003-mfd. Compax reaction condenser.
1 Bulgin 3-pt. shorting switch, type S.39.
1 Bulgin 4-pt. shorting switch, type S.87A.
1 T.C.C. .1-mfd. tubular fixed condenser.
1 T.M.C.-Hydra .1-mfd. fixed condenser, type 30.
1 Dubilier 10,000-ohm resistance, 1-watt type.
1 Bulgin 50,000-ohm potentiometer, type V.C.36.
1 Belling & Lee wander-fuse.
1 pair Bulgin G.B. battery clips, type No. 1.
1 piece copper foil, 18 in. x 10 in.

MODERNISING THE "MAGIC"

(Continued from previous page.)

can modernise their "good old 'Magics'" and, without spending much money, enable them to achieve an efficiency equal, if not superior, to any present-day three-valver.

Others can, if they desire, start from scratch and build up the whole modernised design, and so help to swell the numbers who will maintain the "Magic" tradition in the future years.

With this object in mind we have divided the list of components into two sections. There is first a list of the original parts which can be retained in the modernised design, and then there is a further and somewhat shorter list of the new parts which will be required. Thus it can be seen that these two lists together constitute a complete kit of parts for building up a 1935 "Magic."

There are only four of the original parts which cannot be used. One of the L.F.

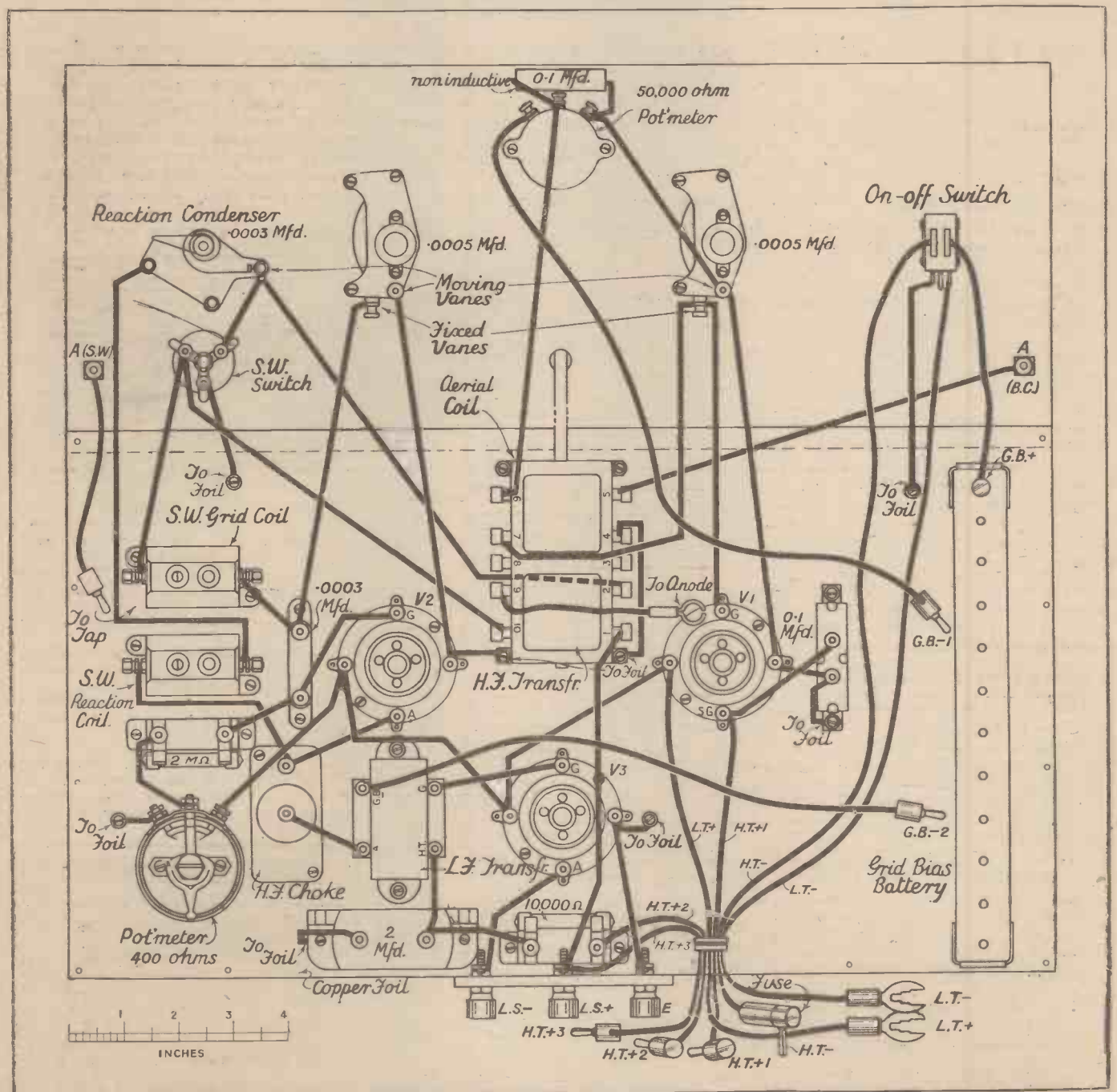
(*Continued on page 230*)

THE RECOMMENDED VALVES

	H.F.	Det.	Output
Cossor	220 V.S.	210 H.F.	220 P.A. or 230 X.P.
Hivac	V.S.215	H.210	P.220 ,, P.P.220
Marconi	V.S.24	H.L.2	L.P.2 ,, P.2
Mazda	S.215 V.M.	H.L.2	P.220 ,, P.220A.
Osram	V.S.24	H.L.2	L.P.2 ,, P.2
362	V.S.2	H.L.2	L.P.2 ,, P.2
Tungsram	—	H.R.210	L.P.220 ,, S.P.220

BATTERIES. H.T.—120 volts. G.E.C. L.T.—2 volts. Exide.
G.B.—9 or 16½ volts (to suit output valve). G.E.C.
LOUDSPEAKER. W.B. Stentorian.

WIRE UP YOUR 1935 "MAGIC" THREE FROM THIS DIAGRAM



The new wiring for the modernised "Magic" is shown in this diagram. The two short-wave coil holders can be seen on the left and the screened coil unit for the medium and long-wave bands in the centre of the baseboard. Note specially how certain leads are taken direct to the metal foil on the baseboard. In the case of the lead from the 2-mfd. condenser near the terminal strip, the end of the wire is screwed down tightly between the mounting lug on the case and the foil on the board.

B.B.C. JUBILEE PLANS EXCEED ALL EXPECTATIONS!

Huge Public Demand For New MARCONI Superhets

SECURE PERFECT RECEPTION NOW!

Radio House, London.

WITH THE FIRST OF THE BRILLIANT JUBILEE BROADCASTS STARTING NEXT WEEK, THE MANY THOUSANDS OF LISTENERS WHO TOOK THE PRECAUTION OF PLACING AN EARLY ORDER FOR THEIR MARCONI SUPERHET ARE NOW ENJOYING PERFECT RECEPTION AND EAGERLY LOOKING FORWARD TO THE FIRST RADIO JUBILEE. THE MARCONIPHONE COMPANY, WHOSE SPECIAL JUBILEE YEAR SUPERHETS ARE THE OBVIOUS CHOICE OF ALL DISCRIMINATING PURCHASERS, ARE MEETING THE HEAVY PUBLIC DEMAND WITH SUCCESS, BUT BELATED PURCHASERS ARE STRONGLY ADVISED TO PLACE THEIR ORDERS WITH THE LEAST POSSIBLE DELAY.

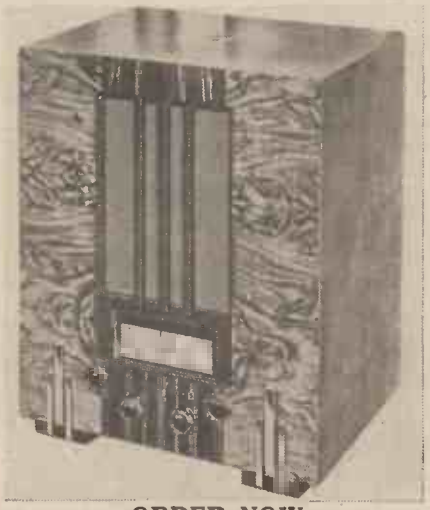
The long list of outstanding Jubilee programmes is growing daily. It seems improbable that such a galaxy of pageantry and entertainment can be arranged again in our lifetimes and it is certain that listeners who do not now secure for themselves thoroughly satisfactory reception will find in it a cause for regret for years to come. Broadcasts by H.M. The King, The Archbishop of Canterbury, and Mr. Rudyard Kipling have already been announced; to these is now added a long list of brilliant items of which the following are but a few:—

Thanksgiving Service attended by their Majesties at St. Pauls.
Twice weekly relays from Covent Garden.
"The Desert Song."
Loyal addresses by members of the Lords and Commons.
Eight Special Concerts from the Queen's Hall.
"Royal Box."
Tauber in "Songs from my Shows".
"Bitter Sweet."
Silver Jubilee Aldershot Tattoo.
H.M. The King reviews the Air Force, the Army, the Fleet and the Police.
Broadcasts by T.R.H. The Prince of Wales, The Duke of York, The Duke of Gloucester.
"Drake," a magnificent microphone re-enactment.

Only up-to-date superhet radio can do full justice to these wonder programmes; it is, in fact, already essential for proper reception and a modern superhet is the soundest investment that can be made.

The three Marconi Jubilee Year Models are all available on particularly accommodating terms of only 5/- per week and are thus within the reach of every household. They are the Radio-gramophone at 22 gns., the Console at 17 gns., and the Table Grand at 12½ gns.; each employs the same 5-valve 7-stage superhet chassis with a most advanced performance.

Their technical refinements are so ingenious and so numerous that it is impossible to make a representative mention of them here; 25 of the outstanding features are fully described in the interesting leaflet which all listeners are urged to obtain without delay. The great thing from the average man's outlook, however, is that while each model, and particularly the Table Grand, is well within his means, it is nevertheless a really delightful piece of figured and inlaid walnut furniture that will grace any home.



ORDER NOW IN TIME FOR THE JUBILEE!

Technical experts everywhere express their enthusiasm for this new triumph of the Marconi-men; Prof. A. M. Low, the eminent scientist, writes: "*I am astonished at its range and accuracy . . . I have seldom heard any instrument which so usefully combines simplicity of operation with results which can appeal to the most musical ear*".

The technical expert of "Popular Wireless" states: "*A range of receivers which have made commercial radio history . . . will receive every station in Europe with ease . . . a joy to handle . . . It is sensationally real*".

Next time you are out shopping, look out for this Marconi-man symbol. It is the sign of a first-class radio dealer who is waiting to let you see and hear the Jubilee Year Models, and to hand you an illustrated leaflet which clearly explains all their advantages. If you prefer to write direct just fill in the coupon below.

APPLY NOW for illustrated descriptive list of the Marconi Jubilee Year Models and the address of your local Marconi-men.

Name .....

Address .....

..... Pop. W., 4/5/35.

The Marconiphone Co. Ltd., Radio House, Tottenham Ct. Rd., W.1.

MODERNISING THE "MAGIC"

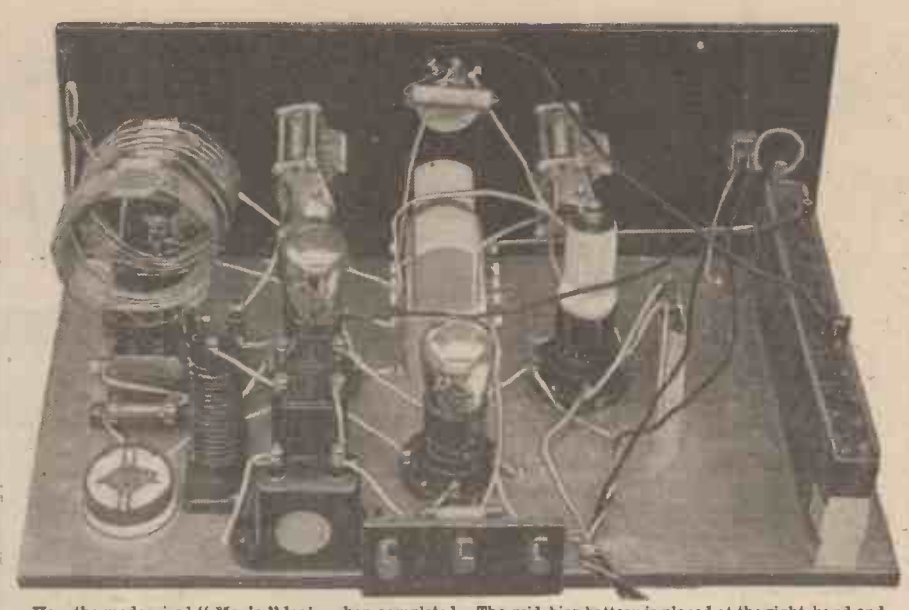
(*Continued from page 228.*)

transformers has to be discarded because it is unnecessary to the revised circuit.

The two-point push-pull on-off switch is rejected because it is unsuitable owing to the fact that a variable-mu H.F. valve figures in the new outfit, and this, of course, demands multi-point switching. We have discarded the original differential-reaction condenser because experience acquired in later years has shown that even better results are to be obtained with an ordinary type of higher capacity, so long as the coils are carefully chosen.

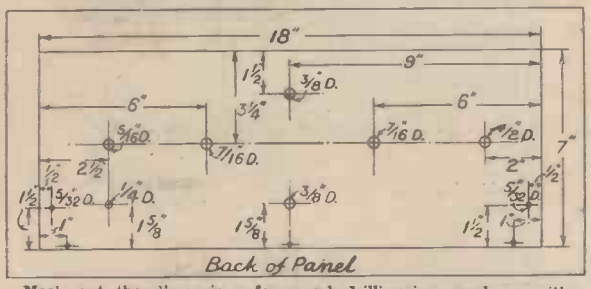
Very Little "Scrapping."

Finally, in place of the 25,000-ohm resistance one of 10,000 ohms is required. But we think you will agree that, in view of the very substantial circuital changes made and the great advance in results which follows in consequence of this, there is comparatively little part-scrapping to be done.



How the modernised "Magic" looks when completed. The grid-bias battery is placed at the right-hand end of the baseboard, with the G.B. positive wander-plug nearest the panel.

A WELL-BALANCED LAYOUT



Mark out the dimensions for panel drilling in accordance with those given in this diagram. Don't forget to do your marking out on the back and not the front of the panel.

The original "Magic" was a detector and two L.F. arrangement capable of developing considerable sensitivity with its two stages of transformer-coupled low-frequency amplification. But the one tuning circuit and absence of an H.F. stage, while perfectly adequate for those days, would not be able to give complete satisfaction in all present circumstances.

The modernised "Magic" reveals very sweeping alterations. It now becomes a three-valver having a stage of H.F. employing a multi-mu screened-grid valve giving great sensitivity and—note this—smooth and flexible control of amplification, or, in other words, the most efficient method of volume control. It is in this respect especially that a big step forward is taken.

So far we have been referring to the modernised "Magic's" medium and ordinary wave capabilities, and before we pass on to short waves it should be noticed that wavechange switching for the normal broadcast bands is now incorporated, and that is a refinement of value in itself in so far as the modernisation of the original outfit is concerned. Of course, switch wavechanging is one of to-day's standard practices.

Only two of the valves of the new "Magic" are used for short-wave reception, but the results it gives must be experienced to be believed. Undoubtedly the retention of potentiometer detector control has a lot to do with this, together with a happy coincidence of component characteristics.

Changing to Short Waves.

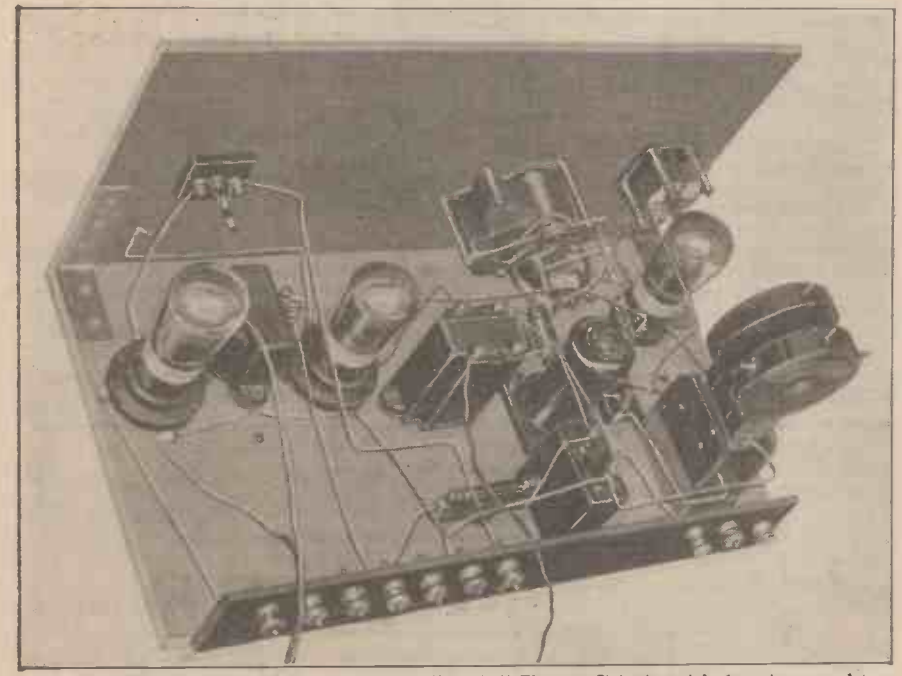
The change-over from the ordinary wavebands to short waves is accomplished merely by operating a simple switch and taking the aerial terminal and connecting it to another. These two aerial terminals are placed on the front panel, so that they are immediately accessible; moreover, separate coils are employed for the short waves—the efficient plug-ins at that.

There is no coil changing necessary in order to go from the normal broadcast band into the fascinating regions of the short waves, but the short-wave coils can be changed in order to vary the regions in which the constructor explores the very high frequencies.

There are just a few more words to say about the components. Although, as we have indicated, the larger proportion of the old ones can be retained, many constructors may wish to take the opportunity of scrapping one or two more than is absolutely essential in order to bring the set to its optimum peak of efficiency. Particularly may this be so, for instance, in regard to the one L.F. transformer which is needed. Some of the transformers sold five years ago were, to say the least of it, rather below the

(*Continued on page 238.*)

THIS IS THE ORIGINAL "MAGIC" THREE



This photograph will interest owners of existing "Magic" Threes. It is the original version, complete with its plug-in coils and two transformer-coupled L.F. stages. Compare it with the modernised version of the famous set shown above.

Lightning Strikes

through your Wireless Aerial

Why risk the terror Lightning brings, the ruination of a good set, the possible destruction of property—perhaps life itself?

Lightning seeks your aerial, protect it and your home with a

GARD AUTOMATIC LIGHTNING ARRESTER

and be permanently safe in the fiercest storms. No need to worry with GARD on guard, no need ever to switch off.

PREVENT DISASTER!

Anyone can fit a GARD in two minutes. No technical knowledge required, just connect it to your lead-in and laugh at Lightning.

£200 Lightning GUARANTEE.

GARD never fails, there is nothing to go wrong, and its efficiency is permanent. Every GARD is flash-tested before leaving the works and is covered by a £200 Guarantee against Lightning damage.

GET A GARD NOW—before the next Storm.

You can fit GARD, you should do so now. Ask your Dealer for the genuine Graham Farish GARD, 2/- complete, or post free from sole manufacturers, Graham Farish Ltd., Masons Hill, Bromley, Kent.

GARD

AUTOMATIC

LIGHTNING ARRESTER

2/- EACH

THERE'S DANGER IN AN UNPROTECTED AERIAL

Our Astounding Book Offer

Your Second

Five Volumes of THE MASTERPIECE LIBRARY OF SHORT STORIES

Are Now Ready

SEND FOR THEM WITHOUT DELAY

Token No. 8, to complete your second Gift Voucher, appears in POPULAR WIRELESS to-day. Send in this completed Voucher AT ONCE, together with the first if you have not already done so. Follow the instructions given on the Gift Voucher carefully and do not forget to indicate which type of binding you have selected—

BLUE ART. LEATHER or SUPER DE LUXE

Your volumes are waiting. Complete Gift Vouchers and remittances should be sent to:

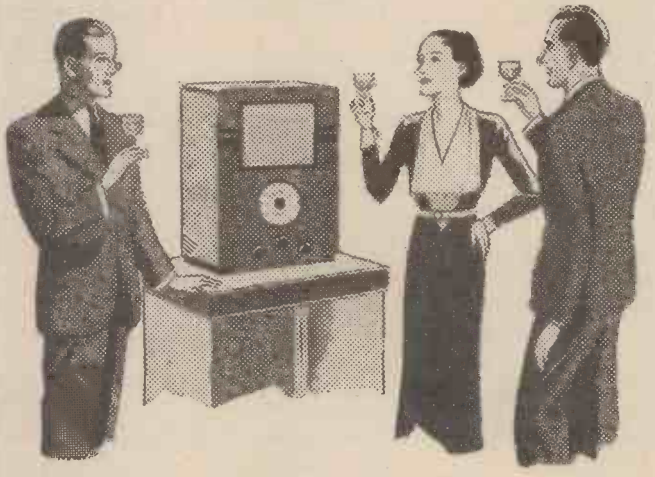
The Amalgamated Press Book Dept.,
(G.P.O. Box 184a), Cobb's Court,
Broadway, London, E.C.4.

Enclose P.O. for 10s. 6d. for each set of five volumes in the Art. Leather binding or £1 for each set of the Super De Luxe edition.

All applications will be dealt with in strict rotation; the sooner you apply, the sooner will you receive these magnificent volumes, of which you will be justly proud.

Make the most of the

JUBILEE CELEBRATIONS



Next best to witnessing the show is hearing it on the wonderful new

See all you can of the celebrations—and hear the rest at home with the utmost vividness, the most moving realism, on KB 'Cavalcade.' This is the wonderful new receiver specially designed for the Jubilee. On this set *hearing* is believing.

KB 'CAVALCADE'

AC/DC SUPERHET

11½ GUINEAS

No other radio at anything like the price offers you such flawless reproduction, with such ample volume, from a cabinet so handsome. 5 of the latest multiple-function valves (including rectifier)—delayed automatic volume control—continuously variable tone control—illuminated full-vision dial with station names. Only 11½ guineas for years of entertainment and delight—or 28/- down (including 3/- insurance) and 12 monthly payments of 21/-. Hear it at the nearest KB authorized dealer's to-day, or post the coupon now.

Name .....

Address ..... Pop. W.

● *For full particulars of KB 'Cavalcade' and the other KB receivers, from £5 15s. to 28 guineas, write your name and address in the coupon (block capitals, please!), tear off, and post in an unsealed envelope (½d. stamp) to*

KOLSTER-BRANDES LTD., CRAY WORKS, SIDCUP, KENT

BARRY KENT CALLING

Broadcasting News & Views

TALKING about marvels and miracles, I sometimes wonder what I am going to come across next. The B.B.C. has never done anything special about authors. "Heartbreak House" has been the title of Broadcasting House in literary circles. The late Reginald Berkeley had a terrific struggle before he got 100 guineas as fee as author of "The White Chateau," the first specially commissioned radio drama. And so it has been all along: too much discouragement for outsiders with brains and initiative; and now, wonder of wonders, some of the pundits have decided actually to try to help authors. The idea is to look up authors who have written successful radio plays and have not been heard of for several years; but more than this is needed, as the Drama staff at Broadcasting House know full well. Likely authors should be given retainers, as in the case of enterprising publishers.

* * *

Summer Variety.

Eric Maschwitz is justly proud of his plans for summer variety this year. I have been looking through a list of the special arrangements. Here are a few of the best: In May, in addition to the Jubilee Gala and the "Red Sarafan," there are two Wodehouse Sketches, May Revue, "Chateau de Madrid" and masses of special variety. In June "Scrapbook, 1905," Jubilee Music-Hall, White Coons, more Wodehouse Sketches, June Revue, more "Chateau de Madrid" and an extra dose of All-Star Variety. And then, in July, the "Seven Cafés," more White Coons, new Ramsay Rhythm Symphonies, "One Band to Another," "Cavalcade" (by J. B. Priestley) and so on *ad lib*.

* * *

Newcastle's Trouble.

Tyneside has now got its own exclusive wavelength, which has been provided by the successful synchronisation of the three Nationals—North, London and West. But this has not solved the whole problem for Newcastle. There is still interference at ranges of ten miles from the transmitter. The cause of this interference is the Hungarian station Nyireghyhaza, which is working very close to Newcastle. The Hungarians have been warned to move their station, or if they cannot move it to put it on the same wavelength as Newcastle.

* * *

Mrs. Hamilton's New Group.

Mrs. Agnes Hamilton, the only woman member of the Board of Governors of the B.B.C., is supposed to be a Socialist (she sat in the House of Commons as a Labour member). Anyway, she takes pride in the possession of advanced views about politics and everything else. But until now she has not had much chance of pressing these views on the B.B.C. Board. Now, however, Mrs. Hamilton is believed to be intending to form a new group consisting of herself, Mr. H. A. L. Fisher and Mr. Harold Brown, supported by Mr. Charles Siepmann, the Director of B.B.C. Talks, who is also an "advanced thinker."

SINGING AT THE SAN MARCO

THE RADIO THREE, whom you have probably heard singing with Maurice Winnick at the San Marco Restaurant. On the left is Kay Cavendish, the pianist and South of England hockey player; the centre one is Ann Canning, Cambridge graduate and originator of the act; and the third is Joy Worth, sister of Butterworth, the Oxford Blue

If Mrs. Hamilton succeeds there will be another interesting experiment in "balance of power." Lord Bridgeman and Mr. Norman, although outnumbered, will have the advantage of Lord Bridgeman's position as Chairman. Anyhow, whatever happens, there is bound to be trouble, and that is always a good thing in a haven of complacency such as the "Big House" tends to become every now and then.

* * *

More Holidays for Broadcasters.

There have been extensions of holiday concessions for the programme workers of the B.B.C. Also arrangements have been made to compensate with extra time those who have to work exceptional hours. It is hoped in this way to remove the need for so much sick leave as has been necessary in the past few years. Breakdowns have been shockingly frequent amongst all ranks.

While more holidays and more time off will be welcome, the real cause still remains unsolved. The work is not properly divided and distributed. There should be more staff and in some cases better staff. Also there should be no thought of reducing programme effort in order to simplify staff problems. I am hoping that some day the B.B.C. authorities will realise the importance of this elementary truth. Anyway, the Government inquiry is unlikely to overlook it.

* * *

Important B.B.C. Appointment.

Mr. Gerald Cock, who has been Outside Broadcast Director of the B.B.C. for the past six years, and is now to be Director of Television, is succeeded in his former job by Mr. de Lotbinière, a comparative newcomer in the B.B.C. who has been General Talks Executive. Mr. John Snagge is promoted to be second-in-command of the "O.B." Department.

THOSE NEWS BULLETINS

Candid comments on B.B.C. programmes by our Broadcasting Critic.

I HAVE noticed before that résumé writing isn't the strongest point of the B.B.C. News Department. Let me go straight to the point and say that the First News Bulletin Summary of the Chancellor's Budget speech (a most eagerly awaited bit of news) was as unsatisfactory as it was obscure.

Isolated that evening in a south coast village, I was entirely dependent on the B.B.C. for my early information. After listening to the report I had little more than a vague idea of the Chancellor's new proposals. Précis writing, I know, is an art which has to be learnt.

* * *

Compare the B.B.C.'s compressed Budget statement with the Chancellor's, which came later the same evening. Mr. Neville Chamberlain, in fifteen minutes, gave all the relevant facts, plus a lot of detail contained in a speech which actually took ninety minutes to deliver in the House of Commons.

This summary left no doubts or uncertainties in listeners' minds. It was orderly in arrangement, attention had been paid to the sequence of facts, and, as should be in a good piece of composition, the speech had besides a carefully thought out beginning, a finishing up as perfect as one could wish for. The delivery of the speech, too, was equally faultless.

* * *

Now that I am mildly criticising the News Department, may I also point out a tendency of theirs to take our geographical knowledge too much for granted? In one News Bulletin that I recall there were at least three towns or districts stated which I am certain scores of listeners wouldn't be able to locate. I frankly confess I had to look two of them up myself.

News of this sort is of little value. I think it is all the more imperative that we should be given "full postal addresses," since world news, rather than home news, always comprises the major part of B.B.C. Bulletins.

* * *

I know a man who welcomes big events at home because, as he says, they invariably crowd out of the evening News Bulletins the masses of uninteresting world news that normally litters them.

* * *

Returning to talks, one must mention the Prince of Wales' appeal on behalf of the Jubilee Trust Fund. This was a good speech. Yes, the Prince of Wales *is* an excellent broadcaster.

* * *

Two other speakers to impress me are Philemon, who talks on books, and the Oxford professor who speaks primarily to farmers. In the case of the latter don't be put off because you may not be farmers. I have listened to these talks for some time now.

Mr. Morgan first attracted me. The Oxford professor is quite as good as his predecessor, and he was first rate. I don't know that I've any special interest in pig-breeding, yet time spent in listening to the subject, as Professor Scott Watson deals with it, isn't time wasted.

(*Continued on page* 238.)

ON THE SHORT WAVES

GETTING H.T. FROM THE MAINS

By W. L. S.

I HOPE I have already convinced readers that they may use indirectly-heated valves on raw A.C. without the slightest trouble from mains hum. The next stage is the conversion of the short-waver to an all-mains proposition, and this, while giving a little more food for thought, cannot by any stretch of imagination be described as difficult.

There is, however, one *very* important point to be considered. It very often happens that a battery-operated short-waver will pick up quite an appreciable amount of mains hum. This is definitely a fault which may, and must, be cured. Obviously, it's no good running your set from the mains if it is in such a state that even with battery operation it makes 50-cycle noises.

Reduce the Grid Resistance.

Generally speaking, the use of a metallised detector valve will prevent the trouble. Sometimes, however, if the layout is very bad it will be essential to install a metal baseboard and a layout of the "universal earth-return" type before quietness is achieved.

Now suppose you have taken the first step and have changed over to indirectly-heated valves. Do you get a little hum now? If so you are probably using too high a value of grid leak. I generally advise something between 3 and 5 megohms for battery valves, but you will probably need to reduce this to ·5 megohm when you change over to mains valves. This value should still give quite smooth reaction control.

Right, then. The next step is the construction of a suitable unit for supplying your H.T. from the mains. A 250–0–250 transformer is shown in the sketch, but that gives, really, an unnecessarily high output for general purposes.

Plenty of Smoothing.

It is nice for loudspeaker receivers with a big output valve, but certainly isn't essential for smaller sets, for which the less common 150–0–150 would probably be more suitable. For either transformer a rectifier of the DW2 class should be used. Suitable valves are the Mullard DW2, Marconi or Osram U10, Cossor 506 B.U. or Mazda UU60/250.

The smoothing circuit, as shown in the fig. is quite conventional. An 8-mfd. condenser of suitable rating follows the rectifier. After this there is a 28-henry choke in the positive lead, followed by another 8 mfd. A special tapping for the detector has its own further smoothing circuit included, another 28-henry choke and 4-mfd. condenser being used, followed by a 25,000-ohm resistance by-passed to earth by a further 2 mfd.

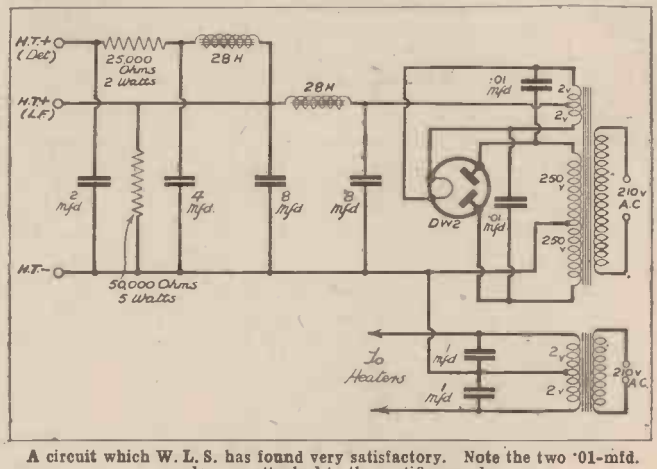
It will probably be possible to dispense with some of these refinements, but the circuit, as shown, is identical with the one I am using myself, and is the only arrangement I have yet found that gives dead-silent operation.

Separate Detector Feed.

Mind you, *dead silence* means a background that is absolutely indistinguishable from that of a really good battery set. One hundredth of a per cent of hum would spoil it.

The chief factor contributing to the success of this arrangement is undoubtedly the use of a separate smoothing circuit for the detector.

FOR ALL-MAINS SHORT-WAVE WORKING



A circuit which W. L. S. found very satisfactory. Note the two ·01-mfd. condensers attached to the rectifier anodes.

Other components that I have not mentioned are the "bleeder" resistance across the main output and the two small condensers across the plates and filament of the rectifier. The former is a 5-watt 50,000-ohm resistance, which, with 250 volts across it, will pass a steady 5 milliamps. (Please note that the 5-watt rating has an ample margin of safety! A 2-watt type would be quite adequate.)

The function of this component, of course, is to assist in keeping the output voltage steady. Minute variations in the mains voltage will have rather a bad effect on the operation of the set. A beehive-type neon tube might be used instead of the resistance—but *don't* remove the resistance incorporated in the base of the neon tube or you'll certainly have a blow-up!

Removing the Last Traces.

The two ·01 condensers are effective in removing the last trace of hum. Without them the set sometimes picks up a little mains noise when it is just oscillating. Note that each is connected from one end of the rectifier-filament winding to one end of the H.T. winding. In other words, there is one between each of the rectifier anodes and its nearest filament terminal.

One often sees these condensers connected, one from each end of the H.T. winding to the centre tap on the filament winding. It is *much* more effective to take one to each end, as shown.

I have also shown the heater-winding in the diagram. Whether it is incorporated in the main transformer or whether a separate transformer is used is entirely a matter for individual preference. In any case, the pair of 1-mfd. condensers from the ends of the winding to the centre tap should not be omitted, and sometimes they may be duplicated inside the set with advantage.

H.F. Leakage Effects.

On a battery set the leakage of H.F. back into the H.T. supply shows up as pure instability, with hand capacity and head capacity. When we run our set from the mains the same fault causes the same effects, plus an A.C. hum. There's no excuse for instability, anyway, and the fact that it shows up rather more plainly in a mains-operated receiver only means that one really *must* get the set working well—a distinct point in favour of the mains.

The heaters should be very carefully wired with twisted wires. I prefer No. 20 gauge, in systoflex, to ordinary lighting flex—it makes a much neater job. Remember, too, that if you wire up a dial lamp in parallel with your heaters you will have to take just the same care about its wiring.

Don't take the twisted flex anywhere near the detector grid, whatever you do. You will almost invariably pick up some hum if you do things like that.

RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos. Every care will be taken to return M.S.S. not accepted for publication. A stamped, addressed envelope must be sent with every article.

All Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

All inquiries concerning advertising rates, etc., to be addressed to the Advertisement Offices, John Carpenter House, John Carpenter Street, London, E.C.4.

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialties described may be the subjects of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS

A CONTINUAL WHISTLE.

C. C. (Tilehurst, Berks).—"Can you say what is likely to be the cause of a continual whistle which has developed recently on a set hitherto free from anything of the kind?

"Circuit is two H.F. stages, leaky-grid detector and output, four valves in all, battery driven. And new batteries make no real difference to the whistle.

"Set was built just over two years ago, and has never given any sign of this kind of trouble before. Careful investigations show that it is not interference from a neighbouring set, nor is a similar trouble heard on other sets.

"Finally, everything *looks* as usual, and there have been no alterations to wiring or anything that could account for the noise appearing."

It sounds a bit of a poser! Have you thought of the possibility of H.F. instability arising through a defective joint somewhere?

We certainly suspect those two H.F. stages, and it is fairly safe to say that your concentration on that end of the set should put matters right.

There will be plenty of lurking places for a high-resistance joint or accidentally developed resistance: all the by-passing arrangements, for example, and all the wiring, especially such taken-for-granted connections as a soldered joint to earth, to the screening or to one of the batteries.

And we are not quite reassured by your statement about new batteries, for we know how a dud G.B. battery, for instance, can be overlooked and give rise to this kind of trouble.

A LOUDSPEAKER FAULT THAT "WASN'T."

J. B. B. (Swindon).—"I thought my S.T.600 was almost perfect with the old loudspeaker, but when I tried a 'W.B.' on it, loaned by a friend, it was such a pleasure to listen to that I did not rest until I got a similar loudspeaker for myself.

"That was last September, and, although I have heard innumerable loudspeakers since then, I would have backed my own combination against the lot.

"But now comes a fault on the loudspeaker which I cannot understand at all. Instead of the full clear quality on the loudest notes of the music I get a bad rattle.

"It is just as though something in the loudspeaker has worked loose, and the row is unbearable after the beautiful clarity I have got accustomed to.

"I have looked over the loudspeaker and leads till I am sick of looking, but there is nothing whatever wrong. Moreover, I got my friend to bring his loudspeaker round again, and that was *no better*.

"He says it is perfect at home again, on the same type of set (S.T.600), so I have been all over my leads again, but cannot account for it. I thought of sending the loudspeaker back to the makers, but that was before I tried the other one, and the results with that make me sure that what is wrong is something I shall have to put right myself.

"What can you suggest?"

Now that you can be reasonably sure that it is not the loudspeaker itself, nor the leads to this, you should concentrate on the output stage. Apparently you have been deceived by the nature of the noise heard and have assumed that, because the trouble shows itself as a rattle, there must be something loose to cause that effect.

This is not correct. Very often a defective output valve, or sometimes improper voltages on this, or some other output-stage fault creates a rattling noise, though there are no loose mechanical parts to account for it.

So try a different valve of the same type, and check up on all the voltages applied. You will probably find that either the particular valve you had in use, or the voltages applied to it, were the cause of the rattle.

REMOVING THE CONDENSER MAKES NO DIFFERENCE.

F. J. L. (Gillingham).—"The 50,000-ohm potentiometer had been in use since early in 1933, and had got a bit noisy, so I treated myself to a new one. In fitting this, in a rather dark corner of the room, I omitted to put back the short lead from the condenser (·1 mfd.), which should have gone to the slider.

(*Continued on next page.*)

TELEVISION SHORTS

AN interesting side-line to high-definition television is the development of micro-waves. This has been encouraged by the knowledge of the fact that the ordinary service land-lines would not be suitable for the relaying of outside television broadcasts in any cases where the distance was considerable.

A special cable has been designed for this particular job, but micro-waves offer an interesting and economical alternative, especially as recent experiments have shown them to be capable of covering quite long distances.

Readers may possibly wonder why these little fellows, with a wavelength of 10 or 20 centimetres, can be made to travel for 20 or 30 miles when the range of a 5-metre signal is so restricted. The answer is in the aerial system.

Easily Arranged Beam Aerials.

It is the simplest conceivable matter to arrange a really effective beam aerial when we are dealing with a wavelength that we can "hold in our hand," so to speak. A highly complicated directional array can be stood on an ordinary table, whereas a similar arrangement for the ordinary short and ultra-short waves would be tremendously unwieldy.

A complete micro-wave transmitter with beam aerial is easily portable for the purpose of outside broadcasts, and—another advantage—the wavelengths are not subject to the types of interference that make reception difficult in other circumstances.

The American journals are full of references to Great Britain's television development, and the various comments make interesting reading. Dr. Goldsmith, of the R.C.A., has said that he sees, in the future, the possibility of television broadcasts across the Atlantic. It would certainly be incredible that this should *not* come to pass sooner or later.

He also points out that we are going to have an easy time over here compared with the U.S.A., which is nearly 40 times as large as the British Isles and would require over 400 stations to give complete coverage.

Even when television really develops in the States it seems that only the town-dwellers can hope to have a full service available to them.

Another writer points out that television would probably help to pull the U.S.A. out of the depression, but that it is largely the depression that is holding television back! He estimates that a total investment of two hundred million dollars would be required to initiate a nation-wide television service.

The remarkable point on which all these writers and speakers agree is that Great Britain has given them something to think about, and unless they are careful they will be in danger of being left behind.

Apparently the radio public in the States is terribly prejudiced against television, probably for the reason that none of the really first-class demonstrations have been seen by the man in the street. Public demonstrations have all been mediocre in character, although laboratory experiments are reported as having given results superior to the home talkie.

Still the war wages—not between films and television, but between mechanical and electrical scanning. A big company is being floated in the States, and it is reported (unofficially) that a new mechanical scanning system of a revolutionary nature is behind it all.

Amateur Work in Australia.

Australia, too, is watching us quietly, but with an enormous amount of interest. The Australian amateur transmitters have gone in for ultra-short-wave work with a vengeance and are obtaining extraordinary results. Doubtless they are due, in some measure, to the vast tracts of fairly flat country and the fact that the average "ham" has plenty of space to erect a beam aerial.

In this country most of the amateurs who can co-operate in work of this kind are situated in the large cities, and not many of them are fortunate enough to occupy really commanding positions. Those who live in the country and in ideal locations often have nobody with whom they can carry out regular tests.

L. H. T.

RADIOTORIAL QUESTIONS & ANSWERS

(Continued from previous page.)

"It has been working like that for two weeks without any trouble. And when I spotted it to-day and put it back on the slider there is no difference that I can tell. So what is the good of the condenser?"

The fixed condenser that is often fitted between the slider of a potentiometer and earth is there for by-passing purposes. And although, as you have noticed, it sometimes appears to make but little difference, it is really quite important.

In all sets it is desirable, and in some sets it is imperative, to have a by-pass across the resistance placed in circuit when the volume control is operated. The condenser provides a low-impedance by-pass, and so reduces the risk of instability and assists noise-free operation.

Possibly you tested it when the batteries were new or some other condition was favourable to its removable—but do not leave it out for that reason, or you may wish you had not done so.

"NO RESULTS" WITH CRYSTAL SET.

G. E. H. (Liverpool).—"I have a crystal set which is absolutely perfect as regards the simple wiring, but gives no results whatever. The crystal is the cause of the trouble, I think.

"I have tried several well-known makes, but they proved useless. I don't think you can buy one that has been recently manufactured. Is there any way of making them re-sensitive again?

"It seems to be of no use breaking them for sensitive spots. The ones you buy now are probably years old."

The fact that the crystals have been laid aside for some years should make no appreciable difference to them. We have had good results with crystals about twenty years old!

Are you sure that the phones are still sensitive? Either this or poor contact somewhere is likeller to be the cause of the failure, and we suggest you test phones and crystal by connecting them to a valve set in the following manner:

Join one side of the crystal to one telephone tag, and then join the other crystal terminal and the other phone tag to the fixed and moving vanes respectively of a tuning condenser in a valve set which, before fixing on the added test wiring, was tuned to the local station.

You should be able to determine, in this manner, whether the crystal-detector circuit is acting properly. And, if it is, all you have to do to get satisfactory reception is to connect it across a suitable tuned circuit connected to a reasonably good aerial, and earth.

If it is *not* acting properly, try fresh surfaces on the crystal and variations of the pressure of contact. You should easily get good results with the ready-tuned circuit to help you.

RADIO IN THE KING'S REIGN

(Continued from page 216.)

are a few of the developments in other directions.

In March, 1931, the ether is disturbed by new and incoherent noises; it is television, for the B.B.C. have started a regular service—the baby is growing up. A year later the Empire hears regular broadcasting from the Homeland. Australian backwoods, Africa's sandy plains, Greenland's icy mountains and India's coral strand—all now hear the voice of England, the music of the Motherland.

The year of the King's Jubilee dawns. Wireless is established as one of Britain's most prosperous industries; but the young giant is telling us in no uncertain voice "that we ain't seen nothing yet," for practical television is almost on us, undoubtedly the greatest scientific achievement of the century: a marvel before which all previous wireless inventions pale into insignificance. Verily a most fitting present to celebrate the Jubilee of His Most Gracious Majesty King George the Fifth!

PETO-SCOTT

EVERYTHING RADIO—CASH C.O.D. or EASY TERMS

SEND US YOUR ENQUIRIES FOR EVERYTHING RADIO

Miscellaneous Components, Parts, Kits, Finished Receivers or Accessories for Cash or C.O.D. or H.P. on our system of Easy Payments. Send us a list of your wants. We will quote you by return. C.O.D. orders value over 10/- sent carriage and post charges paid (GREAT BRITAIN ONLY). Hire Purchase Terms are NOT available to Irish and Overseas customers.

EVERYTHING *for* SHORT WAVES

Peto-Scott were first in the field with Short-Wave Apparatus for the Home Constructor for Cash, C.O.D. or on Easy Terms. We supply EVERYTHING for this fascinating branch of Radio. Orders over 10/- sent carriage and post charges paid. Send us your enquiries for anything you are needing . . . we will quote you by return of post. SEND TODAY.

Peto-Scott Short-Wave CHASSIS

In 16-gauge aluminium. Assembled ready for your own drilling.
10" × 6" × 2½" (undrilled) 4/-
12" × 8" × 2½" ,, 4/6
14" × 8" × 2½" ,, 5/-
Postage 6d. extra.
Drilled to customer's own specification at slight extra cost. We will gladly quote for making special size chassis and screens to customer's own specification on receipt of dimensioned sketch.

B.T.S. Short-Wave COILS

Product of the pioneer manufacturers of popular priced plug-in short-wave coils.
4-PIN SET OF 4
No. 1. 13-26 metres 4/-
No. 2. 24-52 ,, 4/-
No. 3. 46-96 ,, 4/6
No. 4. 90-190 ,, 4/6
16/- Post Free
4-Pin Coil Bases, 1/6 each.
6-PIN SET OF 3
Type SPA 13-26 metres 4/6
,, SPC 22-47 ,, 4/6
,, SPD 41-94 ,, 5/-
13/6 Post Free
6-Pin Coil Bases, 2/- each.
2-PIN. As specified for the modern version of the "Magic 3." Nos. 2, 4, 6 and 9, 15-100 metres. Set of 4, 10/6, Post Free. 2-Pin Coil Bases, 8d. each.

B.T.S. All-Wave H.F. CHOKE

(Screened)

An efficient choke giving maximum choking effect from 10-2,000 metres. Type 112 ... ... Price 4/6.
B.T.S. All-Wave H.F. Choke (with Pigtail), Price 3/6.
B.T.S. Short-Wave H.F. Choke (unscreened), Price 2/9.

B.T.S. Short-Wave MICRO-CONDENSER

Specially designed to eliminate "hand-capacity" on S.W. working.
Type MC (as illustrated). Price 4/6.
B.T.S. Short-Wave Variable Condenser. Robustly designed for S.W. requirements. Capacity ·0002-mfd.
Type SC10, Direct Drive, Price 4/9.
Type SSC11, Slow-motion Drive, Price 5/9.

B.T.S. Slow-Motion DIALS

Standard Model Vernier Knob and Dial, with reduction ratio of approx. 9:1, affording smooth, even turning free from backlash. Price 5/-.
Vernier Knob and Dial fitted with large knob, 6/-.
Vernier Knob and Dial fitted with micrometer adjustment, providing 600:1 slow-motion drive, essential for S.W. work. 7/6.

Ericsson's HEADPHONES

The most famous headphones on the market. Receivers and headbands are of aluminium. Extremely light and comfortable in use. Wound to 4,000 ohms resistance.
12/6 Per Pair

B.T.S. 1935 SHORT WAVE ADAPTOR

RECEIVE AMERICA DIRECT
The famous B.T.S. SHORT-WAVE ADAPTOR on EASY TERMS! Simply plugs into your present Battery or A.C. Mains set. The only adaptor at the price incorporating 100-1 ratio aerial tuning and slow-motion reaction; for use either as Plug-in or Superhet Short-Wave Adaptor. Walnut Finished Cabinet.
Cash or C.O.D. Carriage Paid. With 2 plug-in coils, 13-26 and 24-52 metres. Extra coils, 46-96 and 90-190 metres, 4/6 each.
READY ASSEMBLED **52/6**
7/6 DOWN and 10 monthly payments of 5/-.

PILOT AUTHOR KITS

MODERNISE *your* MAGIC 3

CONVERSION KIT CASH or C.O.D. Carriage Paid **£1:13:6** or YOURS FOR **5/-**
Complete Kit of Components to convert your existing Magic 3 to the 1935 version, less valves.
and 6 monthly payments of 5/3.

KIT-BITS

You pay the Postman. We pay post charges on all orders over 10/-, GR. BRITAIN ONLY.

	£ s. d.
1 Polar Slow-motion Tuning Condenser... ...	6 6
1 Polar Compax Reaction Condenser	2 6
1 Formo 2-gang Coil Unit, type A.H. ...	10 6
Set of 3 Cossor Valves: 220VS, 210H.F., 220PA	1 5 0

SILVER KING

KIT "A" CASH or C.O.D. Carriage Paid **£7:15:0**
Or 12/6 deposit and 11 monthly payments of 14/3.
KIT "B" Cash or C.O.D. Carriage Paid, £9/8/6, or 12 monthly payments of 17/3.
KIT "C" Cash or C.O.D. Carr. Paid, £10/16/0, or 12 monthly payments of 19/9.

PETO-SCOTT "SILVER KING" Walnut CABINET

Hand French-polished with Macassar Ebony Veneers. Cash or C.O.D. **27/6**
Carriage and Packing, 2/6 extra.
Turntable ... ... 5/- extra.

• S.T.600 •

KIT "A" CASH or C.O.D. Carriage Paid **£4:19:6**
Complete kit of components, as first specified by Mr. John Scott-Taggart, copy of "Popular Wireless" with free full-size Blue Print and S.T.'s 100 STATION "SPOT-ON" DIAL and other "P.W." FREE GIFT, less valves, cabinet and speaker. YOURS FOR **7/6** and 12 monthly payments of 8/6.

KIT "B." As for Kit "A," but including set of 4 first specified valves, less cabinet and speaker. Cash or C.O.D. Carriage Paid, £7/4/0, or 12 monthly payments of 13/3.

KIT "CT." As for Kit "A," but including valves and Peto-Scott S.T.600 Table Cabinet, less speaker. Cash or C.O.D. Carriage Paid, £8/1/6, or 12 monthly payments or 14/9.

KIT "CC." As for Kit "A," but including valves, and Peto-Scott S.T.600 Consolette Cabinet, with speaker baffle and battery shelf, but less speaker. Cash or C.O.D. Carriage Paid, £8/19/0, or 12 monthly payments of 16/6.

S.T.600 A.C. VERSION

KIT "A" CASH or C.O.D. Carriage Paid **£9:15:0**
Comprises complete Kit of Components as FIRST specified by Mr. John Scott-Taggart, less Valves, Cabinet and Speaker. YOURS FOR **17/9** and 11 monthly payments of 18/-.
Set of 3 Specified Valves £2 13 6

SPECIAL JUBILEE OFFER

SIMPSON'S 1935 ELECTRIC TURNTABLE

THE PERFECT GRAMOPHONE MOTOR AT LAST! Low consumption. CONSTANT SPEED. 1-HOLE FIXING. Darwin's Magnets. A.C. Mains only. 100/150 or 200/250 volts, 50 cycles. 12-in. turntable. Send only 2/6, balance in 11 monthly payments of 4/-. Cash or C.O.D. Carriage Paid, £2/2/0.

2/6 DOWN

Simpson Turntable as above, complete with Guaranteed B.R.G. Pick-up. Cash or C.O.D. Carriage Paid, £2/10/0 or 2/6 Deposit and 12 monthly payments of 4/6.

PETO-SCOTT CO. LTD. 77, Pr.W.22, CITY ROAD, LONDON, E.C.1. *West End Showrooms*— 62, Pr.W.22, High Holborn, W.C.1. *'Phone: Clerkenwell 9406-7. 'Phone: Holborn 3248.*

Let Us Send You This 28-Page Booklet—*Free*

It gives all particulars of various Courses that cover every phase of Radio work.

The Radio Industry is progressing with amazing rapidity. Only by knowing thoroughly the basic principles can pace be kept with it. I.C.S. instruction includes American broadcasting as well as British wireless practice. It is a modern education, covering every department of the industry.

OUR COURSES

Included in the I.C.S. range are Courses dealing with the installing of radio sets and, in particular, with their Servicing, which to-day intimately concerns every wireless dealer and his employees. **The Operating Course** is vital to mastery of operating and transmitting.

There is also a **Course for the Wireless Salesman.** This, in addition to inculcating the art of salesmanship, provides the knowledge which enables the salesman to hold his own with the most technical of his customers.

Then there are **Preparatory Courses for the City and Guilds and I.W.T. Exams.**

We will be pleased to send you details and free advice on any or all of these Courses. Just fill in and post the coupon, or write in any other way.

International Correspondence Schools, Ltd.,
Dept. 161, International Buildings,
Kingsway, London, W.C.2.

Without cost or obligation, please send me your Radio booklet of information about the Courses I have marked X.

- ☐ COMPLETE RADIO
- ☐ RADIO SERVICING
- ☐ RADIO EQUIPMENT
- ☐ RADIO SERVICING AND SALESMANSHIP
- ☐ WIRELESS ENGINEERING
- ☐ WIRELESS OPERATORS
- ☐ EXAMINATION (state which)

.....

Name..... Age.....

Address .....

.....

VALUABLE GADGETS FOR CONSTRUCTORS

Reports on components we have recently handled.

THE "GOLTONE" FUSE PLUG.

IT is often said that so long as there is one good fuse in the mains circuit itself, additional fuses become redundant. It is certainly true that this principle seems to be widely followed in the use of domestic electrical apparatus. Electric irons, vacuum cleaners, fires and so on do not usually carry their individual fuses.

We think it is a pity that they do not. The blowing of a fuse should not be regarded as an indication that the fuse requires replacing, but as evidence that a fault has occurred. Steps should be taken that such faults do not recur. It makes it easier to localise such faults if each section of the power circuit has its own fuse.

When that is done the mains fuses, which are fitted in every system of house wiring, then have the task of guarding against faults in the wiring. The great advantage that follows, in addition to the easier fault finding, is that a piece of faulty apparatus having its own fuse does not render the whole circuit out of commission. It blows its own fuse, and not the mains fuse so long as the fuse ratings are correctly chosen.

It frequently happens that the power or lighting of several rooms has only the one pair of mains fuses, and a fault causing these to blow plunges a section of the house into darkness.

So, on several scores, it pays to use plenty of fuses, and that is why we have great pleasure in bringing to the notice of our readers a new device produced by Messrs. Ward & Goldstone, Ltd., Pendleton, Manchester.

This is the "Goltone" Fuse Plug. In dimensions and appearance it resembles an ordinary but particularly neat mains plug. And it is interchangeable with all standard 5-ampere, 2-pin plug sockets. But

CLOSED AND OPEN

This photograph shows the "Goltone" Fuse Plug when closed, and also illustrates how the fuses are accommodated.

it contains two fuses of the cartridge type. These are in neat clips, making them easily replaceable.

They are designed to blow at approximately 2 amperes, and are, therefore, especially suitable for mains radio work.

Access to the fuses is quickly obtainable by unscrewing two small screws and removing the cover of the plug. In the accompanying photo two of these ingenious and useful "Goltone" Fuse Plugs are shown. In the one case the cover has been removed in order to reveal the fuses.

The plug is excellently designed and made, and we have no hesitation in recommending it to our readers as a device which they are sure to find of advantage to use.

At one time or another they are bound to want to employ a mains plug. The advantages of the "Goltone" Fuse Plug are such that, at the price of 1s.4d. each, complete with two fuses, they might surely use it instead of the non-protective ordinary kind.

A USEFUL COMPONENT.

ALTHOUGH many readers may not realise the fact, a grid-leak and condenser detector valve operates with a small negative grid bias, even though the grid leak is connected to the positive side of the filament supply.

Although the grid is negative, a certain amount of grid current flows, but this can only be measured in micro-amperes. The detecting action is similar to that which occurs in an anode-bend detector, only it takes place in the grid circuit instead of in the anode circuit.

The grid current varies as with different grid potentials, and therefore for the most efficient detection you must operate on a particular part of the grid-current – grid-volts curve. The operating point can be moved by altering the value of the grid leak.

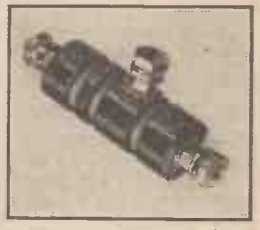
Alternatively, a potentiometer connected across the filament supply, with its centre point joined to the grid, provides a ready means of arriving at the best detector-grid voltage. On short waves particularly the benefit of the adjustment is often considerable.

But for most conditions and in the majority of sets it is not necessary to have such close control. Nevertheless, there are definite advantages in being able to vary the grid's potential in a broad manner.

This can be done to quite a fine enough degree with the aid of a fixed resistance having an unsymmetrically placed tapping. A suitable component of this nature is manufactured by Messrs. British Television Supplies, Ltd., Bush House, London, W.C.2. It is a quite small device, little more than an inch in length, with three small terminals conveniently placed.

The resistance is approximately 300 ohms, so that when it is connected across, say, a 2-volt accumulator there is negligible current consumption. It will be seen that, as the tap is unsymmetrically placed, no less than four adjustments for the grid voltage are possible.

The grid leak can be connected straight to either L.T. negative or positive, or it can be taken to the tap to give the third adjustment. The tap is a third



A TAPPED RESISTANCE

This wire-wound potentiometer enables the grid bias to be varied.

of the way along the winding, so by reversing the two end connections of the component the fourth position is obtained.

There are very few sets embodying a grid-detector valve which would not be improved by the addition of this easily added B.T.S. grid-bias resistance. It is wire wound and there is nothing in it which can go wrong. It retails at the attractively reasonable price of 1s. 6d.

GRAHAM FARISH "POP" TERMINALS.

ONE of the neatest connecting devices we have yet encountered is the Graham Farish "Pop" terminal. In place of the usual nut and washer for connecting leads to it, there is an ingenious spring device. A strong spring is pressed back, the end of the lead pushed through a large hole in the shank of the terminal and, upon releasing the spring, the connection is completed.

The hole is large enough to take several wires, and the spring is sufficiently strong and is so arranged that they are very firmly gripped. Just as reliable a connection results as can be obtained by the normal and, we can add, clumsier methods.

Although the spring is, as we have indicated, a strong one, as it must be if the wire is to be held in place properly, it is extremely easy to manipulate, as considerable leverage can be obtained upon its smooth and rounded end with the fingers.

We haven't seen anything which enables such rapid connections to be made as does this Graham Farish "Pop" terminal.

The other part of the terminal conforms to the standard Graham Farish practice. That is to say, there is a neatly milled nut, which is also supplied with a slot for the application of a screwdriver, that runs down on to a castellated base. It may be remembered that we described this feature recently in "P.W." and showed how much superior it was to the ordinary bevelled, circular base.

These "Pop" terminals are supplied in pairs mounted on a bracket. You can see two of these complete fitments in the photo; they reveal both front and back views.

The bracket is a clean and attractive bakelite moulding, skilfully designed to give the maximum

FOR SECURE CONNECTIONS

The Graham Farish "Pop" provides sound and quickly made connections.

strength for a minimum amount of material. There are projecting pieces between the two terminals to help to keep the leads well separated and to prevent the possibility of accidental shorts between them.

The moulding is also arranged so that the terminals cannot turn and in that way tend to come loose.

The price of the bracket, complete with two of the new "Pop" terminals, is only sixpence, and we must say we consider that to be a very low price for such a well-made and useful article.

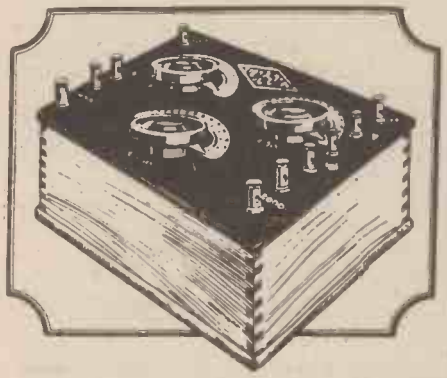
A CAVALCADE OF PIONEERS

(*Continued from page 226.*)

batteries; Westinghouse. All household names in radio.

Take Dubilier, T.C.C. and T.M.C.–Hydra—firms whose names are so indelibly linked with condensers. And not just condensers for radio receivers, but giant equipment for large transmitters and power work generally. Huge condensers that are called upon to withstand thousands of volts without distress.

When you look at the small fixed condenser in your set remember that it is



This unit incorporates three variable condensers and was designed for use with a special inductance unit. It was marketed by Peto-Scott in the days when unit construction was so popular.

the result of years of specialisation by those who have concentrated on this particular item in the chain.

Variable condensers, too! In the early days of broadcasting tuning condensers were big, clumsy pieces of apparatus in which the moving and fixed vanes were separated by an almost incredible space. Yes, these were the best air-dielectric models, and the wide spacing was necessary because the moving vanes were apt to get slightly out of truth and might touch the fixed vanes. Ganged tuning was unknown, and if you wanted a hand-made precision condenser it cost you quite a lot of money.

Effect of Specialised Production.

And now look what specialised production has done. Look at the tuning condensers fitted to your 1935 set. Notice the rigidity of the assembly, the beautifully smooth action, the ball-bearing movement, the die-cast, close-spaced and deadly accurate vanes. Yes, we owe a lot to firms like Jackson Bros. and Polar.

Some years back we endeavoured to achieve high amplification and selectivity by doing everything possible to keep down the losses on the H.F. side. Most sets with H.F. had one stage at the outside. Probably the majority of sets had no H.F. stage at all. There were no screened-grid valves or H.F. pentodes to help us. At first we used three-electrode H.F. amplifiers and applied positive bias to the grid in order to get stability. Later on we utilised critically adjusted neutralised circuits and so achieved stability by wiping out feed-back in the valve itself.

As these changes in circuit design proceeded so the coil specialists carried on with their researches in an endeavour to produce something still better: something that would give the utmost selectivity and amplification in conjunction with the latest circuit developments. Some of these coils were cumbersome, but they worked well—their designers saw to that.

Several names flash through one's mind—Colvern, Wearite, R.I., Varley. Is there a better known name in connection with coil design than Colvern? It was this firm which introduced the iron-cored coil into this country. Colvern "Ferrocart" coils instantly met with success, and there are now thousands of them in use all over the country. Many "P.W." readers will testify to their remarkable efficiency.

Loudspeaker Developments.

We mustn't forget loudspeakers. It seems a far cry to the days of the old horn type. How we used to juggle with weird-shaped horns in the effort to improve the bass! But, alas! a glorified headphone wasn't the sort of thing that was likely to respond to the real low notes.

Later came the cone type with a reed or balanced-armature movement. This was a great advance on previous models and satisfied us for a while. Then in 1925 the moving-coil era commenced. We heard the B.T.H. power amplifier with its coil-driven speaker and immediately clamoured for one like it.

A resistance-capacity coupling unit developed by Varley some years ago. All of the coupling components are contained in the unit.

This year the majority of sets incorporate a moving-coil speaker either of the permanent-magnet or mains-energised type. You can buy a good permanent model for something like 25s., whereas eight or nine years ago the price was prohibitive in so far as the majority of ordinary listeners were concerned.

Intensive research and specialised production have alone made this wonderful progress possible, and for that we have to thank such firms as W.B. and Blue Spot.

All Pioneer Firms.

Unfortunately, my space is all too limited and it is impossible to do full justice to many of these great pioneer firms.

But before closing I should like to pay tribute to the invaluable spade work carried out by such firms as R.I., who produced the first permanent crystal detector and the well-known "Parafeed" transformer; to Westinghouse, makers of the metal rectifier, which has done so much to popularise mains units; to Varley, because of their pioneer work in permeability tuning; to Peto-Scott and Graham Farish and Bulgin, all friends of the home constructor.

Pioneers all—I take off my hat to them!

A. J. R.

Easy Terms

ALL MANUFACTURERS' COMPONENTS and ACCESSORIES in STOCK. SEND US YOUR ENQUIRIES.

AVOMINOR NEW UNIVERSAL MODEL **TEST METER**

TEN TESTING INSTRUMENTS IN ONE!

Measures 0-6, 0-30, 0-120 m.a., 0-6, 0-120, 0-300 volts, 0-10,000, 0-60,000, 0-1,200,000 ohms, and 0-3 megohms. Complete with leads. Send only 2/6; balance in 10 monthly payments of 4/3. Cash or C.O.D. Carr. Pd., £2/0/0.

2/6 DOWN

B.R.G. S.T.600 KIT

KIT "1" Comprising B.R.G. Kit of matched components, including specified Formo 2-gang condenser, with Colvern coils, Peto-Scott ready-drilled walnut-faced panel and terminal strip, with Metaplex baseboard, less valves, cabinet & speaker. Cash or C.O.D. Carr. Paid, £3/19/6.

5/- DOWN

DELIVERY FROM STOCK.

or deposit 5/- and 12 monthly payments of 7/-.

KIT "2." As Kit "1," but including set of specified B.V.A. valves, less cabinet and speaker. Cash or C.O.D. Carriage Paid, £6/4/0, or deposit 7/6 and 12 monthly payments of 10/9.

KIT "3." As Kit "1," but including B.V.A. valves and Peto-Scott table cabinet, less speaker. Cash or C.O.D. Carriage Paid, £7/1/6, or deposit 10/- and 12 monthly payments of 12/3.

ATLAS ELIMINATOR

5/- DOWN

MODEL T10/30. Send only 5/-; balance in 12 monthly payments of 6/-. Cash or C.O.D. Carriage Paid, £3/9/6.

SEND FOR LATEST LISTS

New Times Sales Co.

56, P.W.14, LUDGATE HILL, LONDON, E.C.4.

CLIX for CONTACT

CONSISTENTLY SPECIFIED

By designers of sets described in "Popular Wireless."

LECTRO LINX LTD.,

79a, Rochester Row, London, S.W.1.

ENGINEERS!

ARE YOU EARNING LESS THAN £10 PER WEEK?

If so, you cannot afford to carry on without reading our 256-page Handbook. The book explains clearly and definitely many ways of carving out a successful career. Among other things it explains the Services of our unique Appointments Department, outlines Home-Study Courses in all branches of Civil, Mechanical, Electrical, Motor, Aero, Wireless, Television, "Talkie," Eng., Building, etc., and gives details of A.M.I.A.E., G.P.O., MATRIC., and all Exams. We alone Guarantee—"No Pass—No Fee."

256 PAGES FREE!

Whether you be an old hand or a budding apprentice get this book to-day—FREE AND POST FREE.

British Institute of Engineering Technology, 101, Shakespeare House, 29/31, Oxford Street, London, W.1.

LONG DISTANCE POCKET RADIO

HIVAC have brought the miniature receiver into the sphere of practical radio by the introduction of a

RANGE OF MIDGET VALVES.

The HIVAC XSG Screen Grid Valve—*the only one of its kind* makes possible a useful range of reception, thus removing the snag which has so completely restricted the use of "pocket radio." **15/6**

The XD Detector Valve is suitable for R.C.C. or transformer coupling. **10/6**

The XL L.F. Valve possesses a degree of Sensitivity hitherto unattained in Midget Valves. - - - **10/6**

All types have the low consumption of 06 amps at 2 volts.

Leaflet "P" gives full characteristics.

HIVAC
THE SCIENTIFIC VALVE

THE HIGH VACUUM VALVE Co LTD
113-117, Farringdon Road, London, E.C.1.

There was a young housewife named Pam;
She just craved for a Radio-Gram!
So Sam did his duty—
And built her a beauty—
He used FLUXITE—of course—clever Sam!

See that **FLUXITE** is always by you—in the house—garage—workshop—anywhere where simple speedy soldering is needed. Used for 30 years in government works and by the leading engineers and manufacturers. Of all Ironmongers—in tins, 4d., 8d., 1/4 and 2/8.

Ask to see the **FLUXITE SMALL-SPACE SOLDERING SET**—compact but substantial—complete with full instructions, 7/6.

Ask also for Leaflet on **CASE-HARDENING STEEL** and **TEMPERING TOOLS** with **FLUXITE.**

THE FLUXITE GUN

is always ready to put Fluxite on the soldering job instantly. A little pressure places the right quantity on the right spot and one charging lasts for ages.

The Gun also serves for grease as an oil can does for oil. Price 1/6.

ALL MECHANICS *WILL* HAVE

FLUXITE

IT SIMPLIFIES *ALL* SOLDERING

Write for Free Book on the art of "soft" soldering—Dept. 324.

FLUXITE, LTD., DRAGON WORKS, BERMONDSEY, S.E.1.

THOSE NEWS BULLETINS

(*Continued from page* 232.)

There's no suggestion of deep lore about Philemon's book talks. And they are none the worse for that. Philemon sounds a vigorous man, of the open air rather than the cloister or the study. There is vigour in his criticisms, and none of the tulip or lily suggestiveness of some of our (melancholy) literary men. Philemon is very understandable—and helpful.

A Very Good Comedy.

The Youth v. Age controversy is no new theme in drama. We've had it now for some long time, but in all cases hitherto the dramatist has been on the side of youth.

Somerset Maugham, in his comedy "The Bread-winner," takes up the cause of a father in his revolt against his family, and thereby presents a familiar problem from a different angle. The result is refreshing, and in broadcast achieves a remarkable success.

* * *

But not only for that was the broadcast a success. The language throughout is brilliant and the comedy sparkling. All the problems raised are precisely those we ourselves, or our friends, have been up against. There's nothing fantastic in "The Bread-winner." That is why the play makes an instant appeal and sustains the interest for the full ninety minutes. It is all so real and characteristic of the age. So much for the play itself.

As regards the broadcasting of it there were many excellent features. Firstly, there was the small cast of super players. The preliminary notices had stressed the fact that the play brought Ronald Squire before the mike for the first time. Of course this is a notable event, but such a notice tends to laud the one individual at the expense of the rest of the cast.

As was anticipated, Ronald Squire gave a magnificent performance. So did Norman Shelley, who played Alfred Granger. Ditto Mary O'Farrell (Margery) and Joyce Barbour (Dorothy), the two wives. And if we applaud all these we must also applaud the four children. Every player played his or her part to perfection, and in this case, at any rate, it is invidious to single out any one of them for special praise.

* * *

I have never enjoyed a radio play more. Val Gielgud, who produced, deserves his meed of praise as well. He dispensed almost entirely with effects and allowed no break in the continuity of the story. The speed was just right. This broadcast proved at least one thing, viz. that listeners can listen to a ninety-minute play with ease and enjoyment provided the play is a play and not some triviality masquerading as such.

Knowledge About Churches.

The Village Church series of talks were nothing if they weren't opportune. We are beginning to think of the summer holiday, and the summer holiday is the time when people do poke their noses inside a church other than their own. It is the proper thing, when on holiday, to penetrate the hinterland a bit, and village churches are always open to the invader.

We do like to inspect the mural paintings, effigies, brass and particularly the glass, and to hold forth on the same with the authority of an expert. Mr. Greening Lamborn has at least made us more knowledgeable beings, and we ought to be able now to know what to look for this summer.

C. B.

"ANSWERS" MAGNIFICENT JUBILEE DOUBLE NUMBER

THIS week's "ANSWERS," on sale Friday, commemorates the Silver Jubilee of our beloved King and Queen by a greatly enlarged, special number. For the usual price of two pence, this wonderful issue gives you, in articles and photographs, the whole story of King George's reign.

There are sixty-four pages, and an eight-page photogravure pictorial supplement which tells in pictures the story of 25 wonderful years, from 1910 until to-day. Among the contributors are Sir John Hammerton, the Rev. Canon H. R. L. Sheppard, Major Mitford Brice, Margery Allingham and other popular writers.

Don't miss this fine Jubilee number—go and reserve a copy at your newsagent at once.

MODERNISING THE "MAGIC"

(*Continued from page* 230.)

standard achieved in modern manufacture. Then there is the variable condenser. It is worth considering the purchase of two modern ones, so that their dials will match and a greater certainty be obtained of getting similar readings.

The holder of the 25,000-ohm resistance can be retained if a 10,000-ohm resistance which will go into it is purchased; otherwise a new holder for it will be needed, though the cost of this will be but a matter of a few pence.

You will notice that the list of extra parts specifies "1 terminal strip and terminals." The original "Magic" had a long strip running the full length of the baseboard, on which there were ten terminals. The new version requires only three terminals centrally placed on the small strip. Clearly, the old strip and three of the original terminals could be made to serve if re-arranged accordingly.

The Aerial Terminals.

Two of the old terminals could also be employed for the aerial terminals on the front of the panel, though, if carrying unsuitable markings, the result might not be considered too happy by some. In any case the cost of new terminals would not amount to much.

The battery connections to the new "Magic" are via flexible leads and wander-plugs, a modern innovation which is very popular for more than one reason.

The same panel and baseboard can be used. Indeed, all the holes in the original panel are employed, and to prepare the new panel the mere drilling of a few extra holes is all that has to be done. The original holes do not all carry their original components, however, but all it amounts to is that the functions of a switch and a reaction-condenser hole are changed over.

It will be necessary to strip all the components off both the panel and baseboard. The panel can then be drilled for its additional holes and the baseboard covered with copper foil, which can be held down with a few brads. Alternatively, a new "Metaplex" baseboard could be used if desired.

It will be found that there is very ample room on the baseboard for the new team of parts. With the aid of the new wiring diagram no difficulties of any kind should be encountered in placing them.

But more of this remarkable set will be said next week when the operation will be discussed.

Your EXTENSION SPEAKER must be a ROLA

THERE'S A REASON!

Write for Chart just published showing Correct Extension Speaker for all British Receivers

THE BRITISH ROLA CO., LTD.
MINERVA RD., PARK ROYAL, N.W.10.
'Phone: Willesden 4322-3-4-5-6

ULTRA-SHORT-WAVE RECEPTION

Jottings of interest to all readers.

By Dr. J. H. T. ROBERTS, F.Inst.P.

IN view of the increasing interest in short-wave reception, and particularly the fact that ultra-short waves are to be used for the new high-definition television by the B.B.C., several people have asked me lately whether there will be any difficulty in receiving these extremely short waves and whether a special type of aerial will be necessary.

It is not very easy to give a precise answer to the question about the size of the aerial. In point of fact, many people find that they can receive ultra-short waves down to, say, 6 to 7 metres quite well on an ordinary outside aerial which may be perhaps 30 or 40 feet long. On the other hand, an aerial consisting of a few feet of wire of suitable capacity will often prove quite efficient for the reception of such very high frequencies.

If you are using an ordinary aerial, naturally you will have to put a small condenser in series with it, so as to tune the aerial, and for this purpose it is much more convenient to have the condenser variable. As to the capacity of this condenser a maximum capacity of about 0·0005 mfd. will generally be found useful, and you can easily mark it for particular wavelengths.

Receiving "Broadcasting" as Well.

Arrangements should also be made so that this series condenser can be thrown in and out of circuit, or rather, I should say, so that the aerial can be connected direct to the ordinary broadcast wavelength receiver, or switched over to the short-wave receiver, the latter including the variable condenser in series with the aerial terminal. In this way you can readily change over from broadcast to short-wave reception.

Notwithstanding all this, I think that most people will prefer, when the time comes, to use a special short-wave aerial rather than to rely upon the one aerial serving both purposes. This is all the more likely to be the case since the ultra-short-wave aerial is such a very simple affair and can be so very easily rigged up indoors.

What is a Time-Base?

Several readers have asked me lately what the "time-base" is for in a television receiver. It relates to the scanning of the receiving screen in a cathode-ray tube. As you probably know, the beam of electrons passes through a fine hole and then shoots on to the screen, but, on the way there, it passes between two pairs of metal plates, one pair being set at right angles, so to speak, to the other pair. It is by means of the potentials applied to these two pairs of plates that the stream is deflected in such a way as to make it traverse the screen.

One pair of plates makes the spot of light, where the beam hits the screen, travel up and down (or from left to right, according to which way the screen is being scanned) whilst the potential on the other pair of plates causes the spot to progress gradually across the screen, the result of both of these motions being that the spot of light scans the screen very much in the same way that your eye scans a column of type, that is, going along in lines and progressively moving on. The "time-base" is the arrangement by which the potentials on these plates are controlled.

Reliable Small Fuses.

Those of you who require fuses for mains sets or battery sets or, in fact, small fuses for any other purpose, will find those made by Microfuses Limited very useful. This firm has specialised in the manufacture of small fuses accurately rated for all purposes. I may say in passing that the making of small fuses is not such a simple matter as it looks, if they are to bear any sort of respectable rating and to be relied upon to "blow" at the specified current.

The firm mentioned keep twenty different ratings always in stock. They make, for instance, a fuse (type F.2) which blows at 1 amp. and has a resistance of 1¼ ohms. Fuses can be obtained to blow at currents as low as 1 or 2 milliamps. For battery sets there is a fuse rated to carry 150 milliamps and blowing at 300 milliamps, having a resistance of just over 7 ohms. All the above are tested to break a voltage of up to 250 volts D.C. when the specified current is exceeded. They can be obtained from the firm mentioned at 4, Charterhouse Buildings, E.C.1.

Grid Emission.

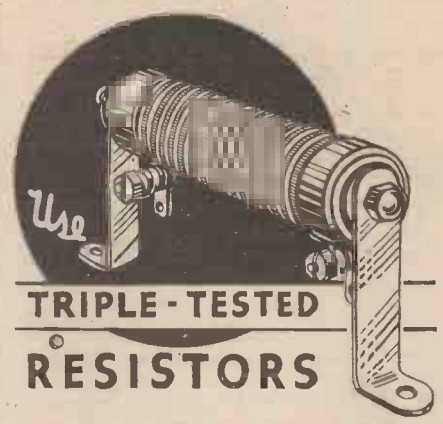
A fault which occasionally occurs in a set, although fortunately not very often, is due to the overheating of the valve, or rather, I should say, to the heating of the grid. It may be that the valve is a defective one in the sense that the electrodes are not properly spaced, or it may be that the receiver assembly is so compact that the valves get overheated owing to absence of ventilation. In the ordinary way the grid should not get so heated from the filament as to act as an electron emitter. But if from the causes mentioned above the grid *does* become overheated, naturally it begins to act just like the cathode, and you will get awful distortion.

This comparatively rare fault can usually be diagnosed by the fact that it comes on *gradually* after the set has been put in operation. You can see why it takes a little time to come on and gradually gets worse, since it depends upon the gradual heating-up of the grid. If you experience anything of this kind with your set you may suspect the valves and, if you have spare valves with which to replace them, you might try replacing each one in turn until you find the culprit.

Electric Soldering.

Many radio experimenters and constructors have to do some soldering in the course of their work, and from my observations I think a large number of people still use the ordinary small iron which they heat

(*Continued on next page.*)



For an absolutely unequalled range of resistors go to Bulgin. They have an enormous stock of resistors to suit every purpose. Triple testing ensures perfect accuracy and unbeatable performance. The non-ferrous nickel-chrome wire is spiralled on a heat-resisting core and retains itself on the grooved porcelain former. The tapping bands can be adjusted for non-standard values without disturbing the windings.

Send for 80-page Catalogue and Manual, enclosing 2d. in stamps, to A. F. BULGIN & CO., LTD., Abbey Road, Barking, Essex.

	Each
50 to 25,000 ohms	2/6
30,000 to 50,000 ohms	3/-
60,000 to 75,000 ohms	3/6
80,000 ohms	4/-
100,000 ohms	4/6

be sure it's

BULGIN

because it pays to buy QUALITY

BARGAINS

McMICHAEL 5-VALVE BATTERY "LODEX"

7/6 DOWN and 17 monthly payments of 10/9.

16 GNS LIST PRICE 8 GNS OUR PRICE

● 2 H.F. Stages, Detector, Driver and Class B Output. ● Moving Coil Speaker. ● Exceptional degree of selectivity. ● Long range. ● FINE VOLUME. ● Complete with all valves, H.T. battery and accumulator. ● Ready to play.

"SUPERVOX" D.C. 4-VALVE

LIST PRICE 16 GNS OUR YOURS FOR 7/6 and 17 monthly payments of 10/9

OUR PRICE 8 GNS Twin Matched M.C. Speakers, 2 S.G. High Frequency Valves, detector, corrected Pentode Output. Walnut Cabinet. D.C. Mains, 200-250-v. A.C. MODEL. 100-115 or 200-250-v. 40-100 cycles. **List Price 18 Gns. Our Price 12 Gns. Or 15/- Deposit and 17 monthly payments of 16/-.** State voltage and cycles required.

G.E.C. OSRAM

MUSIC MAGNET A.C.4

with PEDESTAL CABINET & MOVING-COIL SPEAKER

LIST PRICE £15 : 15 : 0

OUR PRICE £7 : 15 : 0

OR YOURS FOR 10/-

Ready to play. 2 H.F. detector and super power output valves; mains unit; cabinet; G.E.C. moving-coil speaker. Tested on home and foreign stations. BRAND NEW in MAKER'S CARTON.

and 16 monthly payments of 10/6.

NEW TIMES SALES CO. 56, P.W.13, LUDGATE HILL, LONDON, E.C.4

EASY TERMS

Everything Radio supplied on the lowest terms. Send list of requirements for quotation by return of post. Prompt delivery.

SEND 2/6 W.B. STENTORIAN

Revitalise your Set with the

SENIOR P.M.S.1. SPEAKER. Cash Price £2 2 0, or 2/6 with order and 11 monthly payments of 4/-.

STANDARD P.M. SPEAKER. Cash Price £1 12 6, or 2/6 with order and 11 monthly payments of 3/-.

SEND 5/- ATLAS H.T. ELIMINATOR

Model T.10/30, with trickle charger. For all types of receivers. Output 30 Milliamps. 3 H.T. tappings. Cash Price £3 9 6, or 5/- with order and 12 monthly payments of 5/11½ for A.C. mains.

Every type of valve replacement supplied on convenient terms.

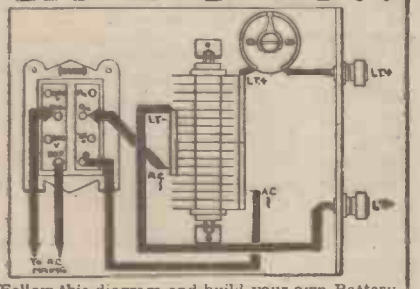
ALL CARRIAGE PAID

Estd. 1925 THE 'PHONE: NATIONAL 1977

LONDON RADIO SUPPLY COMPANY

11 OAT LANE-NOBLE STREET-LONDON.E.C.2

BATTERY CHARGERS!!



Follow this diagram and build your own Battery Charger from a Heayberd Kit of Parts in FIFTEEN MINUTES.

PRICES FROM 30/6

Send this advt., together with 3d. in stamps, for latest Radio Handbook, "Mains Power for your Radio." P.W.

F. C. HEAYBERD & Co. 10, FINSBURY ST., LONDON, E.C.2.

Please be sure to mention "POPULAR WIRELESS" when communicating with Advertisers. Thanks!

ULTRA-SHORT-WAVE RECEPTION

(Continued from previous page.)

on the gas-ring or in the fire. If you have never used an electric soldering iron you do not realise what a great convenience it is. For one thing, it is always available just when you want it, and you do not have to leave your work in order to go and put it back on the gas and fetch it again, whilst, for another thing, when you pick it up it is always clean and ready for the job. There is nothing more annoying than to feel hurried and worried all the time you are at work because the iron is burning in the fire.

At any rate, if you want to know peace and happiness in soldering, give up using an ordinary fire-heated iron and get yourself an electric one, and you will certainly never go back to the other.

High-Frequency Amplification.

The range of a receiving set, or what is sometimes called its sensitivity, depends, to a large extent, upon the amount of high-frequency amplification which is used. This is fairly obvious, because, before the signal is delivered to the detector for rectification, it will have passed through any high-frequency amplifying stages which are present, and so a set with a large amount of H.F. amplification will be able to "deliver the goods" to the detector at the necessary strength, even though the incoming signal may be extremely small.

In other words, it will be able to pick up stations which are very weak, or signals from a powerful station which is so far distant that the signals are weak by the time they reach the aerial.

In order that the amplification shall be efficient it is very important to have properly designed couplings between stages and properly adjusted tuned circuits.

Number of Tuned Circuits.

As you no doubt know, the greater the number of tuned circuits in a receiving set the greater the selectivity. You can understand this if you think of it on a kind of "probability" basis.

The chance of the first tuned circuit being receptive to frequencies outside the resonance frequency is comparatively small, but the chance of *both* the first *and* the second tuned circuit responding to a non-resonant frequency is very much less. Anyway, without going into details the fact is that a number of tuned circuits give you much greater selectivity than only one.

An advantage of high-frequency amplification, quite apart from the sharpness of tuning—that is, the selectivity—is that *reaction* can be dispensed with if there is sufficient amplification without it. Reaction has many good points, but there is always a great danger, when using reaction to any serious extent, of introducing bad distortion.

TELEVISION TO-DAY.

Readers interested in television should note that under this title a comprehensive volume to be completed in about 16 weekly shilling parts is being published by George Newnes Ltd.

ELECTRADIX BARGAINS

THE FAMOUS EILSEL Public Address and Band Mike (Reisz principle), 55/-. Highest quality uniform response. Can be obtained from us only. Worth £5, but Our Price, 55/-. Stand 10/- extra. Screened imped. matched transformer, 7/6. **55/-** *Stand extra*

Transmitters, Hand Model, 50/-.

We make 25 types of Microphones to suit all. Prices from 5/6. Special Instructive Leaflet "P" free.

Switches and Plug Sockets on Ebonite Panel. Mahogany Case

If you have Resistances to measure you will find this Standard **RESISTANCE BOX** of great use. These are second-hand, in good condition. Tested and guaranteed to G.P.O. Standard. Offer only holds good whilst stock is available. We still have a few left. 1,000 ohms, £2; 4,300, £2 10s.; 8,000, £3; 12,400, £3 15s.

This Battery Superseder provides H.T. from your L.T. 2-volt battery, rectified and smoothed. 3 tappings. A boon to those who are not on the mains. Reduced **1 p o m** £3 15s. New and Guaranteed, 37/6.

Special Bargain. Electric Pumps for your garden pool or fountain. Direct coupled A.C. or D.C., 100 to 150 gals. per hour, 56/6 only

SWITCHGEAR AND BOARDS, RHEOSTATS, REGULATORS, METERS, RELAYS, CUT-OUTS, &c.

STEELCLAD CHARGERS. We have 25 models of Standard and special types for Service Charging at prices from £3. Multiple Charging on 3 to 6 lines with meters, Indicating Switches and Regulators. Please state supply and total cells on charge. A Lesdix Charger will repay you well.

Ask for Charger Leaflet "P."

ELECTRADIX RADIOS

218, Upper Thames St., London, E.C.4

Telephone: Central 4611.

"A RELIABLE PRODUCT"

"*Popular Wireless*" says that you can rely upon the Amplion reputation—that implies that in choosing a Fuse or Resistance you are safe in selecting "Amplion."

Did you read the "test" report on page 200 of April 27th issue?

Amplion Fuses, 60 m/a to 3 amp. only cost 6d. each.

Amplion 1-watt Resistances, 50 ohms to 5 megohms, only cost 1/- each.

AMPLION (1932) LTD., 82-84, ROSOMAN ST., LONDON, E.C.1.

All applications for Advertising Space in POPULAR WIRELESS should be addressed to the Advertising Department, John Carpenter House, John Carpenter Street, London, E.C.4.

Masterpiece Library of Short Stories 8

Printed in Great Britain and published every Wednesday by the Proprietors, THE AMALGAMATED PRESS, LTD., The Fleetway House, Farringdon Street, London, E.C.4. Advertisement Offices: John Carpenter House, John Carpenter Street, London, E.C.4. Registered for transmission by Canadian Magazine Post. Subscription Rates: Inland and Canada, 17/4 per annum. Abroad (except Canada), 19/6 per annum. Sole Agents for Australia and New Zealand: Messrs. Gordon & Gotch, Ltd.; and for South Africa: Central News Agency, Ltd. Saturday, May 4th, 1935. S.S.

MISCELLANEOUS ADVERTISEMENTS

3d. per Word

6d. per word for first words in heavy type
6/- per line for displayed lines (12 pt. type.)

Minimum Charge 3/-

Remittance must accompany order.

Advertisements for these columns are accepted up to first post WEDNESDAY MORNING for following week's issue.

Radio components and accessories advertised in these columns at below list price do not carry manufacturers' guarantee.

The Proprietors have the right to refuse or withdraw advertisements at their discretion.

Postal orders in payment for advertisements should be made payable to the Amalgamated Press, Ltd., and crossed.

All communications should be addressed to:—Advertisement Department, "Popular Wireless," John Carpenter House, John Carpenter Street, London, E.C.4.

PEARL & PEARL.
190, Bishopsgate, London, E.C.2. All the following Bargains, guaranteed new goods. Cash or C.O.D. Carriage Paid in British Isles.
TELSEN Receivers (1935 Models). Guaranteed new, in original cartons. 6-valve Super-het, A.C. model. List 14 gns. Our price 9 gns. Battery model with batteries complete. List 14 gns. Our price 9 gns.
BURGOYNE Receivers. 3-Valve Class B model. Complete with Mullard valves; Exide H.T. and L.T. batteries. M/c speaker. Artistic cabinet of highly polished walnut. Chromium fittings. Brand new in original cartons: 1935 model. List £6/10/-. Our price £3/18/6. Carr. Paid.
CROMWELL Cabinets (for set and speaker combined). Horizontal type 23in. wide, 8in. deep, 11½ in. high. Polished walnut veneer, additional baffle behind speaker grille. Only 4/11 each. Carriage fwd.
SPECIAL. Telsen Radiomag (Latest Edition) 64 pages. 4 Full-size Blue Prints for the "Economy Three," "Short-Wave Three," "Super Four" Battery receivers, and a "Quality 3-valve Amplifier." Full constructional details, many other articles of interest, sent Post Paid for 6d.
TELSEN Chokes, Coils, Condensers, etc., all at Special Reduced Prices. List "P.T." on request.
HUNDREDS of Bargains in Free List "N."
All Mail Orders Direct to
PEARL & PEARL,
190, Bishopsgate, London, E.C.2.
Telephone: Bishopsgate 1212.

WOBURN RADIO Offer following New Stock.
ALL KITS as last week.
BURGOYNE Class B three, new and in maker's sealed cartons, including Mullard valves, Drydex and Exide batteries, Magnavox 7-in. P.M. Speaker, 69/6, carriage extra. Telsen Model 474 A.C. Band-pass Three in sealed cartons arrive next week, price will be announced next issue.
WESTINGHOUSE rectifiers H.T.8 and 9, 8/9d. Transformers for H.T.8, fully shrouded, made by Standard telephones, with 4v. 4a. C.T. at 8/6d. Chokes: 30h. 30 m.a., 3/6d.; 150h. 60 m.a., 9/-. Dubilier Electrolytics, dry, 8 mfd. 500v., 2/10d.; T.C.C. electrolytics 25 mfd. 25v., 50 mfd. 12v., 15 mfd. 100v., 1/3d.; 6 mfd. 50v., 6d.; 2 mfd. 200v. working, 1/6d. Tubulars: ·1, ·01, ·02, 6d.; ·25 mfd., 9d. Dubilier and Erie resistances, 6d. each.
BRITISH RADIOPHONE semi-curved dials, with twin dial lights, and bronze escutcheon, 3/9d. Slow-motion condensers with slow-motion dial, ·0005, ·0003, 2/11d. Short-wave slow condensers, ·0001, ·00015, ·00016, ·0002, ·00025 with dial, 3/-, without, 2/-. Bakelite reaction condensers, ·0001, ·0003, ·0005. Differentials, all sizes, 1/2d. Popular Iron cored canned coils, 2/6d. Popular Air-cored coils, canned, 1/10d.; without can, 1/6d.
WESTERN ELECTRIC Microphones, 2/3d. Mike transformers ratio 100:1, 2/3d. Electric Soldering Irons, complete with flex adaptor and rest, 1/11d., plus 6d. postage—fresh stock of these irons arriving April 28th, place order now.
TRADE LIST NOW READY. Enclose Trade Heading and stamp.
WOBURN RADIO CO., 9, Sandland Street, W.C.1. Holborn 7289. First turning on right up Red Lion Street, from Holborn.
HIVAC valves now stocked.

SOUTHERN RADIO'S WIRELESS BARGAINS.
CALLERS at our various shops are assured of an immense saving in their radio purchases.
THOUSANDS OF BARGAINS in Receivers, Valves, Mains Equipment and all classes of Components.
BRANCHES at 46, Lisle Street, W.C.2; 271/275, High Road, Willesden Green, N.W.10.
All Mail Orders to 323, Euston Road, N.W.1.
SOUTHERN RADIO, 323, Euston Road, London, N.W.1 (near Warren Street Tube). 'Phone: Museum 5324.

"SWIFT SERVICE" RADIO

GENUINE JUBILEE OFFER

WE will send Quotation for anything you require. Just state your requirements, whether Complete Set, Kit of Parts, Components, Loudspeakers, etc., and how much you wish to spend.
WE will endeavour to accommodate you from our Extensive Stocks, and save you at least 50 per cent.
NO REASONABLE OFFER REFUSED.
WE GUARANTEE TO SUPPLY ONLY GENUINE LINES.
BURGOYNE Class B 3-valve battery sets (complete with Mullard valves, batteries, accumulator, Magnavox M/C Loudspeaker), ready for use (£6 10 0). **Our Price, £3 15 0:** carriage paid.
LUCERNE RANGER, S.G. 3, Kit "A," 27/6; or with set of Hivac valves, 47/3.
SHORT-WAVE ADAPTOR KIT (Battery Model), 17/-.
DISC TELEVISION KIT (for mains or batteries), complete with Flat Plate Neon Lamp, 52/6.
All "Swift" Kits are complete, including blue print for assembly.
REAL BARGAIN PARCELS (containing Coils, Transformers and various Components). 5/- and 10/-.
WORTH TREBLE THE PRICE.
·00025 Miniature type Condensers (suitable for short-wave work) (10/6), 3/6.
THE SWIFT SERVICE & SUPPLY CO. (P.105), 3, Featherstone Buildings, High Holborn, London, W.C.1. 'Phone: Holborn 1336.

UTILITY SALES. The "Færitone" Short-Wave two with 3 sets of coil ready made, 55/-; separate component lists of prices with diagram, 6d.
10,000 New Dario valves to clear. Detector, H.F., L.F., 2/6; Power, 3/6; S.G., Pen., 5/6; Triotron, all types, 3/-; Power, 4/-; S.G. Pen., 6/6.
DARIO 4-volt Valves. Super, H.F., Detector, R.G., L.F., 1/3.
CELESTION 45/- list 7" Permanent Magnet universal transformer, 17/6. Ditto, Lotus, 14/6.
Cash with order, 24 hours' service carriage paid.
FÆRITONE RADIO, Færitone Corner, 57, Praed Street, London. Paddington 0251.

SPEAKER repairs, new cones, coils and centres fitted, 5/-. Complete re-winding service mains transformers, etc. Work guaranteed.—Write Dept. X, Weedon P.L.R. Co., 80, Lonsdale Avenue, London, E.6. (Maryland 1782.)

BIRMINGHAM RADIOMART

SPECIALISTS IN SHORT-WAVE AND QUALITY COMPONENTS AT LOWEST PRICES.
Our stock is much too large to itemise here: From a soldering tag to a superhet, we can supply everything, and, what is more, you won't be "Caught"! Send 1½d. stamp for our latest **CATALOGUE.** No firm has larger stocks or is cheaper than

THE SQUARE DEALERS,

BIRMINGHAM RADIOMART,
19, John Bright Street, Birmingham.

VAUXHALL. Magnavox permanent-magnet speakers, universal for Class B power, pentode or push-pull 7-in. cone, 16/6; 10-in. cone, 22/-.
VAUXHALL. Magnavox energised types, 2,500 or 6,500, 10-in. cone, 22/-; 7-in. cone, 15/3. All brand new, complete with hum-bucking coils, state power or pentode. Other speakers. Send for particulars.
VAUXHALL. New Lists just issued, 3,000 bargains. New goods. Limited number available free.
VAUXHALL. Immediate delivery of all goods advertised in previous issues.
VAUXHALL-UTILITIES, 163a, Strand, London, W.C.2. Over Dennys the Booksellers, Temple Bar 9338.

SPOT CASH for Components, Sets, etc.—Economic Radio, 96/98, South Lambeth Road, S.W.8.

THE JUBILEE "RADIO GOLD-MINE"

Thousands are now buying and building their radio receivers in time for the Jubilee programmes now almost upon us. Whether you require a kit at the lowest price obtainable or simply technical advice or an odd valve, component or battery to bring your set up to scratch, with the least possible delay, it makes no difference, in every case you will find just what you want and what you didn't know you wanted amongst the galaxy of amazing values and unprecedented bargains which comprise the thirty illustrated and packed pages of the
JUBILEE RADIO GOLD-MINE.
Last week a synopsis of the contents appeared. If you have this issue handy look it over. If you haven't don't bother. Just send to-day for THE RADIO GOLD-MINE ITSELF enclosing 3d. stamps to cover part cost and postage, and by return you will receive the latest and greatest edition of this amazing catalogue, completely up to date, and containing thousands of new bargains, also particulars of an unprecedented offer, whereby we are giving away **1,000 SPEAKERS ABSOLUTELY FREE,** and also full details of our new special easy **HIRE PURCHASE TERMS** available on all goods, whether bargain surplus offers or otherwise. If you have not yet received your copy of the **JUBILEE RADIO GOLD-MINE,** send to-day, enclosing 3d. stamps to cover part cost and postage. 3d. THAT WILL SAVE YOU POUNDS.
London East Central Trading Co. (Dept. P.J. 102), 23, Bartholomew Close, London, E.C.1.

WE can supply complete Kits of specified components for the A.C. S.T.600 at a competitive price.
ALL other goods advertised in last week's issue still available.
WARD, 46, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

EXCHANGE all-electric H.M.V. Radiogram A.C. mains for S.T.600. Complete parts or set.—98, Streatham Road, Mitcham, Surrey.

LOUD SPEAKERS REPAIRED, 4/-. Blue Spot a Speciality. Transformers and Headphones, 4/-. Eliminators. Mains Transformers and Moving Coils quoted for. 24-Hour Service. Trade Discount. Clerkenwell 9069.—E. Mason, 44, East Road, London, N.1.

PREMIER SUPPLY STORES (Dept. P.A.), 20-22, High Street, Clapham, S.W.4.
ALL BARGAINS previously advised still available. Send for illustrated list.

CLARION VALVES.—All brand new; battery types, 2-volt, H.F.2, L.F.2, L.P.2, 1/9; Super-power, P.P.2, 2/6; screens and pentodes, 3/9; A.C. Mains, 4-volt 1-amp., general purpose, 3/3; power, 4/-; screens and pentodes, 4/6; full-wave rectifier, 3/6; postage paid, cash with order, or C.O.D. over 10/-.—Clarion Valves, Dept. 5, 885, Tyburn Road, Erdington, Birmingham.

RADIO CRYSTALS. The famous "NEUTRON" Crystals, 1/- per tin; the oldest and best. Obtainable from: V. Zeitlin & Sons, Ltd., 144, Theobald's Road, London, W.C.1; Expert Radio Service, 266, High Street, Stratford, E.15; Real Radio Service, 61, Cannon Street, E.C.4; Maxim Stores, Ltd., 7a, Tothill Street, Victoria, S.W.1; etc., etc.

OUR JUBILEE 3 can be built for 25/-. Wiring diagram and component list, 3/-. Sets repaired, modernised.—Radio Service Bureau, 9a, Shepherd's Bush Road, Hammersmith, London.

---

500 LARGE FLOWERING GLADIOLI, in 10 best named varieties, and 25 Begonias, for only 8/-. Carriage and duty paid to destination (C.O.D. 6d. extra.)—The First Hillegom Bulb Nurseries, Hillegom, Holland.

ORDER FORM

**The Advertisement Manager, "Popular Wireless,"
John Carpenter House, John Carpenter Street,
London, E.C.4.**

Please insert our/my advertisement in "Popular Wireless" for..... insertions at a charge of £ s. d. per insertion. Remittance herewith.

Signed.....

Address.....

Date.....

A New Masterpiece — in Price & Performance

Will it operate on A.C. and D.C. mains?	**Certainly. It is a Universal set suitable for mains of 200 to 250 volts**
How many valves?	**Four, including rectifier**
Does it get many foreign stations?	**It is an 'All-Europe' receiver, charted by station-name to give 38 stations. Many others should be received**
Is it easy to tune?	**Simplicity itself—just one-knob station-by-name tuning**
The cabinet is very handsome!	**Yes! It is magnificently moulded, and there are two finishes, figured walnut or black and chromium**
Has it a moving-coil speaker?	**Yes, with a natural tone and very generous output**
Can one purchase on easy terms?	**Certainly. Initial payment of 14/6d and 12 monthly payments of the same amount—or approximately 3/6d per week**

AND THE PRICE? **8 GNS.**

MODEL AD36. Walnut finish 8 gns.
Black and Chromium, as illustrated, 10/6 extra.

Ask your Radio or Motor Dealer for particulars of Ekco Car Radio.

EKCO Radio

TO E. K. COLE LTD., DEPT. A.16, EKCO WORKS, SOUTHEND-ON-SEA. Please send me free illustrated literature.

NAME.....

ADDRESS.....

POPULAR WIRELESS, May 11th, 1935. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

SPECIAL ARTICLE BY JOHN SCOTT-TAGGART

Popular Wireless AND TELEVISION TIMES

A FRIENDLY WARNING TO THE B.B.C.

★ REDUCING THE NUMBER OF VALVES ★

BARRY KENT CALLING

EVERY WEDNESDAY PRICE 3D

No. 675.
Vol. XXVII.
May 11th, 1935.

IN THE TELEVISION CONTROL ROOM

Low-definition television programmes are regularly transmitted by the B.B.C. This photograph shows the television control room, the well-known B.B.C. "eye" design, which is used for preliminary viewer adjustments, being seen on the caption drum in the foreground. The engineer on the extreme right is manipulating the projector which carries the arc light and scanning device, while the other two engineers are looking after the sound and vision controls.

COSSOR
UNIVERSAL RECEIVER
for D.C. or A.C. Mains

There is now no longer reason to tolerate out-of-date radio just because your supply may be changed or you may be moving. This new Cossor Universal Receiver gives outstanding performance off either D.C. or A.C. Incorporating the famous 'Super-Ferrodyne' developments—and every worth while radio feature—you are assured *NOW* of even greater selectivity—even wider range, whatever your supply. Ask your Dealer for a demonstration—or send coupon.

●

A BRIEF SPECIFICATION: With 4 Cossor Valves, Var.-mu H.F. Screened Pent., H.F. Pent. Det., Super-Power Output and Rect. Super-Selective Iron-cored coils. Single knob dual-pointer tuning, full-vision scale in wavelengths, illuminated according to waveband in use. Combined "on-off," wavelength change and pick-up switch. Selectivity and volume control. 8 in. Permanent Magnet M.C. Speaker. Provision for pick-up and for extension Speaker. For D.C. 200/250 volts (adjustable) and A.C. 200/250 volts (adjustable), 50 to 100 cycles.

Prices do not apply in I.F.S.

£8.18.6

Hire Purchase Terms: 20/- deposit and 11 monthly payments of 16.6.

VARIABLE-MU H.F. PENTODE IN H.F. STAGE
●
H.F. PENTODE DETECTOR
●
SUPER-SELECTIVE IRON-CORED COILS
●
SUPER POWER OUTPUT
●
SINGLE KNOB TUNING
●
FULL VISION SCALE ILLUMINATED ACCORDING TO WAVE BAND IN USE

Super-Ferrodyne
MODEL
369

THIS COUPON BRINGS FULL DETAILS

Please send me free of charge, literature giving full particulars of the new Cossor Universal Receiver Model 369.

L.137

To A. C. COSSOR, LTD., Melody Dept., Highbury Grove, London, N.5.

Name .....

Address .....

P.W. 11/5/35

6883

POPULAR WIRELESS AND TELEVISION TIMES

MANAGING EDITOR: N. F. EDWARDS. TECHNICAL EDITOR: G. V. DOWDING ASSOC. I.E.E

THE TOWER
RADIO ECHOES
MERELY RELAYED
SIXTY-SIX STATIONS

RADIO NOTES & NEWS

NOW THEN, LADIES!
IN ROUMANIA
DROITWICH FACTS
WARM WORK

An Old-Timer.

THE "downfall" of Eiffel Tower, from long waves to 206 metres and from comparatively high power to a mere 5 kilowatts, has brought me many kindly references to the old fellow. Several correspondents remind me of the station's war services, which were numerous and varied, and of its constant help to seafarers in giving time-signal services, gale warnings and so forth.

It seems a shame that such a gallant old-timer should fizzle out as a low-powered broadcaster, so I hope there is truth in the rumours that quite a different fate awaits the Tower station. They say that it is to be developed as an experimental transmitter for ultra-shorts, television and other new ideas—a fitting finish to a great career.

Bow Bells Mystery.

"AFTER the Bow Bells had finished," writes S. K., of Wandsworth, "I heard the last part of the peal all over again, but a long way off. Is this a delay echo?"

Without being dogmatic I can say "No" to this. It might have been a wonky gramophone reproduction or it might have been a purely acoustic effect from a distant chime, but it certainly was not one of those echoes of long delay which have given the scientists so many sleepless nights.

Such echoes are always confined to short waves, and they are mostly faint and hardly recognisable echoes of Morse characters. The scientists who have been waiting for these echoes have not caught one definitely for nearly twelve months, and they do not expect any more till 1939 or thereabouts—a long time to you and me, but nothing at all to these research fiends.

Trap for the Unwary.

BOASTING of how he has been able to pick up VK2ME, Australia, on a Kelsey adaptor, a Manchester reader rather spoils the effect of this capture by his claim to have got Japan. He sends me some snatches from the log-book of what he has received, and although the origin of the broadcast appears to have been Tokio, JOAK, it seems as though this particular programme was being rebroadcast by an Italian station.

It is a mercy the letter did not go direct to my lynx-eyed colleague "W. L. S." He thinks that there are so many really long-distance stations to be had for the tuning that to pick up a relay from Europe is an unpardonable lapse—merely "local-continent" reception and next door to local-station work.

ON OTHER PAGES

	Page
Modernising the "Magic"	243
Wonders of the Vacuum	253
Unusual Units	256
Time-Base Speedometers	258

Branching Out.

MR. E. NORMAN, of 29, Varley Road, West Ham, London, E.16, is busily organising yet another branch of the Anglo-American Radio and Television Society. Those interested should write to Mr. Norman at the address stated; and in this connection there are two forget-me-nots to mention: (a) There are no charges; and (b) a self-addressed envelope, duly stamped, must be enclosed.

Russian Radio.

MOSCOW recently made known some interesting figures about radio in the U.S.S.R. The radio report presented to an All-Union Conference gave quite a host of facts and figures of wireless progress, and the total number of Soviet broadcasting stations was disclosed—for the first time, I believe—as sixty-six.

Another surprising figure was the estimated number of listeners in Russia, this total coming out at twenty millions. Obviously this is only an estimate, but at least it's an official one and comes from the competent authority.

Broadcasting in India.

THE inveterate cheerfulness with which I view the world occasionally brings me a reproach from men of sterner stuff who take things seriously.

Here, for example, is a letter from W. C. T., of the Indian Army, about broadcasting in that great country. Speaking as a resident of Lahore, my correspondent affirms that India *must* have its Delhi National station, while Bombay, Calcutta and Lahore must be adopted as Regionals.

In addition, he says, there should be stations at Peshawar, Karachi, Quetta, Bangalore, Madras and Benares. Cogent reasons are given, so I expect it is all true and demonstrable. But when I remember that millions of inspired voices have called to India in the past I cannot help wondering if its narrow castes will not be too much for the broadcasts after all.

For the DX Man.

THE London Chapter of the International DX-crs' Alliance seems to be enjoying a good time, the April activities having included visits to the International Telephone Exchange at Faraday House and to Dollis Hill P.O. Research Laboratories.

(*Continued on next page.*)

THEIR MAJESTIES VISIT H.M.V. WORKS

The King and Queen recently visited the "H.M.V." factory at Hayes, Middlesex, to see how radio sets and records are made. His Majesty is here seen displaying a close interest in one of the factory processes.

FIFTY-THREE MILLION RADIO RECEIVERS!

On the May agenda are visits to the Battersea Power Station and to the P.O. Radio Research Station on May 27th. "P.W." readers who want to be in on these high jinks should get into touch with Mr. H. M. Blaber, 9, Stanton Road, S.W.20. You ought to ask him, too, about the component-exchange club which was recently formed—it might prove a very happy hunting ground.

Our Better Halves.

LONG-HAIRED chums who find time, between knitting one jumper and the next, to cast an eye over these Notes will like to know the following bit of news:

Miss Eileen G. Harris, of "Frampton," Victoria Avenue, Porthcawl, Glam., has been appointed British representative of the Ladies' Section of the Anglo-American Radio and Television Society. She will welcome enrolments at the above address, but Miss Harris asks that a self-addressed stamped envelope be included in the applications.

Incidentally, this feminine section of the society grows apace, and already has representatives in New Zealand and Australia—which just shows you!

Argentina's Prompt Action.

AN unusual and much-appreciated offer of a wireless station was made when bandits broke into a bank at Santa Cruz, shot dead two British bank clerks and escaped with £10,000 in cash.

The crime aroused Argentina to intense indignation, and the Santa Cruz station immediately ceased all its broadcasting programmes so that the transmitter could be used by the police engaged in the man hunt.

People in the neighbourhood of Santa Cruz were instructed by their loudspeakers where and for whom to watch to assist the police; and we British listeners are grateful to Argentina for this radio net so promptly wide-flung in an effort to arrest the murderers of our countrymen.

Radio Roumanie.

GOOD FRIDAY was planned to be "Good Gracious!" day in Roumania, for the engineers working on the new long-wave station schemed to test their new transmitter on that occasion. It has been allotted a wavelength of 1,875 metres, and since the power is 150 kilowatts we can assume that it will be well heard in this country when it has shaken down to regular service. The official title of this newcomer is "Radio Roumanie."

Committee Sidelights.

THERE are a few human-interest sidelights that I think you ought to know about the all-important Government Committee that will decide the future of broadcasting in this country.

Lady Reading was formerly Miss Stella Charnaud, Lord Reading's secretary and chief of staff.

Lord Ullswater had the last word in the House of Commons from 1905 till 1921 as Mr. Speaker Lowther.

Major Attlee, Labour M.P. for Limehouse since 1922, was Postmaster-General in 1931.

Lord Selsdon—who was formerly Sir William Mitchell-Thomson, M.P.—addressed "P.W." readers at one of our last meetings at the Central Hall, Westminster. He is Chairman of the Television Advisory Committee and a fine speaker, as perhaps you remember.

BROADCASTING BREVITIES

Philip Ridgeway and his "Parade" will take part in the National programme at 8 p.m. on May 20th. They will also be heard in the Regional programme the following day at 7 p.m.

This broadcast marks the twenty-fifth anniversary of Philip Ridgeway's début on the stage, so that it is somewhat of a Jubilee occasion.

* * *

Cecil Lewis, whose programme "Hotel" will be heard by National listeners on May 23rd, has spent ten consecutive days and nights in one of London's great hotels in order to achieve the true atmosphere.

In his own words, he is attempting to portray orally over the microphone the incredible effort which goes to the smooth working of a giant hotel, where 500 people may sleep in luxury and 1,500 others lunch and dine in an atmosphere of calm and efficiency.

* * *

The ever-popular Leonard Henry will be relayed to Western listeners from the St. Mellons Country Club on May 18th.

* * *

Variety is to be relayed from the New Hippodrome, Darlington, for Northern listeners on May 16th.

The Silent Key.

AMATEURS all over the world will regret with me the passing of G 2 N L. The station belonged to Mr. F. J. Hughes, of "Ashdene," Bath, who was buried in the Abbey cemetery at Bath on April 16th, with honours thick upon him.

He spent twenty-three years in the Colonial Service on the Gold Coast, in Northern and Southern Nigeria and on the West Coast of Africa, and on his retirement he became actively interested in short-wave wireless.

Mr. Hughes, who was one of the first to have a transmitting licence in Bath, was always a pioneer, and his duties in Africa took him to places where no white man had ever penetrated.

A Good Earth.

CRITICS of the Droitwich station who lightly maintain that a better site could have been chosen will be staggered by a recent revelation as to the lengths—or rather depths—to which the B.B.C. engineers will go to get things right. Before the site was selected the question of Droitwich's subterranean brine stream was considered, and it transpired that the average depth of this stream is about 190 ft. So the engineers, good, careful chaps, bored down to 300 ft., just to make sure that the station should be on good motherly earth and not on the briny deposits.

If you remember that the height of St. Paul's Cathedral cross is about 300 ft. you will admit that this boring job was carried out with commendable thoroughness.

Our Big Family.

ONE of those statistics-loving professors who card-index everything has recently performed the magnificent feat of calculating the number of the world's wireless sets.

Shutting himself up with his records and a listing-and-adding machine, the professor worked out, from the latest information available, just how many sets each country would have on a given date. Provisional and partial checks having shown that his methods gave substantially correct results, he brought all his records right up to date, oiled the listing-and-adding machine, took a deep breath and then added all his latest totals to find the world's grand total.

It came out at just over the fifty-three-and-a-half million mark.

Society Note.

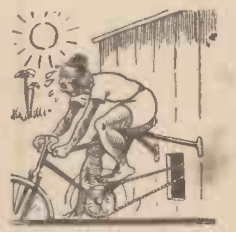
THE Golders Green and Hendon Radio and Scientific Society has arranged its annual Direction-Finding Competition for May 26th this year. This event—as London radio men will remember—is always keenly contested and enjoyed, the competition being open to all radio societies.

The wavelength to be used is 90 metres, and there will be some bonny prizes awaiting the successful sleuths, so secretaries are invited to get in on this contest quickly.

Full particulars are obtainable from Lieut.-Col. H. Ashley-Scarlett, D.S.O., 60, Pattison Road, N.W.2.

In the Saddle.

CYCLING enthusiasts will be tickled to know that the new Peshawar station on the North-West Frontier of India is run on bicycle power.



Its storage battery is kept in condition by a 12-volt car generator, and the power for this comes from the rear wheels of specially mounted bicycles. To drive the belt at the required rate perspiring wallahs sit on the bicycles and pedal like heck for two hours a day. It gets them nowhere, of course, but it develops the leg muscles and also engenders a fine contempt for those who merely *listen* to radio.

ARIEL.

Modernising the "MAGIC"

HINTS AND TIPS ON HANDLING THE 1935 "MAGIC" THREE, CONSTRUCTIONAL DETAILS OF WHICH APPEARED LAST WEEK.

WE think it will be quite clear to everyone that the new "Magic" is something much more than an old set into which a few modern refinements have been crowded. The original was an all-wave three-valver incorporating two stages of L.F.

The new "Magic" is an up-to-the-minute S.G. Det., L.F. set for all-wave reception, embodying variable-mu sensitivity (volume) control and iron-cored coils. The transformation is possible without the necessity of scrapping more than a few of the original parts, and the same baseboard and panel are employed. It isn't even necessary to stop up panel holes, for the ones already drilled in the panel are again used, yet a satisfactory layout, symmetrical and orderly, is obtained!

We think we can safely say that we have never accomplished a better modernisation, and it is particularly fitting that we can claim this in view of the importance of the receiver which is being dealt with.

A First-Class Receiver.

We have already described (in last week's issue) how the constructor should proceed to make all the necessary alterations. That information will also prove completely adequate for all those who desire to build the 1935 "Magic" as a new set. As we have said, it is from every point of view a first-class modern instrument, able to hold its own, if not to beat, any similar present-day outfit in its class.

Regarding the valves, we would urgently advise owners of original "Magics" to purchase entirely new sets and not to try to use one or two of their old ones. After all, four or five years' life is a good run for a valve, and also it should be remembered that valves, like everything else of a radio nature, have been subject to progress and improvement during the past few years.

Constructors often do not recognise decay in a valve, for the process is a slow and insidious one in the majority of instances. We know it seems a drastic step to scrap valves which you think are still as good as ever, and many will want very much to employ the same detectors and output valves that served in the old set so well.

We can only say that the probabilities are that to do so will considerably limit the possibilities of the modernised instrument. However, if it is desired to economise to as great an extent as possible, no doubt, whatever we say, two of the original team of valves will appear again!

Using Existing Valves.

If you must use the old valves, then we expect the H.F. one will prove the most suitable detector, although the detector type proper ought to be tried. You see, we face the fact that many will consider the undoubtedly rather lower standard of performance to be a reasonable price to pay for the saving of the cost of new tubes! And we must admit that we sympathise to some extent with the attitude, the more particularly in view of the grand overall capabilities of the set.

Buyers of new teams of valves have a fine selection of makes and types from which to choose. This alone will indicate plainly the robust characteristics of the new "Magic."

There will be no need at all for us to give you a lead in regard to the combinations of valves. You can freely choose from the list of recommended valves we give in the secure knowledge that any three of them suitably positioned in the set will work together properly.

It will be noticed that there are two columns of output valves. The first column lists the smaller types and the second one the larger ones. These qualifying terms are, of course, in reference to their power outputs and not necessarily their physical dimensions.

Let us take as an example the first ones in the list, the Cossor 220 P.A. and the Cossor 230 X.P. The output of the 230 X.P. is 450 milliwatts at 150 volts H.T. The output of the 220 P.A. is rather less than half of that, but it must be remembered that its H.T. current consumption of 10 milliamperes is also rather less than half of that of the "larger" power valve.

Therefore those who use dry batteries for their H.T. supplies will find the support of a bigger output valve rather unendurable, though that is the type they will need to use if a really hefty undistorted volume is desired.

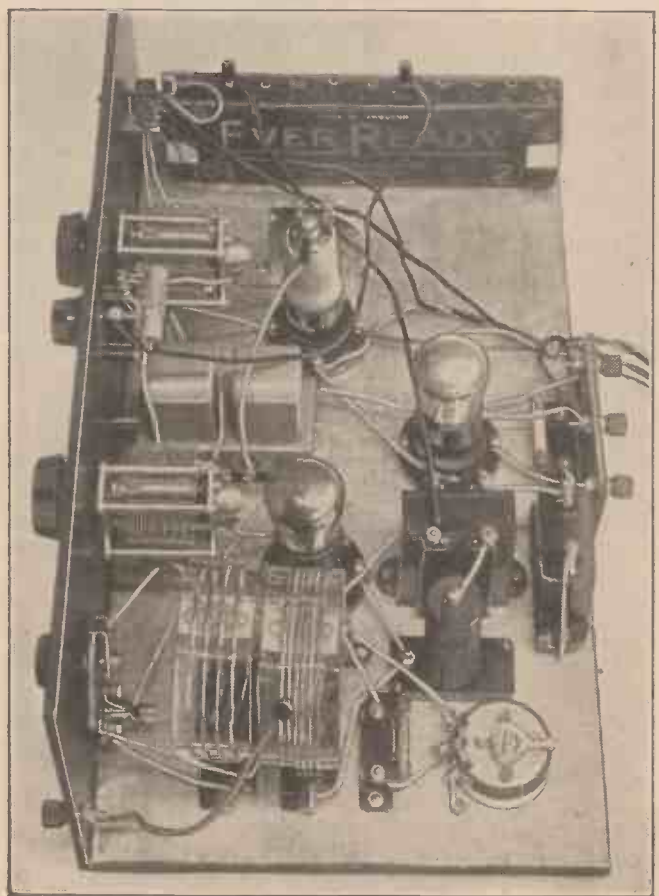
Plenty of Volume.

Actually, we are sure that most constructors will get all the volume they want from the more modest power valves. Loudspeakers are so much more sensitive these days, and it is seldom that you encounter anyone who likes to run his radio so loud that the limitations of a "big tube" are extended.

Of course, where it is possible to employ a mains unit the question of H.T. current consumption does not arise so forcibly. By the way, we trust we haven't given the impression

(*Continued on next page.*)

GIVEN A NEW LEASE OF LIFE



THE MODERNISED "MAGIC" in its completed form and all ready for present-day ether conditions. The new set is highly selective, and owners of original "Magic" Threes will find the conversion well worth while.

MODERNISING THE "MAGIC"

(*Continued from previous page.*)

that the "Magic" is a greedy H.T. consumer. In this respect it is, we assure you, perfectly normal and consumes no more m/a. than the average S.G. det., L.F.

The majority of constructors will no doubt employ 120 volts H.T., and with that there will be a smaller H.T. consumption and quite as much power as can be used by all but a very few. Particularly will this be the case if the recommended speaker is employed, for this has a sensitivity well above the average.

Naturally, the amount of grid bias will depend upon the valves used. The "9 or 16½" volts which is specified largely concerns the variable-mu valve. You generally give this all the voltage available in the G.B. battery. Before purchasing the G.B. battery reference should be made to the leaflet accompanying the S.G. valve which you employ. The literature concerning the power valve will give you the correct G.B. voltage for that valve.

H.T. Voltages to Use.

The maximum H.T. should be applied to H.T. plus 3, and about 90 volts to H.T. plus 1. A little experiment under practical conditions may be needed to decide the best voltage for the detector (H.T. + 2). This is not at all critical on the medium and long waves, and something around about 60 volts will be quite O.K. But on short waves it is advantageous to try a few different voltages ranging from 30 upwards.

Once you have decided upon a satisfactory figure this will serve also quite well for the medium and long waves.

For operating the set on the normal broadcast bands (medium and long) the aerial lead should be connected to the left-hand aerial terminal looking at the front of the set. Both of the tuning condensers are operated.

Maybe the readings will not line up exactly if the condensers are of totally different makes, but that won't interfere with the station-getting powers of the set. You will remember that we had a few words to say about this subject last week.

But once you have found the relative settings for a few stations you will discover that the intermediate settings will be more or less similarly disposed. Handling two tuning condensers is not half as difficult as many would try to make out. It is the right-hand one which you closely set in conjunction with the reaction adjustment in order to achieve the greatest sensitivity.

The other condenser must, of course, be operated so that it tunes its associated circuit to the required wavelength as well, but the adjustment is rather broader and you do not have to "juggle" so closely with it. It should be noted that the use of two condensers eliminates all ganging troubles and ensures that you can get optimum results at all times.

For short-wave reception you merely change the aerial lead over to the other aerial terminal and pull out the short-wave switch. (Don't forget to push this in again when you go back to the normal bands.)

On the Short Waves.

Only the one tuning condenser is now in action, and that is the right-hand one. It is very important to note that the tuning conditions on the short waves are very different. Here you must turn the condenser much more slowly, or you will flash past stations. Also it will be necessary to "push" the reaction and search for the stations by their carriers.

Thus you hear them first as squeaks which change in pitch as you very slowly alter the tuning setting; then, by dropping back on the reaction adjustment, you "resolve the carrier" until the speech or music is heard.

The volume control (variable-mu) is not operative on the short waves, but another adjustment now assumes considerable importance. We refer to the 400-ohm potentiometer. This is a sensitivity adjustment, and we have deliberately avoided mention of it until we came to deal with the short waves. It is helpful on the other bands, but its importance is supreme on the short waves.

Having tuned in a short-wave station, this control can be adjusted until the best results are obtained. After that you need not refer to it except very infrequently, and in any case any adjustment which suits the short waves is sure to be O.K. for the other bands.

There will be no purpose in buying new short-wave coils if you already possess an original set, for they were very good ones.

We would once again like to remind constructors of the tuning difference on the short waves. You use only the one condenser, but it must be operated ever so much slower.

The Aerial Tap.

In the photograph which appears on this page you will see how the aerial is "tapped" on to the short-wave grid coil by means of a split-type wander-plug.

Alternatively, one of the smaller types of crocodile clips could be used for this. The object of this particular adjustment is to vary the aerial coupling. A tapping about half-way along the coil turns is usually satisfactory—although other points should be tried.

By means of the adjustment, "flat spots" in the short-wave tuning can be eliminated. Of course, it has no bearing at all on reception on medium and long waves.

Well, that is all that need be said about the operation of the new "Magic." It is an exceptionally easy set to handle, and once you have got the "feel" of it you will marvel at the facility with which it enables the more difficult stations to be received. Given a moderately good aerial, its performance is out of all proportion to the number of valves used.

THE RECOMMENDED VALVES

	H.F.	Det.	Output
Cossor	220 V.S.	210 H.F.	220 P.A. or 230 X.P.
Hivac	V.S.215	H.210	P.220 „ P.P.220
Marconi	V.S.24	H.L.2	L.P.2 „ P.2
Mazda	S.215V.M.	H.L.2	P.220 „ P.220A.
Osram	V.S.24	H.L.2	L.P.2 „ P.2
362	V.S.2	H.L.2	L.P.2 „ P.2
Tungsram	—	H.R.210	L.P.220 „ S.P.220

BATTERIES. H.T.—120 volts. G.E.C. L.T.—2 volts. Exide.
G.B.—9 or 16½ volts (to suit output valve). G.E.C.
LOUDSPEAKER. W.B. Stentorian.

ADJUSTING COUPLING

When working on short waves the aerial is tapped on to the short-wave grid coil, the position of the tapping being variable in the manner illustrated here.

EXISTING PARTS THAT CAN BE USED AGAIN

1 ·0005-mfd. tuning condenser, with slow-motion dial. (Polar No. 2 S.M.)
3 4-pin valve holders. (Benjamin.)
2 2-pin coil holders. (B.T.S.)
1 200-ohm or 400-ohm baseboard-mounting potentiometer. (B.T.S.)
1 H.F. choke. (Wearite.)
1 L.F. transformer. (Varley.)
1 ·0003-mfd. fixed condenser. (Dubilier.)
1 2-mfd. fixed condenser. (T.M.C.-Hydra.)
1 2-meg. grid leak and holder. (Graham Farish.)
1 resistance holder. (Dubilier "Dumetohm.")
1 baseboard, 18 in. x 10 in. (Peto-Scott.)
1 panel, 18 in. x 7 in. (Peto-Scott.)
1 terminal strip. (Peto-Scott.)
5 terminals. (Belling & Lee.)
Wander-plugs and accumulator spades. (Clix.)
Wire, screws, flex, etc.

NOTE.—Makes are given for the benefit of readers building up the entire set. Therefore the above list, together with the list of extra parts, constitutes a complete kit of components for a 1935 "Magic" Three. Of course, in the case of many original "Magic" Threes the components which can be used again will be of different types, or even makes from the above list, but none the less suitable for the purpose.

EXTRA COMPONENTS REQUIRED

1 Polar No. 2 S.M. tuning condenser.
1 Formo two-gang coil unit, type A.H.
1 Polar ·0003-mfd. Compax reaction condenser.
1 Bulgin 3-pt. shorting switch, type S.39.
1 Bulgin 4-pt. shorting switch, type S.87A.
1 T.C.C. ·1-mfd. tubular fixed condenser.
1 T.M.C.-Hydra ·1-mfd. fixed condenser, type 30.
1 Dubilier 10,000-ohm resistance, 1-watt type.
1 Bulgin 50,000-ohm potentiometer, type V.C.36.
1 Belling & Lee wander-fuse.
1 pair Bulgin G.B. battery clips, type No. 1.
1 piece copper foil, 18 in. x 10 in.

TELEVISION

WHAT THE VARIOUS SECTIONS DO

An explanation of the purposes served by the electrodes in a cathode-ray tube.

By L. H. THOMAS

THE letters that I receive from readers seem to indicate that they want to return to the subject of the cathode-ray tube for a while. It is certainly vital that its operation should be understood, for we shall have its controls at our finger-tips in the new receivers and shall have to make the most intelligent use of them.

Everyone has studied and understood by now the simpler facts relating to the C.R. tube, and should know how our beam of electrons, terminating in a spot of light, is brought under control and made to swing about in two different directions.

There seems, however, to be a certain amount of misunderstanding about the functions of the electrodes of the tube, other than the deflecting plates themselves.

The Source of Electrons.

Let us start with the cathode and work through them one by one. The cathode itself is heated and gives off electrons, which are attracted by Anode No. 1. We will leave Anode No. 2 out of it for a little while. Anode No. 1, of course, is highly positive with relation to the cathode, and has a small central hole through which some of the electrons pass in the form of a jet.

Many of them, of course, strike the anode and form a current in the anode circuit—that is ordinary thermionic valve practice.

Those that pass through tend to spread out fanwise; being similarly charged, they naturally tend to repel each other. The purpose of the control shield round the cathode (which is *negatively* charged) is to "focus" the electrons emitted from the cathode towards the centre of the anode, for one can treat an electron beam very much in the same way as one can deal with a beam of light.

The various electrodes of the C.R. tube perform a kind of "electronic-optical" function. In the case of a hard tube the function of the control shield is chiefly to control the *brightness* of the spot which the electron beam produces on the fluorescent screen at the far end of the tube.

Varying the Amount of Light.

"Intensity modulation" is a term that frightens the weak hearted right away from television theory, but it is quite easy to understand. All that it implies is that the brightness of our moving-light spot is varying in accordance with the part of the picture that is being scanned. Our neon tube, in a disc receiver, does this, but we have to produce our effect of a moving spot by mechanical means, since we can't throw the neon tube itself about!

It is difficult to obtain satisfactory results with the ordinary soft C.R. tube, for the one reason that a varying voltage applied to the control shield will not simply vary the brightness of the spot, but also the focus. The reason for this has already been hinted at—one of the uses of the shield is to "contract" the beam of electrons.

We want a spot of constant size, and this is where the "hard" tube comes in, and particularly Anode No. 2. By applying an even higher potential to this anode than we have on Anode No. 1 we can produce a really fine jet of electrons which will give a small but intensely brilliant spot. Most important of all, the spot will be practically independent of anything that we may decide to do with the control shield.

Our modulation is therefore applied to the latter, and it controls the brilliance of the spot by varying the number of electrons that the anodes are able to attract from the cathode. In a very indirect way its function may be likened to that of the grid in an ordinary triode—make it sufficiently negative and you reduce considerably the amount of current that can flow.

The similarity, however, is very superficial, and knowledge of the operation of the thermionic valve does not help us very much in our understanding of the cathode-ray tube.

"Velocity modulation"—not to be confused with the system we have been reviewing—is a different story. I do not propose to deal with it here, except just to explain that its essential property is that the bright parts of the picture are formed by making the spot travel slowly and the dull parts by speeding it up. The brightness of the spot, considered as a stationary unit, never changes.

Since the cathode-ray tube is essentially a voltage-operated device, it is generally assumed that the average receiver for television will operate the tube straight from the second detector without the necessity of using an L.F. stage. This simplifies the design considerably, although an L.F. stage may be required for bringing up the synchronising signal to a reasonable amplitude.

But the term "voltage operated," fortunately, applies also to the deflector plates that we shall use for swinging our electron beam about. This implies that, although we shall have to use very high potentials, there need be no great supply of *current* behind them, and they will therefore not be unduly dangerous to handle.

Actually it seems probable that the cathode-ray tube and its time-base equipment, all operated directly from the mains, will be sold as one complete unit by several of the leading firms, and that the home constructor, unless he chooses, need not play with this part of the receiver very much.

Constant Adjustment Not Required.

After all, this part of the equipment may be regarded almost as the equivalent of the loudspeaker. It converts electrical energy into vision instead of sound, and it so happens that it has to be a lot more complicated to do so efficiently. There will be many controls requiring adjustments in the first place, but there is no reason why they should not be left alone afterwards if the equipment is well constructed and reliable. Certainly you need not fear that the reception of television will be one long bout of knob twiddling. In the demonstrations that I have seen the apparatus was not touched from beginning to end.

All sorts of people are promising "revolutionary developments" in cathode-ray tube design, but I don't think we need worry particularly. The most satisfying of these will probably be a substantial reduction in price sooner or later, and that will please everybody.

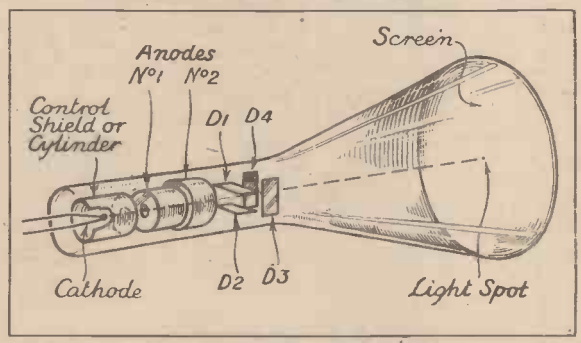
Coated with Graphite.

Although the tube in the diagram has been depicted as transparent, many modern C.R. tubes are coated with an internal conductive deposit that serves as a screen between deflector plates and the beam and any powerful fields that may exist in the immediate vicinity of the tube.

This screen may be regarded as an extra electrode, although it is sometimes given a common connection with one of the others that operates at earth potential, such as one of the deflector plates.

Tubes not so equipped are generally operated inside a metallic cylinder, which serves both as a screen and as a protection. The cylinder is usually extended beyond the end of the tube to give a kind of "viewing-tunnel" effect. Incidentally, it also forms a stand for the tube.

A MODERN CATHODE-RAY TUBE



This sketch clearly indicates the various electrodes that are employed in a television cathode-ray tube.

MAKING YOUR OWN METAL CHASSIS

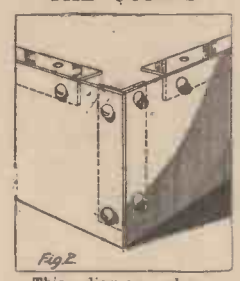
Some practical help for constructors

By G. LENNIE.

FOR quite a time now I have been constructing my own metal chassis. Nice jobs they are, too, although I say it myself. I can make any chassis I wish, and very easily. Use is made of sheet aluminium of anything from 20 to 16 gauge and angle aluminium ½ in. by ½ in. and $\frac{1}{16}$ in. thick. One-eighth-in. diameter by ⅜-in. long round-headed steel bolts and ⅛-in. nuts then complete the outfit.

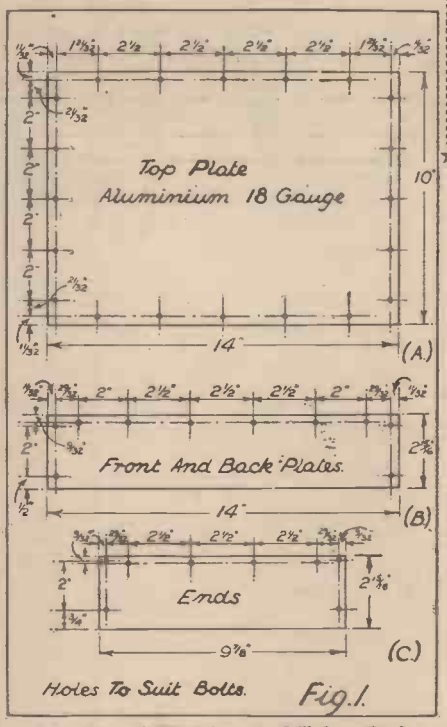
Firstly I determine the size of chassis I require. Let us suppose it is 14 in. by 10 in. by 3 in. Aluminium, ready cut, is ordered as follows: 1 sheet, 14 in. by 10 in.; 2 pieces, 14 in. by $2\frac{15}{16}$ in.; 2 pieces, $9\frac{7}{8}$ in. by $2\frac{15}{16}$ in. The angle pieces are cut: 2 pieces, 12 in.; 2 pieces, 9 in.; 4 pieces 2½ in.

THE JOINTS



This diagram shows how the various pieces are joined.

The large sheet, which is to be the top, is then drilled with ⅛-in. clearance holes as shown in Fig. 1A. The front and back are drilled as in Fig. 1B, while the ends are drilled as Fig. 1C. You will notice that the holes on the top plate are staggered when compared with those on the front, back and end plates. This ensures that the bolts do not interfere.



How the various plates are drilled ready for bolting together.

The angle pieces are now marked, using the holes on the sheet aluminium as a template. A portion of the corner is shown in Fig. 2. The method makes possible a strong and rigid chassis and to any required size. The necessary holes for components can be marked out and, if desired, the chassis can be dismantled in order to drill them out. For large holes in the plates all that is necessary is to drill a series of small holes, knock out the centre and file to take off the ragged edges.

Moreover, any of the bolts used for holding the chassis together can also be used for earthing purposes.

Aluminium, being soft, is very easily worked, yet the angle pieces, because of their shape, possess great strength.

DETECTING AIRCRAFT

AT the present time anti-aircraft batteries detect aeroplanes by means of directional sound deflectors and sensitive listening apparatus. This gear operates by virtue of the sound made by aeroplane engines.

Since the development of the silent aeroplane is progressing apace, and promises to become an accomplished fact in the future, detection by sound is likely to be rendered of no avail. What method will be devised then?

Listening for Ignition Systems.

Probably a system of detection by radio will make its appearance. Every aeroplane has an ignition system, and, as all short-wave listeners are aware, such systems act as transmitters. So all that is needed is a special form of sensitive direction-finding apparatus.

The next step will be complete screening on the aricraft. But since the machine cannot be actually earthed, some form of detectable radiation may still prove to be existent. But that point we must leave to the future.

A. S. C.

TELEVISION JOTTINGS

TELEVISION transmissions from Broadcasting House have lost their place in the Saturday afternoon programmes, with the result that we now have two late-evening transmissions available. Monday and Wednesday evenings are likely to be rather interesting, since the same programme is to be repeated.

This gives the television enthusiast a chance to view the entire programme, and then, at his leisure, to make adjustments to his receiver and try again on the same programme two days later. Admittedly the standard of the two transmissions that he sees may not be the same, but there is not likely to be much variation, and he should be able to tell whether things are better or worse.

Thirty-Line to Continue.

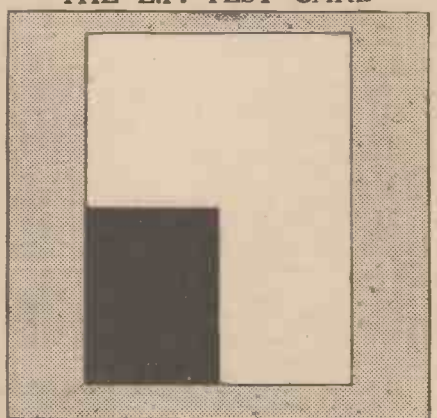
I have been given to understand that the 30-line transmissions will definitely be given a place in the programmes for some time to come. In view of this I was not surprised when a well-known manufacturer of disc kits told me that his sales have actually increased since the publication of the Committee's report.

The general feeling seems to be that a little first-hand knowledge of television—crude as it is—will stand one in good stead and quite possibly save one a little money when the high-def. transmissions begin.

Readers who have followed these ramblings of mine since they commenced last autumn will remember that I gave a full description of the receiver that I have been using for 30-line transmissions. It flies in the face of theory by being a perfectly ordinary receiver, using a leaky-grid detector and transformer-coupled L.F., both of which are decried by the purists.

Admittedly I have not used it very much on television lately, but it has remained in use for ordinary broadcast reception, and was once more hitched on to my disc-type viewer a few days back. It seemed to work as well as ever. Probably it was imagination, but I thought the detail was clearer than it used to be. If I am right it signifies an improvement in the transmission, for the receiver certainly hasn't changed.

THE L.F. TEST CARD



Unless your set has a good bass response, you would see little of the black patch.

I think I heard somebody ask why the 30-line transmissions should be of any help in preparing for the high-definition programmes. Well, there are several reasons. Chief among them is the fact that one simply cannot obtain a proper grasp of the principles of television until one has tried some sort of gear, however simple, for oneself.

Recognising the Faults.

The whole subject of scanning remains, in the minds of many readers, a rather confusing business, but as soon as one has played with even a disc viewer for an hour or so it becomes perfectly clear.

Then, again, it enables one to recognise faults in images. The negative image, of course, is perfectly obvious. But the effects of loss of bass or excess of top have to be *seen* if you are going to recognise them again. The sketch on this page shows the B.B.C.'s "Low-frequency test card."

If your viewer reproduces it just as it is shown here you have reason to be proud of your receiver. You are more likely to find the whole rectangle coloured a dull grey, with a slightly darker patch in the bottom left-hand corner! If your receiver reproduces anything at all at 25 cycles you will begin to distinguish the dark patch quite clearly.

L. H. T.

With the EXPERIMENTER

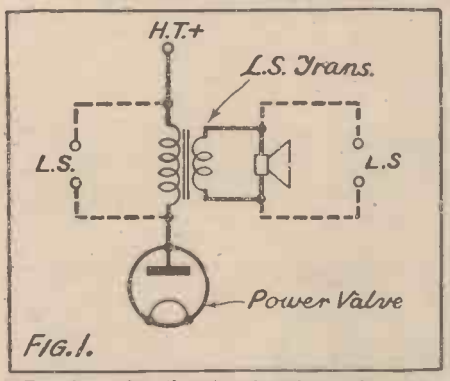
"THAT EXTRA LOUDSPEAKER"

"YOU would think," wailed the Rabbit, "that a seven-valve radiogram would be powerful enough for working two loudspeakers, wouldn't you?" I try not to think when Bunny's about. It hurts too much. But I fell into the trap of being slightly interested.

"No, I shouldn't think anything of the sort," I replied. "I should know it would have enough reserve of power. I suppose you are talking about your uncle's new model."

Yes, he was talking about that. Further,

TWO ALTERNATIVES



Two places where the external speaker can be connected. The left-hand "L.S." terminals are for a speaker of the high resistance type, and the other terminals are for a low-resistance speaker.

he had proved, to his own fatuous satisfaction, that an extra loudspeaker he had borrowed from Bob's shop would not ring the bell. Indeed, he moaned to me that as soon as he put the extra cabinet loudspeaker on to the two terminals of the radiogram marked "Ext. L.S." the volume had dropped by an enormous extent.

I suppose you, dear, well-informed reader, can guess what the congenital idiot had done. Yes, he had connected a low-resistance moving-coil loudspeaker—without a self-contained integral matching transformer—to the output of a pentode power valve.

How it Was Connected.

By doing this he had not merely lost all chance of volume from the external loudspeaker, but he had ruined the volume of the loudspeaker inside the radiogram cabinet.

If you look at Fig. 1 you will see better what I mean. The poor wretch had, in effect, put his external loudspeaker across the primary winding of the internal loudspeaker's transformer—that *not* being the method adopted by the maker for his extra terminals.

Knowing something about his external loudspeaker's impedance—it was 10 ohms at 800 cycles, to be exact—and knowing something of the radiogram in question, I adopted the method shown on the right in Fig. 1. In other words, I put his low-impedance external across the secondary of the transformer inside the set—where the maker, in his infinite wisdom, obviously intended it to go.

I discovered that, trying to be clever, Bunny had taken his leads direct to what he thought was the right place inside the instrument—instead of using the two terminals thoughtfully provided by the makers on the back of the cabinet.

Anyway, I got him out of his mess, but fell a-wondering about this extension loudspeaker business. It can be quite a worry sometimes. Don't you agree?

Although by no means an ideal method, it is often possible to put an external loudspeaker across the primary winding of the transformer, as Bunny had wrongly done for his particular conditions. Indeed, several set makers provide terminals that are simply taken to the primary as shown on the left of Fig. 1, with instructions to use a high-resistance loudspeaker.

Perfect Matching Not Essential.

Theoretically, the power valve is "matched" to its internal loudspeaker; but very little experiment is needed to show you how far from the matching you can stray without audible difference.

So it comes about that one or two extra loudspeakers—always assuming that they are as high in resistance as the internal one—can be added across the primary winding with perfectly good results. Even if there is an audible drop—as there may be with some valves, pentodes particularly—the volume control can be increased a little to make good the overall effect.

There is a snag, though. If you take a couple of terminals from the primary of the internal loudspeaker's transformer the full high-tension battery or mains voltage will be applied to them and shocks may make you jump or say things you should not.

With small battery sets there is not much in this objection, the voltage being too small to worry about. Not so with mains sets, particularly if there is a nice fat pentode driving the loudspeaker.

The use of the secondary terminals, as on the right of Fig. 1, is preferable from this point of view. So long as the matching question can be settled—as by the use of a similar type of loudspeaker externally as internally—there is everything to be said for the right-hand method.

The external loudspeaker is then completely protected from the risk of high-tension shocks, for it is not in direct connection with the supply at all. Then, too, the stepping down of the signal through the transformer means that the A.C. variety of shock—by no means negligible, as I have frequently found to my discomfort—is also most unlikely.

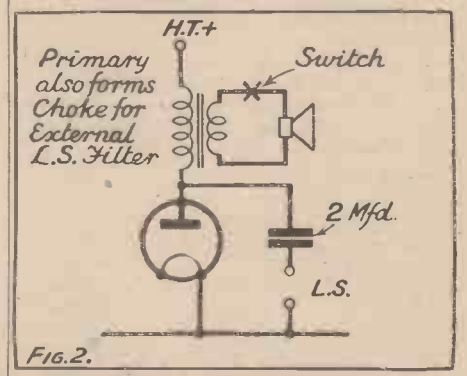
All of which is for the more or less perfect set-up. There are times when neither method shown by Fig. 1—primary or secondary paralleling—will serve its turn. You may have a perfectly good extra loudspeaker, with integral loudspeaker transformer, which you want to connect up to the set having an entirely different loudspeaker and transformer.

A Good Scheme.

Then the Fig. 2 method comes into the picture. It is really quite a natty idea, but don't imagine I invented it. The reason I mention it is that it seems to be very little used by amateurs I have run up against.

You see the idea? The primary winding of the internal loudspeaker's matching transformer forms a low-frequency choke for the external loudspeaker's choke-capacity filter.

A SIMPLE METHOD



Using the primary of the "main" loudspeaker transformer as a choke for filtering part of the speech currents to the external speaker via a 2-mfd. condenser.

Simply connect a 2- or 4-microfarad fixed condenser between the anode and one side of the external loudspeaker, taking the remaining external loudspeaker lead to earth.

Your external loudspeaker is then virtually in parallel with the primary of the internal loudspeaker's transformer, although each transformer's secondary will be looking after the individual matching problems.

Just one little point—from practical experience. If the set is pumping out anything like its full power you can get quite a respectable shock from the Fig. 2 external loudspeaker terminals, although I don't

(*Continued on page 252.*)

BARRY KENT CALLING

News and Views about Broadcasting

IT is Canada's turn this year to provide the Empire Day programme for the Empire. This will be given between 7.30 and 8 on the evening of Friday, May 24th. It will take the form of a dramatic representation of the story of the foundation of Empire Day in Canada, and it will be relayed from Hamilton, Ontario, by the Canadian Radio Commission.

* * *

Review of the Fleet.

Gerald Cock and his O.B. staff have worked out most elaborate plans for the broadcasting of the Review of the Royal Navy off Spithead in July. There are to be no less than five separate narratives, all relayed from the deck of a battleship, battle cruiser or destroyer, picked up by a special receiving station at Spithead and passed on by land-line.

* * *

Nottingham Angry.

It has leaked out that Sir John Reith will not approve the proposal to re-establish an outpost of broadcasting in Nottingham, either as a representative with office or as a studio without special staff. This decision throws the influence of Nottingham into the scales against the present administration of the B.B.C. so far as the Ullswater Committee is concerned. There is consternation among the B.B.C. staff at the Midland Regional offices in Birmingham.

* * *

Morning Programme Set-Back.

I was telling you recently of the proposal that the B.B.C. would provide the music to entertain the crowd waiting for the Jubilee processions. This would mean transmission beginning about 9 o'clock each morning. Plans were drawn up and provisionally agreed; the Radio Trade was asked to co-operate in making sure that only the B.B.C. transmission would be taken by the public-address system installed along the route. Then, all of a sudden, Scotland Yard announced that they had arranged for bands to be stationed at frequent intervals along the route. So the B.B.C. will not do these early morning transmissions.

* * *

Charles Brewer for America.

Mr. Charles Brewer, perhaps the most successful and versatile of B.B.C. producers, is taking extended leave in a two months' visit to Canada and the United States. Mr. Brewer will combine work with pleasure to the extent of having a good look at things in Radio City.

* * *

Another B.B.C. Dance Band?

There is renewed talk these days of a second B.B.C. Dance Band, both to ease the strain on Henry Hall and also to cope with the more exacting requirements from light entertainment. Under the new plan Henry Hall would remain in charge, with the two bands working for him. Several outside conductors have been interviewed for the post of second-in-command if the new scheme materialises.

* * *

The Ullswater Committee Begins.

Lord Ullswater's Committee of Inquiry into Broadcasting has had two meetings and has decided on its procedure. Most of its sessions will be in public and many witnesses will be examined. Contrary to what was said in the beginning, the whole work of the B.B.C., in all its departments, will come under review.

WORLD FAMOUS

Miss Marian Marsh, the well-known film star, listens to a programme on a Marconiphone Jubilee Model "264" receiver.

Social Life in the B.B.C.

When I was in the restaurant at Broadcasting House the other day I heard some interesting gossip about the attitude of the B.B.C. to the social activities of its staff. There is a properly organised staff club with fully equipped recreation grounds at Motspur Park. So far as money goes, the Corporation has been most generous in helping this club in its activities.

But Motspur Park is a long way off, and, every now and then, there is a tightening up of office discipline just to make sure that people are not leaving too early for their recreation. Also the B.B.C. does not care for members of its staff to get unduly friendly with each other. The ban against any kind of trade union organisation or "Whitley Council" in the B.B.C. is so rigidly applied that even the social activities of staff are limited.

THAT GALLANT ADVENTURE

Candid comments by our Broadcasting Critic on recent programmes.

I LISTENED with rapt attention to the re-enacting of the gallant but tragic adventure of Gallipoli. Reconstructions of history have become a frequent and popular feature of B.B.C. programmes. All these reconstructions have been successful as radio fare. So much so that now we can always depend on a good show when past history is the theme.

The fact is that in all cases these productions have only been possible after immense research work on the part of the authors. Thus fact and not fancy is the keynote of them all. In other words, meat, and not a watery meat essence, is their basic ingredient.

For Gallipoli, Winston Churchill, Sir Ian Hamilton, Henry Nevinson and Compton Mackenzie were the authorities drawn upon. And the production was Val Gielgud's, who can add yet another to his rapidly growing list of successful productions.

Children's Hour Competitions.

Competitions are a present feature of Children's Hour programmes. The latest to date is a literary one. What is wanted is something in rhyming couplets about Spring, Ships, The Children's Hour and another.

Auntie Barbara read as specimens some amazingly clever children's efforts at writing verse—all prize efforts in a previous competition held under other auspices. My young nephew sends me his effort for my opinion of it before entering. Here it is:

Spring is *not* at my door,
But rain and wind, dark skies galore.
King Sol his kingdom has neglected;
And although at Easter we expected
His warming touch to feel, Alas! We had to
Stay indoors. And so had
Dad too!

* * *

Bach doesn't suit everyone's taste. His cantatas, however, have a more universal appeal than some of his other compositions have. This is why I think this week's Foundation Music has been of unusual interest. There has been a good array of soloists, but if I have any preference it is for Bradbridge White (tenor), the soloist in Cantata No. 160, "Ich weiss dass mein Erlöser lebt." His singing was beautiful.

* * *

On another occasion I liked the trumpeter (Ernest Hall) too, for I think, like Filson Young, that brass instruments lend themselves well to faithful reproduction by broadcasting.

* * *

I hope School Bursars and House-masters listened to the Medical Officer's talk on School Feeding, his observations on the importance of a balanced diet and his suggested proportions of proteins, fats and carbohydrates. Most of us who still sport an old school tie remember the "muck," as was the vogue to call it, that was forced down our throats by Bursars, House-masters, Lady Superintendents or Matrons.

While I would agree with most of what the M.O. had to say, I wish he had done more than just refer to the *service* of meals. He should have dwelt on this point, for here, in my opinion, is the cause of the trouble. Bad service is perhaps more inevitable in those large schools where boys feed, not in Houses, but in one common dining-hall.

A Refreshing Change.

"April Showers" bases its first claim to notoriety on the fact that it was an afternoon item. It must have been a refreshing change to listeners who are getting tired of light orchestral programmes.

* * *

The results of the mobile unit's activities may not yet be considered entirely satisfactory, but with perseverance improvement is sure to come. The idea behind it all is unquestionably good.

* * *

"Human nature being what it is, and frail," to quote George Allison's remark in the Cup Final commentary, after a slip by one of the players, may account for his own errors in the same commentary. No doubt, it was the terrific excitement that caused Allison to confuse left with right, mix Brown for

(*Continued on page* 263.)

ON THE SHORT-WAVES

Conducted by W.L.S.

SOMETIMES I feel that I should like to attempt to answer, in print, some of the more ridiculous of the queries that reach me. My good nature, however, is proverbial and shall remain so, and I feel that it might hurt the feelings of those who pen them to find themselves exposed to the ridicule of better-informed readers.

Just to show what some of them are like, however, I can't resist the temptation to quote one or two specimens which are now sufficiently old to be laid bare. The following was dated 1930, and the original is still in my possession, as they say in the adverts.: "Dear Sir,—Is it generally known that a valve will rectify with the glass broken away and the filament removed and the grid and plate joined together? Is it a discovery?" No comments, by order.

More Awkward Ones.

Next: "Dear Sir,—Is it better to have a short-wave aerial of insulated or copper wire, and is there any way in which you can make a crystal set louder by fixing a coil on to it?" And lastly: "Sir,—I should like to know what is the cause of this trouble. Me and my neighbour next have both got machines and when his are going and my one as well his one seems to go very loud."

Forgive me, readers, for inflicting these on you, but it's just to show you the sort of thing a scribe has to put up with. I take my solemn oath that the foregoing are not "faked" and that each one received a politely worded reply. My thoughts, though—well, let's leave it at that.

Many sensible queries are almost as difficult to answer as the above howlers, as, for example, the following: "Will you give me some idea of how much apparatus is required for a complete short-wave transmitter and, of course, a receiver to go with it?"

I'm trying to answer that one with a picture on this page. Since the writer doesn't say how much power he is going to use, or what wavebands, or even whether he knows he's got to have a licence first, I can only take a representative station.

The two switches on the white block in the middle represent the division between transmission and reception. The metal box with the three dials is the short-wave receiver for all bands. The little unit to the left of it is an extra H.F. stage for occasional use. The other box, behind the "mike," is a monitor—in other words, a heterodyne wavemeter on which one listens to one's own transmissions.

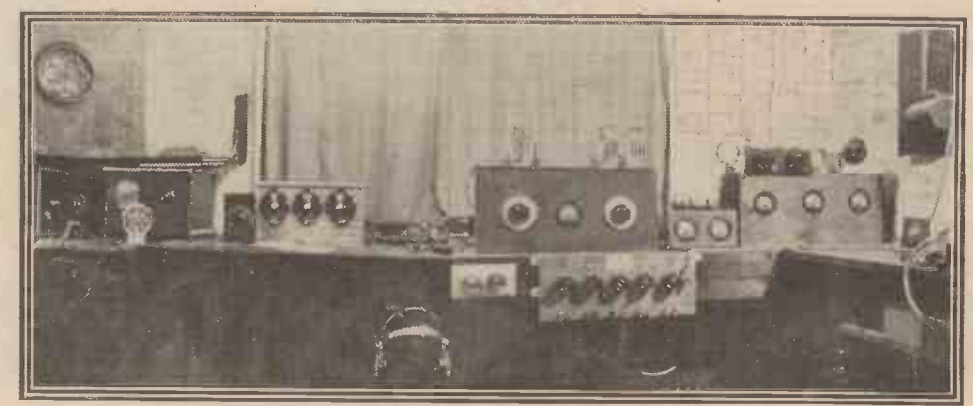
The big panel just above the switches is the final stage of the transmitter, housing a 50-watt valve. The large unit to the right is the crystal-control section, with three small receiving valves—one as oscillator and two as frequency doublers. Between the two is the large 60-watt modulator valve for telephony transmissions.

SOME QUESTIONS ANSWERED

The speech amplifier, used for other purposes, is out of the picture, but the "mike" on the left feeds into it. Under the bench are two power supplies, one of 400 volts 100 ma. for the crystal-control panel and one of 1,000 volts 100 ma. for the last stage and modulator.

Yes, you're right—it is my station (or rather *was* some few years back). There's nothing in the picture that can actually be dispensed with if one wants to put out 50 watts of telephony on 160, 80, 40 and 20 metres, and I hope my querist considers that he has had a fair answer.

A TYPICAL STATION



This photograph of an amateur lay-out provides an answer to the reader who asks how much gear is necessary in a short-wave transmitting station.

Next, a Retford reader brings up a point that may be very important. He has taken my advice and added an untuned S.G. stage to his set to get rid of instability and hand-capacity effects, which it does, below 25 metres. But he finds that it has increased the background on 49 metres and made the set inselective. I am afraid this may often happen with a *really* untuned stage of S.G., particularly if a resistance is used across the grid and filament of the first valve.

If you cannot find a size of choke (for the first grid circuit) which will overcome this difficulty the only thing is to install a "roughly tuned" circuit consisting of a 9-turn coil and some sort of variable condenser. There's no need to tune it accurately if you don't want to, although that is undoubtedly a good plan. Others, similarly caught, please note.

That Word "Ham"!

Here's a funny one: "What is an amateur transmitter? And what is the difference between one and a 'Ham'?" That's rather delicate, since no "Ham" would object to being called an amateur transmitter, although many amateur transmitters would not thank you if you called them "Hams."

The term "Ham," in its original usage, meant a bad or ham-fisted operator. For some reason it became applied to all amateurs, and it is now merely an abbreviation for an amateur transmitter. All its original implication that the person concerned was a bad operator has disappeared. The latter is now known, for some reason, as a "lid."

As for the amateur transmitter. Well, he's a person who has satisfied the Government of his country that (a) he wishes, for some good reason, to be allowed to run a private transmitting station, using the bands officiallyassigned for experimental work; and (b) that he has sufficient technical qualifications to be entrusted with the necessary permission. In this country, also, (c) that he can send and receive the Morse code at 12 words per minute.

There are some 40,000 of him in the world.

The last query is: "What do you consider the best system of volume control for a short-waver?" As we have to keep the background down I generally use a variable resistance of about 50,000 ohms across the headphones.

ON THE SHORT WAVES—*Page 2.*

Points from the POST-BAG

T. J. S., my regular correspondent from Ontario, expresses surprise that I have been "converted" to the use of A.C. valves, with A.C. on the filaments, too, for short waves. He, being the proud user of a 25-cycle supply, thinks he'll be lucky if he gets really satisfactory results.

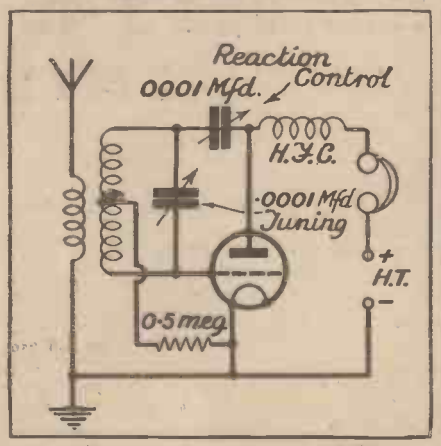
Having heard some Canadian amateur transmissions from out-of-the-way parts and formed an impression of what their mains must be like, I confess that I think precisely the same.

It Might be Worse.

T. J. S. would like to use ordinary valves, but to feed them with rectified A.C. at 4 or 6 volts, and asks whether I can recommend eliminators for the job. Personally, I'm a little scared of it, and think he would be even worse off that way than by using A.C. valves. Any suggestions from kindly readers ?

C. A. W. (Tunbridge Wells) is a sufferer from hand capacity, and his case seems worth quoting in case anyone else has made a similar slip. He admits having extended the tuning condenser back from

A SENSITIVE CIRCUIT



Yet another short-wave detector circuit that is worth trying. It is a combination of the old Ultraudion and the modern Colpitt's or Hoffman circuit. Both the reaction and tuning condensers are "live" and must be set back from the panel, but great sensitivity partly compensates for this.

the panel, but he hasn't treated the band-spreader in the same way. That's probably your trouble, C. A. W. Anyway, this hand-capacity business has me beat in some cases—I don't know anything about radio (or so I tell myself when I meet some of these diseases that seem incurable).

Nine readers out of ten take my hints and write to say that all is well. The tenth—well, I keep up a sort of correspondence course with *him* for several years. Re C. A. W., he has yet another trouble. When he uses a speaker he gets a kind of microphonic noise that he thinks is coming from the screened-grid detector. He doesn't get it when using phones or when the same valve is in his S.T.500. It doesn't matter where the speaker is placed: it still happens.

Sorry, but all I can think of at the moment is—change the valve and see what happens.

P. T. (Co. Waterford) inquires: "Is it absolutely necessary to get an Amateur Call-Book if one wants to send Q S L's. to amateurs ?" No, it isn't. You can always forward the card to their national radio society, with postage for forwarding. The R. S. G. B. will always accept cards for British transmitters.

An Obvious Remedy.

Next question: "If I disconnect the grid leak from my one-valver I get terrible motor-boating. Is there something wrong ?" Don't disconnect it, my dear chap !

Lastly: "Which are better for the one-valver—low- or high-resistance phones ?" Nothing to choose, P. T., assuming, of course, that you mean low-resistance phones with a suitable step-down transformer.

L. W. J. (Sheffield) has a two-valver to which he wants to add an S.G. stage. I'm going to harp on this subject again very shortly, but, meanwhile, study the words of wisdom that I spilt in the issue of May 26th, 1934. That will give you all you need to get on with. Re your remarks on hand capacity—the very best cure for difficult cases like yours *is* an S.G. stage.

L. B. (Stapleford) is rather keen on covering the whole of the short-wave spectrum with a single coil and a wavechange scheme. But let me quote him: "I have come up against a snag, and that is that no matter how I try to short my grid coil out with a crocodile clip or vary my aerial coupling with a small condenser, the wavelength never varies more than about 5 metres."

Well, L. B., I don't know why you expect it to vary much when you alter your aerial coupling; but, regarding the other business, I should say it must be a very, very dud crocodile clip ! Seriously, you must have gone astray in the wiring somehow—it's against all the fundamental laws of radio !

Short out half of a 40-metre coil and you *should* be down somewhere in the region of 25 metres. You would be well advised to give up the idea of wave-changing with a single coil, though. I have never been keen on the idea.

The Single-Signal Super.

J. T. (Lake, I.O.W.) wants to make a compact 5-metre receiver, and wonders whether he can use the two halves of a Class B valve as detector and "quencher." Shouldn't think so, J. T.—it doesn't sound too good to me.

G. W. G. (Ipswich) suggests, in the course of a long letter, that I should explain what a "single-signal" superhet is.

It's this way. The ordinary C.W. receiver, tuned to a signal when it is oscillating, will produce the familiar squeal—high note, down to zero beat, up again on the other side. Thus it really receives *two* signals—one on either side of the zero-beat position. Elaborate circuit planning will eliminate one half of the beat, so that you will only hear the note on one side of zero beat and will obtain almost dead silence on the other.

That, of course, reduces the interference by exactly 50 per cent.

SHORT-WAVE NEWS

IT is interesting to note how many of the Colonies and Dominions are adopting the plan of re-radiating or relaying the Empire broadcasts. One of the latest additions to the ranks is Lagos, West Africa. Freetown, Sierra Leone, has already installed a successful equipment, and the Lagos gear is to be on the same lines. In this case the programmes are not re-radiated, but are relayed to the subscribers' homes.

The charge, including installation and provision of loudspeaker, is 5s. per month, and local broadcast news of interest will be interspersed with the Empire programmes. We shan't hear much more of "Exiles of Empire" if this sort of thing continues. They'll know more about things than we do at home—*we* rarely listen to the Empire programmes ourselves.

Excellent Conditions.

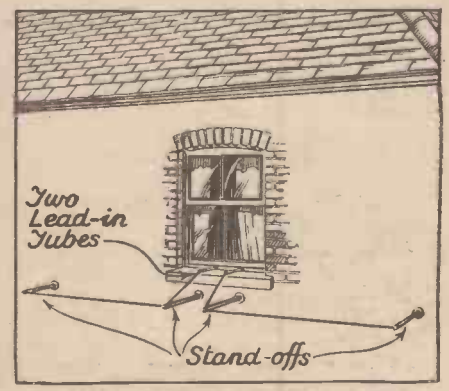
Jamaica reports excellent results from the Empire station: so excellent, in fact, that I am told, unofficially, that the erection of their own radio station will possibly be delayed in consequence.

Conditions, as I write, are quite extraordinarily good. Americans from all over the continent have been pouring in, especially on the shorter wave-bands, and the reception of the West Coast amateurs on 20 metres has been phenomenal.

Incidentally (although I haven't confessed to it), I have been taking the first lap of my summer (?) holiday on the South Coast, and have been listening down there. I find things just as lively there as I do at home, although I have an idea that a rather different set of stations is received there.

The best time to receive the West Coast of America, just at present, is between 5 and 8.30 p.m. By the time this appears in print they should also be coming over between 6 and 8 a.m. Many of the amateurs in

AN AERIAL TO TRY



An aerial arranged as in this diagram will give interesting results, even if the horizontal arms are not a quarter-wave in length. The two leads-in should be connected to an aerial coil, which should be tuned to give the best signals on any given band.

that part of the States use telephony, and can only be distinguished from the nearer ones by a persistent kind of "quick fading" that makes them a little difficult to follow.

The 25-metre band has been livelier of late than it has been for some months. Pittsburg (W 8 X K) is actually stronger there than he is on 19·72 metres, which, as you can well imagine, is saying something.

Other stations to look for on "25" are Wayne (W 2 X E) on 25·36; Winnipeg (C J R X) on 25·6 (when Pontoise isn't on that wave !), and Hauhuku, Hawaii (K I O), who may sometimes be heard on 25·63 metres round about midnight.

It is disappointing to find that relatively little use is made of the 31-metre band nowadays. So many of the stations that are huddled together on the 49-metre band would give an even better programme service on 31; yet there are barely a dozen stations in that neighbourhood, and it is rare to hear more than four of these at any given time.

As a kind of off-set to this we have more and more stations working outside the actual broadcast bands, especially between 31 and 40 metres. At times they are badly hashed up by commercials, but many of them are fortunately clear. Among those are Lima, Peru (O A 4 A C), on 38·36 metres; Geneva (H B P) on 38·47; Rabat, of course, on 37·3; and others such as Guayaquil, Ecuador (H C-2 J S B), on 38·2.

W. L. S.

Spread Your Wings!

Says JOHN SCOTT-TAGGART

. . . . . Now you have the chance to read what your favourite radio designer thinks about flying. He is an enthusiastic amateur pilot of considerable experience, having owned no fewer than five planes.

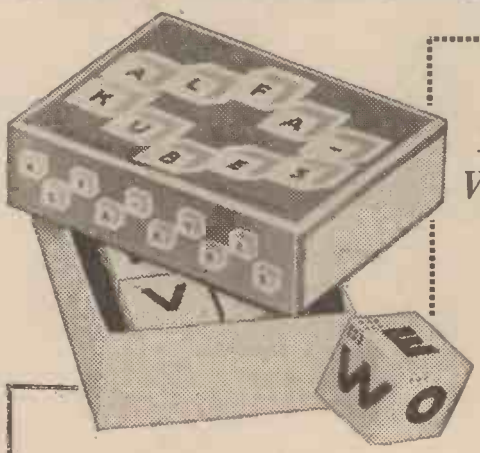
. . . . . AERO AND AIRWAYS is the new monthly aviation magazine, full of readable articles by such people as H. L. Brook, Capt. F. McDermott, Charles Dixon, W. O. Manning, G. W. Ferguson, Pauline Gower, and others. Owen Cathcart-Jones is Consulting Editor.

. . . . . Special features in the May Issue are a Jubilee Review of Aviation; Maps of the Empire Air Routes and Great Britain's Internal Routes, Full List of Aerodromes open on Empire Air Day; Continental Time Tables—in fact, seventy-two pages packed full of interesting aviation news and views.

AERO AND AIRWAYS

Everything in Aviation for . . . . . Everybody *In the May Issue* - - 1/-

THE LATEST CRAZE



New Novelty Word-Making Dice Game!

Can you spell? You don't need to be a first-class speller to enjoy the new and breezy game of making words and scoring points with ALFA-KUBES—but the better you spell!—and the more quickly—the bigger will be your score. ALFA-KUBES are six square dice, each with six different letters—and each letter is given a numerical value from one to six. The game is just to throw your ALFA-KUBES as you would ordinary dice and then make up a word quickly from the letters turned up. You score by adding together the "pips" of the word you make.

ALFA-KUBES

Of all Newsagents, Booksellers, Stores and Toy Shops. **1/-**

for the MODERN "MAGIC THREE"

The WEARITE H.F. CHOKE

Type H.F.P.

A highly efficient iron-cored H.F. Choke completely screened providing absolute freedom from inter-action with adjacent components.

CHARACTERISTICS.

Range of effective Impedance, 15–2,500 metres.
Self-capacity, 4·5 m-mfds. (Approx.)
Inductance, 255,000 m-h.
D.C. resistance, 300 ohms (Approx.)

PRICE **3/6**

Registered Trade Mark

WEARITE COMPONENTS

that modernize any set . . .

WEARITE "UNIVERSAL" COIL (Standard & Type "A")

These Universal Coils will bring your set up-to-date whatever the present circuit. Equally suitable for H.F., Aerial or Band Pass Tuning. Range 180-550 and 750-1,000 metres. Says a user:—

". . . for selectivity, range and simplicity is all that could be desired. I log more stations than ever I hoped to."

5/-

THE WEARITE IRON-CORED WAVE TRAP COIL UNIT

Here is a wave-trap coil that really does its job. With ·0005 Variable Condenser and a Switch, you have a Unit that will cut out that interfering station with ease—and no loss of volume from the wanted station! It works on any Set—"Super," "Straight" or "Short-Waver." Coil unit as shown.

A suitable Wearite Switch is the G.S.P. Price 1/-.

PRICE **7/6**

COUPON

Please send me a copy of your latest Booklet P834 containing full technical data on Coils, Chokes, Transformers, etc., and also Blue Prints of "Teamster" Receivers.

To Messrs. Wright & Weaire, Ltd., 740, High Road, Tottenham, N.17.

Name.....

Address.....

P.W. 11/5/35 .....

CA 6875

A FRIENDLY WARNING TO THE B.B.C.

Some Constructive Suggestions Concerning Television and Programme Control

By LOOKER-ON

WITHIN a comparatively short period two events of capital importance to British broadcasting have occurred. And their occurrence has possibly, if not probably, rendered much of the content of the articles I have recently written out of date. The first of these events was the publication of the Report of the Television Committee. The second was the resignation of Colonel Dawnay from the post of Controller of Programmes.

The Future of Television.

Of the possible results of the Television Report it is hard at this stage to speak. The data is incomplete; the recommendations are untried; the medium itself is in the experimental stage. But one thing stands out like some Everest above surrounding foothills: that this new development, with all its potentialities, has been handed over to the care of the British Broadcasting Corporation, which must, from this time, shoulder television along with its many other burdens. It would be pleasant if its first television activity took the form of final and complete removal of any suspicion that the Corporation has no basic belief in television.

Mr. Moseley, in his recent book, made many statements about the B.B.C. To grant his claim to be the man who saved television for the Union Jack would be simultaneously to raise a smile, if partly of admiration of his nerve! But the attitude of the B.B.C. engineers towards television requires explanation if it is not to be condemned by default as at best unimaginative; at the worst, pig-headed. However, now that television is admitted to have arrived, even though it rest as yet on a distant horizon, obstructionism, whether deliberate or merely obscurantist, must stop, and stop with a jolt. It may be years, it may be decades before television replaces ordinary broadcasting.

A Very Important Branch.

The expert who, a year ago, said "fifty years at least" now states "ten at least" with equal certainty to himself, if not quite the same to his lay audience. But that it will come is certain. And once it becomes a generally practical proposition, let there be no mistake about it, the listener will no longer listen to "blind" wireless than he will go at this day to a "dumb" film. Silent pictures and aural radio will go together to the scrap-heap; regretted, perhaps, but definitely dead. One dimension cannot compete with two, once two have been experienced, however crudely and imperfectly.

Therefore the B.B.C. cannot rest content with the "creation" on paper of a new "branch." Its staff must, one and all, be trained mentally and technically for a vast though gradual change-over.

The cinema industry lost about twenty-five years of artistic development when the talkies came in. It shows every sign of repeating the absurd process when colour comes in. The B.B.C. should beware lest television brings that fate upon British broadcasting. It will do so if television is either tucked away in a corner, despised and rejected and starved, or, equivalently, if it is allowed to run its own road in the hands of a few enthusiasts, gorged, flattered, and treated like a spoiled child, because it is "the new thing."

No one who has had any contact with Colonel Dawnay can fail to regret his retirement on every personal ground.

A VERY POPULAR TRIO

The Carlyle Cousins, experts in syncopated rhythm, caught by the camera during a rehearsal. Note the microphone in front of the piano.

His charm, his conscientiousness, his zeal are alike beyond question. His abilities in other fields have been amply proved.

The truth of the matter is, of course, that broadcasting is now too great a thing to be controlled and learned simultaneously. Colonel Dawnay was too conscientious to try to control without learning. His breakdown was the inevitable result of continual overwork in an unfamiliar environment. He deserves, and will have, every listener's sympathy.

But every listener should be prepared to make his influence felt against the repetition of such an experiment—possibly, in another case, with someone who might attempt to control without bothering to learn.

The Board of Governors, and perhaps future Directors-General, supply sufficient leaven from the great outside world. The control of programmes should be the greatest prize open to the B.B.C. staff. And if there are not always several possible candidates for such a position there is something very seriously wrong with the recruitment of that staff. The Controller of Programmes is, or should be, the creative hub of the B.B.C. He must initiate as well as control. He must ride the whirlwind as well as direct the storm. He must know the business of broadcasting from A to Z.

This knowledge is unattainable without many years of routine service given to the Corporation, providing the experience which alone can make application of that knowledge a practical possibility.

The New Appointment.

Major Gladstone Murray's brief interregnum stirred the face of the waters. Rumour has it that, in addition, so many peaceful dovecotes were fluttered that much opposition can be anticipated to his reappointment when Colonel Dawnay returns to the Army in the autumn. Rumour proverbially lies. Yet proverbs are not invariably true. Any alternative appointment that is made from the ranks of the distinguished "outsiders" will need considerable justification.

And it may be worth while here to add that the business of the B.B.C. is to broadcast programmes—and not politics. To appoint a Controller of Programmes on any political basis whatsoever would be a very definite breach of faith to every licence holder in the country.

WITH THE EXPERIMENTER

(*Continued from page 247.*)

suppose for a moment there will be much respect in your ensuing epithet.

As soon as the external loudspeaker is fitted you will find occasions when the internal one is not wanted. This is easy enough to provide for, of course. A make-and-break switch in series with the loudspeaker and the secondary winding will do the trick.

What you have to guard against especially with a high-power pentode, is the disconnection of the external loudspeaker when the internal one is being also disconnected. One or other must be in circuit all the time.

The best thing is to make a rule that you never switch out the internal loudspeaker unless you have first made sure the external loudspeaker is already connected up.

My poor friend Bunny wanted an external loudspeaker so that he could listen in a different room from his somewhat irascible uncle. Well, that is one use for an external. But another and to me much more interesting use is for more realistic reproduction from two loudspeakers in the same room.

I don't pretend to know why two loudspeakers should sound better than one. But it is so—at least, in my experience it is. Perhaps because the sound is better diffused—less directional.

Wonders of the Vacuum

by JOHN SCOTT-TAGGART
M.I.E.E., F.Inst.P., Fel. I.R.E.

WHEN Manchester falls foul of Aristotle, that's news. And at the moment of writing everyone in this great northern city is absorbed in nothing, talking of nothing and scrutinising glass vessels containing nothing.

Never before has the vacuum received so much publicity. Even people who hitherto have thought a vacuum merely a device for cleaning carpets are now aware of the vast usefulness of emptiness in science and industry.

In fact, in Manchester there is much ado about "nothing." And the reason is that the Institute of Physics is holding its first great "Physics-in-Industry" Conference—an enterprise "to emphasise the important part which Physics plays in modern industrial life."

For three days we are demonstrating to Manchester the revolution in industry created by vacuum-tube devices, for that is the selected subject of this great Conference. Since all readers of POPULAR WIRELESS cannot go to this capital of industrialism, I have been asked by the Editor to jot down some of my impressions.

"The vacuum has given us radio. It has solved for us television. Great motors are controlled by it. Our houses and streets are lighted by it. Horse races are timed by it and burglars caught by it," says Mr. Scott-Taggart, in telling us something of the wonders of modern electrical and optical science.

A Slight Misunderstanding.

I arrived here one Thursday morning, and —by some queer misunderstanding with the taxi-driver—was taken, not to the Physics Exhibition, but to the great Dog Show which apparently opened the same morning.

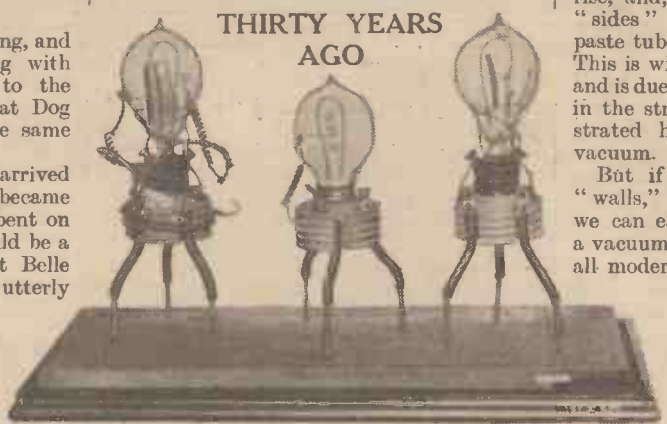
Hurriedly correcting the error, I arrived at the University and immediately became swallowed up by the eager throng bent on learning about the vacuum. It would be a little unfair on our dumb friends at Belle Vue Gardens to say the scene was utterly different. In many ways there was a close resemblance.

We have here in the Conference our St. Bernards of Physics, learned, high-domed, almost silent savants. We also have our yapping little Poms who think Eddington small beer and Einstein a back number. But this we all show—a dog-like devotion to the vacuum.

It has given us radio. It has solved for us television. Great motors are controlled by it. Our houses and streets are lighted by it. Horse races are timed by it and burglars caught by it. *Ex vacus semper ali quid novo.*

And yet Aristotle, famous Greek philosopher, declared that "Nature abhors a vacuum." That fallacious dictum makes us almost abhor Aristotle. To the modern scientist it seems all Greek. The whole universe is simply a vacuum, with here and there specks of worlds floating about in the empty space. Nature, in fact, adores—rather than abhors—a vacuum. And if the good lady had shares in a valve factory—even one outside the Ring—she would adore the vacuum even more.

Of course, what Aristotle was getting at was this: If we suck, draw or pull air out of a given space, other matter will try its best to get into the "vacuum" created.



Very early examples of the vacuum as applied to radio—Fleming two-electrode valves, which were the direct result of the inventor's investigations into the Edison shadow effect noticed in the carbon filament lamp.

I like to think of the great Athenian discovering this mighty truth while sitting on the Acropolis sucking an ice-cream soda through a straw. (After all, Newton was picturesquely struck with the idea of gravity when an apple fell on his head.)

When you or I or Aristotle suck at the end of a straw we draw up the air inside it; this leaves a "vacuum" in the tube, and since Nature abhors this the ice-cream soda rushes up to fill the vacuum.

If we go on sucking—and most of us unashamedly do—we imbibe a mouthful of the liquid and more rushes up the straw to take its place; it does this because if it did not do so a vacuum would be created in the straw.

The whole thing can be explained more scientifically by saying that the air presses on everything with a weight of 16 lb. per square inch. The air weighs on the surface of the ice-cream soda in the glass. But if the straw is lying idle in the glass the air is also "weighing" down the straw. If, however, we remove the air by sucking up the tube, the weight of air on the surface of the ice-cream soda forces the liquid up the tube into the mouth.

The Result of Air Pressure.

If the straw gets stopped up at the bottom end or bent or otherwise obstructed, and you suck up the tube, the liquid cannot rise, and, instead, the straw collapses; its "sides" fall in and it resembles a tooth-paste tube on which someone has trodden. This is within the experience of all suckers and is due to the great air pressure squashing in the straw. Nature, in fact, has demonstrated her abhorrence of a threatened vacuum.

But if we make a tube with strong "walls," stop the end up and suck hard, we can easily defeat Nature and produce a vacuum. Many electric lamps and nearly all modern valves are simply glass bottles (they are even called bottles by the jejune) from which the air has been very thoroughly sucked.

Air is useful stuff to breathe, even in Manchester, but remarkable things can be done in an empty bottle. The incandescent lamp was the first great industrial application of the vacuum allied to electricity. A wire or filament is heated in the vacuum to a white heat. The wire does not burn out—or evaporate—at any rate, for, say, a thousand hours' use.

When a filament is hot it gives off heat, light and, if hot enough, electrons.

(*Continued on next page.*)

WONDERS OF THE VACUUM

(*Continued from previous page.*)

In a lamp we ignore the electrons. We have also to ignore the heat. In fact, only a small portion of the energy is useful as light, but research is always being directed to increasing the useful proportion of energy.

Heat and light, like wireless waves, are radiations in that all-pervading, mysterious, much-debated medium the "ether," which exists even in a vacuum. The difference in each case is one of wavelength. An incandescent lamp gives off radiations of a wide variety of wavelength.

We have the ultra-violet "rays," which are invisible but will tan your skin and sterilise the milk you drink.

Then come the colours of the visible "spectrum," which are the colours of the rainbow.

Beyond these visible colours come more invisible rays—the "infra-reds." These can be focused like light rays and may be used for invisible signalling. In fact, Marconi's show at this Exhibition a complete two-way telephone outfit using a modulated invisible searchlight of infra-red rays. I have talked on it myself, and it works excellently over several miles.

The Eye as a "Detector."

Then come the heat waves. As you know, electric lamps give out heat. Touch one and feel. But this is all wasteful, and there has been most interesting lecturing describing how research has progressed in the search for less wasteful methods of producing light.

Actually the eye as a "detector" responds only to a very narrow range of wavelengths. What particular colour of light would you say the eye could see best?

The answer is "green." To either side of the green part of the spectrum the eye falls off in sensitivity. For example, it is less able to see blue or red, while the ultra-violets and infra-reds are invisible. But although the eye cannot see these rays, certain instruments such as photo-electric cells *can* detect them, but that is another story. Just for the moment let us talk lamps.

All "hot" lamps give out waves of very wide range, and so most of the energy is wasted. But by increasing the temperature more and more visible light is emitted. This applies up to a temperature of 6,500 degrees—after which the proportion of visible light begins to fall off.

Most bodies, however, "go up in smoke" long before 6,500 degrees. So we have to search for some material which will stand a very high temperature for a long time without vaporising. The metal tungsten is used in the modern incandescent lamp.

The rate of "evaporation" of the tungsten is reduced by heating it in an inert gas (i.e. one that will not act chemically on the tungsten). The modern lamp is therefore not a vacuum lamp as it used to be. It is "gas-filled." To reduce the loss of heat by contact with the gas (i.e. by "convection") the filament is made in the form of a spiral.

Getting Increased Efficiency.

Very recently it is claimed that by once more spiralling the spiral filament an efficiency increase of 15 per cent to 20 per cent in the smaller lamps has been obtained.

THE RESULTS OF MODERN RESEARCH

"... to assess the 'brilliant' results of research you have only to stand near the centre of Piccadilly Circus or Leicester Square ..." says Mr. Scott-Taggart. Here is a view of Piccadilly Circus at night.

Such lamps are being called "coiled-coil" lamps.

A very different method of producing light consists in passing electricity through a "tube" of glass or silica (which is also transparent) containing a gas or vapour. Such a tube is known as a discharge tube and was used for producing light long before Swan and Edison developed the incandescent-filament lamp.

Now we are tending to go back to these gaseous-discharge tubes, not for house lighting at present, but for street lighting and, of course, for those advertising signs which almost blind us with their gorgeous blues and reds and other excitingly vivid hues.

Such lamps can be made to give far more light than the usual "temperature radiators" for a given expenditure of power. The electricity passes not through a nearly perfect vacuum, as in the case of a wireless valve, but through a partial vacuum. They are "vacuum tubes" in a sense, and to assess the "brilliant" results of research you have only to stand near the centre of Piccadilly Circus or Leicester Square—or in almost any other place where you are likely to get run over. Nature abhors these vacuous "signs," but she seems content to do nothing about it.

THRILLS WITH THE KELSEY ADAPTOR

By LESLIE W. ORTON.

HOWEVER good my short-wave receiver may be, I find it an impossibility to keep it for long—I simply have to take it down and build something new! This complaint (for what else can it be?), which seems to be experienced by most short-wave listeners, has just resulted in my constructing the Kelsey adaptor—twenty-five-shilling model, although it did not cost me that to construct, as I had most of the parts on hand. My arrangement had several modifications, but gives excellent results nevertheless.

W-2 X A F, our old Schenectady friend, was the first "DX" station I tuned in, if America can be called "DX" on short waves. Volume was excellent, and I listened to a good dance programme.

American Stations Easily Received.

A slight twist of the dial and another American station did its utmost to burst my ear-drums—it was W-1 X A Z at Springfield, which was broadcasting Miss Marie Cowell, the lady reporter who was busy interviewing some celebrity before the "mike."

Another twist of the dial and I was listening to W-3 X A U relaying W C A U in Philadelphia.

At "one minute past four o'clock, Eastern Standard Time," to use the 2 X A F announcer's term, that station closed down and I did likewise.

Unfortunately, it was some days before I had another chance to try the adaptor out. However, when I did so conditions were again extremely good. I commenced by tuning in the veteran short-wave enthusiasts' favourite station, P C J, at Eindhoven, Holland, which, I might add for the benefit of those new to short waves, announces in a terrific number of languages, including English.

A Dance Programme.

Next came W-8 X K with a dance programme which included such tunes as "Moon Shadow," "Tiger Rag," "Everyday," "When my Prince Charming Comes Along" and "Limehouse Blues"—who said that short waves were not entertaining?—and an excellent xylophone player rendered the programme doubly entertaining. Just below W-8 X K I tuned in W-2 X E in New York City at moderate strength.

On the 49-metre band I found that V Q-7 L O, Nairobi, was coming in at fine

(*Continued on page 259.*)

REDUCING the NUMBER OF VALVES

Four-valve superhets equal to the old seven- or twelve-valvers are quite common to-day. But there are possibilities of even further reduction on the lines explained on this page.

By JOHN WAYNE

THERE has been a very decided tendency during the past year or so to reduce the number of valves employed in the average receiver. So great has been the progress that, as many readers are aware, it is to-day possible to build a really efficient superhet having no more than four valves.

It used to be considered in the past that a superhet could not be built without using at least six valves, these being first detector, oscillator, two intermediate-frequency amplifiers, second detector and low-frequency amplifier, and in America, even to-day, receivers having upwards of eleven valves are by no means uncommon.

The important point to be borne in mind, however, is that the average British four-valve superhet is often more efficient than the American twelve-valver. The reasons for this need not be discussed at the present juncture, but it is evident from the facts that the time has arrived when we should not describe a set by the number of valves, but rather by the number of *stages*.

Even to state how many stages a receiver comprises is not sufficient, since there are many other factors which should be taken into consideration, but this is clearly better than the old method of description.

Using Multi-Electrode Valves.

To return for a moment to the popular style of four-valve superhet of modern design, this very often has so many as seven stages, these being first detector and oscillator, intermediate frequency, second detector, automatic volume control, first L.F. and output.

The functions of the first two stages are performed by a frequency changer of the pentagrid, heptode or octode type; intermediate-frequency amplification is performed by a high-frequency pentode; second detector, A.V.C. and preliminary L.F. amplification are looked after by a double-diode triode or double-diode pentode; and final (or power) L.F. amplification is carried out by a power or pentode valve.

THE STAGES OF EVOLUTION

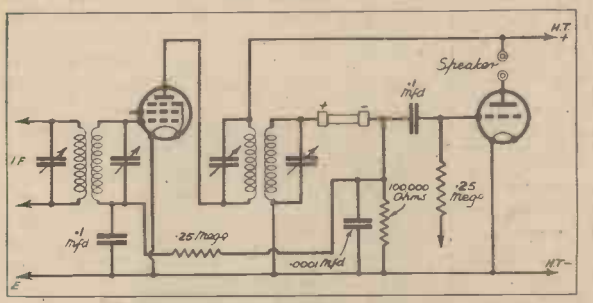


Fig. 1. The first step in the reduction of the number of valves is to replace the second detector by a metal rectifier.

Having produced a high-efficiency multi-stage receiver with so few valves, one might well ask if it is not possible to go even further and use fewer valves still. As a matter of fact, it is possible to effect a further reduction in the number of valves, and the writer has recently carried out a number of interesting and successful experiments with this object in view.

A rather obvious and simple method of eliminating one valve is by using a high-frequency metal rectifier for second detection and A.V.C., as shown in Fig. 1. This idea is only really useful in the case of superhets, and where reaction is not employed, because in any other instance an appreciable loss in output must necessarily result.

Additionally, the H.F. metal detector is not so efficient on wavelengths below some 600 metres as it is on the higher wavelengths. In a superhet, of course, the second detector only deals with frequencies corresponding with about 2,000 metres, in which conditions it proves extremely efficient.

It might fairly be argued that a valve is not actually saved by using this form of second detection, since there is a loss of L.F. amplification which would have been provided by the triode or pentode portion of the multiple double-diode valve.

At the same time it should be pointed out that, by using a high-ratio transformer between the "Westector" and the output pentode, it is possible fully to load the latter valve, and therefore to obtain as great an output as would otherwise have been the case.

A Suggested Reflex Arrangement.

There is another side to this argument, however, for the intermediate L.F. amplification can easily be obtained, if desired, by the employment of a "reflex" arrangement; in other words, by feeding the audio-frequency output of the second detector back to the grid of the I.F. valve, so using the latter in a dual capacity.

The circuit arrangement described will more readily be understood by referring to Fig. 2, where all the relevant connections are shown.

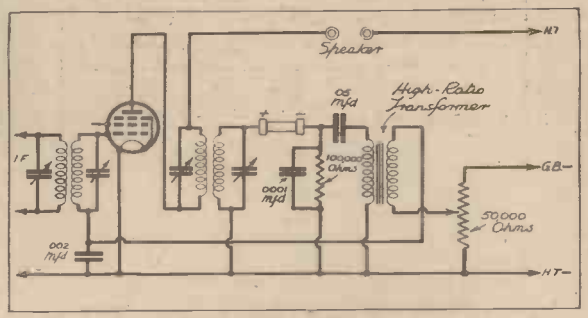


Fig. 2. By reflexing the I.F. amplifier the output valve can be dispensed with.

At first glance it might appear that the H.F. pentode could not function satisfactorily at both high and low frequencies, but this idea is not quite correct. Provided that the audio output from the second detector is not very high, the H.F. pentode gives a really useful measure of low-frequency amplification.

The only real difficulty with this arrangement occurs when the H.F. valve is of the variable-mu type, its bias voltage being controlled by means of a potentiometer or variable

(*Continued on page 262.*)

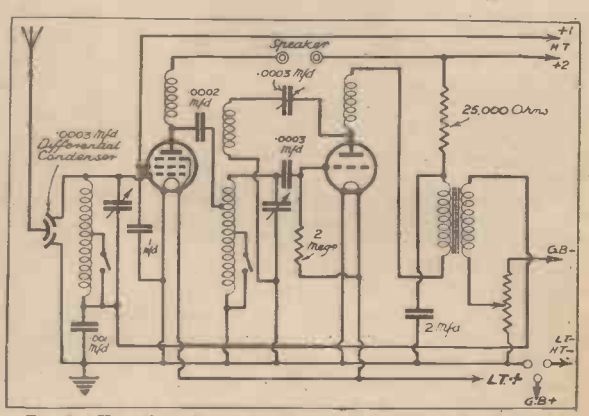


Fig. 3. How the scheme can be used to provide a reflex circuit of the H.F., det., and pentode type.

UNUSUAL UNITS

Everyone interested in the technical side of radio is familiar with the ohm, the ampere and the volt. Here are details of less common, but none the less interesting, electrical units.

By J. F. STIRLING

OHM, ampere, volt. They are long-familiar words to all of us. Terms, indeed, which every technically minded radio and electrical amateur has known intimately from the earliest days of his scientific novitiate.

Ohm, ampere, volt. Grander, more universal and enduring than any material monument are these scientific, for-all-time memorials of a famous trio of electrical pioneers. Without such units the vast structure of electrical science could never have been successfully erected.

JAMES CLERK-MAXWELL, on whose researches practically the whole of radio is based, and who is commemorated by the unit called the "maxwell."

The lesser-used and more-specialised electrical units, such as the farad, the microfarad and the henry, are also expressions which all wireless workers are well familiar with.

An Elizabethan Philosopher.

But how many amateurs, I wonder, have ever come across the *gilbert*, the *oersted*, the *maxwell*, the *mho* and the *kelvin*. Not many, I imagine, because most of these unusual units, although they were adopted with enthusiasm by scientists at the time of their introduction, are nowadays far removed from common usage.

Like the majority of the well-known electrical units, most of these little-used units commemorate famous electricians of the past. The gilbert, the oersted and the maxwell, for instance, are expressions which have been applied respectively in honour of William Gilbert, the famous philosopher of Queen Elizabeth's time, who first scientifically investigated magnetism; Christian Oersted, the discoverer of electro-magnetism; and James Clerk-Maxwell, the famous electrical mathematician upon whose theories of electric waves wireless science is founded.

THE "GILBERT." The unit known as the "gilbert" derives its name from the famous Elizabethan writer on magnetism, William Gilbert.

The gilbert is a unit of magnetism, being the measure of magneto-motive force. The maxwell is also a magnetic unit—the unit of magnetic induction; whilst the oersted is the unit of reluctance. The three units are all intimately related to one another, as you see from the expression:

$$\text{Maxwells} = \frac{\text{Gilberts}}{\text{Oersteds}}.$$

Of these three units the little-known oersted is the most interesting because it is the magnetic equivalent of the ohm. Magnetic reluctance is the resistance of a magnetic circuit to the spread of magnetic flux through it, and, like the ohm (the unit of electrical resistance), the value of the oersted is dependent upon the nature of the metal, its length and its cross-sectional area. Reluctance, in plain words, is merely magnetic resistance. Thus an oersted is the ohm's "sister" unit.

Another unusual unit is the *weber*. Indeed, so unusual is this unit that it is never heard of nowadays. Nevertheless, during the last century it constituted the unit of magnetic flux. One weber was the magnetic flux generated by a current of one ampere flowing through a circuit possessing an inductance of one henry.

The weber has more or less been superseded by the maxwell in modern usage.

Have you ever come across the *mho?* It is a rather mystifying term, but when you look at it closely you will observe that it is nothing more than our old friend the ohm spelt backwards.

The Gauss and Weber.

The mho is the unit of electrical *conductance*. Conductance is the converse of resistance. Hence the mho is the converse of the ohm. You can say that a particular circuit has so many ohms resistance or so many mhos conductance. Both expressions signify the same thing, and, in calibrating electrical measuring instruments, it would be an easy matter to scale them in mhos instead of in ohms.

For various reasons, however, the ohm has proved to be the more popular and useful unit of the two. Hence it is nowadays used almost exclusively in preference to the mho.

The *gauss* constitutes a unit which is not very much heard of these days. It is the unit of intensity of a magnetic field. The gauss and the weber were originally applied in honour of Professors Gauss and Weber, who were not only among the earliest inventors of the telegraph, but who were the first to appreciate the great advantages to be derived from the use of electrical standard units.

The *kelvin*, an electrical standard coined in memory of that great electrical pioneer and scientist Lord Kelvin, is a unit whose use appears to be on the increase at the present day rather than on the decrease. It is a unit of electrical energy, and, as adopted by the Board of Trade, is equivalent to the kilowatt hour. The kilowatt hour is, as its name implies, equal to a thousand watt hours, the watt hour being defined as "the work done in one hour by a current of one ampere flowing at an electrical pressure of one volt."

Few radio constructors would recognise the henry, which, of course, is the well-known unit of inductance, under the name of *secohm*. Yet for many years the secohm was invariably employed as the unit of electrical inductance. Its name was changed to *henry* in 1893 by the Chicago International Conference in honour of Joseph Henry, the famous American electrical pioneer. The *secohm* is now practically obsolete, although one does come across it now and again.

A Naval Name.

An interesting practical unit—and, to most amateur radio enthusiasts, quite an unknown one—is the *jar*, which is a unit of capacity used in the British Navy. One jar equals one nine-hundredth of a microfarad. The unit is obviously quite an arbitrary one. Nevertheless, it is found to be a very convenient unit in the practical dealing with all types of small condensers.

The jar is a "private" unit, however. As such it is not usually to be come across in electrical text-books and similar writings.

LORD KELVIN. This great pioneer gives his name to a unit of electrical energy known as the "kelvin."

Everyone nowadays has heard of the *bel* and the *decibel*, the scientific units of sound intensity which are applied in modern sound measurements in honour of Alexander Graham Bell, the inventor of the telephone, the photophone and other sound-producing and transmitting instruments. Only television enthusiasts, however, are familiar with two light units, the *lux* and the *lumen*.

The lux is another name for the old "metre-candle" light unit, which is the amount of illumination derived from a burning candle placed at a distance of one metre. The lumen, on the other hand, is a more scientific unit, representing the amount of light energy falling upon a given surface. The lumen is a unit which, in the future, will become anything but unusual.

There are still electrical and physical characteristics whose units are nameless. Where, for instance, are the names for units of elastance, elastivity, reluctivity, remanence and other electrical properties? You will look in vain for them. Such units are not sufficiently well used to necessitate the application of a distinctive and commemorative name to them.

Another Opportunity To Secure Our Great New

PRESENTATION VOLUME

RESERVE YOUR COPY NOW

The Wireless Book Everybody Needs

So many requests have been received from readers who failed to take advantage of our previous offer of Scott-Taggart's great radio masterpiece that we have decided to provide readers with a further opportunity to obtain this superb volume on bargain terms. If you want to take advantage of this new opportunity you must reserve your copy without delay.

"The BOOK OF PRACTICAL RADIO" has been acclaimed as the finest all-round book on radio yet offered to the public.

Every radio enthusiast needs this book; it is a sure guide to knowledge and success in everything connected with the practical side of wireless, written by a man whose qualifications are unrivalled, the greatest living expert in set designing to-day.

Over 800,000 copies of John Scott-Taggart's books have been bought by the wireless public!

JOHN SCOTT-TAGGART'S
BOOK of PRACTICAL RADIO

"THE BOOK OF PRACTICAL RADIO" represents the essence of the author's 22 years of practical radio experience as applied to radio receivers.

If you obtain this book it will be like having John Scott-Taggart at your side, showing you how to get the most out of your set, how to construct a design and how to put right a set which does not work correctly.

Over 50,000 copies of the author's "Manual of Modern Radio" were completely sold out, and there are thousands who cannot now obtain the book through delaying to accept our offer. Fill up the forms to-day!

Although this book is absolutely self-contained, no one who already has the "Manual of Modern Radio" will want to miss this new book. It is beautifully bound in green cloth and printed in clear type, and gives practical information and advice which every person interested in radio requires.

Incidentally, there is a special section dealing with S.T. sets, so that, if you possess one or intend to do so, this book will be invaluable.

There is a wealth of "how-to-do" sketches and photographs, and the whole atmosphere of the book is intensely practical.

There are 384 pages, including 63 art plates; sketches and diagrams accompany the text.

HOW TO OBTAIN THIS BOOK

First of all you must write your name and address on Form 1, which is just an ordinary label, on which you must stick a ½d. stamp. Then fill in Form 2, which is your reservation form. Then send these two forms to POPULAR WIRELESS. When they are received in our office, you will be sent a Gift Voucher on which to qualify for your "Book of Practical Radio."

There are four spaces on this Gift Voucher on which you will have to stick four Gift Tokens cut from the bottom left-hand corner of the last page of reading matter of POPULAR WIRELESS for four consecutive weeks. When this Gift Voucher is complete—i.e. after four weeks—you are asked to send a P.O. for 2/10 (2/6 with 4d. stamp attached). This 2/10 is to cover the cost of carriage and delivery to your door, cardboard container for packing, and insurance. "The Book of Practical Radio" can only be supplied to readers who complete the necessary Gift Voucher.

As this volume is only available to regular readers, if you have not placed a regular order for POPULAR WIRELESS you must do so at once. This offer applies only to readers residing in Great Britain and Northern Ireland. Irish Free State readers will be liable for any import duty imposed.

1

½d. Stamp must be affixed here by **YOU**

Name.....

Full Address .....

.....

.....

2

POST AT ONCE

RESERVATION FORM

Applicants must complete label above and affix halfpenny stamp in space provided. Fill in this Reservation Form and send with label to:

POPULAR WIRELESS Presentation Book Dept. (G.P.O. Box No. 184a), Cobb's Court, Broadway, London, E.C.4.

I hereby apply for GIFT VOUCHER and request you to reserve for me in accordance with your special offer the presentation "Book of Practical Radio." I have given a standing order to my newsagent to supply POPULAR WIRELESS regularly each week

Reader's Name.....
(State Mr., Mrs. or Miss)

Full Address.....

.....

Reader's Signature.....

Newsagent.....

Address .....

For Office Use

PLEASE WRITE IN CAPITAL LETTERS.
YOU MUST FILL IN LABEL ABOVE and send with the Reservation Form in unsealed envelope bearing halfpenny stamp.

TIME BASE SPEEDOMETERS

First details of some particularly ingenious ideas which may prove very beneficial in the future in greatly simplifying the adjustment of cathode-ray television outfits.

AS far as I am aware, the ideas put forward in this article are quite new; at the same time it is quite likely that some of them will be found in common use in the near future. Experimenters may find that the suggestions lead to fruitful research. Be that as it may, the general theme of time base speedometers is a particularly interesting one on which to ruminate.

First of all, perhaps I had better explain just what is meant by the description "time base speedometer." The idea first occurred to me when I was searching for a means of indicating when a cathode-ray television outfit was scanning at the right number of lines and giving the correct number of frames per second.

As you know, both of these factors are controlled by separate time bases, the main feature of which is a fixed condenser which is continually being charged and then suddenly discharged at a fixed rate. Dealing with one of the bases, it is a fact that the number of times the condenser is discharged per second corresponds exactly with the number of times the cathode-ray beam is deflected across the fluorescent screen per second.

A Simple Scheme.

All we need do, then, to tell when scanning is going on at the right speed is to insert an indicator in a resonant circuit and couple this resonant circuit to the condenser-discharge valve. (The circuit being, of course, resonant at the desired frequency.)

There are many ways that could be devised for coupling the resonant circuit to the valve anode circuit, for a certain amount of reactance in the latter is not detrimental to its satisfactory working. Also, since the discharge is a fairly heavy one, the drawing off of a small amount of power to work the indicator is not likely to cause any difficulties.

Magnetic coupling, via a transformer, for instance, could be adopted; or entirely capacitative coupling would be practicable. Then, again, feeding the indicator via an extra valve whose grid circuit was connected to the discharge valve might have valuable advantages.

(In all fairness I must mention that this idea of a buffer valve was suggested by a colleague when I was describing the original ideas to him.)

Using A Neon Indicator.

Well, now, having got our resonant circuit coupled to the discharge valve, the next thing is to consider what form the indicator should take. There are a number of schemes that could be adopted.

Probably the simplest of all would be a neon tube. A striking voltage could be applied independently to it, and it could be controlled very much on the same lines as a neon indicator in a visual-tuning device. Alternatively a meter could be employed, such as a sensitive microammeter. In this instance a maximum reading would be obtained when the correct scanning speed was attained.

A third method of indication, and the one that appeals to me most, although it would no doubt be the most difficult to put into practice, is by means of a tuned reed.

This reed would be magnetically operated by the resonant circuit, and being also resonant itself to one frequency would introduce, as it were, a second tuned circuit. A sharp indication of the critical frequency would therefore be obtained.

So much for the indication of one fixed and predetermined frequency of scanning. A true speedometer is one that indicates speeds over a certain range, and not when just one figure is reached.

An indicator of this type might not appear at first sight to be of much more use for television, but it must be remembered that in years to come, when television is broadcast from all countries, we may wish to adapt our cathode-ray viewers to all sorts of differing systems.

An Adjustable Device.

Also an indicator for one frequency only will not show you whether you are operating above or below the desired figure. And it cannot be denied that to "watch the approach" to the correct frequency would be a great advantage.

To change our fixed-frequency indicator to a real speedometer only requires the resonance of the circuit to be variable. This could be done either continuously or in fixed steps.

Tapped chokes, fixed condensers of various values or variable condensers would all enable the frequency of resonance to be altered. All that would then remain to be done would be to calibrate the device, much in the same way as an ordinary wavemeter is calibrated.

Anyone who has worked with a cathode-ray tube will appreciate the difficulty of knowing how near one is to the correct scanning speeds. It is difficult enough with slow speeds such as those used in 30-line television, and with high-definition work becomes a big problem.

A. S. C.

COSSOR AND CAMBRIDGE

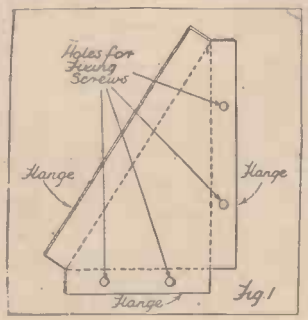
A technician explaining how the huge Cossor television tube works to Cambridge undergraduates who were visiting the Highbury Works.

MAKING PANEL BRACKETS

IN constructing a receiver one may frequently require brackets of non-standard size or shape for supporting a panel or terminal strip; a sloping panel, for example, would need brackets of the correct angle in place of the usual right-angle variety.

Strong but neat brackets can be constructed quite easily from sheet metal, such as tin-plate, of suitable gauge. First the size of bracket required should be marked out on the sheet, leaving a margin of, say, half an inch all round; this margin is to form a flange, so the sheet should be cut out as shown in Fig. 1, where the dotted line is the actual size of the finished bracket. The holes for the fixing screws should be drilled now, and if desired nuts can be soldered on behind the holes so that the panel can be bolted on without having to fumble for nuts behind it. It only remains now to bend the flanges at right angles to the sheet (when making a pair of brackets be careful to bend the flanges in opposite directions so as to make one right- and one left-handed), and solder the corners where the flanges meet. The finished bracket will appear as in Fig. 2, and if a specially strong job is required the corners can be joined more securely by soldering a piece of tinned copper wire into the angle.

For small sizes, e.g. for mounting aerial and earth-terminal strips, pick-up sockets, or local-distance switch at the back of a receiver, the width of flange would naturally be reduced; ¼ in. will be found quite enough if 6 B.A. fixing bolts used.



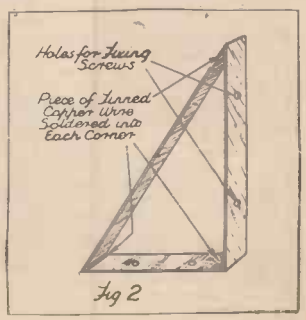


Fig. 1 shows the bracket marked out on sheet metal, while Fig. 2 shows it in finished form.

RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos. Every care will be taken to return M.S.S. not accepted for publication. A stamped, addressed envelope must be sent with every article.

All Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

All inquiries concerning advertising rates, etc., to be addressed to the Advertisement Offices, John Carpenter House, John Carpenter Street, London, E.C.4.

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialties described may be the subjects of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS

THAT LAST TRACE OF HUM.

D. G. (Cowdenbeath.)—"The range and power of the set amaze me, and it seems as though I shall never tire of the variety of programmes it brings. My only criticism—if you can call it such—is the slight hum when receiving the local station.

"I am not grumbling, because it is quite a small point compared with the performance of the set on all other stations; but if there is a way of removing this from the 'National Eckersley' A.C. Three I should naturally like to know of it."

You appear to be suffering from modulation hum, but we think you will find that the addition of two fixed condensers will eliminate this completely.

The condensers should be of ·1-mfd. capacity, and they should be rated to work on 250 volts A.C.

Mount the pair of the ·1 mfds. near the *secondary* of the mains transformer.

One condenser should be connected on one side to the 60-milliamp terminal of the mains transformer. The other terminal of this condenser should be joined to the 250-volt terminal on the transformer (that terminal marked "250 volt" which is nearer).

The other ·1-mfd. condenser should be treated in the same way, viz. connected on one side to the 60-milliamp terminal of the transformer, and on the other side to the *remaining* 250-volt terminal of the mains transformer.

THE LIMIT TO SENSITIVITY.

C. M. (Hastings).—"My S.T.500 is so magnificently selective and powerful that I want to know if it would be possible to ensure reception of home stations with this set if I take it to West Africa in June, when I take up an appointment there.

"It seems to me that, although reports from that part of the world are not encouraging—in fact, it is said that medium-wave wireless reception of European stations is impossible—a set like this only wants 'enlarging,' as it were, by extra valves to make it capable of receiving many thousands of miles."

It is not as simple as that, because the sensitivity of a receiver can never be increased beyond a certain limit; not because its valves are incapable of handling the required amplification, but because the unwanted noises become too obtrusive.

You will appreciate the fact that every receiver, apart from amplifying the voltages developed in its aerial circuit, receives also a certain amount of mush or background noise. This is due to the fact that atmospheric and other electrical disturbances also set up small voltages in any receiving aerial, and these can be heard as a faint whisper, during ordinary programme intervals, if listened for carefully. There is also a very faint background noise traceable to the operation of the valves themselves—too faint to be noticed in the ordinary way, but nevertheless continuously present.

Any such mush or background noise is amplified at the same time as the programme being received.

Therefore, unless the required signal develops a voltage in the aerial circuit which is far greater than the voltages due to mush, valves, etc., the required signal inevitably becomes submerged in the background noises. In West Africa the received programme voltage would be immeasurably small and the atmospheric-noise voltages large and continuous.

(In point of fact, it is possible to achieve such enormous amplification that, so far as *strength* goes, distance is no longer important; but what is important is the above-mentioned condition—that the station desired shall be capable of producing at the receiving aerial voltages considerably in excess of those due to mush and background.)

So it comes down to this—neither the strength nor selectivity of the set, however increased, can avail to produce an enjoyable programme unless the input to the aerial is reasonably strong—a condition that would not be fulfilled in West Africa from European stations.

A POPULAR STAR

A recent photograph of Lew Stone, the popular dance band conductor, who now broadcasts from the Hollywood in London.

DOES GRID CURRENT MATTER?

S. S. (Inverness).—"To settle an argument, please say whether or not there will be any harm done by grid current flowing in a Q.P.P. amplifying valve."

It depends on what exactly you mean by "Q.P.P." If you are using the term to indicate that form of quiescent push-pull amplification that was popular before Class B, and which differed from the latter in its necessity for a high grid bias, it can be said that the grid current must *not* be allowed to flow.

The object of the high grid bias applied in that form of Q.P.P. circuit was to prevent the flow of grid current.

ALTERING THE LAYOUT.

R. P. O. (Trowse, Norwich).—"The set was called 'Universal' Three, and built from your paper over a year ago. I altered it to fit a pick-up switch on panel, and have been getting good results except for a hum.

"I do not think the pick-up should cause this, because I used screened wire. Would it be due to bringing the detector nearer to the panel?

"Apart from the hum, the results are very good."

Mains sets are very apt to protest against alterations in layout by creating hum. And what may appear to be a small alteration may, in fact, make a big difference to clarity of reproduction.

Your screened pick-up wiring may not be a complete protection against hum, so we should try the following:

First, restore the original layout exactly. Then, having achieved the no-hum condition, place a pick-up switch close up to the valve holder so that its wiring can be *very short*. Work the switch by an extension rod to the panel, and you should have no difficulty from hum.

L.T. FROM AN H.T. UNIT?

J. S. (Norton Canes, Staffordshire).—"I have an A.C. unit which is to supply H.T. only, but upon reading in a back number of 'P.W.' I saw how, by winding a few turns of wire round one of the transformers inside this unit, I could obtain a free dial light.

"This I have tried and have proved it a success. Upon placing a voltmeter across these leads I find that the reading is TWO volts.

"This is the filament voltage that I use by means of an accumulator, which has to be charged and PAID for (joke!), so I ask you:

"Could these leads be used to supply L.T.?"

Alas! no. You cannot get the necessary filament current by "winding a few turns of wire." That current from the extra winding is A.C., and you would either have to use a 4-volt winding and A.C. valves or to rectify it before you could use your battery valves. You cannot use A.C. current for battery-valve filaments without getting a tremendous amount of hum.

THRILLS WITH THE KELSEY ADAPTOR

(*Continued from page 254.*)

strength, and once again I left the dials and sat back in my chair to enjoy a programme of tunes, including "Smoke Gets in your Eyes," "Hot Cha Cha," "On the Isle of Capri" and, once again, "Tiger Rag"—a tune which is extremely popular overseas.

Later in the evening I searched for the Cuban stations C O H and C O C, but, possibly owing to adverse conditions, I heard nothing.

On the other hand, Rio de Janeiro, Brazil, came in at excellent strength upon the 31-metre band. Incidentally, he gave two different station calls. P R F 5 I and P R F 1—which is correct I don't know.

From this station I heard all about the discovery of coal in Brazil and—not so black!—two Brazilian tunes sung by Miss Victoria Bredia and played by Miss Amunda Bersha (I sincerely hope I have spelt their names correctly!).

A little later I tuned in T I E P in Costa Rica, and thence I turned to Y V 5 B M O and Y V 4 R C in Venezuela.

Many other stations were also received, and although volume was not so great as when I coupled my short-wave receiver to the power amplifiers it was quite sufficient for the average listener—and how much more thrilling than listening to London and medium-wave stations!

ON THE TEST BENCH

"P.W." reviews some recent products from the radio manufacturers.

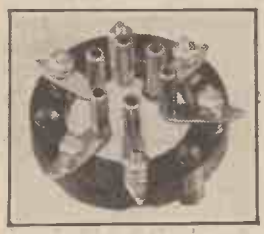
B.T.S. SHORT-WAVE COILS.

WE have recently received a range of plug-in short-wave coils from Messrs. British Television Supplies, Bush House, London, W.C.2. There are three coils in the range, and these are the SPA, which covers a band of 13–26 metres and costs 4s. 6d.; the SPC, which also costs 4s. 6d. and has a range of 24–52 metres; and the SPD, which covers 46–96 metres and costs 5s.

There is also a six-pin base, price 2s., for these coils.

There are two features in their construction which particularly appeal to us. Each of the coils has its former extended at the top end as a large milled ring. This makes it very easy to handle them, and they

AN EFFICIENT HOLDER



The skeltonised type of B.T.S. six-pin coil holder for use with their special short-wave coils illustrated on this page.

can be pulled out of the holder or placed in it without the necessity of the fingers coming into contact with the windings.

It has often happened with some other makes of short-wave coils that an otherwise quite good job has been spoiled by the omission of some similar facility. Short-wave windings are much more critical than those of the medium or long waves, and accidental displacement of a turn or two may throw the tuning-range out quite a bit. As will have been gathered, this cannot occur with the B.T.S. coils, and it should further be noted that the windings are tightly carried in grooves as an additional safeguard.

The other special point is that the wave-range of each coil is clearly marked in black figures on white discs on the top of the component, where it can be seen at a glance while the coil is actually in the set.

The six-pin base is well skeletonised to reduce solid dielectric to a minimum, although it is adequately substantial in design. There are three stand-off insulators integrally moulded into the base which raise the holder well above baseboard level. Thus the constructor is saved the trouble of fixing up a bracket or in some other way of arranging to raise the holder, as is often quite essential, especially where the metallised type of baseboard is employed. Non-soldering set builders will also be pleased to learn that neat terminals are fitted.

One of our short-wave experts has tested these B.T.S. short-wave coils, and he reports that he finds them to be satisfactory in every way. We can, therefore, recommend them to our readers for both set and adaptor use.

THE REJECTOSTAT.

ELECTRICAL interference undoubtedly affords a problem of some considerable magnitude. The reception of tens of thousands of listeners is ruined by this scourge. It is true that there is an interference committee which was set up some long time ago to deal with the matter. But it is still sitting, and there are few indications that it will be doing anything else during this present generation!

In the meantime, the listener has to do what he can himself. There is no legislation compelling owners of interfering electrical apparatus to take any steps, and there is no organised attempt being made by any official body on a large scale to detect the sources of interference so that private co-operative action can be taken.

Frequently, therefore, sources of disturbance cannot be got at, so the only thing is to try to stop the radiations from getting into the set. Not at all an easy matter.

But considerable success has been obtained by means of the Rejectostat principle invented by Messrs. Kolster-Brandes, Ltd. In fact, we believe that, properly applied, this ensures a freedom from direct radiated and re-radiated forms of interference in practically all cases, and in every instance there must be a great diminution of it.

The Rejectostat apparatus is being sold by Messrs. Belling & Lee, Ltd., Cambridge Arterial Road, Enfield, Middlesex. It is manufactured by Messrs Kolster-Brandes, but this special Belling-Lee Type 1227 has been modified to the specification of Messrs. Belling & Lee, so that it can conveniently be used in conjunction with any ordinary receiver.

All those who are troubled by electrical interference should make a point of securing a copy of the book published by Messrs. Belling & Lee, entitled "The Rejectostat System." It is fully

FOR 13 TO 96 METRES

These three B.T.S. short-wave coils cover the whole of the more useful range of short waves. They have six-pin bases.

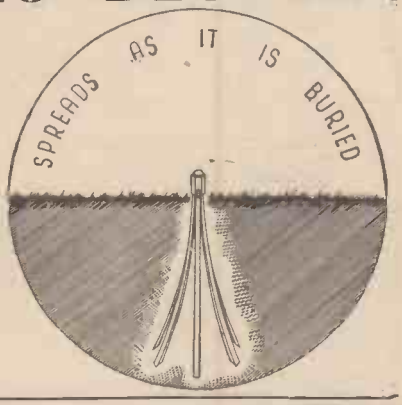
explanatory and includes a number of clear sketches and diagrams. Here is an extract from this well-produced little book which describes the theory of the Rejectostat principle:

"The theory on which the Rejectostat system is based can be described briefly as follows: a field of interference is set up by any source or conductor of interference, and unless precautions are taken any receiver that is operated within that field, or of which the aerial or earth system enters the field, will reproduce noises dependent on the sensitivity of the set and the form of the interference, etc. The strength of this interfering field becomes much weaker in a vertical direction, and as a rule can hardly be detected at a distance of 20 feet above the

(Continued on next page.)

AN EARTH-ROD 6 TIMES BETTER!

Do not let faulty earthing ruin your enjoyment of the forthcoming Jubilee broadcasts. Get a "SPREAD-BURY" and forget your earth. Six spreading contacts in one, six chances to one that you earth in ground with efficient conductive properties. A great improvement on rigid earth-rods. Available at all stores and radio dealers.



3/- SPREAD-BURY

200% GREATER EARTH CONTACT

WRITE FOR FULL DETAILS TO DEPT. S.B.2.

Z. ELECTRIC LAMP & SUPPLIES CO., LTD., 21, NEWMAN STREET, LONDON, W.1.

THE GAME OF THE CENTURY!

Made by John Waddington Ltd., Makers of LEXICON, GRANDFATHER'S WHISKERS, etc.

3/6

At all Stationers, Toyshops and Booksellers

The World's Biggest Jig-Saw and the World's Greatest Travel Game

Thrilling! Exciting! Enthralling! Instructive! This jolly game is all that and more. It takes you round the world, to lands of romance and mysticism, gives you hours of fun and entertainment and teaches you all sorts of interesting things about the positions of the most important places of the globe. In all there are 500 square inches of Jig-Saw puzzle to be made into a Map of the World. It is an education in itself.

MAPPA-MUNDI

The QUINTESSENCE of QUALITY

DO NOT ATTEMPT TO JUDGE QUALITY BY PRICE ALONE

If the price is right, that is one essential. But your real interest is quality. Make sure of this by buying 362 Valves. Entirely British. Non-microphonic No mains hum

BATTERY PRICES. H.HL. & L. 3/6. Power 4/-. Super Power 4/6. SG & VS 7/6. VP2 9/-. Pentode Type 10/-. BA & BX 9/-.

MAINS PRICES. ACHL4 7/6. P625 8/-. ACPX4 9/-. ACSG4 & ACVS4 12/6. ACME & ACHM 13/-. RB41 7/6. RB42 10/-.

If your dealer is not an appointed 362 Agent, do not be persuaded to buy the next best. Post free direct from makers, cash with order.

The 362, Radio Valve Co., Ltd., Dept. X, Stoneham Road, London, E.5. *'Phone: Clissold* 1294.

H.L.2 3/6

The only valve with a 6 months guarantee

ON THE TEST BENCH

(Continued from previous page.)

source or conductor of interference. The trouble is that, when a receiver is operated in the usual way, it is probably situated in a strong interfering field set up either by mains-conducted interference or direct radiation, and some part of the aerial and earth system, not to mention the wiring of the receiver itself, is introducing these unwanted noises to the set with disastrous effects. The Rejectostat principle consists in erecting an efficient aerial outside the field of interference and in coupling it to the receiver by means of a highly efficient screened transmission line. Some form of low-loss screened down-leads has been in use for a considerable time, but it should be pointed out that it is not possible to use more than 30 feet of these cables without seriously upsetting reception, whereas the Rejectostat equipment is so designed that losses are hardly detectable with lengths of *approved* cable of hundreds of yards. Thus the Rejectostat has the great advantage that the effective portion of the aerial can be erected anywhere within a quarter of a mile of the receiver, and it *should* be possible to find a suitable location for the aerial wire.

Minimising Capacity Losses.

"In order to minimise the losses due to the inherent capacity of the cable which acts as the transmission line between the aerial wire and the receiver, a step-down transformer is fitted close to the aerial and out of the field of interference. This unit transforms the picked-up energy at aerial-circuit impedance to that at approximately a tenth of the value and applies it to the two conductors of a twin cable which composes the transmission line. The two conductors in this cable are exactly balanced with respect to earth, so any pick-up on one of the wires is cancelled by a similar pick-up on the other. This point, in addition to the metal screening outside the cable, accounts for the fact that with a properly erected system there should be no pick-up on the transmission line itself. The transmission line normally consists of a twisted twin flex with cotton separation, with a metal-braided external shield over which there is a sheath of gutta-percha to render the whole waterproof.

"The receiver is coupled to the transmission line by means of a second transformer in which the line impedance is raised to match that of the input circuit of the receiver itself. Between the primary and secondary windings of this unit an electrostatic screen has been introduced, so that capacitative coupling is reduced and so that the full benefit of the balanced conductors is obtained when they are inductively coupled to the high-impedance windings. The receiver Rejectostat thus consists of a high-frequency transformer and is housed in a pressed metal case which can be conveniently screwed on

FOR REJECTING INTERFERENCE

The two component parts of the Belling-Lee Rejectostat for the elimination of static interference. One is arranged at each end of a special down-lead, which is available at 8d. per yard.

the wall behind the receiver. On it are three terminals for connection to the bottom end of the transmission line; a screened lead leaves the side of the unit which is terminated in two plugs for connecting to the receiver."

We must emphasise the fact that this is only a brief extract. There are descriptive illustrations to augment the text, and many other interesting and valuable aspects of the principle are dealt with in the book.

Another Valuable Application.

In addition to the elimination of interference, the Rejectostat has another valuable application. With the aid of the system it is possible to work a number of sets from the one aerial without there being any interaction.

To equip an aerial and set with a Rejectostat a Belling-Lee Aerial Rejectostat and a Receiver Rejectostat are required. These cost 15s. and 12s. 6d. respectively, and are shown in the accompanying photo. In addition, a length of cable is needed. The Belling-Lee Type C is suitable for all purposes and sells at 8d. per yard.

We have a set in operation which is seriously troubled with electrical interference radiated from adjacent lifts, letter openers and other such things Obviously, this set was just what was wanted to test the Rejectostat.

Applying the principle exactly in accordance with the instructions resulted in a complete wipe-out of this interference, and as a larger aerial could be employed there was actually a better pick-up. On another set situated in another neighbourhood there was a slight reduction in pick-up, but this was much more than compensated for by the freedom from electrical disturbances—probably due in this case to a re-radiated tram-car interference.

NOVEL BROADCAST

ON May 22nd there will be in the Midland programme for the first time an electrical recording of a talk broadcast directly to the Empire. The subject and speaker have a special appeal to Birmingham, for the Heavy Section of the British Industries Fair is to be described by the Rt. Hon. Neville Chamberlain, Chancellor of the Exchequer, who has been a Birmingham M.P. since 1918.

A Thousand Stands.

Hitherto, except in Wembley year, the Fair at Castle Bromwich has coincided with the London section. This year there will be about a thousand stands, and a new feature will be the Exhibition Road, 2,000 feet long and paved with wood, rubber, steel, tarmac, concrete and stone—so that different kinds of road surface may be compared. H.R.H. the Prince of Wales is to be there on May 23rd.

* * *

Some representative foreign visitors to the Fair will take part in the feature "At the Langleys'" on May 23rd (Midland Regional). This follows the line of "In Town To-night," except that it is more intimate and has an imaginative framework.

PETO-SCOTT EVERYTHING RADIO—CASH C.O.D. or EASY TERMS

SEND US YOUR ENQUIRIES FOR EVERYTHING RADIO

Miscellaneous Components, Parts, Kits, Finished Receivers or Accessories for Cash or C.O.D. or H.P. on our system of Easy Payments. Send us a list of your wants. We will quote you by return. C.O.D. orders value over 10/- sent carriage and post charges paid (GREAT BRITAIN ONLY). Hire Purchase Terms are NOT available to Irish or Overseas customers.

GRAHAM FARISH **SENSITY SUPER**

Complete Kit for building, less Valves, Cabinet and Speaker. Send only 5/-; balance in 11 monthly payments of 5/-. Cash or C.O.D. Carriage Paid, £2/13/6. With Valves and Peto-Scott Sensity Super Cabinet (illustrated). Cash or C.O.D. Carriage Paid, £5/1/0, or 12 monthly payments of 9/3.

5/- DOWN

PILOT AUTHOR KITS

MODERNISE *your* MAGIC 3

CONVERSION KIT — CASH or C.O.D. Carriage Paid £1:13:6 or YOURS FOR 5/-

Complete Kit of Components to convert your existing Magic 3 to the 1935 version, less valves.

and 6 monthly payments of 5/3.

New DISCOVERER H.F.P.3

PETO-SCOTT SHORT-WAVER

WORLD WIDE PROGRAMME RECEPTION MADE EASY! Covering 13-96 metres, with a 12,000-mile tuning range, this wonderful Peto-Scott Short-waver will enable YOU to know the thrill of programme reception from every corner of the world. Embodies many new technical refinements . . . . . the most up-to-date short-wave circuit extant.

FINISHED INSTRUMENT *READY to PLAY*

Comprises H.F. PENTODE, DETECTOR and PENTODE OUTPUT VALVES. Individually tested on American S.W. stations. Complete with Valves and walnut veneered Cabinet illustrated, less Batteries. Cash or C.O.D. Carriage Paid £8/0/0, or 10/- down and 12 monthly payments of 14/-. Send for fully illustrated leaflet.

10/- DOWN

S.T.600

KIT "A" CASH or C.O.D. Carriage Paid £4:19:6 or YOURS FOR 7/6

Complete kit of components, as first specified by Mr. John Scott-Taggart, copy of "Popular Wireless" with free full-size Blue Print and S.T.'s 100 STATION "SPOT-ON" DIAL and other "P.W." FREE GIFT, less valves, cabinet and speaker.

and 12 monthly payments of 8/6.

KIT "B." As for Kit "A," but including set of 4 first specified valves, less cabinet and speaker. Cash or C.O.D. Carriage Paid, £7/4/0, or 12 monthly payments of 13/3.

KIT "CT." As for Kit "A," but including valves and Peto-Scott S.T.600 Table Cabinet, less speaker. Cash or C.O.D. Carriage Paid, £8/1/6, or 12 monthly payments of 14/9.

KIT "CC." As for Kit "A," but including valves, and Peto-Scott S.T.600 Consolette Cabinet, with speaker baffle and battery shelf, but less speaker. Cash or C.O.D. Carriage Paid, £8/19/0, or 12 monthly payments of 16/6.

FINISHED INSTRUMENTS

Exact to Mr. John Scott-Taggart's First Specification. Aerial tested on actual broadcast. With B.V.A. Valves and Peto-Scott Specified Cabinets.

TABLE MODEL with lift-up lid. Cash or C.O.D. Carr. Pd., £9/12/6, or 12 monthly payments of 17/9.

CONSOLETTE MODEL with Peto-Scott S.I. P.M. Speaker. Cash or C.O.D. Carriage Paid, £11/11/0, or 12 monthly payments of 21/3.

S.T.600 A.C. VERSION

KIT "A" CASH or C.O.D. Carriage Paid £9:15:0 or YOURS FOR 17/9 and 11 monthly payments of 18/-.

Comprises complete Kit of Components as FIRST specified by Mr. John Scott-Taggart, less Valves, Cabinet and Speaker.

Set of 3 Specified Valves £2 13 6

W.B. STENTORIAN STANDARD

For Power, Pentode and Class B. Send only 2/6, balance in 11 monthly payments of 3/-. Cash or C.O.D. Carriage Paid, £1/12/6. W.B. Stentorian Senior. Cash or C.O.D. Carriage Paid, £2/2/0, or 2/6 deposit and 11 monthly payments of 4/-. W.B. Stentorian Baby. Cash or C.O.D. Carriage Paid, £1/2/6, or 2/6 deposit and 9 monthly payments of 2/6.

2/6 DOWN

EVERYBODY'S KELSEY ADAPTOR

KIT "A." Author's Kits of First Specified parts, less Valve and Cabinet. Cash or C.O.D. Carriage Paid ... 22/6

1 MARCONI H.L.2 Valve as specified, 5/6.

PETO-SCOTT CO. LTD. 77, P.W.23, CITY ROAD, LONDON, E.C.1. *West End Showrooms*— 62, P.W.23, High Holborn, W.C.1. *'Phone: Clerkenwell 9406-7. 'Phone: Holborn 3248.*

ADDING A REACTOR

How the range of a "quality" receiver may be extended without upsetting its circuit.

THE quality fiend who, like myself, goes in for diode detectors and local-station reception often wishes he could join the ranks of ether combers who nightly bring in something like twenty or thirty foreign programmes.

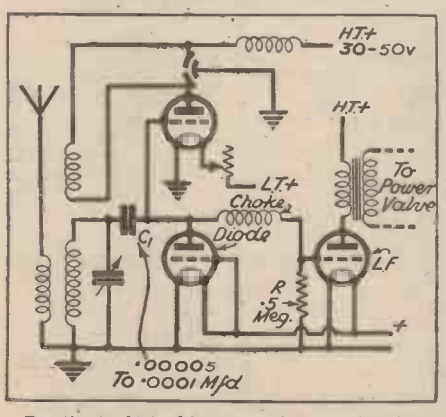
Without plenty of H.F. and its attendant disadvantages the reception seems an impossibility until the separate reactor valve is remembered.

I have just been adding a reactor to my diode, and the results are surprisingly good. The addition is easy to carry out, as can be seen from the diagram, but there are one or two points about the conversion that should be kept in mind by anyone attempting a similar addition to a family set of this description. It is obvious, for instance, that the reaction valve is connected directly across the diode.

Slight Effect on Tuning.

The capacity effects from this cause will, however, be negligible if ordinary care is taken. A slight shift of the tuning points downwards is likely to be the only effect noticed. In principle, the grid condenser and resistance should be reconsidered, but

A SEPARATE VALVE



Reaction is obtained by means of a separate valve coupled to the input of the receiver's diode.

if C_1 is not larger than ·0001, and R not greater than ·5 megohm, no effect upon the quality should be detected.

The reaction circuit is really quite normal, and any ordinary means can be taken to ensure smooth action: low H.T., 30–40 volts with a medium impedance valve, for instance.

If the main circuit arrangement has a strange appearance to a new reader I would mention that I have had it in use for several months with great satisfaction. An H.L.2 has given the best results, in the diode position, among those so far tested. A similar valve is also a highly efficient intermediate L.F.

Critical readers will no doubt seize upon the direct connection of the grid of the reaction valve to the diode as a weak point.

However, the circuit I have given works, and its operation will provide considerable entertainment.

C. J. D.

THIS week I want to start with details of a great classic that will delight the hearts of lovers of orchestral works. It is Berlioz' *Symphonie Fantastique*, and is perfectly recorded by Columbia in a series of six records. It is played by the Orchestre Symphonique and is an authentic interpretation.

The work was considered revolutionary on its production in 1830, and with its wealth of scoring is truly a very great piece of composition.

Berlioz, at the age of twenty-seven, was an implacable musical rebel, and he fell passionately in love with Harriet Smithson, an Irish actress. Although she eventually became his wife, she at first jilted him, and in a revengeful spirit the composer altered his already written "Symphonie Fantastique" so that it became a distorted reconstruction of his violent admiration for the temperamental young woman.

The programme of the score shows a morbid young musician in a frenzy of amorous despair. He takes opium, but the drug is not sufficiently strong to cause death, setting up instead strange delusions, and his sensations, emotions and reminiscences are musically translated as they pass through his feverish brain.

A Fine Series.

A fixed theme in the form of a melody denoting the beloved one runs throughout the work. Suffering and jealousy after meeting the object of his affection depict the first movement; tumult and bewilderment on meeting her at a ball, the second; dark brooding amid pastoral surroundings, the third.

In the fourth he dreams that he has murdered her and is being marched to the gallows. The "beloved" motif appears during a moment's tender reflection and is suddenly cut short by the fall of the axe.

The final movement of this terrific work is an orgy of terror. The artist is among witches and monsters who dance round his coffin, and the scene is worked up till it ends in a diabolical dance.

There is plenty of percussion in the recording, that section of the orchestra being given a great deal to do. It will tax your radiogram to the utmost, but the whole series of discs forms sheer delight to the lover of "big" orchestral music. The records are supplied in a free album, together with interesting details of the composition and facts about the composer.

* * *

A "swinger" is usually the last thing that a gramophone user wants, and nowadays, with better record manufacture, it is not often that one comes across that type of disc annoyance. But the latest issue of swingers is worthy of notice. I do not mean mechanical swingers, but the instrumental variety—none other than the "Six Swingers," a combination of hot-music players who are recording for Regal-Zonophone.

Steadily Increasing Popularity.

The first records of this combination was issued last November, and since then their recordings have steadily increased in popularity.

The band is a "house" affair specialising in "hot" rhythm, and has just recorded *Streamline Strut* and *Swing, Brother, Swing*, on MR1621, and also *Dixie After Dark* with *I'm a Hundred per cent for You* on MR1620. If you like American style rhythm playing you should certainly hear these discs.

* * *

Of a quite different type is MR1637 in the Regal-Zono list. Here we have a tuneful medley of popular hits from Jerome Kern's musical comedies, played by Arthur Young and his Youngsters. It is called *A Bouquet for Jerome Kern* and follows up the other record of the same band, "A Bouquet for George Gershwin," which was popular a short time ago

Arthur Young is a jazz pianist of no mean order, and he has gathered a band of instrumentalists to support him on these records to make a very fine disc At a shilling you will probably consider it excellent value.

* * *

There is still something lacking in the recording of many of the dance bands and their vocal stars. I mentioned last time that Bing Crosby had just recorded another of his "very best." The record was *It's Easy to Remember*, and it was certainly quite a good disc. But shortly after hearing the record I heard Bing himself via the ether from Hollywood, during one of the popular B.B.C. "Five Hours Back" programmes.

Bing sang the same number, with the same chorus effects, and, incidentally, it sounded like the same chorus personnel. I believe he and his chorus were singing "in the flesh," and that it was not a record broadcast. It was given out that it was Bing himself, but you never know nowadays. However, whether the singing was in person or via a wax, the point is that it was decidedly better than the record I had. I tried the latter over immediately afterwards, and there was quite a loss of personality in the "disc" Bing, besides a great deal of roughness added to the voice.

If the broadcast was a record (I do not think it was), then it had been most skilfully corrected, for Bing's voice was much more realistic, and the chorus had lost that harshness that crept into the record—a sort of edginess that I find not too pleasant.

It is worth while listening to those broadcasts (though they will probably stop now that summer is coming, and especially because I have seen fit to refer to them), and quite often one gets an interesting comparison between the real thing (via the ether) and the recorded facsimile.

* * *

I have been taken to task! Quite kindly, by the Synchrophone people, for my remarks the other week when I said that I had two records with the same items, the same title labelling, but with different label numbering. They point out that one of these records has a vocal refrain and the other has not. That is true, but I did not think that the fact justified the publishing of the two otherwise apparently identical recordings. However, as my correspondent pointed out, they were trying to please everybody. Incidentally, there may be some quite important and welcome news about Octacros records in the near future. I have been informed that . . . but I must not say at present. When it happens I'll let you know.

K. D. R.

REDUCING THE NUMBER OF VALVES

(*Continued from page 255.*)

resistance. Even in this case, however, the difficulty is not nearly so great as might be imagined, so long as it is not necessary to increase the bias to a fairly considerable extent.

When A.V.C. is applied to the valve the comparatively slight bias variations do not appear to affect the functioning of the valve at low frequency to any noticeable extent.

The circuit shown in Fig. 2 is by no means confined in its application to super-heterodyne receivers, and can satisfactorily be employed with ordinary "straight" sets, where a valve detector is used. Fig. 3 shows a complete "reflex" circuit of the H.F.-detector-pentode type, in which only two valves are used.

This simple and economical arrangement is perfectly satisfactory in practice, and can be recommended to all experimenters. The H.F. pentode is not of the variable-mu type, and is given a variable grid-bias voltage by means of the usual 50,000-ohm potentiometer.

The latter is not intended for use as a general volume control, however, but simply to provide the most suitable bias for efficient L.F. amplification on any transmission.

Obtaining Greater Volume.

A receiver built according to the circuit in Fig. 3 will give a reasonably good output, and sufficient volume for satisfactory operation of a moving-coil loudspeaker in a room of average size, whilst, if greater volume is desired, it is a perfectly straightforward matter to add a second L.F. stage using a super-power valve.

There are no "snags" in building a receiver round the circuit given in Fig. 3; and although it might be thought by some that "reflex" circuits are now obsolete, there are no grounds for this contention.

In fact, there is probably more justification for the use of such circuits to-day than ever before.

Although having access to every modern development, the writer is quite convinced that the "reflex" has still very much in its favour; it certainly provides ample scope for the amateur experimenter.

THAT GALLANT ADVENTURE

(*Continued from page* 248.)

Pearson, and Pearson for Brown, to substitute United for Wednesday, Irish Guards for Welsh Guards, and refer to the match as "this great International." I quite expected a passing remark about this wonderful turf at Twickenham. He was never certain about the goal-scorers; we had to wait for him to inquire who they were.

* * *

This seems hard and cruel criticism of one who in spite of everything does make a football broadcast live. No one could impart all the thrills more faithfully than he does or bring Wembley closer to everyone's home.

It struck me during the match how much more helpful it would be to listeners wishing to follow the game if the commentator, instead of using players' names, referred to them by the position they occupied on the pitch. Mistakes in identity would never happen then, there would be little or no hesitation.

The ball would move about, and listeners, naturally more familiar with a playing pitch than with any individual team of players, would follow its movements easily. There might be occasions on which to mention individual players, and the commentator would certainly have the opportunity.

* * *

Lastly, a word or two about a Saturday evening Regional item. After listening to Variety from Northampton, which wasn't variety at all, as six saxophonists held the fort practically all the time, I had a dip at No. 6 of the Microphone Tour Series. This tour, which dealt with the everyday work of the Tyne, was undoubtedly the most interesting thing of the evening.

Actuality can be very interesting. I would like to hear stacks more of it. There's something very fascinating about a ship leaving port, and Venus' departure at dusk for Bergen was no exception to the rule.

C. B.

FINDING THE SPOT

IN a cathode-ray tube the presence of the electron stream is made visible by a bright spot of light occurring where it strikes the fluorescent material with which the end of the tube is coated. The position of the spot on the fluorescent screen is determined by the voltages on the deflector plates, and it is possible for the spot to be deflected right off the screen.

Behind the Accelerator.

In these circumstances, if the spot strikes a plain part of the glass tube, it will still usually be visible, due to the glass itself becoming fluorescent. But it is possible for the stream to strike one of the electrodes inside the tube or the earth screen coating on the tube. In this case it will not be visible.

Should this be so, when connecting up apparatus for the first time, a "hunt the spot" game starts, the deflector voltages being varied more or less haphazardly in an effort to make the spot visible.

In the modern Ediswan tube this hunting process is facilitated by a small coating of fluorescent material on the cathode side of the second anode or accelerator, as it is commonly called. Should the spot not pass through the hole in this anode, a glance will show just where it is positioned, and the necessary adjustments can be made to bring the spot on to the screen. Much time is thus saved by this ingenious little refinement to the cathode-ray tube.

A. S. C.

PIANO ACCORDIONS
Write for Catalogue.
All makes, Special terms.
DALE FORTY Ltd.
106, Great Portland Street, W.1.

TECHNICAL JOTTINGS

Some notes of interest to all readers.

By Dr. J. H. T. ROBERTS, F.Ins.P.

When Television Comes.

THERE is a good deal of speculation as to what we are likely to see when the new high-definition television service comes into being. No doubt many people, without having given the matter very much thought, imagine that we shall see transmissions of actual scenes, in particular the finish of the classic horse-races and things of that kind. It is not at all sure, however, that we shall see direct television, at any rate of outdoor scenes, in the early stages. It is far more likely that the early transmissions will be confined to *films*, because this gets away from many of the very serious problems of television technique.

I expect that at first ordinary films will be used, that is to say films which have been made some considerable time before, like those we see in the cinema. As time goes on and technique improves, however, it is possible that we may have the "delayed television" which employs a film, but the film is prepared for transmission a few seconds after the actual event has taken place. This is sometimes known as the "intermediate" film.

What Shall We See?

As regards the running of the Derby or the Test Match in Australia, which we have so frequently been promised, I am afraid you are not at all likely to see either of these televised for many years to come. You may perhaps see individual scenes, more or less close-ups of a race, and you may possibly see the actual finish of the Derby, but for various reasons it is very unlikely that the progress of the race will be capable of being televised in the way in which we see it in these days on the cinema screen. However, although these various things may take time, there is no reason to expect that progress in television will not go on in the same way as in various other branches of science. It is really amazing what discoveries and improvements have been made in television even during the past three or four years, and we can do things to-day which we hardly dreamt of then.

Interference Suppressors.

I have mentioned in these Notes, once or twice before, the use of suppressors for cutting out interference in mains sets, and now comes another "suppressor" of a somewhat different kind, which is designed to eliminate interference from the Droitwich station. This new component is made by the Whiteley Electrical Radio Company, who are well known to all of you as manufacturers of the famous "Stentorian" loudspeakers.

It is claimed that this accessory, which is easily fixed to the set, will eliminate the Droitwich transmission, leaving you free for required stations. It is emphasised that it is *not* a "general-purpose" wave-trap, but has been specially designed to deal

(*Continued on next page.*)

EASY TERMS

Everything Radio supplied on the lowest terms. Send list of requirements for keen quotation. Prompt delivery.

Revitalise your set with the new

W.B. P.M. STENTORIAN SPEAKER

Senior P.M. Speaker. Cash Price £2/2/0, or 2/6 with order and 11 monthly payments of 4/-

Standard P.M. Speaker. Cash Price £1/12/6, or 2/6 with order and 11 monthly payments of 3/-.

5/- Secures delivery.

Atlas T 10/30 H.T. Eliminator and Trickle Charger combined. Cash price, £3/9/6, or 5/- with order and 12 monthly payments of 5/11.

Estd. 1925 **THE LONDON RADIO SUPPLY COMPANY** 'PHONE: NATIONAL 1977

11 OAT LANE · NOBLE STREET · LONDON, E.C.2

ELECTRADIX BARGAINS

S. G. BROWN'S BATTERY SUPERSEDER.

This provides H.T. from your L.T. 2-volt battery, rectified and smoothed. 3 tappings. A boon to those who are not on the mains.

Reduced from £3/15/-. New and Guaranteed. **37/6**

SELENIUM CELLS. Light sensitive-resistance, gold grids, moisture-proof. L to D ratio 5 to 1, mounted in bakelite, 7/6. Super model in oxy-brass, 10/-.

R.C.A. PHOTO CELLS, 25/-; B.T.P., 15/-. Secret Ray 3-guinea Burglar Alarm Kits, 36/-.

SECRET RAY CONTROLS. Raycraft set with Bridge cell, relay, and projector, 35/-.

HOME RECORDERS. Acoustic De Luxe Model, complete in makers' carton. List price, 45/-. Sale price, 21/-.

BINOCULARS AND TELESCOPES. Prisms, 55/-. Field, 40/-. Procession, 15/-. Navy Telescopes, 24" Gun type, 17/6. Hand Range Telescopes, 25/-. Stick Periscopes, 3½" × 1½", Mirror and Cover, Swivel back, 6d.

MICROPHONES AND P.A. OUTFITS. A splendid range for all purposes. For full details and prices, write for Special List, "M.P.A."

1,000 *other Bargains in our Sale List, "P," post free. Send addressed envelope.*

ELECTRADIX RADIOS,
218, UPPER THAMES ST., LONDON, E.C.4.
Telephone: Central 4611.

ENGINEERS!

256 PAGES FREE! Send to-day for this Extraordinary HAND-BOOK

LISTEN...

There *are* thousands of opportunities around you, but unless you know where they are, and just how to prepare for them, the chances are that your opportunities will pass by unheeded. Our unique Guide, "ENGINEERING OPPORTUNITIES," clearly explains the steps you *must* take if you are to secure one of the good jobs that are within your reach. Among other things, the book explains how we can quickly prepare you, in your own home, for all salary-increasing qualifications, such as **A.M.I.Mech.E., A.M.I.E.E., A.M.I.A.E., A.M.I.W.T.,** etc. The guide also gives details of over 100 courses in all branches of **Civil, Mech., Elec., Motor, Radio and Aero Engineering** and outlines the activities of our Employment Dept. Send for your copy of this unique Hand-book to-day FREE and without obligation. The book must benefit you.

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY,
101, Shakespeare House, 29/31 Oxford Street, London, W.1

TECHNICAL JOTTINGS

(*Continued from previous page.*)

with this one station. Those of you who want further information about it should consult your local dealer or the Whiteley Electrical Radio Company, Mansfield, Notts.

Are You an Experimenter?

It is surprising how few experimenters have anything in the way of what we might call experimental equipment. They may have a lot of assorted stock of odd components of all kinds, but they seldom possess any real outfit of meters, milliammeters, voltmeters and so on. I do not see how anyone can carry out any sort of experimental work in radio without a reasonable range of measuring instruments, and I think I have advised readers of these Notes before to provide themselves with at least a good voltmeter and a good milliammeter.

As a matter of fact, it is a comparatively simple matter to do so nowadays, because there are on the market various types of combined instrument in which you can

NEXT WEEK

FOR MIKES AND PICK-UPS

Details of a special two-valve amplifier of unusual interest to all constructors.

Popular Wireless

On Sale May 15th.

get everything you want at a very reasonable all-in price. Unless you can actually measure currents and voltages you are only guessing as to what is happening and are simply working in the dark.

Eliminating Hum.

Although I have more than once mentioned the elimination of alternating-current hum in mains-operated receivers, I continually get letters from readers telling me of their troubles in this direction and asking me how they can get over them.

There is no doubt, as I have said before, that A.C. hum varies very much in different conditions, and it is almost impossible to give any precise set of rules by which it can be completely done away with. The various manufacturers who make suppressor units know this only too well, and they usually give a long set of instructions telling you how to try the device in this, that or the other way, to see which is best.

The Principal Causes.

What I *can* do, however, is to go over a few of the principal causes so that you can see for yourself which is operating in your particular case.

If the grid bias applied to an amplifying valve is not correct you may find that the grid sometimes becomes positive, and this will result in hum being produced. A very obvious cause, also, of course, is the presence of an alternating-current lead close to any of the conductors in the amplifier, particularly to a grid lead: this effect is due to a capacity coupling between the grid and the alternating-current lead.

Another point which is often overlooked is the centre tapping of the filament winding in a triode valve with A.C. heating.

Balancing the Output.

Generally the filament is "balanced" by means of a tapping to the electrical centre of the secondary of the heating transformer. You will note that since the voltage applied to the filament is comparatively low, there are only a few turns on the output of the transformer; consequently the electrical centre has to be located with a good deal of care. Another way to tap off the electrical centre, if you cannot get at the centre of the winding, is to connect a potentiometer of suitable resistance across the winding and then to connect the tapping to the slider of the potentiometer, this slider being shifted about until the electrical centre is found. Incidentally this is often a more convenient way than the other, because it gives you a means of adjusting whilst the circuit is actually in operation, so that you can tell by ear the best position for the slider.

Decoupling the Grid Circuit.

If the connection from the centre tapping goes to earth via a resistance, instead of directly to earth, there will be a voltage drop in this resistance, and if you connect the lower end of the resistance (that is, the end joined to earth) through a suitable resistance to the grid circuit of the valve, you will have a means for automatically biasing the grid. This arrangement has the advantage that the bias will increase automatically with the anode current in the valve.

I should mention that it is advisable to connect the grid circuit (lower end) of the valve also to the other end of the resistance through a condenser, say 50 mfd., which is for the purpose of decoupling.

The above remarks refer to a single output valve, but if two output valves are used it is desirable to feed the two filaments from separate heater windings so that the bias can be adjusted separately for each valve.

Rating of Smoothing Chokes.

In the smoothing circuit (where the current is drawn from A.C. supply) it may be that the smoothing chokes used are not able to stand up to the current. It is important to use chokes which are generously rated for the work to be done.

Unfortunately, some of the components on the market are rated far too high and will not maintain their inductance on current loads which are even appreciably *below* those for which the manufacturers rate them. This is a very serious source of trouble. It means that whereas you think you have introduced an effective smoothing circuit or filter, the smoothing is inadequate.

MISCELLANEOUS ADVERTISEMENTS

3d. per Word

6d. per word for first words in heavy type.
6/- per line for displayed lines (12 pt. type).

Minimum Charge 3/-

Remittance must accompany order.

Advertisements for these columns are accepted up to first post WEDNESDAY MORNING for following week's issue.

Radio components and accessories advertised in these columns at below list price do not carry manufacturers' guarantee.

The Proprietors have the right to refuse or withdraw advertisements at their discretion.

Postal orders in payment for advertisements should be made payable to the Amalgamated Press, Ltd., and crossed.

All communications should be addressed to:—Advertisement Department, "Popular Wireless," John Carpenter House, John Carpenter Street, London, E.C.4.

PEARL & PEARL,
190, Bishopsgate, London, E.C.2. All the following Bargains, guaranteed new goods. Cash or C.O.D. Carriage Paid in British Isles.
TELSEN Receivers (1935 Models). Guaranteed new, in original cartons. 6-valve Super-het, A.C. model. List 14 gns. Our price 9 gns. Battery model with batteries complete. List 14 gns. Our price 9 gns.
BURGOYNE Receivers. 3-Valve Class B model. Complete with Mullard valves; Exide H.T. and L.T. batteries. M/c speaker. Artistic cabinet of highly polished walnut. Chromium fittings. Brand new in original cartons: 1935 model. List £6/10/-. Our price £3/18/6. Carr. Paid.
CROMWELL Cabinets (for set and speaker combined). Horizontal type 23in. wide, 8in. deep, 11½ in. high. Polished walnut veneer, additional baffle behind speaker grille. Only 4/11 each. Carriage fwd.
SPECIAL. Telsen Radiomag (Latest Edition) 64 pages. 4 Full-size Blue Prints for the "Economy Three," "Short-Wave Three." "Super Four" Battery receivers, and a "Quality 3-valve Amplifier." Full constructional details, many other articles of interest, sent Post Paid for 6d.
TELSEN Chokes, Coils, Condensers, etc., all at Special Reduced Prices. List "P.T." on request.
HUNDREDS of Bargains in Free List "N."
All Mail Orders Direct to
PEARL & PEARL,
190, Bishopsgate, London, E.C.2.
Telephone: Bishopsgate 1212.

WOBURN RADIO Offer following New Stock.
ALL KITS as last week.
BURGOYNE Class B three, new and in maker's sealed cartons, including Mullard valves, Drydex and Exide batteries, Magnavox 7-in. P.M. Speaker, 69 6, carriage extra. Telsen Model 474 A.C. Band-pass Three in sealed cartons arrive next week, price will be announced next issue.
WESTINGHOUSE rectifiers H.T.8 and 9, 8/9d. Transformers for H.T.8, fully shrouded, made by Standard Telephones, with 4v. 4a. C.T. at 8/6d. Chokes: 30h. 30 m.a., 3/6d.; 150h. 60 m.a., 9/-. Dubilier Electrolytics, dry, 8 mfd. 500v., 2/10d.; T.C.C. electrolytics 25 mfd. 25v., 50 mfd. 12v., 15 mfd. 100v., 1 3d.; 6 mfd. 50v., 6d.; 2 mfd. 200v. working, 1/6d. Tubulars: ·1, ·01, ·02, 6d.; ·25 mfd., 9d. Dubilier and Erie resistances, 6d. each.
BRITISH RADIOPHONE semi-curved dials, with twin dial lights, and bronze escutcheon, 3/9d. Slow-motion condensers with slow-motion dial, ·0005, ·0003, 2/11d. Short-wave slow condensers, ·0001, ·00015, ·00016, ·0002, ·00025 with dial, 3/-, without, 2/-. Bakelite reaction condensers, ·0001, ·0003, ·0005. Differentials, all sizes, 1/2d. Popular Iron cored canned coils, 2/6d. Popular Air-cored coils, canned, 1/10d.; without can, 1/6d.
WESTERN ELECTRIC Microphones, 2/3d. Mike transformers ratio 100 1, 2/3d. Electric Soldering Irons, complete with flex adaptor and rest, 1/1d., plus 6d. postage—fresh stock of these irons arriving April 28th, place order now.
HIVAC valves now stocked.
TRADE LIST NOW READY. Enclose Trade Heading and stamp.
WOBURN RADIO CO., 9, Sandland Street, W.C.1. Holborn 7289. First turning on right up Red Lion Street, from Holborn.

G.P.O. ENGINEERING DEPT. (No experience required.) Commencing £4 per week. Age 17–23. Excellent prospects. Free details of Entrance Exam. from **B.I.E.T.** (Dept. 568), 31, Oxford Street, W.1.

Book of Practical Radio 1

Printed in Great Britain and published every Wednesday by the Proprietors, THE AMALGAMATED PRESS, LTD., The Fleetway House, Farringdon Street, London, E.C.4. Advertisement Offices: John Carpenter House, John Carpenter Street, London, E.C.4. Registered for transmission by Canadian Magazine Post. Subscription Rates: Inland and Canada, 17/4 per annum. Abroad (except Canada), 19/6 per annum. Sole Agents for Australia and New Zealand: Messrs. Gordon & Gotch, Ltd.; and for South Africa: Central News Agency, Ltd. Saturday, May 11th, 1935.

S S.

SOUTHERN RADIO'S WIRELESS BARGAINS. Every Article Guaranteed New, Perfect, and Sent Post Paid.
RECEIVERS. Telsen Radiograms. Model 3550/R.G.A. Latest 1935 6-Valve Superhet. A.C. This Receiver embodies the very latest in radio. Complete with 6 valves. Mains Energised Speaker. Contained in Exquisite Cabinet with Garrard Electric Record Changer. In original Sealed Cases. £18 10. (List 32 Guineas).
TELSEN THREE-VALVE BATTERY SETS. Model S93 complete with 3 Mazda valves, in attractive Bakelite Cabinet. 30/- (List 75/-).
TELSEN "AIRMARSHAL 3" 3-Valve Battery Sets. Complete with 3 Mazda Valves, Speaker. In attractive Walnut Cabinet, 47/6. (List 98/6).
BURGOYNE CLASS B THREE-VALVE SETS. Complete with 3 Mullard Valves, Exide Batteries and Accumulator. Magnavox Moving Coil Speaker. In Magnificent Cabinet, finished in Chromium. £3 9 6.
SPEAKERS. Blue Spot Permanent-Magnet Speakers. With Universal Transformers to Suit any Circuit. 1935 Series. 99 P.M. 24/6. 45 P.M. 20/-. Celestion P.P.M.W. 16/6. Celestion Soundex, 11/- All in sealed Cartons.
ELIMINATORS. Regentone 1935 Series New and Boxed for A.C. Mains 200/250 Volts. Type W.5a, complete with Trickle Charger, 39/6. Type W1a (less Trickle Charger) to carry 30 Milliamps, 33/-. W1C (less Trickle Charger), 30/-.
CONDENSERS. Plessy 4-Gang Superhet Condensers. 0·0005 Fully Screened with Trimmers, 7/3.
Lotus 0·0005 Condensers, Fully Screened with Trimmers. Complete with Escutcheons, Dials, Knobs. 3-Gang, 11/- 2-Gang, 7/3.
COILS. Igranic Superhet 4-Coil Set (1 Osc.), 2 I.F. (with Pigtails) and 1 I.F. (Plain), 9/- per set (list 50/-). Varley Square Peak Coils with all Accessories, Type B.P.5, 2/3. Telsen Twin Matched Coils, W287, screened with switch, 7/9. Triple Matched, W288, 10/9. Telsen Twin Coil Unit, W478, 12/6. Triple W479, 17/6; W477, 17/6.
MISCELLANEOUS. Biflo Static Cut-Outs. Definitely eliminates all Interference, 2/- Lewcos Spaghetti Resistances. Assorted Capacities. New and Boxed, 1/6 per dozen. Telsen Binocular H.F. Chokes, 2/- Telsen Ace L.F. Transformers, 3:1 and 5:1, 2/9 each.
STOCKTAKING BARGAIN PARCELS. After our recent stocktaking, we gathered at our Head Office a very large number of odd lines from our various Branches. We are offering these in Parcel Lots as under:
5/- Parcel containing Components to the value of at least 20/-, including Condensers, Resistances, Coils, Wire, etc. 10 Different Ready Radio and Telsen Circuits are included with each parcel.
10/- Parcel contains Components to the value of at least 45/-, and includes Transformers, Variable Condensers, etc., etc., also Circuits as above.
Every article contained in these Bargain Parcels are of Present Day Radio use, and are Brand New and Boxed.
SOUTHERN RADIO. Branches at 271/275, High Road, Willesden Green; 46, Lisle Street, W.C.2. ALL MAIL ORDERS TO 323, Euston Road, LONDON, N.W.1.
SOUTHERN RADIO, 323, EUSTON ROAD, LONDON, N.W.1.
(Near Warren Street Tube). 'Phone Museum 6324.

BIRMINGHAM RADIOMART

SPECIALISTS IN SHORT-WAVE AND QUALITY COMPONENTS AT LOWEST PRICES.
Our stock is much too large to itemise here: From a soldering tag to a superhet, we can supply everything, and, what is more, you won't be "Caught"! Send 1½d. stamp for our latest **CATALOGUE.** No firm has larger stocks or is cheaper than

THE SQUARE DEALERS,

BIRMINGHAM RADIOMART,
19, John Bright Street, Birmingham.

LOUDSPEAKERS REPAIRED, 4/-. Blue Spot a Speciality. Transformers and Headphones, 4/-. Eliminators, Mains Transformers and Moving Coils quoted for. 24-Hour Service. Trade Discount. Clerkenwell 9069.—E. Mason, 44, East Road, London, N.1.

PREMIER SUPPLY STORES (Dept. P.A.), 20-22, High Street, Clapham, S.W.4.
ALL BARGAINS previously advised still available. Send for illustrated list.

UTILITY SALES. The "Færitone" Short-Wave two with 3 sets of coil ready made, 55/-; separate component lists of prices with diagram, 6d.
10,000 New Dario valves to clear. Detector, H.F., L.F., 2/6; Power, 3/6; S.G., Pen., 5/6; Triotron, all types, 3/-; Power, 4/-; S.G., Pen., 6/6.
DARIO 4-volt Valves. Super, H.F., Detector, R.C., L.F., 1/3.
CELESTION 45/- list 7" Permanent Magnet universal transformer, 17/6. Ditto, Lotus, 14/6.
Cash with order, 24 hours' service, carriage paid.
FÆRITONE RADIO, Færitone Corner, 57, Praed Street, London. Paddington 0251.

SPEAKER repairs, new cones, coils, and centres fitted, 5/-. Complete re-winding service mains transformers, etc. Work guaranteed.—Write Dept. X, Weedon P.L.R. Co., 80, Lonsdale Avenue, London, E.6. (Maryland 1782.)

G. Marconi

WHEN you are building that new battery set to celebrate the Jubilee, put a worthy output stage on it. Selectivity and range you will have in plenty, so match the H.F. side by really good L.F. performance, with quality, punch and economy.

We have some notes on the L.F. side of battery sets, which should be useful to every enthusiast and which we shall be pleased to send you.

WRITE TO THE VALVE DEPARTMENT, MARCONIPHONE COMPANY LIMITED, 210 TOTTENHAM COURT RD., LONDON, W.1, MENTIONING THIS PAPER.

MARCONI VALVES

THE CHOICE OF THE EXPERTS

AMAZING FREE SPEAKER OFFER!

Whereby 400–500 speakers are being given away absolutely free to first applicants. Send for full particulars. Enclose also 3d. stamps to pay for the Jubilee number of "The Radio Gold-mine," the biggest money-saver and money-maker in radio to-day **LONDON EAST CENTRAL TRADING CO.** (Dept. P.J.W.3), 23, Bartholomew Close, London, E.C.1. (National 7473.)

VAUXHALL. Magnavox permanent-magnet speakers, universal for Class B power, pentode or push-pull 7-in. cone, 16/6; 10-in., 22/-.
VAUXHALL. Magnavox energised types, 2,500 or 6,500, 10-in. cone, 22/-; 7-in. cone, 15/3. All brand new, complete with hum-bucking coils, state power or pentode. Other speakers. Send for particulars.
VAUXHALL. New Lists just issued, 3,000 bargains. New goods. Limited number available free.
VAUXHALL: Immediate delivery of all goods advertised in previous issues.
VAUXHALL-UTILITIES, 163a, Strand, London, W.C.2. Over Dennys the Booksellers, Temple Bar 9338.

The following unused Set Manufacturers' Surplus; All goods guaranteed perfect; immediate delivery.
ERIE resistors, 1-watt type, 7d.; 2-watt type, 1/2; Marconi K19 pick-ups, 22/6.
WESTINGHOUSE rectifiers, HT8, 9/6; HT9, HT10, LT4, LT5, 11/-. Regentone transformers for HT8 or HT9 with 4v.-4a. L.T. winding, 7/6.
MAINS transformers, 350-0-350v., 60 m.a., 4v.-4a., 4v.-2a., 12/6. Eliminators, outputs, 150v., 25 m.a., S.G. and detector. A.C. type with Westinghouse rectifiers, 25/-. D.C. type, 12/6. Collaro gramophone motors, 100-250v. A.C., 34/-.
ROTOROHM volume controls with switch, 2/6. B.T.H. pick-up tone arms, 3/-.
MAGNAVOX speakers, complete with hum-bucking coils, output transformers, etc., 152 (9-in. cone), 22/6; 154 (7-in. cone), 15/9. All with 2,500 or 6,500 ohm fields. Magnavox PM254, 18/-. Carriage paid, cash with order or C.O.D.
WE can supply complete Kits of specified components for the A.C. ST.600 at a competitive price.
WARD, 46, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

UNOBTAINABLE ELSEWHERE. We supply any new Receiver on Easy Terms, making a good allowance on your old goods. We pay the deposit and first instalments according to the allowance. Components and Peto-Scott Kits supplied for Cash or part-exchange.—R. Wigfield, Furlong Road, Goldthorpe, Yorks.

WANTED FOR CASH. Second-hand Wireless Parts, Sets, etc. Exchanges. Bring or send.—University Radio, Ltd., 142, Drummond St., London, N.W.1. Nr. Euston Station (L.M.S.). Phone: Museum 3810.

BANKRUPT BARGAINS. List free. 3v. kit, 15/0d. 1935 Drummer 5v. A.C. Superhets 7 gns. Vidor 8 gn. universal, £6. Many others. Celestion P.M. M.C. speakers. Soundex, 10/6d. PPM/W 16/6d Lotus P.M. 12/6d. Regentone eliminators, A.C. 30 ma., 30/0d. Telsen 28 ma. 28/6d.—Butlin, 143B, Preston Road, Brighton.

RADIO CRYSTALS. The famous "NEUTRON" Crystals, 1/- per tin; the oldest and best. Obtainable from: V. Zeitlin & Sons, Ltd., 144 Theobald's Road, London, W.C.1; Expert Radio Service, 266, High Street, Stratford, E.15; Real Radio Service, 61, Cannon Street, E.C.4; etc., etc.

ORDER FORM

The Advertisement Manager,
POPULAR WIRELESS,
John Carpenter House,
London :: E.C.4.

Please insert our/my advertisement in "Popular Wireless" for..... insertions at a charge of £ s. d. per insertion. Remittance herewith.

Signed.....

Address.....

.....

Date.....

SUPERB JUBILEE SOUVENIR BOOK

Bound in Royal Blue Suede Leather Cloth inset with Silver Panels

WONDERFUL LONDON

This superb volume presents a living picture of the world's greatest capital as it is today, described by its best writers and illustrated by the finest collection of photographic views of London, London life and London ways ever brought within the covers of a single volume. There are over 200 PHOTOGRAPHS reproduced in photogravure.

Contributors to WONDERFUL LONDON include:

ALFRED NOYES J. B. PRIESTLEY E. V. KNOX
H. V. MORTON H. M. TOMLINSON ROBERT LYND
STEPHEN GRAHAM SIR PHILIP GIBBS G. K. CHESTERTON

WONDERFUL LONDON is a triumph of beautiful printing and binding. It is a magnificent souvenir which should find a place in every home in the land. It measures 11½" × 8¾" and is 1½" thick.

6/-

On Sale at all Newsagents, Bookstalls, Booksellers, and Leading Stores.

If you have any difficulty in securing these volumes, they may be obtained direct post free, price 6/9 each, from the publishers, The Amalgamated Press, Ltd., Bear Alley, Farringdon Street, London, E.C.4.

A Beautiful Companion Souvenir Volume, recording the outstanding events in the lives of Their Majesties. Illustrated by nearly 500 photographs and 18 magnificent full colour pictures.

OUR KING AND QUEEN
6/-

POPULAR WIRELESS, May 18th, 1935. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

THE STORY OF THE VALVE

Popular Wireless

AND TELEVISION TIMES

HOW TO BUILD A TWO-VALVE AMPLIFIER
★ ★
WONDERS OF THE VACUUM
By John Scott-Taggart
★ ★
Etc., Etc.

EVERY WEDNESDAY PRICE 3D

No. 676.
Vol. XXVII.
May 18th, 1935.

AMUSING GRANDPA WITH A CRYSTAL SET
This homely group of Asiatic peasants illustrates how radio has penetrated to remote corners of the globe. No doubt the valve, which has revolutionised Western listening, will eventually follow the crystal set into the peasant dwellings of the East.

COSSOR 1935 RADIO

Incorporating "THERMOMETER" Tuning

and

ANTI-FADING CIRCUIT
HIGH SLOPE PENTODE OUTPUT
DIODE DETECTION

MODEL 364

SUPREME VALUE IN

A.C. MAINS SUPERHETS

To-day's supreme value in highly selective Receivers, this remarkable set separates stations with ease, and due to its Anti-Fading circuit 'holds' them at even volume. Its exclusive 'Thermometer' tuning gives *instant* selection of the wanted programme by means of a rising or falling column. Station names and wavelengths are plainly seen on its illuminated scale. Hear and see this remarkable Superhet at your usual Wireless Shop.

BRIEF SPECIFICATION

As illustrated with Pentagrid frequency changer, I.F. Amplifier, Double Diode Detector, High Slope Pen. Output, Full Wave Rect. "Thermometer" Twin Scales. Four-way combined On/Off, Wavechange and Pick-up Switch, Vol. Control, Mains Energised M.C. Speaker. Complete with plug and sockets for extension speaker and for pick-up. For A.C. Mains only 200/250 volts (adjust.) 40/100 cycles.

Prices do not apply in I.F.S.

11 GNS

Hire Purchase Terms: 20/- deposit and 12 monthly payments of 20/-.

To A. C. COSSOR LTD., Melody Dept., Highbury Grove, London, N.5.

Please send me, free of charge, a copy of Folder L.143, which gives full details of the new Cossor Super Heterodyne Receiver, Model 364.

L.143

Name.....

Address.....

P.W. 18/5/35.

THIS COUPON BRINGS FULL DETAILS

CA 6853

POPULAR WIRELESS AND TELEVISION TIMES

MANAGING EDITOR: N.F.EDWARDS. TECHNICAL EDITOR: G.V.DOWDING ASSOC. I.E.E

REMEDY BY RADIO
LESS CODE
AN S.-W. TEST
FRENCH TELEVISION

RADIO NOTES & NEWS

POLICE CALLS
MARCONI PROPHECIES
B.B.C. PRONUNCIATION
THE "WOODPECKER"

Dr. Radio.

FORMED in Rome a few weeks ago, the International Centre of Medical Radio-Communication has quickly proved its usefulness.

The first patient was a stoker, taken seriously ill in mid-Atlantic. The captain of the vessel he was on wirelessed to the director of the new centre, Professor Guida, describing the painful and alarming symptoms.

The centre phoned to a specialist, and only a few minutes after the receipt of the message a reply—indicating the correct treatment—was on its way to the ship.

The report from Rome states that in this, the first case, immediate and lasting relief to the patient was secured.

Radio Coincidences.

MY Note in the April 20th issue of "P.W." on strange radio happenings has reminded Mr. Rose, of Long Eaton, of another curiosity.

"During 1927," he says, "I was serving on a ship that made regular calls at Queenstown, where we used to lie in the Roads about 500 yards from the beach. Queenstown has a fine cathedral carillon, from which the Dublin transmitter broadcast recitals. And one of our "sparks" discovered that a note from the carillon could be received over 300 miles of land-line and radio *before* it arrived in actuality across the few hundred yards between ship and shore.

"A kind of round game resulted—listen to the last note on the radio, snatch off your phones, poke your head out of the wireless-room door and hear the *same* note come across the water!"

This is scientifically explicable—but highly mystifying in those days!

Listeners' Loss.

MANY readers of this journal will have sorrowed at the news from South Africa of the death of Dan Godfrey, director of the Durban Municipal Orchestra.

He was a son of Sir Dan Godfrey, and before going to South Africa was a popular figure in B.B.C. circles. Listeners knew him best as conductor of the old 2 L O Orchestra—a post he held with distinction in the face of many difficulties.

Farewell to Morse.

MY recent reference to speedy cable working has brought me enthusiastic encores from the old Key-Pushing Brigade. "Morse may be dead," says one correspondent, "but what a craft, lad! *What* a craft!"

He writes from the C.T.O. (Central Telegraph Office, G.P.O.), and sadly records the absence of the Morse keys from there; and he says there are signs that, even on wireless, key thumping in Morse code is disappearing, for the French now work a regular wireless-Baudot service from Paris to Madagascar.

And in prospect there's the micro-ray, and the possibility of telegraphed "visuals," in which the original writing, printing or what you like is reproduced at the other end. It's good-bye to Morse, indeed!

Madrid Calling.

SENORS, you are invited to give ear to Madrid. A special international broadcast has been arranged for Saturday, May 25th, from station E A Q.

As every short-wave senor knows, the wavelength of Madrid E A Q is 30·43 metres, and on this wavelength there will be two transmissions.

The first is from 8 to 9 p.m., B.S.T.; and the other from 1 to 1.30 a.m., B.S.T.—that is to say, in the wee sma' hours o' the Sabbath. Reports will be welcomed by Mr. A. E. Bear, International Short-Wave Club, 10, St. Mary's Place, Rotherhithe, S.E.16; but if you want a special verification send postage for reply.

Eiffel's Resurrection.

IT seems that I spoke sooth about Eiffel Tower's future recently when I said it was to be employed as an experimental station.

Here is M. Mandel—Minister for Posts and Telegraphs, I'd have you note—proclaiming that by mid-July a Paris television service will probably be radiated from the top of Eiffel Tower.

The actors will have their exits and their entrances in the P.T.T. station's studio, and the programme will be sent throughout the day and evening.

Asked if it would be a good up-to-date service, M. Mandel raised the eyebrow and shrugged the shoulder in a manner which inferred that Britain's and Germany's best would look like a cave man's rough sketches beside the finished product of the Paris service!

Up to the present I have no details of the system to be used, nor of the degree of picture definition that our French friends are to employ.

(*Continued on next page.*)

ON OTHER PAGES

Barry Kent Calling . .	Page 270
Berlin is Television Minded	Page 271
On the Short Waves. .	Page 273
Wonders of the Vacuum .	Page 275

HARRY ROY AND HIS BOYS

This popular dance-band director, who broadcasts from the May Fair Hotel, was saxophonist in the first "hot" rhythm orchestra to play in this country. This orchestra was directed by his brother, Syd Roy, and played at the Café de Paris in 1926. Harry formed his own orchestra in 1930, and is now one of the most successful dance-band leaders in the country. He is seen above, with his boys, listening to a programme on a Cossor set.

THE DROITWICH STATION UNDER TECHNICAL CRITICISM

Somewhere a Voice . . .

WHEN Sir Robert Peel planned the beginnings of the first police force he could not have foreseen that a respectable householder of Liverpool would one day curse the Force with relish for interfering with his rightful entertainments, "plucked from the empty air." But so it is.

A Liverpool reader of "P.W." tells me that he is being continually annoyed by a man in blue butting in on his loudspeaker to affirm "GTM calling all patrols." A selectivity condenser in the aerial does no good, my correspondent says. A wavetrap is useless. And he stoutly refuses to write humbly to the Post Office engineers to help him.

Normally, of course, one can secure one's rights by calling in a policeman—but in this case the police appear to have called too many times already!

Looking Forward.

AMATEUR prophets and young Moores will rejoice to know that an interviewer has succeeded in making Marconi speculate about the future of radio—his guesses in the past have established reputations for more than one seer! Asked about the outcome of the next twenty or thirty years, Marconi said it was more than likely that the following important developments would take place:

(a) The facsimile transmission of telegrams, etc., in the sender's own handwriting.
(b) Television growing to be as popular as wireless to-day.
(c) Transmission of power by radio.
(d) Disease cured by wireless rays.

As for interplanetary communication, he said: "I do not say impossible. But I must solve the problems confronting me before I turn to other planets."

A Telephone Survey.

IN America nearly everybody is on the phone; and there has been much bad language about the tactics of radio advertisers who call up subscribers haphazard and ask them to answer a number of questions on the various sponsored programmes.

Somebody affirmed that opinions obtained from householders in this way were worthless. So a test was made, and these were the answers to the first six questions:

(1) "Aw, shut up!"
(2) "Who cares? Ring off!"
(3) "Tell your boss he's crazy."
(4) "Who wants to know?"
(5) "If I had you here I'd kick you there!"
(6) "You've got the nerve!"

This Week's Scrapbook.

AN unauthorised amateur transmitter has appeared at Waterford. He interrupted his first programme to denounce a rival amateur at Limerick and to promise to give next time a description of how his transmitter was constructed! Wavelength, 280 metres. Time, 11.15 p.m. onwards.

* * *

A flash of lightning visited the North Regional recently, wrecked the transmitting coils and upset the Chief Engineer's cup of tea.

* * *

Newcastle's wavelength is shared by Alexandria and Nyireghyháza, but nobody grumbles about the latter because they can't pronounce him!

BROADCASTING TOPICALITIES

The play, "The Partners," which is to be relayed from the Winter Gardens, New Brighton, for Northern listeners on May 24th, was first presented at the same theatre fifteen years ago. The author was a young man named Vincent Douglass, son of the manager of the theatre. He died in 1927, shortly after the first broadcast of the play.

Wilfred Shine, who played the lead in the original performance, will take the same part in the forthcoming broadcast; and his son, Billy Shine, who took a small boy's part in the original show, is now grown up and will play the juvenile lead. Hannah Watt, Malcolm Tearle and Lionel Gladstone will also be in the cast.

* * *

An interesting point about Midland plans for the summer months is that "The Microphone at Large," after visiting Ashbourne in June, will become "The Microphone at Play" and will represent various summer-time pursuits and festivals. Thus the call of the river will be reflected by a visit to Evesham at regatta time; one of the oldest of English sports—archery—by the meeting of the Woodmen of Arden at Meriden, in the very centre of England; cricket in its happiest and most traditional form—the match on the village green; and so on.

* * *

A relay will be taken from Fred Winslow's Serenaders' Mandolin Orchestra for Western listeners on May 21st. Fred Winslow has personally constructed all the instruments of the mandolin and guitar family used in his show.

Droitwich Dissected.

JOHN LISTENER has been speaking his mind about the Droitwich station ever since it was erected. And now the experts, at a recent meeting of the Institution of Electrical Engineers, have had their say.

Col. A. S. Angwin first asked about running costs, and said that, with series modulation, the heat dissipated in the final stage was about 335 kw., representing, say, £3,700 per annum. (For H.F. modulation the corresponding figure was put at only 100 kw.)

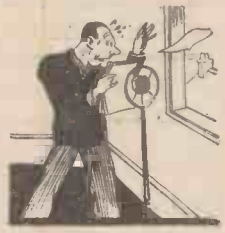
Mr. W. T. Ditcham, who has built stations all over Europe, believed that series modulation had a considerable future, and it would shortly be possible to use it at all reasonable power levels.

Mr. P. P. Eckersley said outright that Daventry was probably a better site than Droitwich, because of hill barriers; and increase of field strength was of little use if fading remained bad, due to the predominance of the indirect over the ground ray.

(As you may have gathered, it was a grand meeting!)

Quick Thinking.

ONE of "P.W.'s" far-off readers, W. L., of Edmonton, Alta., sends me an amusing instance of a quick-thinking announcer. The gentleman in question had the unenviable task of reading before the microphone a publicity boost for a place called—or rather miscalled — Paradise.



He put his soul into the description of the charms of Paradise, and was just reaching his finale when page 5 of his six pages blew out of his hand and sailed through the open window on to an adjacent roof.

For a full half-minute he had to leave the mike silent while he tried in vain to get that paper back. And then, returning to the mike, he said: "Ladies and gentlemen, that pause was for emphasis. I cannot emphasise too strongly that Paradise is *the* place for your next holiday!"

Riddle-Me-Ree.

THE prim proceedings of the B.B.C.'s Advisory Committee on Spoken English were recently enlivened by Professor Wyld.

The question before the meeting was how to pronounce the word "armada," some favouring the second syllable as "ma"—you know, the wife of Pa!—and others preferring it sounded as "may."

The professor suddenly produced a riddle, viz. "What letter made Queen Elizabeth mind her p's and q's?" The answer, of course, is the Armada, which is not only a pun of merit, but is also a proof that the pronunciation "ar-may-da" is as old as the riddle can be proved to be.

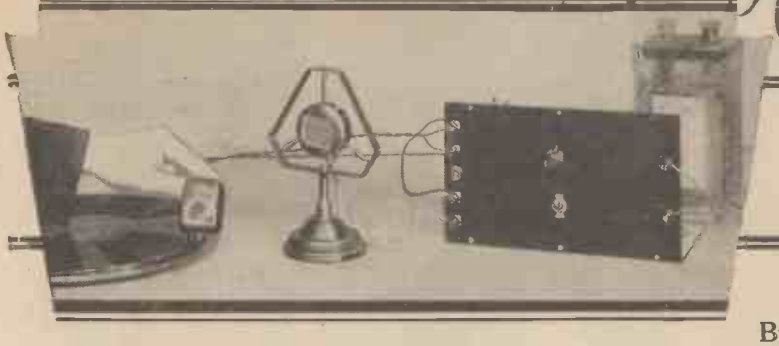
Glad You Called.

ALTHOUGH the question of distinctive calls for radio stations has not been given much prominence of late, the search for something effective, striking and suitable is always going on somewhere.

Sydney's kookaburra—you must never call it a laughing jackass—has been somewhat eclipsed by a Benares idea for using the trumpeting of an elephant. But the most surprising of all was that of a South American station. The station director received letters from listeners complimenting him on the use of a woodpecker's tapping, which it is considered lucky to hear. The official was surprised, because he had never arranged for this to be broadcast; so he kept watch and discovered that it was a nervous new announcer, absentmindedly tapping his teeth with his pencil!

ARIEL.

For Mikes and Pick-ups. A 2 Valve Amplifier



DESIGNED AND DESCRIBED
By THE "P.W." RESEARCH DEPARTMENT

MANY readers will find this easily made unit extremely useful. It is not just an ordinary two-valve amplifier, but one that has been especially designed for microphone and pick-up work. Especially the former, for there has been some considerable demand for an amplifier of that kind.

The obvious use is for "loudspeaking telephone" work. That is to enable someone speaking in one room to be heard via a loudspeaker in some other room or rooms.

But it has been realised that the idea has a valuable family application. This is to enable a baby to be heard above the other noises in the house, which may include a radio programme. The microphone is placed near the baby's cot and is connected by means of a long-extension lead to the amplifier, which, together with the loudspeaker, is situated in the room in which the parent or other person, whose job it is to minister to the needs of the child, happens to be sitting.

A Domestic Use.

Should the baby wake up and begin to cry it can at once be loudly heard through the loudspeaker. The same amplifier and loudspeaker can also be employed for the electrical reproduction of gramophone records. There is a change-over switch on it which enables it at once to be adapted either to microphone or pick-up working.

The microphone transformer is built into the amplifier unit, and it is this that enables long-extension leads to be employed if desired. Only the microphone currents then traverse the long leads, and these are of relatively low potential. If the loudspeaker were made to operate with a long-extension lead, then there would be a possibility of "cross talk" with the radio installation when this, too, was working.

No Microphone Battery.

There is a novel feature in this amplifier. At least, we believe it is quite original. And that is that the L.T. accumulator which is necessary for the filaments of the valves is also made to serve the microphone as well. It is usual to employ a separate battery for the microphone, though there is really no justification for that so long as the microphone is of a type which can be operated with two volts, as is the case in this instance.

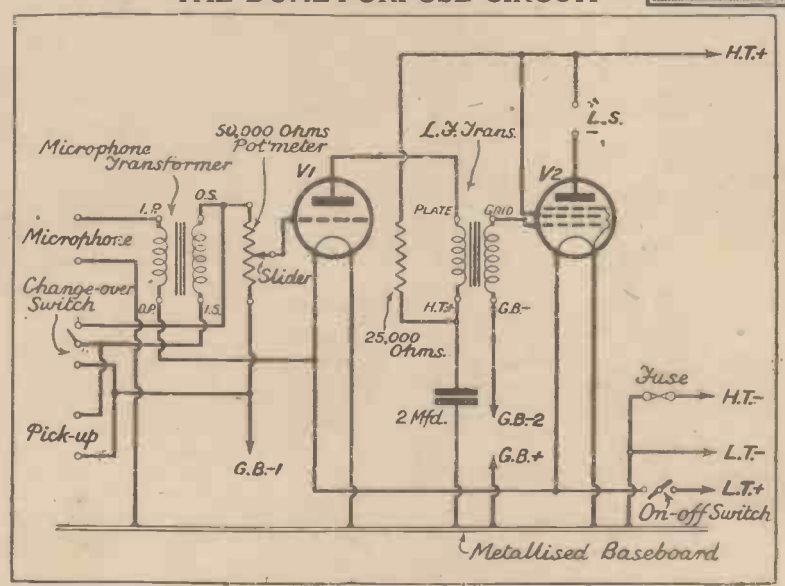
A volume control is fitted to the amplifier, and this is certainly needed, for there is a very ample margin of volume with the average pick-up or microphone.

RECOMMENDED VALVES AND ACCESSORIES

Make.	L.F.	Output.	
Cossor	210.L.F.	220H.P.T.	or 220P.T.
Hivac	D.210	Y.220	or Z.220
Marconi	L.21	P.T.2	—
Mazda	L.2	Pen.229	Pen.220A.
Osram	L.21	P.T.2	—
362	L.2	M.E.2	—
Tungsram	L.D.210	P.P.220	P.P.230

MICROPHONE : Electradix, type 12.T.
LOUDSPEAKER : W.B. Stentorian.
BATTERIES : H.T.—120 volts ; L.T.—2 volts ; G.B.—4½v. to 16½ volts.

THE DUAL-PURPOSE CIRCUIT

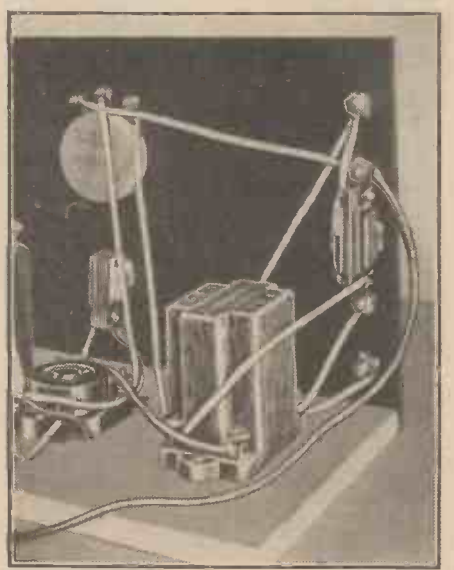


One of the features of the circuit is the use of the L.T. battery for supplying the microphone current. This does away with the special battery which would otherwise be required.

As we have said, the amplifier is easy to make—much easier than the simplest valve set for radio reception owing to the fact that there are no H.F. circuits to deal with. The cost of the parts is reasonable, as you will discover when you have totted them up.

It will be noted that we have specified

INSTANTANEOUS CHANGE-OVER



This photograph shows the change-over switch which provides an instantaneous change-over from microphone to gramophone pick-up. The microphone transformer can be clearly seen in the foreground.

an anti-microphonic type of valve holder for the first valve. It is most desirable that this should be adhered to in view of the nature of the instrument. The graded type of potentiometer for the volume control has also been chosen with a specific object, and that is to ensure that an even adjustment of volume is obtained and so there shall be no jumps from "whispers to shouts" within microscopic knob movements following big movements in which there is hardly any difference noticeable.

The final entry in the list

(*Continued on next page.*)

A 2-VALVE AMPLIFIER

(Continued from previous page.)

of parts reads "screws, flex, etc." You will need some five-eighths-inch screws for mounting the components on the baseboard, and the same size screws (flat-headed for preference) can be used for screwing the panel to the baseboard. Three of them will suffice for that purpose. But drill the terminal and component holes in the panel before fixing it in position.

Mounting the Parts.

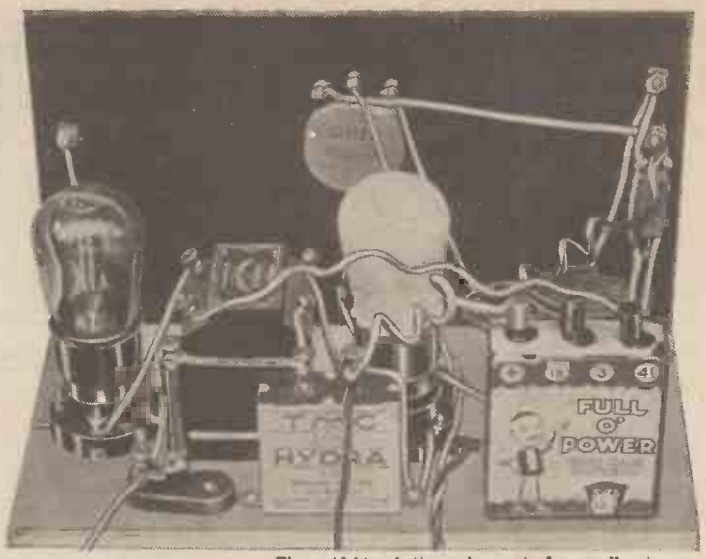
Use metal-working drills for the ebonite. The next operation after screwing the panel in place is to mount the terminals and components, and this is a quite straightforward task. But see that you have the valve holders and transformers orientated correctly; that is, with their terminals facing in the correct directions.

Keep the wiring as direct and tidy as possible. The connections to the metallised baseboard are made merely by baring the ends of the leads in question and clamping these bared ends down on the surface of the baseboard by passing them under the bases of the components as shown in the wiring diagram.

For the battery leads rubber-covered flexible wire is desirable, these leads being kept as short as possible. A wander-fuse is joined at the battery end of the H.T. minus lead.

There is a wide variety of valves from which you can choose, as the accompanying table shows. The output valves fall into two categories. The second column of them gives valves of larger output power for those who desire the greatest possible volume. The majority of constructors will find their purposes adequately served by the smaller valves.

IT CAN BE BUILT IN AN EVENING



The grid-bias battery shown is for smaller types of pentodes. The larger pentodes will need a higher-voltage G.B. battery, in which case this should be mounted on brackets on the inside of the cabinet. Incidentally, the straightforward design of the amplifier is such that it can be built in an evening.

These are capable of providing loudspeaker strength great enough for the average persons in the average-sized room.

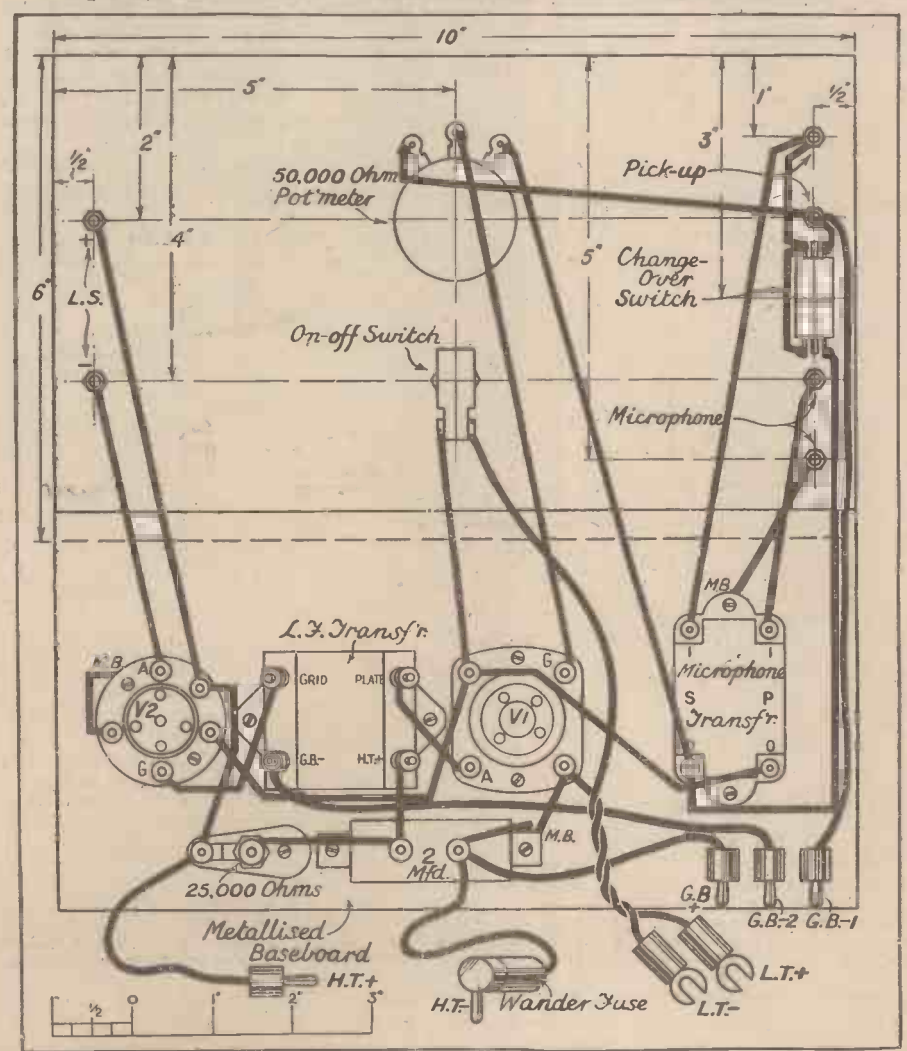
The H.T. and grid-bias voltages will obviously depend upon the particular valves employed, and full details will be found in the leaflets included in the valve cartons.

Suitable cabinets for accommodating the amplifier are obtainable from Messrs. Peto-Scott at reasonable prices. Many readers may, however, prefer to construct their own.

USE THESE COMPONENTS

- 1 Benjamin 4-pin "Vibrolder" valve holder.
- 1 Benjamin 5-pin valve holder.
- 1 Varley L.F. transformer, "Ni-Core II."
- 1 T.M.C.–Hydra 2-mfd. fixed condenser, type 30.
- 1 Graham Farish 25,000-ohm 1½-watt "Ohmite" resistance in vertical holder.
- 1 Erie 50-000-ohm graded potentiometer.
- 1 Bulgin toggle on/off switch, type S.80.
- 1 Bulgin toggle change-over switch, type S.81.
- 1 "Electradix" microphone transformer, ratio 100/1, shrouded.
- 6 Belling-Lee indicating terminals, type R.
- 1 Peto-Scott panel, 10 in. × 6 in.
- 1 Peto-Scott "Metaplex" baseboard, 10 in. × 5 in.
- 4 Belling-Lee wander-plugs.
- 1 Belling-Lee wander-fuse.
- 2 "Clix" accumulator spades.
- 1 Coil B.R.G. "Quikon" connecting wires, screws, flex, etc.

YOUR GUIDE TO THE WIRING AND DIMENSIONS

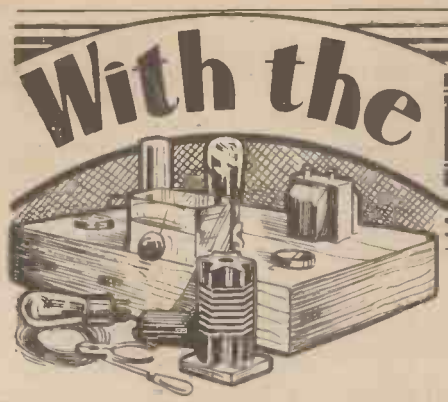


No difficulty will be found in wiring up the amplifier. It should be noted, however, that four of the leads are taken direct to the metallised baseboard by being tucked under certain of the components.

If the amplifier is to be tucked away in some corner of the room where it will not be seen (perhaps in a cupboard or in the drawer of a writing desk, etc.), then a simple plywood box of appropriate dimensions is all that will be needed.

But something in the way of a cabinet is almost essential in order to provide protection against dust. Dust can seriously upset the operation of a microphone or pick-up amplifier, although we must admit that the dust generally has to lie on it pretty thickly before there is a noticeable effect.

Do not try to test the amplifier with a microphone in the same room as the loudspeaker. If you do it is almost certain that you will get nothing but a howl. What happens is that sound waves from the loudspeaker impinge on the microphone, and the speech is again amplified and so a kind of reaction effect is set up.



With the EXPERIMENTER

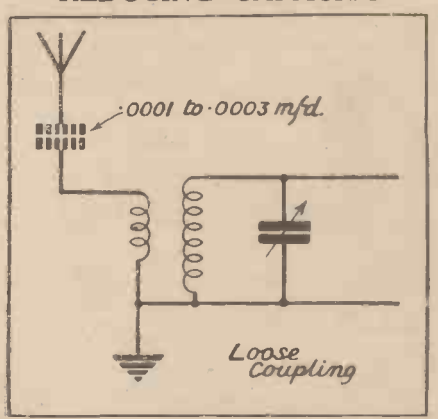
"READY FOR SUMMER DX?"

TWO recent letters force me to write this article. The first: "In the new house I am building can I, for tidiness, run the aerial lead through electric-light tubing to different points?" The second: "My earth tube is driven into the ground outside the window where the set is placed. It is mostly builders' rubble down there. If I pour liquid cement down the hole will it make a better earth contact?"

You wrote neither of those letters, of course. But they were written—and in all seriousness. Yes, to me. People do occasionally take me seriously. Not often enough, I know.

As I put fingers to typewriter I do so with trepidation. For I recall a certain Birkenhead gentleman's diatribe when I last mentioned aerials. He hates ordinary aerials. Like Doctor Fell, I know not why, I cannot tell.

REDUCING CAPACITY



A series condenser may improve matters if a screened down-lead is employed.

Summer is icumen in, and lusty foreigners are a-going out. And unless that aerial—not forgetting that earth—is reasonably efficient you are going to suffer a vast loss of programme alternatives from now onwards. What, if anything, are you going to do about it?

The Inexorable Rules.

You are, I hope, going to spend a week-end overhauling the whole system. Asking yourself whether you are obeying the two inexorable rules of the game: insulation *and* isolation.

You know the rules as well as I do. My point is that, if you live where there is what the B.B.C. rather grandly calls "industrial interference," you must perforce obey these rules more rigidly than those living in idyllic country cottages.

Programme value depends on signal-to-noise ratio. Signal strength from foreigners is waning. The presumed noise is not. Therefore the ratio is decreasing, and with it entertainment value.

The noise comes in almost equally badly over the whole wavebend, and usually is much worse on the long waves than on the medium. Ordinary selectivity has no power to alter affairs. But the aerial has that power.

For the noise is local, and if the aerial can be taken sufficiently far from the baneful influence of the noise it will pick up less of it. Even if the aerial is then no more efficient than before, the ratio of signal to noise will go up, and so will entertainment value.

Often enough this can be done by the very simple process of putting up a reasonably good outdoor aerial, such as I described for your delight in the March 2nd issue of this delectable journal. Assuming, of course, that you were previously using some kind of indoor wire.

Don't imagine I am against indoor aerials. Not *per se*, as the Romans would have said. Not when the various forms of industrial interference are absent. All I am reminding you is that indoor aerials are not such good signal pickers-up as outdoor aerials, and that they may very easily be much closer to the noise machine—say vacuum cleaner or dentist's drill—than an outdoor aerial would be.

"Niggers in the Ether Woodpile."

Strong, healthy signals, such as we have been getting from so many continental stations all winter, tend to hide noise niggers in the ether woodpile. When they wane, as they are doing and will do still more soon, snaky noises in the grass may rear their ugly heads and spit crackling venom at you through the loudspeaker. A horrid idea!

To all those plagued with local interference, whether from a machine or a tram route, I do seriously suggest some kind of screened down-lead. There are several very good brands on the market and they are not expensive.

Don't confuse this special down-lead stuff with the screened cable you use for connecting pick-ups and valve anodes. It is more complicated than that—it has to be.

The general idea is a conducting wire as the centre core and a spaced outer covering of metal foil. Distance pieces are inserted along the core to keep the foil well away, and so reduce capacity effects, which would otherwise put the aerial tuning right up the loop.

As a rule, the outermost covering is some waterproof material, with the foil screening underneath it. It sounds easy enough but you try to make it, and then you will agree that prices are very reasonable.

But why a screened down-lead? And what does it screen? The first question is answered by remembering the advice to take the aerial away from the source of the noise. If the set must be used near that source the mere removal of the aerial will be nullified by the pick-up of the noise as the lead-in wire comes back to the set.

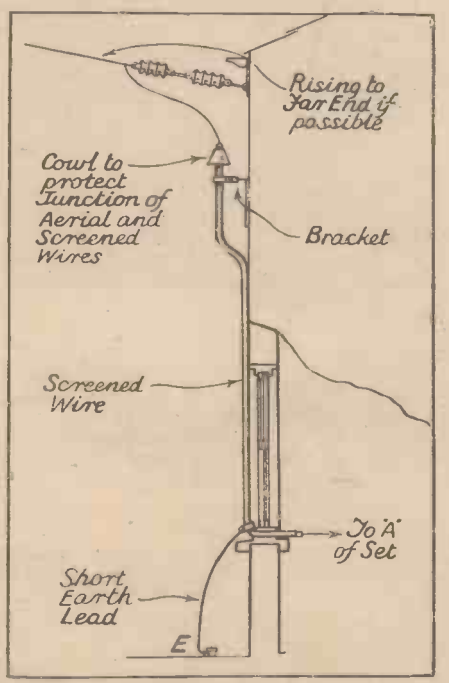
Screening the Lead-in.

Take the aerial away from the malignant influence of the noise and then screen the lead-in to the set so that it—the lead-in wire—does not pick up the near-by radiation. Don't ask me why not use a near-by screened aerial itself and be done with it. For that would be much sillier even than it sounds. We must have a good big horizontal length to give us our high signal-to-noise ratio.

Two points arise from bitter experience in helping town-dwelling friends to erect such anti-noise aerials. First: Don't let the screening lead sway about in the wind. Clamp it to the wall on its way down to the set—the usual rules of isolation do not

(*Continued on page* 284.)

FIX IT FIRMLY



How the special screened down-lead is fitted to the aerial. It should be firmly fixed to the wall.

BARRY KENT CALLING

News and Views about Broadcasting

WAR has broken out between the B.B.C. and the G.P.O. And, believe me, it is the real thing this time: no ordinary estrangement or temporary misunderstanding. Round at Broadcasting House the other day I asked about how the arrangements for the King's Empire broadcast had been carried through, and they told me that the whole thing was endangered by Post Office muddling. Then off I trotted to St. Martin's-le-Grand, where wrathful officials exploded at the mention of the B.B.C. Yes, all relations between the B.B.C. and the Post Office have been broken off. This war is the culminating point of a series of "incidents." The B.B.C. does not at all like the arrangements the Post Office has made for the Ullswater Committee.

* * *

The Committee at Work.

Mention of the Ullswater Committee reminds me that I was discussing it the other day with two people who have been called as witnesses already. One is a well-known radio critic. They were received in private and invited to say exactly what they felt. Apparently Lord Ullswater and his colleagues are determined to probe all parts of the work and organisation of the B.B.C. They meet on Wednesday and Thursday each week, and sometimes on Friday as well.

* * *

Wales Wins.

The victory of the Welsh Nationalists in their long struggle against the B.B.C. is complete. Cardiff and Bristol are practically separate headquarters. At Cardiff the whole staff is to be Welsh speaking, all the business is to be transacted in Welsh and most of the transmissions are to be in the language of the Principality. The B.B.C. has advertised half a dozen new posts in the Welsh papers, and there is intense competition for the jobs.

A cynic at Swansea has remarked that once the new staffing is complete the B.B.C. will have given employment to all the leaders of the Nationalist Party, and then needn't trouble to transmit any Welsh at all. Seriously, however, there is some apprehension in Welsh circles that the B.B.C. is going to overdo the vernacular.

* * *

Scotland Next.

Work is in progress at the new station for the Highlands near Inverness, which will be ready next year. Since the announcement of the intention to build this station, activity among the clans has subsided. Formerly there was hardly a month without some move on the part of ex-Provost Murray, of Dingwall, who steadily pursued his objective until it was reached. And the ex-Provost and his followers will not be wholly satisfied until they have had a chance to test the new transmitter under service conditions.

* * *

More Broadcasting House Moves.

The stream of migration westward from Broadcasting House widens and deepens. Staff of the Music Department has been trickling over to Maida Vale for some weeks, but now there is a large-scale move on hand. This is expected to include Dr. Boult and all his staff. Other departments are also on the trek. When these contemplated moves are over the B.B.C. will be rather more scattered than it was in the latter days of Savoy Hill.

There will be actually more programme staff outside the headquarters than in it. In any other public business there would be a searching investigation of the reasons for the inadequacy of the building that was completed only in 1932. But the B.B.C. manages to slide along amid the plaudits of all and sundry.

* * *

The Command Concert.

The B.B.C., of course, will be broadcasting the great Command Concert from the Albert Hall on May 24th. This has been under the special care of Sir Walford Davies, the Master of the King's Musick. The B.B.C. Orchestra, conducted by Adrian Boult and others, will provide the accompaniment to the singing which will be done by choristers and choral societies from all over the country.

Sir Walford has worked very hard for this concert, the proceeds of which will go to various musicians' benevolent funds. It is understood that the B.B.C. will figure prominently in the list of donors.

* * *

South African Broadcasting.

Mr. Adler, the General Manager of South African Broadcasting Company, has been in England visiting the B.B.C. He is now on his way to America, where he will have a look at both the N.B.C. and the C.B.S., and probably go to Canada as well.

The licence of the South African Broadcasting Company terminates in 1937, when it is expected that a new authority will be set up on the lines recommended by Sir John Reith after his investigation last autumn.

HEARING HIS OWN RECORD PLAYED

KREISLER, the world-famous violinist, listens to one of his own recordings played to him on an "H.M.V." All-Electric Auto-radiogram.

ON THE AIR

Candid Comments by our Broadcasting Critic on Recent Programmes.

AS a fitting preparation for the lavish Jubilee programmes the B.B.C. put its millions of listeners on a starvation diet for seven whole days. I cannot recall a week that was so generally devoid of good entertainment as the week that preceded the Jubilee celebrations.

* * *

The Drama Department, too, after a run of successes, seemed to be taking it easy, seeing an all-sufficiency in a play called "Oak Trees." This play was about as empty as the proverbial Mother Hubbard's cupboard as far as dramatic interest was concerned.

An Excellent Turn.

The only sensation of the week was the transference of Saturday night Music-Hall to the Thursday. In fairness to the artists who took part we must admit that the bill was well up to standard, though it was significant and typical of the listlessness of the week that the best turn wasn't mentioned in the programme at all.

This was the last turn, a sketch, in which an un-policemanlike policeman, interviewing a murderess on her own confession, made us roar with laughter with his inanities. I don't mind saying that I listened to this turn during a meal, and I all but choked more than once. It is clear that steak and this ass of a policeman can't be taken at once. This item was the best thing of the week. Indeed, I go so far as to say it was the best laugh of many a week.

* * *

Rudi Grasl, as The Living Instrument, is in a different category. At his job he is a marvel. And I say so without any qualification.

* * *

Hildegarde—quite a stranger to me, although she has broadcast with Ambrose and Henry Hall—sings an uncommon type of song with a finesse that is really enviable. Though I never rave over her brand of entertainment, I can quite see how those who do would think the world of her.

Programmes that Clashed.

The transfer of Music-Hall to Thursday left a big gap in the Saturday evening programmes which even "Dancing Through" couldn't fill, at least to *my* satisfaction. This wasn't Geraldo's fault. It was the fault of the programme builders. "Dancing Through" ought never to have followed "The Old Music Halls." It merely repeated, in its own way, of course, what had already been going on for an hour. No one can stand two solid hours of old-time choruses, or any other choruses.

I listened to and enjoyed the whole of "The Old Music Halls" programme. I have a great liking for that now-famous quartet, Tessa Deane, Bertha Willmott, John Rorke and Denis O'Neil. I think they have shown wisdom in letting a considerable interval of time separate this and their last appearance on an Old Music Hall bill. They turned up again on this Saturday evening as fresh as paint, only to find us ready to welcome them with open arms.

(*Continued on page* 284.)

BERLIN is TELEVISION MINDED

Says Alan Hunter

For some time our contributor has been in Germany, and his remarks on the German television service, which are given here, make particularly interesting reading in view of the imminence of the British high definition system.

An important feature of the Berlin television broadcasts is the fact that official public demonstrations of picture reception are provided, an idea that we might well copy in this country.

AS I write under the shadow of the Funk tower at Witzleben, a suburb of Berlin reached in about fifteen minutes on the admirable State electric railway, I am conscious of the immense interest Berliners are taking in television.

Poor people are already saving up, I am told, against the day when they will be able to buy a Fernseh (far see-er) instrument. Berlin is, like all Germany, a city of enthusiasms just now. It has taken the Post Office's inauguration of daily television broadcasts as yet another sign of the German will to predominance.

Herr Eugen Hadamovsky's speech caused a tremendous wave of popular enthusiasm. You will remember the Director of the German Broadcasting Company explained that the service started in March from Witzleben was the first of its kind in the world, and was the signal for mass production of television sets for the public.

With a definition of 180 lines and 25 frames per second the Germans have certainly made a good start. Vision is sent out on 6·7 metres and sound accompaniment on 6·98 metres. The screen picture is 6 in. by 8 in.

The Home Constructor.

Hadamovsky emphasised that the service was made possible only by the willing co-operation of the Reich authorities, the radio industry and the film industry—the last named being relied upon for most of the material broadcast at present.

Manufacturers are being urged to co-operate in making cheap television sets ready for the forthcoming German radio exhibition, while the home constructor, who, in ordinary radio sets is almost defunct, is being rallied for a new phase of usefulness.

My arrival coincided with the opening in Berlin of the first public television demonstration. These demonstrations are open to anyone who is interested enough to walk up to the top of the Post Office Museum. In a small room a standard 180-line television receiver is in daily use now—and has been since April 9th—picking up the television transmissions, which are under the control of the Post Office.

From 9 till 11 a.m. every day the curious Berliner can see for himself that television has arrived. On Mondays and Wednesdays, from 3 to 4.30 p.m. and from 8.30 p.m. onwards, he can also look-in.

I joined in the queue as soon as I heard about the "free show." Two helpful officials were explaining the system, where it was coming from, and that we were looking at films, not actual events.

At a distance of about three yards the pictures were definitely good. Not so bright as the latest 180-line Baird pictures, I thought, but still very good. Flicker was hardly noticeable, either.

Close-ups were entirely satisfying, but when more detail was introduced into the picture it just failed to impress. Moving nearer to it did not help, for then the inherent limitation of 180 lines became all too obvious, and the whole thing was lost in a blur of indistinct black and white.

My sister, who lives in Berlin and knows nothing of the technicalities of television, was not impressed. "It is like a picture postcard in motion," she said, "and that makes it seem unreal to me."

I cannot help thinking that 180-line pictures, such as the Berlin Post Office is showing, are just not quite good enough. I am more than ever convinced that our Committee was right in suggesting a start being made with 240 lines.

A Far-Sighted Scheme.

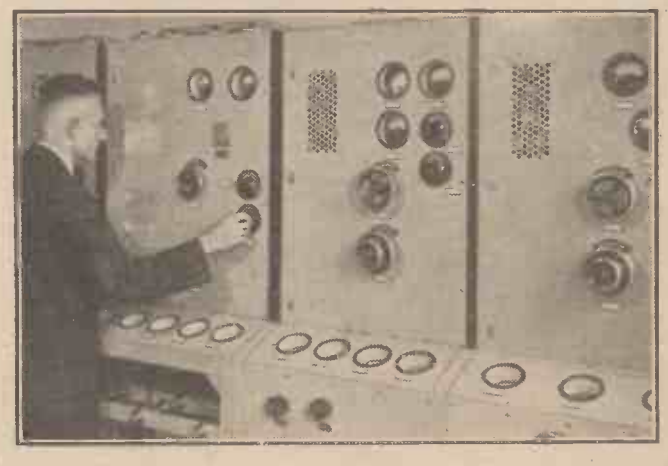
There is an immense novelty value in a 180-line picture, and if the subjects are carefully chosen and close-ups liberally interleaved with the more elaborate scenes one's interest is held. Whether it would be so after a prolonged period I should not like to say.

The idea of giving the public a chance to see what is being transmitted, without committing them to the expense of an instrument right away, is definitely far sighted. I hope that when our service starts up the British will emulate the Germans and arrange suitable public demonstration points.

At first television reception will be the prerogative of the plutocrat—and of the keen home constructor. It is necessary for

(*Continued on page* 285.)

FOR SOUND AND VISION



LOOKING AT THE PICTURES

TRANSMISSION AND RECEPTION. The photograph on the left shows the control panels of the Witzleben television transmitter. Below is a scene at one of the public demonstrations of television reception held in the Post Office Museum. These demonstrations are held at various times so that the public may see for themselves what is "doing" in the new service.

GRAMOPHONE-MOTOR MAINTENANCE

By studying this article, owners of battery radiograms will find valuable assistance on the fitting of new springs to clockwork gramophone motors.

By A. W. YOUNGMAN

SINCE the introduction of the electrical pick-up the ordinary clockwork gramophone motor has become an essential part of the battery radio receiver, especially to those who possess a radiogram combined in a common cabinet.

Like all other mechanical contrivances, the gramophone motor is not immune from breakdown, and similarly a certain amount of maintenance is necessary in order to ensure perfect operation.

In particular, the most common troubles experienced are due either to a broken mainspring or to irregular running caused by a faulty governor spring.

In the majority of cases mainspring trouble is more prevalent during the cold season than perhaps at any other time of the year, and without doubt the reason for this can be attributed to the fact that the metal is subject to comparatively severe temperature change.

Usually the radiogram is accommodated in a room where the temperature varies considerably during the course of a day in the cold weather. This alone can be responsible for a breakdown, and accordingly it is advisable always to allow the motor to run itself out when the gramophone entertainment is finished. In this way the motor is not allowed to stand with tension on the mainspring, and is therefore subject less to temperature strain.

Not Very Difficult to Repair.

However, should the spring break at any time it is—apart from the expense—an inconvenient item to repair. But it is not a very *difficult* matter, and once the spring is obtained it only requires a little care in winding it into the spring box.

When obtaining the new spring the listener should remember to note the width of the old one, because, owing to the various sizes made, it is quite possible that some difficulty will be experienced in fixing if the replacement is not of the correct dimensions.

In the first place, the spring must be released from its wire binding; and perhaps the most suitable method of accomplishing this is by placing it in a vice, cutting the wire with a hacksaw or side cutters, then slowly opening the vice until the spring is free.

It will be noted that the outside hole is designed to fit on the small catch at the side of the spring box, as shown in Fig. 1. When fitting the new spring, once this end is firmly in position the winding can be commenced, but care must be taken to keep the thumbs inside the box with the palms over the spring.

In this way the box can be rotated with the left hand, whilst the right is utilised as a guide for the spring, which, in turn, is prevented from jumping out by the position of the fingers.

Irregular Running.

The inside hole must engage on a small shaft pin, as illustrated in Fig. 2. Contact at this point can best be made by prising the inside of the spring and slowly turning the shaft or spindle.

To complete the repair, and before the motor is reassembled, a suitable lubricant or petroleum jelly should be squeezed into the box.

Irregular running of the motor can very often be traced to a weak governor spring, and here again, if efficiency is to be maintained, a replacement must be effected.

Actually the latter type of spring is made in several sizes and thicknesses for use with various types of motor. In order to obtain the correct duplicate it is advisable in this instance to take the old ones to the dealer for matching purposes.

Should only one of these be weak or broken it is preferable to replace the complete set, otherwise the varying tensions may be sufficiently unequal to set up an irregularity in speed control.

The fixing of the springs is such a simple matter that the diagram given in Fig. 3, illustrating the governor, will provide ample information, although it should be remembered that after the weights are changed over the new springs must be substituted one by one.

DETAILS OF THE GOVERNOR

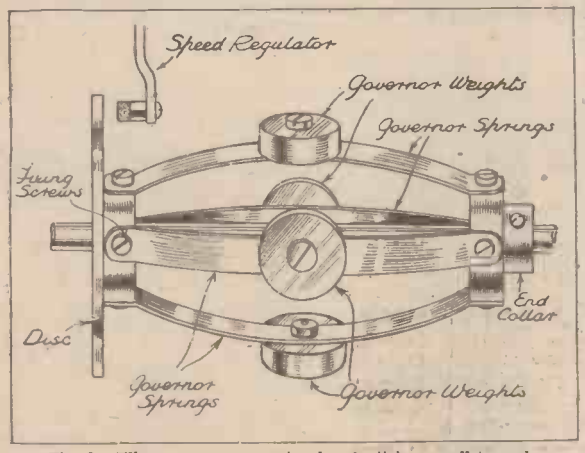


Fig. 3. When a governor spring breaks it is as well to replace all the springs, substituting one at a time.

THE OUTER END

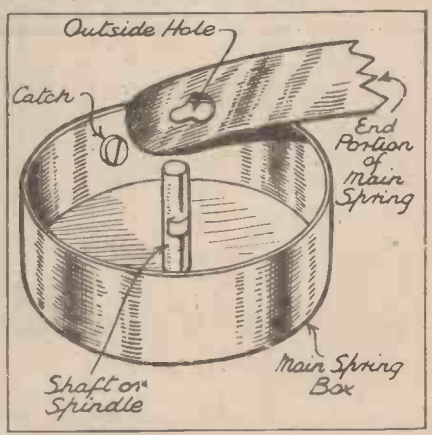


Fig. 1. The outer end of the spring is usually fitted on a small catch on the spring box.

FIXING THE SPRING

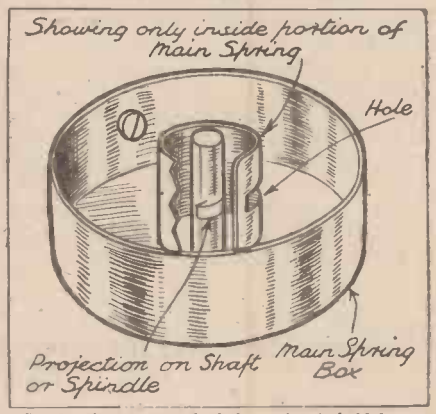


Fig. 2. The inner end of the spring is held by a small projection on the spindle.

TUBES FOR TELEVISION

Recent Cossor Cathode-Ray Releases.

THE coming of high-definition television has meant a great deal to the designers and makers of cathode-ray tubes, not the least being the fact that the picture to be viewed is to be of different proportions from our present 30-line and to cover a greater area of the screen.

The old thin vertical strip-like picture that we know so well in the 30-line television is to give place to a rectangular picture of the proportions 4 units in length and 3 units in height. This means that a picture of some 8 inches long and 6 inches in height will be required if anything like good reception is to be achieved.

With high definition, to arrange only for a smaller picture would be sheer waste of technical achievement, and so cathode-ray tubes with large ends to accommodate the new picture sizes have had to be made.

Three Models Now Available.

Well in the fore of cathode-tube manufacture are A. C. Cossor, Ltd., the well-known valve makers, and this firm has already on the market three high-vacuum tubes ready for television. The first is a small tube that is not really quite big enough for high definition work, except experimentally, having a fluorescent screen diameter of just over 6 inches. It costs 8 guineas.

The second tube costs 12 guineas, and has a screen diameter of 10 inches; while the third tube, which will give a received picture of approximately 10 inches by 8 inches on its screen of over 12 inches diameter, costs 15 guineas.

These tubes want 3,000 to 4,000 volts maximum on the third anode, dependent on the size of tube, but they will work and focus quite well with as little as 1,800 volts.

The deflecting sensitivities at maximum anode volts of the three tubes are quite high, being of the order of $\frac{1}{10}$, $\frac{1}{8}$, and $\frac{1}{7}$ millimetre deflection per volt applied across the deflectors.

All these tubes are of the directly heated cathode type, requiring about 1·25 amp. at 0·4 volt.

K. D. R.

ON THE SHORT WAVES

TIDINESS AGAIN !

W. L. S. has some further comments to make on the all-important subject of keeping your set neat.

SORRY if I appear to be harping on this subject, but I *must* do it. Every week I meet something or somebody that convinces me that it's absolutely necessary. Every case of trouble that I meet with seems to be due simply to carelessness, shoddiness, whatever you like to call it, and I'm getting quite fed up with telling people so.

The little picture on this page shows that you *can* preserve a workmanlike appearance, even if you own more than one receiver. The externals are just as important as the "innards"—possibly even more so.

Those Loose Screws.

Let me start off with a little true story. My own receiver (I mean the one that stays put and is never altered) is in a metal box. The baseboard is raised, and the "chassis"—the front panel and baseboard—slips out nicely. It is held in position by six screws.

First of all, if *one* of those screws becomes a little loose I hear a vague kind of crackling sound. If all six are loose I hear very little else. But that's by the way, and I just mention it to show you that it's a rigid sort of job.

This receiver stands on a bench, and four wires go down to the mains unit underneath. They are lead covered, and the sheathing is earthed. Close by, on one side, is the big 20-metre transmitter; on the other side a wavemeter and a 5-metre receiver.

If I tolerate one single bad contact in that 5-metre receiver I can hear it distinctly in the other one. If I have loose wires lying about anywhere on that bench (over 8 feet long) I know all about it.

If I leave a screwdriver carelessly lying across an ash tray, or something like that, a crackle is sure to turn up before long. In other words, every blessed thing on that bench has got to be decently laid out and wired up, or the short-waver pays for it in some way.

A Marvel That They Work.

Having seen one or two readers' attempts at short-wave sets, I marvel at the fact that they receive anything at all. Panels that could be wrenched from the baseboards with two fingers; valve holders that can be twiddled round so that all the leads fall off (*fall* off, I said!); battery leads that give vent to a whole display of crackles if one just rustles them gently; coils that don't fit in the holders—oh, why go on?

Why is it, I wonder, that the same man who would probably spend a whole afternoon tidying up his garden and carefully trimming the edges of the lawn can turn out a wireless set that looks like a spaghetti factory after a cyclone?

I note with deep regret the tendency, even among commercial sets, to forget the charm of good workmanship. Look at some of the commercial apparatus "built like a battleship" in the good old days, and compare it with some of the modern sets, with their bunched flex leads.

Do take a pride in the appearance of short-wave receivers, and try to believe that if a thing looks well it will work well. It certainly will if the circuit is above reproach; and a bad circuit isn't worth wasting time on, even for the lash-up type of layout.

A GOOD EXAMPLE

Even if you have more than one receiver, you can still maintain tidiness: a fact well demonstrated by this amateur station belonging to Mr. F. A. Beane.

Let me give some specific instances of improvements that you can probably make. If it's a battery-operated set, where do you put the accumulator? I thought so—on the floor, connected up with twin flex. Well, have you ever tried the simple experiment of comparing voltmeter readings at the accumulator terminals and at the valve-holder terminals? And if there's not half a volt difference you're very lucky, or else you've been more careful than most.

What about the H.T.? Same, I suppose; but in this case the resistance of flex cords will not matter particularly. I suggest that you wire up your L.T. *and* H.T. with the thicker type of *single* rubber-covered wire. Don't use match stalks instead of wander-plugs; and don't try to economise and do without spade terminals on the end of the L.T. leads.

Now we'll dive inside the set. What's this at the back? A whole row of rather dirty terminals that have been used many times before and are liberally coated along their shanks with Fluxite? How many leads could you pull off with one finger? None? I bet *I* could! How many connections are finger-tight instead of having been done up with pliers?

Have a Good Clean-up.

Can you twiddle the knob of that on-off switch without making gruesome noises? Can you shake the phone cords about without doing the same? Just spend an evening clearing up all these things instead of knob twiddling, and you'll probably find that you have a new receiver, as far as behaviour goes.

I'm sorry to spend a page in talking about such childish things (for they are, really), but the average "short-waver" seems to think he is so far above them that he needn't worry. Believe me, it's time he started worrying for a bit.

See if you can't turn out a set that would compare favourably with a commercial product. That's the first step, and it doesn't mean spending a lot of money on expensive components—old ones will do perfectly if you give them a good clean-up. Then, having done that much, give it an empty bench to start with, and wire up the externals as neatly as you have wired the set. See to the aerial, too, and the lead-in. Clear up anything near by which is untidy.

Then you can sit back for an evening's listening, and it will probably be a revelation to you. And I haven't even touched on the fact that a little "spit and polish" will give you much more pride in your equipment.

Ruined by Carelessness.

Now just you get down to it, readers—yes, that means *you*, too!—and don't let me have to talk to you again in this strain! There's nothing that makes this usually genial scribe so thoroughly bad tempered as seeing a good circuit ruined by carelessness.

In future no reader's complaint will receive the slightest consideration until he assures me that there's not a single untidy connection in his radio room.

ON THE SHORT WAVES—*Page 2*

WHAT READERS ARE SAYING

L. H. (Retford) comments, with many others, on the "freak" conditions noticed during the first half of April, when reception of American amateurs on 20 metres continued until after midnight. The remarkable thing was that the "phones" continued to come over long after the C.W. stations had faded out.

L. H. also inquires about the placing of the different districts of U.S.A., so that one may know when one has a real "scalp." I won't give all the States in detail, but will give just a broad outline. Districts 1, 2, 3 and 4 are on the East Coast; District 8 includes New York, Pennsylvania, Ohio and West Virginia. District 9 includes the Central States, and District 5 the Southern—Texas, Arkansas, etc.

The 6th and 7th Districts are on the Pacific Coast, the 6th comprising California, Nevada, Utah and Arizona; while the 7th takes in Washington, Oregon and Idaho.

"5's" seem to be the rarest of the lot, while "6's" and "7's" are quite a creditable piece of reception. The 1st, 2nd, 3rd and 8th Districts are ten a penny.

Changing the Band.

W. J. (Glasgow) wants to know whether it is possible to install a two-band wave-change scheme without any serious losses. Guessing that I am generally against all switching schemes for short waves, he seems to expect a negative answer.

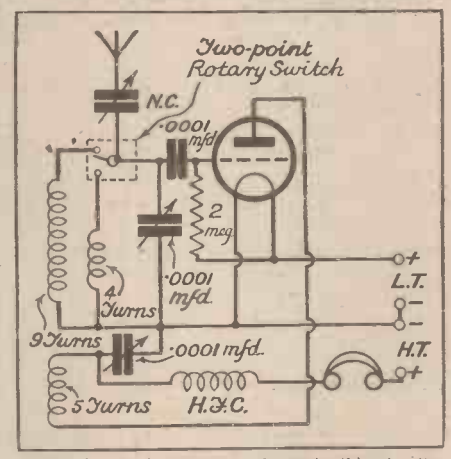
As a matter of fact, I don't see any reason why *two* bands shouldn't be covered quite efficiently by means of a simple arrangement similar to that shown in Fig. 1. Here we have a 9-turn and a 4-turn coil, with the earthed ends both connected permanently and a two-way switch changing over the high-potential ends.

Requirements: (a) One coil on either side of the common reaction coil (5 turns); (b) *a good switch.* Given these, I don't see why you can't cover, say, 16 to 50 metres without plugging and unplugging coils every few minutes.

S. K. (Cambridge) says he has been trying to pluck up courage to write to me for five years. Now that he's succeeded, the result is ten pages, closely written. He describes himself as having built over a hundred sets during his radio career, and he has logged more than a thousand stations on them between 12 and 2,000 metres.

His particular moan (yes, they all have *one!*) is man-made interference, which is tremendous, even when the aerial and earth are removed from the set. Obviously, the

WAVEBAND SWITCHING



The simple change-over scheme in this circuit permits 16 to 50 metres to be covered without changing the coils.

wiring of the set and the coils are picking it up, and I strongly advise him to build it in an iron box, as I do my own. *Then* it might be worth trying one of the noise-reducing aerial systems.

Finally, he wants me to describe a 16-valve superhet, just to show readers that the Yanks aren't the only people able to design hefty receivers. I *might*, S. K.—who knows?

H. A. M. (Margate) reports having heard G T 6 Y V (Barbados). He has certainly garbled the call-sign, which is V P 6 Y B. The address is T. A. Archer, "Verona," Bank Hall Road, Barbados. For the other inquiries I must refer him to the Amateur Call-Book.

Calcutta and Lahore.

W. C. T. (Chiswick) wants me to find out whether Calcutta (49·1 metres) and Lahore (250 metres) are receivable in this country, either during the early morning or later in the day. I can vouch for Calcutta, whom I have heard at 1 a.m., but the 250-metre station is rather out of my province. Can anyone help?

C. T. (Grimsby) tells me that E A Q (Madrid) will, on receipt of a report and one dollar (or equivalent), forward its special Jubilee Q S L card and a copy of the Station Magazine for one year.

F. A. B. (Ridgewell, Essex) is a user of the "Empire Super," and I show a picture of his den on the previous page. He would like to get into touch with other users of the same set. Will such people please introduce themselves to Mr. F. A. Beane, Ridgewell, Essex? Thanks. He has a pretty comprehensive log of short-wave D X on it, anyway.

Five Metres in Glasgow.

Two Glasgow readers write to tell me that they have some 5-metre gear going and will co-operate with anyone in that district. Their address is 23, Braidfauld Street, Tollcross, Glasgow, E.2.

G. B. (Bromley) tells me that I was far too conservative in my description of results with the "B.C.L." Two. He claims to have a "B.C.L." Two that is a wonder of the town and always behaves like a perfect little gentleman.

I must admit that I'm at a loss to account for the complete failure of some readers' efforts when so many others met with success right away.

W L. S.

THE RADIO STARS' AUTOGRAPH ALBUM

Some peeps into the house-book kept by the proprietor of a refreshment haunt popular with B.B.C. stars.

I'VE just had a peep at the radio stars' autograph book, which is kept by the manager of the Bolivar, a refreshment haunt near Broadcasting House, where the radio stars retire for a respite from their rehearsals and for supper after their broadcasts.

The name *Douglas Fairbanks* was scrawled large and thick half across a page, and beneath, in spider-like schoolboy handwriting: *Hughie Green*, "after compering my first variety show, April, 1934."

"Hughie was tremendously thrilled to put his name so near Douglas Fairbanks'," chuckled the manager.

I turned the pages . . . . *Charles Laughton*—"Mr. Laughton drank beer and ate bread and cheese heartily," recalled the manager.

Jack Payne, and beneath it *Henry Hall*—"Mr. Hall gave his band a party here on his anniversary night recently," said the manager. "It was a very gay affair!"

More names followed—the manager remembering, as we turned the pages, the little-known idiosyncrasies of our radio artists as he sees them off duty.

Tessa Deane—"She's on a diet." *Gillie Potter*—"He's a loss to us. We miss him. He's not been near the B.B.C. for months." *Marius B. Winter*—"He's down on crooning now; was arguing about it the other morning."

A Frequent Visitor.

Henry Wood—"Sir Henry is coming in frequently now that he's living in London."

I turned more pages. *Lance Sieveking*—"He has weird tastes where food is concerned." *Elisabeth Welch*—"Makes her own cocktails and sings as she does it." *Eric Maschwitz*—"Just now he sits in a corner trying out his languages in readiness for his coming trip to the Continent." *Stanelli*—"Since he lost his dog we've nowhere to put our meat bones. He always used to take them for the 'hound.'"

Denis O'Neil has written a verse to the tune of "Danny Boy":

"Oh, Bolivar, the pints, the pints are calling!
From B.B.C. and from St. George's Hall,
Rehearsals due, all the artists thirsty—
Oh, Bolivar, it's me that hears your call!"

On the next page a life-like drawing of a baby bawling at a microphone is signed: *Tom Webster*—"A loudspeaker long before the B.B.C."

A man's face drawn with question-marks and semicolons has under it *Stainless Stephen*, and a Scotsman's face is signed *Will Fyffe.*

Near by is transcribed the first familiar bars of "Rhapsody in Blue," and the name *Harold Ramsay*, whose organ you have often heard playing that signature tune.

John Watt—"Ah," remembered the manager, "he was getting his troubles off his chest last night. Telling me what a job he's having with a Jubilee programme."

"My radio star customers are very different 'off the air,'" said the manager. "They like to be quiet here, to talk and rest like ordinary folk. But"—and he pointed to another signature: *Harry Tate*—"It's a scream whenever he pops in!" he chuckled.

L. B.

Wonders of the Vacuum

by JOHN SCOTT-TAGGART

M.I.E.E., F.Inst.P., Fel. I.R.E.

THIS WEEK OUR DISTINGUISHED CONTRIBUTOR GIVES FURTHER FASCINATING DETAILS OF SOME OF THE MARVELS OF MODERN ELECTRICAL AND OPTICAL RESEARCH.

THE semi-vacuum certainly does not hide its light under a bushel. It urges us to go cruises, to grow younger, to undergo permanent waving, and to drink gin.

In any large town the electric sign is a feast to the eyes and a curse to the ears—if the ears belong to a wireless-set owner. Throbbing, whirling, flashing, these tubes of anæmic gas flare with a brilliance and febrile beauty that dazzle one.

We pale before the vividness of the new age of illumination. The coat of Joseph has nothing on these creations of the modern physicist. The "primrose path of dalliance" is now illumined by a sodium tube. And in the London suburbs—for example, at Neasden and Seven Kings—incandescent vapour is flood-lighting roads formerly relieved by the sparse rays from heated filaments.

All this has been done in the laboratory and derives from the pioneer work of Sir William Crookes, prophet of radio, authority on glass and—as I see from advertisements—an early expert on halibut liver oil. But to most of us he is the man who investigated the discharge of electricity through rarefied gases and so launched a great industry.

The jubilations associated with our King and Queen have given a fillip to all forms of flood-lighting and decorative illumination. And most of this light comes from a "glowing vacuum"—actually a partial vacuum through which electricity passes.

The "Daylight" Lamp.

The kind of gas left in the "vacuum" and its pressure (degree of rarefication) govern the results obtained. Ordinary daylight is composed of certain colours—the colours of the rainbow, in fact—mixed together in certain proportions. The eye is actually most responsive to the green.

When considering the usefulness of "vacuum" lighting we have to take into consideration not only the efficiency of the lamp, but the utility of the colour of light it gives. Tubes containing carbon dioxide in a "thin" condition are inefficient, but the colour of the light emitted is extremely similar to that of daylight.

When choosing a tie you do not need to take it to the haberdasher's door; he probably has a suitable lamp on the counter—although this may not necessarily be a vacuum lamp.

Various Colours Obtained.

Of course, advertising illumination is at present the greatest field for the gas-discharge lamp. Tubes containing the rare gases—helium, neon and argon, either alone or mixed with mercury vapour—afford a variety of brilliant colours.

Neon gas will give a red light and sodium vapour a yellow. Mercury vapour, mixed with argon, will give blue. The latter gases, in a yellow tube, will give dark green. Sometimes a fluorescent tube is used: that is, one that glows when a discharge takes place. This fluorescence enables more of a given colour of light to be obtained for the same power.

IN THE "H.M.V." STUDIOS

The dramatic-control panel at the "H.M.V." studios in London, with the aid of which music-and-sound effects from eleven different studios can be mixed and balanced into the making of a single record. This is the only control of its kind in the world in use for gramophone recording, and cost over £1,000. Five miles of wiring are employed in its construction.

Two general kinds of lamps are used: those requiring a high voltage across their terminals and those working off the ordinary electric-light mains.

The gas in all tubes is ionised, and the discharge is like an arc. It usually takes a high voltage to start it, but less voltage to maintain it. The hot-cathode type of tube is a more practical proposition. Electrons from the glowing filament (coated with oxides) readily ionise the gas.

Large currents can be passed through such tubes, and their brightness may be as much as one hundred times that of earlier tubes. For a given power consumption you can obtain two or three times as much coloured light as from ordinary filament lamps used in conjunction with filters.

No one quite knows how useful really powerful coloured light may become. Are the sun's rays the best for health, or can we improve on them? A vast field for experiment lies in the direction of agriculture. Certain plants may thrive on coloured light, and it may become a commonplace to put a sickly tomato in the "blue room."

Lighting Arterial Roads.

Hot-cathode sodium-vapour lamps are now being used for lighting arterial roads. They radiate light of only one wavelength—which is in the yellow region of the spectrum. They are three times as efficient as filament lamps, but colour contrasts are missing. This means that a motorist will miss some of the subtle differences between a ginger tom-cat and a navy-blue pedestrian. But most motorists will forgo such æsthetic distinctions.

Another highly efficient lamp is the high-pressure mercury lamp. This emits yellow, green and blue rays. Red, however, is deficient. All the usual colours, except those containing red, can be recognised under the light of these tubes, which are as much as three times as efficient as filament lamps of the same wattage. For street lighting and industrial illumination these lamps seem to have a big future.

And now let us switch off lamps and consider that other vacuum device, the

(*Continued on next page.*)

WONDERS OF THE VACUUM

(Continued from previous page.)

photo-electric cell. This is the "electric eye" beloved of the quack inventor. How many times has it figured on the covers of magazines dealing with popular science! Its uses are legion—from television to burglar alarms—and every day finds for it some new employment. At one time it was a toy.

I remember, in 1920, being asked to inspect and report on an invention connected with radio. The inventor was typical of his quackish breed and had in his room all the paraphernalia of the scientific magician. Dogs barked or moved along the ground when a light was shone on to them. Bells rang and gramophones started with the magical shaft of light.

My companion, a non-technical business man, was amazed and delighted by these childish exhibitions (which had nothing whatever to do with the object of our visit), and was as ready to swallow anything that followed as I was to yawn.

No Longer a Toy.

But the photo-cell has certainly come into its own. From a toy it has grown into a necessity. There are various kinds, but, generally speaking, a photo-cell is non-conducting in the dark but conducting when a light is shone upon it.

The cathode may be a film of cæsium metal, while the anode may be a metal plate of some kind. These electrodes are mounted in a bulb which "contains" a vacuum. When light falls on the cathode an electron current will flow to the anode if this is kept positive with regard to the cathode. The "cell" is like a two-electrode valve, the electrons being released by light and not by heat.

The current "produced" by the photo-cell is passed through a resistance and sets up electromotive forces, which may, if desired, be amplified and used for a variety of purposes. They may, for example, be used to close a switch, which, of course, could "start" anything from an electric bell to a power station. It is a simple matter, then, to make electric dogs bark or doors open when a light shines on them.

The Burglar Alarm.

Sometimes we arrange for a light to shine in a beam on to the electric eye, and then, if we interrupt the light, we can arrange for the change of photo-cell current to switch on something. The "light" need not even be visible, but may consist of infra-red rays. These rays cannot be "seen," but they will affect a photo-cell. A burglar alarm can be arranged by shining a beam of infra-red rays on to a photo-cell, so that any burglar would, on entering, intercept the beam and start the alarm. (What good starting an alarm bell is I don't know; I've heard scores ringing in London shops without anyone doing anything about it.)

A more peaceful application of the same idea is counting people passing through a doorway or counting tins of bully-beef passing along a conveyer. The problems involved are obviously similar.

The Cell as Selector.

An ingenious machine was shown at the Physics Exhibition at Manchester. A ray of light shone on tins of something as they came along. If the tin had a correct label it was allowed to pass. If the label had been forgotten the photo-cell (presumably by passing more current) "reported" the fact to a mechanical buffer, which knocked the offending tin off the conveyer.

Variations in light falling on a photo-cell may also be used to switch on (or off) street lamps or the lights on buoys. The photo-cell is now being widely used for matching colours, cutting out the human element of error. It may be used to tell when soup is sufficiently cooked or when a chimney is smoking excessively. It can sort the confetti of bus conductors or check the sediment in beer.

By the use of filters or special cells it is possible to separate articles of different colours, and a machine for separating red from blue marbles was exhibited. This seemed an odd pastime, but it is obvious that more practical operations could be carried out on the same principle. Colonel Lee, the Engineer-in-Chief of the Post Office, described, in fact, how letters with the stamp in an unconventional place could now be mechanically turned the right way round so that the obliterating imprint would cancel the stamp. The photo-cell is the hero of this "act." Inadequately stamped letters will also be found out.

All we need now is something of the kind fitted to our letter boxes so as to throw out all letters marked "O.H.M.S."

IMITATING MOTOR-CYCLE NOISES

B.B.C. EFFECTS

The above photograph shows how the noise of a racing motor-cycle can be very easily imitated by the simple procedure of holding a piece of brown paper against a revolving disc to which leather thongs are attached. An electric motor drives the disc. The sound of waves beating upon the shore is produced by slowly rocking a drum containing lead shot in front of a microphone (see picture on right).

"CAVALCADE"

An Interesting New Marconiphone Publication.

ONE of the most attractive and interesting trade books that we have seen is "Cavalcade," a new Marconiphone Jubilee publication that has just been issued.

An embossed silver cover well offsets the book, and the heavy art paper used for its 44 pages has enabled the maximum brightness in printing to be obtained. The book is lavishly illustrated and exceptionally well produced.

Very Interesting Indeed.

To all who have more than a very few years of experience in radio "Cavalcade" must hold a great fascination, for it is a giant reminiscence of the progress of wireless from the time when Marconi was carrying out his first experiments in Italy in 1894, through his early radio tests in the Isle of Wight in 1897, right up to the present day with its promise of television. And POPULAR WIRELESS has not been forgotten, either, a photograph of No. 1 being included as one of "the events" of 1922.

The parts played by the "old" Marconi Co. and the more recent Marconiphone Company are well portrayed, and every stage of the advance of radio is illustrated with interesting and memorable scenes. It is therefore a most useful record as well as an interesting reminder of pioneer days.

"Cavalcade" is intended for "Marconi-men" in the radio trade, and copies have been distributed throughout the country. Readers who are interested in the book, however, should write to the Marconiphone Company, Ltd., Radio House, Tottenham Court Road.

The Story of the Valve

by Dr. J.H.T. ROBERTS F.Inst.P.

OF all the factors that have contributed to the improvement of broadcast reception none has played a part comparable with that of the thermionic valve, and it may fairly be said that the development of the valve is the development of broadcasting.

The history of the valve, short though it be, embraces a multitude of discoveries, inventions, developments and innovations. It has seemed many times that the limit of valve design must surely have been reached; yet at that very moment some new principle discloses itself and the whole field of research opens up afresh.

In this fascinating article Dr. Roberts describes the valve as the "unknown quantity"—the mystery element in radio. We have here its remarkable history in brief, based upon an address by Capt. Mullard, this year's popular Chairman of the Wireless Section of the Institution of Electrical Engineers.

The Early "R" Type.

So often has this happened in the brief history of this subject that even the most initiated have given up prophesying what the future of the valve may be. It is the unknown quantity in radio—the mystery element—and the measure of its secrets seems to be endless. My task in giving you a quick survey of the development of the valve during the past decade is therefore not an easy one. But I will try.

As many of you will remember, the first types of valves used in broadcast receivers were the "R" type, high-vacuum three-electrode valves with tungsten filaments. The filament consumption of these valves was a heavy drain on even large accumulators (a current of as much as 1 amp. per valve was by no means uncommon) and, moreover, the emission current, even for this large filament energy, was very small.

The filaments were fragile and the manufacturing losses high, largely owing to the only method then available for expelling the occluded gases from the electrodes during pumping, which was by electronic bombardment from the filament. This tedious and unsatisfactory method was soon superseded by the process of heating the electrodes by an induced high-frequency current during or after pumping.

This process served a double purpose: it first drove out the occluded gases and then evaporated a small quantity of magnesium, which removed the gases thus liberated.

The first step towards what we may call emissive efficiency dates from Langmuir's work on thoriated filaments—that is, tungsten filaments into which thoria had been introduced. Langmuir pictured the filament as a miniature chemical factory, in which the thorium dioxide is reduced to thorium in the body of the filament and thence transferred to the surface, where it adheres very firmly to the tungsten and forms a highly emissive layer.

This layer is very sensitive to traces of gas, and the rate of production of the thorium metal varies rapidly with temperature; an extremely good vacuum is necessary, both for its initial activity and for the maintenance of this activity during life.

By the use of thoriated filaments clearances between grid and filament were reduced and the "slope" of valve characteristics increased, and thus a big step forward was possible in circuit applications.

The demands, however, for still further improvements in valve characteristics, and also the desire of the manufacturers to improve the reliability of valves in service, led to a more careful consideration of work done years previously with oxide-coated filaments.

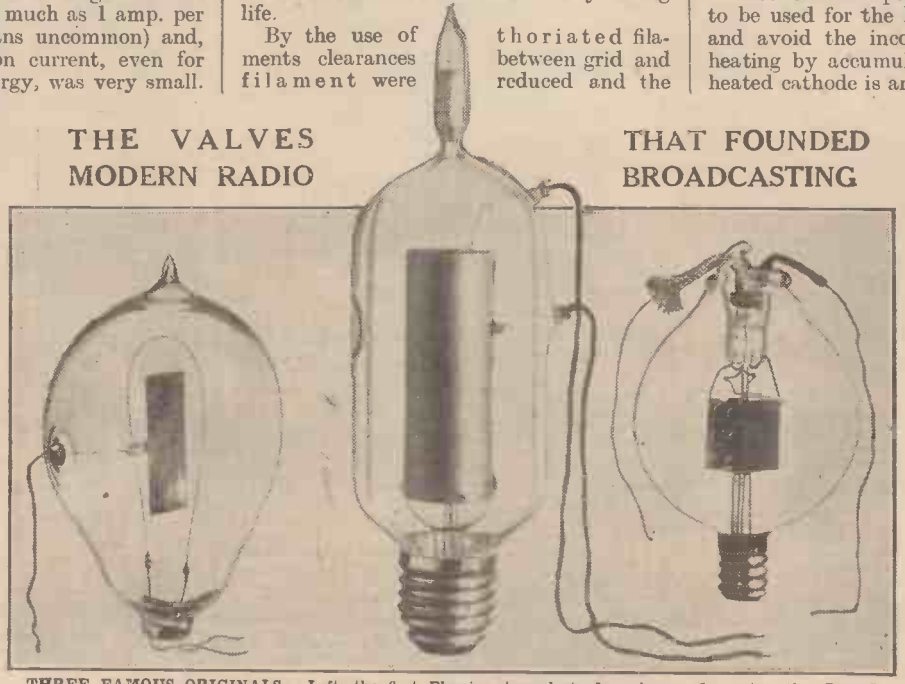
In 1924 a method of producing oxide-coated cathodes commercially was discovered. This process consists of providing an oxidised metal cathode in the valve and surrounding this cathode, after preliminary evacuation, with the vapour of metallic barium. The cathode is generally of tungsten, although practically any metal with a sufficiently high melting point may be used, such as nickel, iron or platinum.

Using an Indirectly-Heated Cathode.

In some types of valve it is necessary, for various reasons, to use the original Wehnelt type of cathode. The Wehnelt process has rendered possible the "indirectly-heated" cathode, in which a metal tube is coated with an emitting layer and heated by a filamentary heater, insulated from it electrically by a refractory material such as aluminium oxide or magnesium oxide.

These cathodes permit alternating current to be used for the heating of the cathode and avoid the inconvenience attached to heating by accumulators. The indirectly-heated cathode is an equipotential surface; it carries no heater current, and thus there is no potential gradient along its length. This cathode is becoming more generally used, and it is only the lack of electric-supply mains in so many dwelling houses that maintains the popularity of battery-heated valves.

Some of you will no doubt be expecting me to say something about the possibility of a cold valve—one not requiring any heating for the cathode. This has been the dream of valve designers for years, but I hate to tell you that it seems to be theoretically impossible.



THREE FAMOUS ORIGINALS. Left, the first Fleming two-electrode valve, and, centre, the Round detector valve, which had a wad of asbestos in the pip. This was warmed with a match to drive off occluded gases and thus to soften the valve. The valve on the right is an early B.T.H. naval "grid-iron" grid type. These valves are at present in the Ediswan museum, where a complete set of historic valves is kept. Fleming, of course, was on the staff of Edison & Swan when he made his famous invention.

THE STORY OF THE VALVE

(*Continued from previous page.*)

There are possibilities in cold cathodes which rely on an external source of radiant energy, such as light, especially if effective use can be made of ionisation and secondary emission. But so far as the ordinary type of emitter is concerned it seems that a certain minimum energy will always be necessary to release the electrons.

Soon after broadcasting started it became evident that amplifying valves of much larger output than any then available would be required, and such valves as were soon afterwards produced were the forerunners of the extremely efficient output triodes of the present time.

The development of radio-frequency amplification led to the introduction of neutrodyne circuits, in which the known capacitance defects of triodes were eliminated by an additional balancing capacitance, thus overcoming the difficulties of coupling between the input and output circuits.

Obtaining Stable Amplification.

This method had its defects; for instance, it was practically impossible to "neutralise" completely over a wide range of frequencies. This attempt by the circuit designer to produce stable cascade amplification with triodes was soon rendered obsolete by a valve of entirely new design.

In this valve, the screened-grid tetrode (introduced in 1927), the grid-anode capacitance was made so small that it was possible to use tuned circuits of low decrement and, at the same time to obtain stable amplification, whereas, with triodes, circuits were often made deliberately inefficient in order to obtain stability, while giving only about one-hundredth of the amplification attainable with the screened-grid valve. The screened-grid tetrode thus became established and the long-known triode defects were eliminated.

It was appreciated that the high-differential anode resistance of the tetrode would make it an ideal output valve, were it not for the negative-resistance portion of its characteristic. The introduction of a fifth electrode between the anode and the auxiliary grid enabled the high-differential resistance to be maintained, while, by preventing secondary emission from its two neighbouring electrodes, it eliminated the dynatron or negative-resistance portion of the characteristic.

The Birth of the Pentode.

It was in this way that the pentode was born. The introduction of the pentode was as great a step forward in low-frequency amplification as the screened-grid valve had been in high-frequency amplification, and the pentode has superseded the triode in the output stage of most modern receivers.

It is interesting to note that the constant-current characteristics of the pentode are simulated in the triodes used for Class B amplification. The great sensitivity and comparatively large output of the pentode type of valve gave improved volume and saved the listener a complete low-frequency stage.

More recently double pentodes for quiescent push-pull have been developed. Their application is identical with that already described, but the two pentode elements are contained in a single envelope.

With the increasing multiplicity of stations and the presence of powerful local stations some kind of automatic volume control became practically necessary. The so-called "variable-mu" valve is now universally adopted for this purpose. It is obvious that a means of regulating the sensitivity of a receiver is readily available by the variation of the grid bias of the high-frequency valves, the sensitivity decreasing as the grid is made more negative.

AFTER 1922 we come to such valves as these; The tiny dull-emitter "Wecovalve," the bright-emitter Mullard "Ora" and a Mazda screened pentode of modern design.

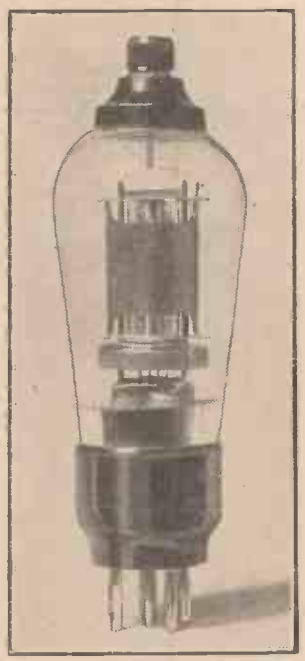
Volume Control.

In the variable-mu valve the shape of the characteristic is such that by varying the steady negative grid potential the amplification is uniformly and gradually diminished and modulation distortion is reduced to a minimum. Any method of controlling amplification which depends upon the negative potential of the control grid needs very little energy and can readily be made automatic, the magnitude of the signal itself determining the grid potential.

The practice now general is that the rectified and smoothed carrier-wave maintains a steady potential at the grid return leads. A strong station yields a large negative bias and diminishes the amplification of the receiver, while a weak signal produces practically no diminution in amplification.

A further refinement is the so-called "delay" action, by which signals up to a certain strength have no effect on the amplification. This effect is produced by biasing the rectifier diode which yields the controlling voltage, and has the advantage that a rapid control of bias by signal is possible, thereby rendering the output much more constant over a greater range of input voltages.

FOR A.C.



AN INDIRECTLY-HEATED screened pentode made by Ferranti for use on A.C. mains.

Another development in high-frequency amplification is the screened pentode. When the electrical characteristics of the pentode were fully appreciated it was desired to apply them to high-frequency amplification.

A Big Step Forward.

The combination of internal screening (which rendered capacitance "feed-back" negligible) with the pentode characteristic of high and constant internal differential resistance produced an amplifying valve of great uniformity and unrestricted anode-potential swing.

It was then possible to utilise signal and intermediate-frequency tuned circuits of high impedance and good power factor without introducing difficulties in the amplifying valve. The comparatively linear relationship between load impedance and stage gain makes it possible for this class of valve to take full advantage of each and every improvement in coil efficiency.

A further development of receiver design led to the appearance of yet another group of multi-electrode valves, more particularly in connection with receivers of the supersonic heterodyne type, which have recently returned to favour on account of their high selectivity and simplicity of operation.

The pentagrid, the earliest of such valves, consists, like all of its successors, essentially of two valves in series. The cathode and

(*Continued on page* 286.)

TELEVISION

WAITING FOR SOMETHING TO HAPPEN!

A DISCUSSION OF THE PRESENT POSITION OF HIGH-DEFINITION TELEVISION IN THIS COUNTRY

By L. H. THOMAS

I SUPPOSE I should be right in saying that the present situation with regard to television is one that is unparalleled in the history of radio. Transmissions are commencing later on, and the radio trade is ready to build receivers for those transmissions. Meanwhile, however, there is practically no means of testing those receivers out.

The firms that are going to provide the transmissions are the only people that are fully acquainted with the details, and though we can all build receivers that we know *should* work (in theory), that is just as far as we *can* get.

It's obviously no good raising a full-sized moan about the position; the best thing we can do is to carry on and hope for the best. In any case we know quite a lot about the sort of thing we shall have to build, so why not do that? If it doesn't happen to work when the regular transmissions commence only minor alterations will be necessary—the fundamentals are sure to be right.

All Ready for Television.

A friend of mine, working on these lines, has evolved a complete cathode-ray receiver—cabinet and all—and is just sitting and waiting in the hopes of catching an experimental transmission in time to test it out. In case readers are interested in the general appearance of the thing I am reproducing a rough sketch of the front of the cabinet, from which you will see that it is not unlike an ordinary radiogramophone.

Internally it follows, fairly closely, the suggestions that I have made from time to time. The broad outline of the radio part of the outfit is: Buffer stage, 1st detector frequency changer, three I.F.'s (one tuned, two aperiodic), 2nd detector feeding directly into the cathode-ray tube and L.F. stage for synchronising signals.

Sound is provided for by a separate circuit, mounted in the same cabinet, but with the controls tucked out of the way so as not to make tuning too confusing a matter.

Tube Mounted Vertically.

The chassis is narrow and deep, with the radio part nearest the front panel and the time-base equipment farther back. The cathode-ray tube is mounted vertically, the screen just projecting through the flat part of the cabinet (normally occupied by the gramophone turntable), and a mirror is provided in the sloping lid for viewing.

Up to the present we have confined ourselves to the reception, on the radio side, of 5-metre amateur transmissions and to experiments with the C.R. tube on an audio-frequency oscillator.

One of these days, when we are both free and hear the Crystal Palace in full blast——

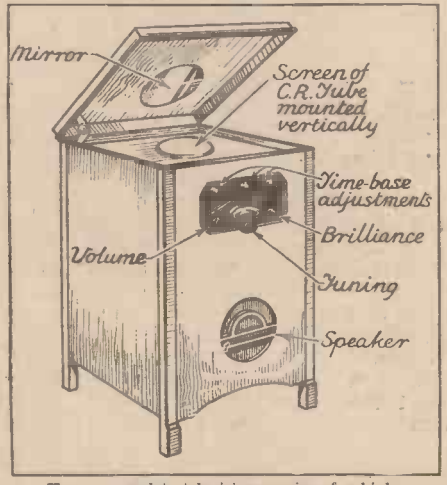
I am trying to get an accurate mental picture of the average reader's feelings towards high-definition television, and can't make up my mind whether he is sufficiently interested to start on constructional work right away. I'm rather afraid the position will resolve itself into the well-known phenomenon of inertia for some months, followed by a most hectic rush as "zero hour" draws near.

Several readers have written to me, however, asking for fuller details of a 5-metre receiver than those that I gave in the April 6th issue, including a full layout diagram and list of components.

Next week I hope to comply with their requests, although I don't think I shall specify individual components when I know that any good modern parts will work well.

I have two 5-metre receivers myself. One is built in a beautiful cellulosed aluminium box, using nice new shiny brass parts—it looks thoroughly commercial. The other was constructed from the contents of the junk box, and would delight the eye of a Heath Robinson. There is very little to choose between the results obtained from the two outfits, and I don't propose to give things away by telling you which is *really* the better of the two.

AN INTERESTING LAYOUT



How a complete television receiver for high-definition could be arranged.

Lest you should think I am treading on the toes of my fellow-scribe W. L. S. when I come over all "ultra-short-wavish," let me assure you that we have been co-operating in this matter, and that he has decided that he has quite enough to do in his section by covering the "ordinary" short waves.

The ultra-shorts are almost entirely bound up with television, and a television page seems to be the appropriate place for them.

Incidentally, those who are not new to the short-wave game will find themselves in a very favourable position over their less-fortunate brothers! I can't imagine the feelings of a man who steps straight from 300 metres to 5 metres without having had any experience of the intermediate wavelengths.

Now I want to do a little "de-bunking" of statements that appear, from time to time, in the non-technical Press. I don't suggest that "P.W." readers are so benighted that they take any notice of them, but certainly some people do.

An Amazing Statement.

"De-bunk" No. 1 applies to this amazing statement: "Any good broadcast receiver will be suitable for the reception of the new television transmissions. The only extra gear required will be the cathode-ray tube *and a special short-wave adaptor*." That story is such complete bunk that all we can do is to write it off in one go. There's no broadcast receiver on earth that will give the wide response needed for television—if there were it wouldn't be the slightest good for broadcasting, since the whole of Europe would come in at once!

"De-bunk" No. 2 is nearly as serious: "It will be a simple matter to convert *almost* any existing 30-line receiver to receive the new transmissions." The italics are mine. If the writer had said *almost* any existing cathode-ray receiver for 30-line transmissions there would have been a suspicion of truth about the statement. As it is—well, I won't say what I think. I'm quite prepared to believe that some of us *will* be using disc receivers, this time next year, on 240-line television, but they certainly won't be converted 30-line models.

Not Quite So Easy.

The man who wrote that sentence apparently thought it would only be necessary to slip another disc on the shaft and presto!—off we go! What a hope some people have!

Motor speed will have to be doubled; discs will be much larger in diameter, and projection on to a screen will be a necessity, not a luxury, as it is now.

The screen, however, need not be extremely large. As I have said before, a neat little screen built into a receiver seems to be the average man's idea of television, rather than a large sheet hung on the wall!

The mechanical people certainly have many difficulties to overcome if they are going to "win through"; but they're working hard behind the scenes, and there may be several surprises in store for us this autumn.

Meanwhile, we must continue to sit on the fence, "waiting for something to happen." It will, sooner or later.

CONCERNING CONDENSERS

The importance of using fixed condensers which line up to the ratings marked on them, and some notes on the "Peak" brand of condenser.

THE quality of a fixed condenser cannot necessarily be defined by a few simple figures alone. Or, put in another way, figures which blandly grace the case of a fixed condenser should not always be taken at their face value.

For example, what does "2 mfds., 500 volts" convey to you? Do you conclude that the condenser so marked has a capacity of 2 mfds. and is able to withstand a voltage of 500? If so you might be quite wrong on more than the one score.

Merely to label a condenser "2 mfds." does not give it that capacity. We say that feelingly, for we recently had a so-called 2-mfd. condenser which actually could not turn in more than just over 1 mfd.!

WIRE-ENDED TYPES

Good but inexpensive condensers with wire ends for connecting are included in the "Peak" range.

And that voltage figure. It might mean that the condenser is safe at 500 volts, but it is most unlikely that that would be the correct interpretation. More probably in an unbranded condenser the figure is more of a pious hope on the part of the makers that the condenser ought to be able to be tested at such a voltage!

Even if our mythical condenser had been tested at 500 volts, that is no guarantee that it would not break down at 250 volts. Let us explain this apparently contradictory statement.

There are two ways in which a condenser can be given a voltage test. The first is generally referred to as a puncture test. It comprises putting the voltage of a D.C. (direct current) source of supply across its terminals. If the voltage breaks down the insulation the condenser has obviously failed to pass the test.

But a condenser which will pass a 500-volt D.C. puncture test quite successfully may find a continuous 250 volts of alternating current too much for it. The reason for this is that in any condenser subjected to alternating current there will be a temperature rise due to losses.

The dielectric losses in a well-designed and carefully made condenser will be small, but in others they can assume serious dimensions. With the increasing temperature that follows the continuous application of A.C. the dielectric tends to lose its insulating properties, and so there is an inevitable breakdown beyond a certain critical voltage if the condenser is left in circuit.

Dependable Makes Ensure Safety.

Generally speaking, it is considered that a condenser which has been tested at so many volts D.C. will not be able to stand up against more than about half that voltage with continuously applied A.C., although momentary surges might leave it unharmed.

But even when a condenser has been found satisfactorily to pass initial breakdown tests of a suitable character, that should not be regarded as indicative of reliability, for condensers tend to age, and the poorly designed condenser's life is often a lamentably short one.

Well, then, what is the constructor to do? The remedy is quite simple, and one which has been mentioned many times before in "P.W." in other applications. It is merely that the constructor should always remember the fact that any one condenser of a particular specification is far from necessarily being as good as any other of a similar specification.

A whole horde of firms are manufacturing fixed condensers, but only a relatively few make really dependable ones. Among these few is Messrs. W. Andrew Bryce & Co., of Woodfield Works, Bury, Lancs., whose products bear the brand name of "Peak."

These "Peak" condensers have a reputation for soundness, and we have heard engineers of leading electrical and radio concerns casually remark, "Oh, yes, 'Peak,' they are all right," which means, coming from the undemonstrative technician, that they are quite first rate.

Up to the Highest Standards.

It is, too, condensers such as "Peak" which we use in our own experimental equipment, carefully avoiding certain others. Both in regard to capacities and reliability we therefore have no hesitation in saying that "Peak" condensers are well up to the highest standards.

There is a wide range of "Peaks" available, including inexpensive wire-end types and high-capacity models, with metal cases and terminals, also competitively priced. The "Peak" Dry Electrolytic, which can be seen in the photo below, is rated at 8 mfds., maximum working voltage 550. This, too, is a well-made and dependable component which does not "fizz" and evince signs of incipient failure when that maximum is approached.

OTHER MODELS

Here are further types of "Peak" condensers made by Andrew Bryce & Co., of Woodfield Works, Bury, Lancs.

TELEVISION SHORTS

Notes on the latest technique.

OWNERS of ultra-short-wave receivers should not confine their attention to the 5- and 7-metre bands. Whereas all that can be heard on "5" is amateur telephony, and on "7" an occasional experimental television transmission, quite a few amateur television transmissions may sometimes be heard just below 10 metres.

I have not yet received any definite information concerning regular schedules on this waveband, but I know definitely that five or six amateurs are licensed for television transmission on these wavelengths and are regularly active.

A Simple Circuit.

Readers who would like to try out a 5-metre receiver on amateur telephony on that band will be interested in the circuit shown on this page. It is a super-regenerative circuit that does not rely on "quench coils" for its operation. I find it rather difficult to explain how it *does* work, but it certainly does, and several friends have had excellent results with it.

The detector uses the popular split series-fed circuit, but a large condenser is connected between the "dead" side of the H.F. choke and earth, and the grid leak is reduced to a very low value—100,000 ohms gives successful operation. The interruption frequency is out of the audible limits, and the receiver handles in exactly the same manner as the familiar type using a separate quench valve with long-wave coils.

A fairly loud rushing sound is heard all round the dial, but this disappears completely when a carrier-wave of any strength is tuned in. The familiar broad tuning is retained, and it is quite easy to handle the receiver.

* * *

Recent developments in the design of mirror drums seem to indicate that high-definition reception by this means will be well within the bounds of possibility. One firm is already giving demonstrations (by land-line only) on 240-line scanning, using a multiple combination of mirror drums and vibrating mirrors. The image, however, is projected on to a large screen, and the future of the arrangement for home reception on a smaller scale seems somewhat hazy.

Tube Developments.

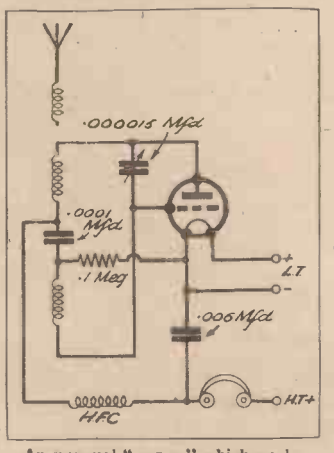
We are rather given to assuming that the cathode-ray tube has reached a state of finality and is waiting for mechanical systems to overtake it. The quiet development that is going on, however, leads one to suppose that for quite a long time the C.R. tube will have a little in hand!

As fast as developments in the mechanical sphere occur, parallel improvements on the C.R. side will doubtless be announced. I understand that quite a small cathode-ray tube is now capable of giving an image of such definition that quite a large amount of magnification is possible.

New types of receiving aerial are being developed for ultra-short-wave reception, and our old, old friend the "dipole" is being dressed up with new names.

It will be quite practicable, in cases where reception from only one station is desired, to equip the *receiving* aerial with a reflector which will give an enormous increase in efficiency.

FOR 5 METRES



An unusual "super" which works well on the "ultra-shorts."

Aerial Reflectors.

Reflector systems need not be complicated, one of the simplest being the use of a wire of similar length to the aerial, mounted a quarter of a wavelength behind it and not connected with it in any way.

One of the great advantages of television reception will be that it will be not only possible, but desirable, to build receivers for use on one fixed station only. Broadcast-receiver design has been enormously complicated by the fact that users want to receive a multiplicity of stations. This position will not enter the television sphere—at any rate, not for a very long time!

L. H. T.

"Wavelengths down to 13 metres are riddled with broadcast programmes"

writes this

WORLD-FAMOUS SET DESIGNER

in his article on

"Ten times as efficient as any other adaptor I have ever tried

says

JOHN SCOTT-TAGGART

M.I.E.E., F.Inst.P., Fel. I.R.E.

THE "HEXOVERTER"

IN THE JUNE NUMBER OF "WIRELESS" + ON SALE TO-DAY +

Now, everyone has the chance to read what Mr. Scott-Taggart thinks about short-wave reception. In a special twelve-page article, in which he describes his "Hexoverter" design, he deals in his usual trenchant manner with the pros and cons of short-waves.—This is no ordinary constructional article, but an outspoken masterpiece which every listener in the country should read.

What all constructors have been waiting for, the first short-wave design by Mr. Scott-Taggart—that is the "Hexoverter," and the designer writes, "I declare roundly that fiddling, fugitive and fading signals do not fascinate me in the slightest. I want signals to be robust, regular and reliable." So he has designed this amazing short-wave adaptor! Get a copy of "Wireless" at once and read all about it.

WIRELESS AND TELEVISION REVIEW

PRICE 6D.

WIRELESS AND TELEVISION REVIEW

RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos. Every care will be taken to return M S S. not accepted for publication. A stamped, addressed envelope must be sent with every article.

All Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

All inquiries concerning advertising rates, etc., to be addressed to the Advertisement Offices, John Carpenter House, John Carpenter Street, London, E.C.4.

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialties described may be the subjects of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS

NOISY RECEPTION.

F. S. N. (Ulverston, Lancs.).—"I was very interested in S. R. T.'s letter and your reply in 'P.W.' I, too, have had trouble with my set, which appears to be indentical with S. R. T.'s trouble, and the following particulars may be helpful.

"My set is one which I constructed to my own design, following standard circuits which I have obtained from 'P.W.' and from Mullard's. It is my first all-A.C. set, and is a superhet octode, H.F. pentode (as I.F. amplifier), double-diode triode (second detector, amplified delayed A.V.C.), H.F. pentode (as L.F. amplifier) feeding two R.C.C. push-pull pentodes, and I.H. valve rectifier.

"I expect you think this L.F. amplifier contains enough complication to introduce any amount of noise, but I have found, by connecting phones in the d.-d.-triode output, that the first three valves are responsible. I have not had the opportunity of trying the set on different mains, but I have obtained H.T. from the mains for years with complete success.

"Naturally, I suspected H.F. interference from the mains at once, and tried condensers and H.F. filters on the mains without effect. I live miles out in the country away from the usual sources of interference. I have also tried H.F. filters in the H.T. lead to the first three valves—no good.

"So far I seem merely to have repeated S. R. T., but here is something which may help you—it simply makes it more confusing to me. I do not get this hissing on all stations—only on about eleven of the fifty or so I can get, but I can find no reason for these stations being affected.

"Amongst the stations affected are North Regional (our local, although it is about 80 miles away). Droitwich to a lesser extent, Cologne, Leipzig, Belfast, Hamburg and Huizen. Apart from these, about 11 stations, all the others are perfectly quiet—there is no trace of ordinary mains hum.

"Now, most important of all, I can completely cut out this noise by slightly *de-tuning* one of the trimming condensers on one of the I.F. transformers, which is, of course, undesirable if I can find any other way out. To me this suggests H.F. instability, but I am unable to find anything along these lines.

"If these further particulars are of any use to you I should value any suggestion for a cure which you can make."

There are scores of possible sources of trouble in such an elaborate set; and it is possible for us to diagnose faults with certainty only when an approved design is followed in detail.

The penalty of experimenting with such hook-ups is that you are forced to do your own fault-finding—for each home-designed set is a law unto itself. But we would like to offer one suggestion that may help.

Since only about a dozen stations cause the trouble, and these include Droitwich and the "local," is it not possibly an over-loading effect? That would account for the de-tuning cure.

If you find, on consideration, that the stations in question are probably your strongest ones, you can assume that the trouble is tied up with over-loading and its attendant possibilities of over-running and inadequate smoothing.

TESTING A CLOSED-IN SWITCH.

R. E. (March, Cambs.).—"Is there any easy way of testing a closed-in L.T. switch for crackles? I cannot be sure it is the switch, and don't want to take it to bits if there is any way of checking it when mounted in the set.

"The crackle is only occasional—about every three-quarters of an hour—which is making it hard to find."

(*Continued on next page.*)

The Game of the CENTURY

Made by the makers of "Lexicon," "Grandfather's Whiskers," and many other novelty pastimes.

3/6 ONLY

The World's Biggest Jig-Saw and the World's Greatest Travel Game

THRILLING! Exciting! Enthralling! Instructive! This jolly game is all that and more. It takes you round the world, to lands of romance and mysticism, gives you hours of fun and entertainment and teaches you all sorts of interesting things about the positions of the most important places of the globe. In all there are 500 square inches of Jig-Saw puzzle to be made into a Map of the World. It is an education in itself.

MAPPA-MUNDI

Made by John Waddington Ltd., Makers of the World's Finest Playing Cards. On Sale at all Stationers, Toyshops and Booksellers.

The point is → Do you want the best, irrespective of cost?

Of course you do! 362 will give you the best of which *your* set is capable—whether BATTERY OR MAINS, and at *far less cost than the next best.* Entirely British. Non-microphonic—no Mains hum

Battery Prices.	Mains Prices.
H, HL and L, 3/6; Power 4/-; Super Power, 4/6; SG and VS, 7/6; VP2, 9/-; Pentode Type, 10/-; BA and BX, 9/-	ACHL4, 7/6; P625 8/-; ACPX4, 9/-; ACSG4 and ACYS4, 12/6; ACME and ACHM, 13/-; RB41, 7/6; RB42, 10/-

If your dealer is not an appointed 362 Agent, do not be persuaded to buy the next best. *Post free direct from makers,* cash with order.

The 362 Radio Valve Co., Ltd. (Dept. X), Stoneham Road, London, E.5. *'Phone: Clissold* 1294. [02

H.L.2. 3/6

362 THE VALVE WITH THE 6 MONTHS' GUARANTEE

PLEASE be sure to mention POPULAR WIRELESS when communicating with advertisers THANKS!

ENGINEERS! LOOK WHAT YOU HAVE AT YOUR FINGER TIPS!

Do not let a first-class post slip through your fingers for the sake of a few letters after your name. Whatever your experience, age or education, you should send to-day for "ENGINEERING OPPORTUNITIES." This free 256-page Handbook shows the easiest way of preparing for the A.M.I.C.E., A.M.I.Mech.E., A.M.I.E.E., A.M.I.A.E., Matric., G.P.O., etc., Exams. The book also gives details of Courses in all branches of Civil, Mech., Elec., Motor, Aero., Wireless and "Talkie" Engineering, and explains the unique advantages of our Appointments Department. Send for the valuable Handbook to-day—FREE and post free.

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY, 101, Shakespeare House, 29/31, Oxford Street, London, W.1.

RADIOTORIAL QUESTIONS & ANSWERS

(Continued from previous page.)

Testing the action of a make-and-break switch such as the L.T. switch is the easiest thing imaginable. All you have to do is to connect a short flex across it!

In this way, instead of depending on the current's passage through the switch contacts, you are providing the current with an external pathway from terminal to terminal via the flex.

If the crackles disappear when you use the flex instead of the switch you can be sure that the crackles were caused by a hidden fault in the switch.

WAVELENGTH RANGE OF HOME-MADE SHORT-WAVE COILS.

G. R. (Welwyn).—"I want to try out some home-made short-wave coils by tuning with a ·0001-mfd condenser, but find some difficulty because I have only a hazy idea as to what wavelengths I am covering with a tuning condenser of that value.

"The coils are very much on the lines of the ordinary manufactured ones, with turns spaced nearly a quarter of an inch apart. Diameter, when unsprung and mounted, is two and a half inches on the average.

"Can you give me some idea of what number of turns to plug in for the different wavebands and the corresponding number of reaction turns to use?"

You will probably find that, with a 4-turn coil in the grid circuit and a 3-turn reaction coil, you will cover the 18- to 30-metre range. Between 30 and 60 metres try a 7-turn grid coil and 5 turns for reaction.

This should give you some idea of the wavelengths covered; but to find out with a reasonable degree of accuracy you will have to tune in some easily recognised stations at the top and bottom of the various coils, and work out the actual waverange coverage from these. It is not possible to say with greater accuracy from a mere description of the dimensions to which the coils have been made.

THE MEANING OF "ANODE VOLTAGE."

J. T. (Oxford).—"I am in doubt about the meaning of 'anode voltage.'

"I have a detector valve whose specified anode voltage is 90 volts for grid-leak detection which I am using. Does this mean that there should be a P.D. of 90 volts between the filament and the anode, or between the filament and H.T. terminal of the transformer, which is used for coupling to the first L.F. stage?

"Similarly, I want to know whether allowance has to be made for voltage drop across resistances when resistance-capacity coupling is employed."

The term "anode voltage" means the voltage difference existing between the filament (or cathode, in the case of a mains valve) and the anode itself. The anode voltage is always smaller than the voltage applied at the H.T. battery (or mains unit), because of the voltage dropped across intervening windings or resistances.

Where the windings in question comprise only those of an H.F. choke and an L.F. transformer the voltage drop is small, and almost negligible in ordinary practice. But where the coupling is not by transformer in the anode circuit, but by a resistance, or where the transformer has a decoupling resistance in series with it, the voltage drop becomes considerable.

The following examples illustrate how voltage drop should be allowed for:

(*a*) When there is only an H.F. choke and L.F. primary winding between the anode terminal and the H.T.+ supply terminal: The voltage drop is now quite small, so allow about 10 volts more. For instance, if the anode voltage should be "100," 108 at the + supply terminal would be O.K.

(*b*) When a 20,000-ohm decoupling resistance has been inserted in the circuit of (*a*) above: There will now be a voltage drop across this resistance, and the number of volts lost can be determined by Ohm's Law. The simplified rule is to multiply the number of *milliamps* taken by the valve by the number of *thousands* of ohms. So, if the plate current required by the valve in question is 1½ milliamps, the voltage drop in the resistance is 1½ × 20 = 30 volts.

Thus, with the decoupling resistance in series, to obtain an anode voltage of "100," the supply voltage must be increased by 30 volts.

(*c*) When resistance-capacity coupling is used: The calculation is exactly as above, but if there is a decoupling resistance in series with the coupling resistance the two resistance values should be added

(Continued on next page.)

PETO-SCOTT

EVERYTHING RADIO—CASH C.O.D. or EASY TERMS

IS YOUR NAME ON OUR MAILING LIST? IF NOT—WHY NOT?

We keep you in touch with all the latest Radio and Television Bargains. Send us your enquiries for everything Radio. Miscellaneous Components, Parts, Kits, Finished Receivers or Accessories for Cash or C.O.D. or H.P. on our system of Easy Payments. Send us a list of your wants. We will quote you by return. C.O.D. orders value over 10/- sent carriage and post charges paid (GREAT BRITAIN ONLY). Hire Purchase Terms are NOT available to Irish or Overseas customers.

W.B. STENTORIAN STANDARD

For Power, Pentode and Class B. Send only 2/6, balance in 11 monthly payments of 3/-. Cash or C.O.D. Carriage Paid, £1/12/6.

2/6 DOWN

W.B. Stentorian Senior. Cash or C.O.D. Carriage Paid, £2/2/0, or 2/6 deposit and 11 monthly payments of 4/-.

B.T.S. 1935 SHORT WAVE ADAPTOR

MAKE YOUR SET an ALL-WAVE SET . . . receive AMERICA DIRECT. Simply plugs into your present Battery or A.C. Mains set. The only adaptor at the price incorporating 100-1 ratio aerial tuning and slow-motion reaction; for use either as Plug-in or Superhet Short-Wave Adaptor. Walnut Finished Cabinet.

With 2 plug-in coils, 13-26 and 24-52 metres. Extra coils, 46-96 and 90-190 metres, 4/6 each.

READY ASSEMBLED 52/6

Cash or C.O.D. Carriage Paid.

7/6 DOWN and 10 monthly payments of 5/-.

SIMPSON'S 1935 ELECTRIC TURNTABLE

THE PERFECT GRAMOPHONE MOTOR AT LAST! Low consumption. CONSTANT SPEED. 1-HOLE FIXING. Darwin's Magnets. A.C. Mains only. 100/150 or 200/250 volts, 50 cycles. 12-in. turntable. Send only 2/6, balance in 11 monthly payments of 4/-. Cash or C.O.D. Carriage Paid. £2/2/0.

2/6 DOWN.

JUBILEE OFFER

Simpson Turntable as above, complete with Guaranteed B.R.G. Pick-up. Cash or C.O.D. Carriage Paid, £2/10/0 or 2/6 Deposit and 12 monthly payments of 4/6.

Peto-Scott Guaranteed H.T. ELIMINATORS

2/6 DOWN.

MODEL DC25. 200/250 volts D.C. 3 H.T. tappings. Output 25 m/a at 150 volts. Yours for 2/6 down and 10 monthly payments of 3/-. Cash or C.O.D. Carriage Paid, £1/9/6.

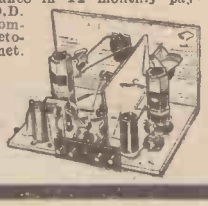
MODEL AC25. 200/250 volts A.C. 50/100 cycles. 3 H.T. tappings. Output 25 a/c at 150 volts. Cash or C.O.D. Carriage Paid, £2/9/6, or 5/- down and 10 monthly payments of 5/-.

MODEL MA10/30 with L.T. Trickle charger. A.C. 200/250 volts, 50/100 cycles. 4 H.T. tappings. Suitable for Class B and Q.P.P. operation on outputs up to 30 m/a. Trickle charger incorporated. 2-v.-5 amp. Cash or C.O.D. Carriage Paid, £2/19/6, or 5/- down and 11 monthly payments of 5/6.

Peto-Scott LUCERNE S.G.3

Complete Kit of Parts for building, less Valves and Cabinet. Send only 2/6; balance in 11 monthly payments of 3/9. Cash or C.O.D. Carriage Paid, £1/19/6. Complete with Valves and Peto-Scott Walnut Table Cabinet. Cash or C.O.D. Carriage Paid, £4/2/0, or send only 5/-, balance in 11 monthly payments of 7/9.

2/6 DOWN



PILOT AUTHOR KITS

S.T.600

KIT "A" CASH or C.O.D. Carriage Paid £4:19:6

Complete kit of components, as first specified by Mr. John Scott-Taggart, copy of "Popular Wireless" with free full-size Blue Print and S.T.'s 100 STATION "SPOT-ON" DIAL and other "P.W." FREE GIFT, less valves, cabinet and speaker.

YOURS FOR 7/6 and 12 monthly payments of 8/6.

KIT "B." As for Kit "A," but including set of 4 first specified valves, less cabinet and speaker. Cash or C.O.D. Carriage Paid, £7/4/0, or 12 monthly payments of 13/3.

KIT "C." As for Kit "A," but including valves and Peto-Scott S.T.600 Table Cabinet, less speaker. Cash or C.O.D. Carriage Paid, £8/1/6, or 12 monthly payments of 14/9.

KIT "CC." As for Kit "A," but including valves, and Peto-Scott S.T.600 Consolette Cabinet, with speaker baffle and battery shelf, but less speaker. Cash or C.O.D. Carriage Paid, £8/19/0, or 12 monthly payments of 16/6.

FINISHED INSTRUMENTS

Exact to Mr. John Scott-Taggart's First Specification. Aerial tested on actual broadcast. With B.V.A. Valves and Peto-Scott Specified Cabinets.

TABLE MODEL with lift-up lid. Cash or C.O.D. Carr. Pd. £9/12/6, or 12 monthly payments of 17/9.

CONSOLETTE MODEL with Peto-Scott S.I. P.M. Speaker. Cash or C.O.D. Carriage Paid, £11/11/0, or 12 monthly payments of 21/3.

S.T.600 A.C. VERSION

KIT "A" CASH or C.O.D. Carriage Paid £9:15:0

Comprises complete Kit of Components as FIRST specified by Mr. John Scott-Taggart, less Valves, Cabinet and Speaker.

YOURS FOR 17/9 and 11 monthly payments of 18/-.

Set of 3 Specified Valves £2 13 6

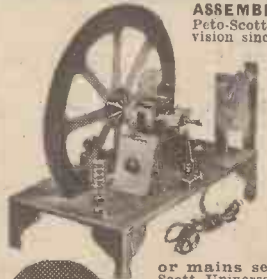
MODERNISE your MAGIC 3

CONVERSION KIT CASH or C.O.D. Carriage Paid £1:13:6

Complete Kit of Components to convert your existing Magic 3 to the 1935 version, less valves.

or YOURS FOR 5/- and 6 monthly payments of 5/3.

Peto-Scott 75-LINE DISC TELEVISION KIT



ASSEMBLED in 30 Minutes

Peto-Scott, Pioneers in Television since 1927, have, after considerable research, produced this "up-to-the-minute" Disc Television Receiver Kit, of which Efficiency and Economy are the Keynotes.

NO SPECIAL TOOLS REQUIRED. Designed to work from almost any 3-valve battery or mains set. Comprises Peto-Scott Universal Television Motor and Stand; controlling resistances; laminated and ready assembled chassis; stroboscopic 16-in. scanning disc; lens and lensholder; neon lamp and holder, together with sundry small parts. Full-size Blue Print with assembly, wiring and operating instructions included with every Kit. Cash or C.O.D. Carriage Paid, 75/-.

10/- DOWN and 11 monthly payments of 6/6

PETO-SCOTT CO. LTD.

77, P.W.24, CITY ROAD, LONDON, E.C.1. 'Phone: Clerkenwell 9406-7.

West End Showrooms— 62, P.W.24, High Holborn, W.C.1. 'Phone: Holborn 3248.

Let Us Send You This 28-Page Booklet—*Free*

It gives all particulars of various Courses that cover every phase of Radio work.

The Radio Industry is progressing with amazing rapidity. Only by knowing thoroughly the basic principles can pace be kept with it. I.C.S. instruction includes American broadcasting as well as British wireless practice. It is a modern education, covering every department of the industry.

OUR COURSES

Included in the I.C.S. range are Courses dealing with the installing of radio sets and, in particular, with their **Servicing**, which to-day intimately concerns every wireless dealer and his employees. **The Equipment Course** gives sound instruction in radio principles and practice.

There is also a **Course for the Wireless Salesman.** This, in addition to inculcating the art of salesmanship, provides the knowledge which enables the salesman to hold his own with the most technical of his customers.

Then there are **Preparatory Courses for the City and Guilds and I.W.T. Exams.**

We will be pleased to send you details and free advice on any or all of these Courses. Just fill in and post the coupon, or write in any other way.

International Correspondence Schools, Ltd.,
Dept. 161, International Buildings,
Kingsway, London, W.C.2.

Without cost or obligation, please send me your Radio booklet of information about the Courses I have marked X.

☐ **COMPLETE RADIO**
☐ **RADIO SERVICING**
☐ **RADIO EQUIPMENT**
☐ **RADIO SERVICING AND SALESMANSHIP**
☐ **WIRELESS ENGINEERING**
☐ **WIRELESS OPERATORS**
☐ **EXAMINATION** (state which)

.....

Name..... Age.....

Address .....

.....

RADIOTORIAL QUESTIONS & ANSWERS

(*Continued from previous page.*)

to obtain the total resistance for calculating the voltage drop.

To take a simplified instance, suppose the coupling resistance is 50,000 ohms and the decoupling resistance is 20,000 ohms.

The total resistance between the anode-supply terminal and the anode will now include 70,000 ohms, so if the plate current is only half a milliamp the voltage drop is quite large, viz. $70 \times \frac{1}{2} = 35$ volts. And for a plate current of one milliamp it will be seen that 70 volts will be dropped across the resistances, so the applied voltage would have to be increased by 70 volts in such an instance.

WHEN THE RECTIFIER OUTPUT IS TOO BIG.

R. E. E. (Colchester).—"The load on the rectifier will be only fifty per cent of its proper load—30 milliamps instead of 60, at 250 volts.

"This low load will have the effect of causing the voltage to rise above 250, which I want to avoid. Is the best way in the circumstances to use a 'bleed' resistance, or is there a less expensive way if this is wasteful?

"If you recommend the use of a resistance, please give the correct value of this, or explain how it can be worked out for the conditions named above."

You are right in supposing that it would be unwise to use such a rectifier to supply only fifty per cent of its rated load. And the provision of a "bleed" resistance is not wasteful, as you might imagine, but is an inexpensive and eminently satisfactory way out of the difficulty. (Mains current is so cheap that the few milliamps used in the extra resistance are not worth worrying about.)

All that is required is to provide a dummy load of 30 milliamps across the — and + terminals of the rectifier. So what you need is a resistance capable of passing this current without overheating, and of such a value that 30 milliamps will flow through it.

Ohm's Law will give you the value. You know the voltage (250) and the current (30 milliamps). So work it out from $R = \frac{V}{I}$, where I is the current in amps.

Since 30 milliamps is ·03 amps., the working is merely $\frac{250}{\cdot 03}$. You will find this comes out at 8,333·3 —an awkward figure to get exactly; but, of course, there is no need for that, and 8,000 or 8,500 ohms will be quite near enough.

ON THE AIR

(*Continued from page 270.*)

It was interesting to notice that the St. Georgeites greeted each singer with a round of applause. There was about the same amount for three of them, but the fourth, I fancy, had a wee bit more than the rest. Such distinctions are, of course, inevitable when applause is spontaneous, and if ever applause at St. George's has been spontaneous it was on this night.

* * *

Geraldo's superhuman effort lost a good deal of its appeal through circumstances outside his control, to use a B.B.C. phrase. He went back twenty-five years for a selection of tunes that had caught on in their day, and dished them up with the result explained above

* * *

At last I have a good word to say for "In Town To-night." I liked Miss Jean Batten's little speech, her tribute to her backer, her little aeroplane (the engine must have been wonderful) and her fond Mamma. The brewer's vanman, now famous because of the part in the Jubilee procession, Mr. Glass, Mr. Parry Jones, Bossy Phelps, etc., were all personalities we wanted to hear.

* * *

The 6.30 Sports Talk of a Saturday evening has dealt with every conceivable sport known to man. At least, one would think so. But each week produces a fresh one, and an expert to deal with it. I have found them all very interesting, and certainly none has been more interesting than Mr. Uffa Fox's story of canoe racing in America.

The series has produced a remarkable assortment of sportsmen, who, judging by their voices have been drawn from all walks of life. Yet they have all had one feature in common, namely a genuine love of sport and a real understanding of what sportsmanship means and entails.

* * *

We have reached the end of the "Soccer" season, and to many this means a less exciting 6 p.m. Saturday News Bulletin. I still feel very strongly about a point I have frequently raised in these notes. The relative unimportance of Soccer as the B.B.C. views it, as suggested by the late broadcasting of football results in this bulletin.

Every other branch of sport, big and small, is given priority of place. Football results are waited for with a certain amount of impatience, and considering the great part football plays in the life of the community, results should be given at the earliest possible moment. The newspapers recognise this. Indeed, they publish half-time results.

C. B.

WITH THE EXPERIMENTER

(*Continued from page 269.*)

apply. Otherwise the foil will crack, and so eventually will your brain—with the resulting mystifying noises.

Secondly: See that the metal-foil screening is properly taken to earth. The earth for a screened-aerial lead-in wire must, like Cæsar's wife, be above suspicion. A buried plate soldered to the lead is best, but a waterpipe will do.

Does this lead-in affect the operation of the set? Yes, it does. Sometimes to an unbearable extent. But that is only when the thing has been badly put up. Normally, the symptoms on a sensitive set are not very marked. Perhaps a loss of "pep" on the lowest settings of the tuning, which, if serious, can sometimes be overcome with a series condenser of anything from ·0001 to ·0003 microfarad.

Always with such aerials it is a good thing to use a loosely coupled tuning circuit. This can be either a tapped coil—my favourite—or an aperiodic type of coil coupled to the tuned grid coil.

It Will Repay You Well.

If, for the summer months, you do decide to go in for an outdoor aerial you will be well repaid.

If, too, you go in for wire to support the aerial wire at the far end and at the house-top I suggest you give egg insulators a miss and provide a type with a longer leakage path. As far as I know—correct me if I am wrong, someone—eggs were invented to break up stay wires.

But I know what will happen. Many readers will smile to themselves and say: "H'm, very amusing, all this. But I shall stick to my indoor wire round the picture rail."

Well, I can't help it. Your using an indoor aerial wire, I mean. But not—oh, please not!—round the almost legendary picture rail. It is so inefficient. Zig-zagged across the loft, perhaps, or suspended round one side of the room at least a foot from walls and ceiling. But *not* right round the picture rail!

Don't, in conclusion, make a concrete fact of the earth, as my correspondent ingenuously suggested. Remember what I told you in my very first article—doesn't it seem ages ago, that?—about the earth being an image of the aerial.

With which—er—reflection I will leave you.

"The Experimenter"

MAINS

GRAMOPHONE

SIGNAL LAMP

No radiogramophone is complete without this Bulgin Signal Lamp for turntable illumination. Strongly made and compact, it is fitted in a few moments. It is made in walnut bakelite and finished with the usual high-grade workmanship always found in Bulgin products. The holders are standard B.C. to take 100/250 volt, 10/15 watt lamps, or S.B.C. for 2 to 12 volt lamps. This Bulgin Signal Lamp is the ideal complement for your radiogram . . . the final touch of luxury, as well as an aid to efficiency.

Walnut Bakelite, B.C., List No. D.31, or S.B.C., List No. D.32. EACH **4/6**

Send for 80-page Catalogue and Manual No. 154 "P," enclosing 2d. in stamps, to A. F. Bulgin & Co., Ltd., Abbey Road, Barking, Essex.

be sure it's

BULGIN

because it pays to buy QUALITY

There was a young fellow named Hind
Who possessed a mechanical mind—
He built a marvellous Set—
Without worry or fret—
He used FLUXITE—and said "what a find!"

See that FLUXITE is always by you—in the house—garage—workshop—wherever speedy soldering is needed. Used for 30 years in government works and by leading engineers and manufacturers. Of Ironmongers—in tins, 4d., 8d., 1/4 and 2/8.

Ask to see the FLUXITE SMALL-SPACE SOLDERING SET—compact but substantial—complete with full instructions, 7/6.

Write for Free Book on the art of "soft" soldering and ask for Leaflet on CASE-HARDENING STEEL and TEMPERING TOOLS with FLUXITE.—Dept. 324.

TO CYCLISTS! If your wheels are to keep round and true the SPOKES must be TIED and SOLDERED at the CROSSINGS. This gives a more rigid wheel. It's simple—with FLUXITE—but IMPORTANT.

The FLUXITE GUN

is always ready to put Fluxite on the soldering job instantly. A little pressure places the right quantity on the right spot and one charging lasts for ages. Price 1/6.

ALL MECHANICS *WILL* HAVE

FLUXITE

IT SIMPLIFIES *ALL* SOLDERING

FLUXITE, LTD., DRAGON WORKS, BERMONDSEY, S.E.1.

THE STORY OF THE VALVE

(Continued from page 278.)

next two grids form a triode oscillator. Surrounding this system are two screened grids, with a control grid interposed, and an anode.

The triode current does not, therefore, all pass to the triode anode; part passes through to the anode of the second valve system, which is in effect a screened tetrode.

Capacitance effects between the triode generator and the tetrode are purposely made as small as possible.

The electron stream through the triode generator is modulated so deeply that it is reduced to zero over part of the cycle. In the tetrode this modulated current is again modulated by the signal, and the resultant current reaches the anode of the screened tetrode.

Amplifying the "Intermediate Frequency."

The anode circuit is arranged to amplify the "intermediate frequency" and pass only this component through the succeeding stages of the amplifier. The efficiency of these valves is measured by the "conversion slope," which is the ratio of the intermediate-frequency current to the input-signal voltage.

With deep modulation of the triode the "conversion factor," i.e. the ratio of conversion slope to static-tetrode slope, may approach unity, thereby enabling the working anode current to be kept low, with a corresponding reduction of valve noise.

The advantages which the screened pentode has been found to possess over the tetrode have led to the adoption of a pentode in place of a tetrode for the modulator portion of electron-coupled valves. The result of this combination is the "octode," and it marks the limit which multiplicity of electrodes has so far reached.

Turning now to future developments, the reception of very short-wave signals is becoming increasingly important, as special communication services and television systems tend to use these wavelengths. The generation of waves shorter than a few metres is now readily possible with magnetron valves, but development of means of receiving these short waves has hitherto lagged behind.

Special Types of Small Dimensions.

Valves of minute dimensions, and therefore of very small time-constant, have now been constructed. The mechanical difficulties in making such electrode systems are great, but the valves enable reception to be carried out even at wavelengths of 1 metre or less, with considerable high-frequency amplification.

A factor which has contributed to the success of these tiny valves has been the use of transmission-line resonators in place of ordinary tuned circuits, whereby efficient transformer action can be obtained even at a wavelength of a few centimetres.

I have tried to give you a rapid survey of valve developments during the broadcasting era, but my space is at an end. Those of you who would like fuller details of the progress of valve manufacture should read Capt. S. R. Mullard's address, as Chairman of the Wireless Section of the Institution of Electrical Engineers, published in the Journal of the I.E.E.

TECHNICAL JOTTINGS

Items of interest to all readers.

By Dr. J. H. T. ROBERTS, F.Inst.P.

IN the early days of broadcasting no receiver was really complete without a large and high outdoor aerial, preferably of the twin type. In fact, amateurs used to vie with one another in the length, height and elaborateness of their outdoor aerial equipment. As improvements in the efficiency of receiving sets took place, however, and more particularly in the efficiency of high-frequency amplifying valves, the need for an elaborate aerial became gradually less and less, until to-day a very large percentage of listeners do not use any outdoor aerial at all.

This is a very important point for manufacturers, and I can distinctly remember, only a very few years back, having to work out all sorts of problems for a well-known set manufacturer in order to avoid, as far as possible, with the means then available, the need for a large outdoor aerial.

Efficiency of Receivers.

In these days of efficient superhets almost any kind of indoor aerial suffices, and with the increasing popularity of superheterodyne receivers there seems every likelihood of a return, at any rate for a large proportion of listeners, to the completely self-contained type of radiogram.

When television comes the question will arise whether an indoor aerial will be sufficient or whether an outdoor aerial will be necessary. I think that most people within reasonable distance of the transmitter will find a short indoor aerial quite sufficient, but no doubt some people will prefer to use an outdoor one. This may result in a revival, so to speak, of the outdoor aerial practice. Of course, the aerials necessary for ultra-short-wave reception will be very much smaller than the outdoor aerial used for receiving medium and long broadcast waves. It is considered that a double aerial or dipole is better for reception of these ultra-short waves, the total length of the aerial being about half the wavelength received.

Ultra-Short-Wave Reception.

A curious feature of this ultra-short-wave reception is that it has been found better to arrange the receiving aerial in the same direction—that is, horizontal or vertical—as the transmitting aerial. If the receiving aerial is tried at different angles to the horizontal it will be found that there is a best position, and this appears to correspond with the position of the transmitting aerial.

Of course, these are rather in the nature of refinements, and in case any of you get the idea that the picking up of these ultra-short waves—at any rate, so far as the *aerial* is concerned—is a difficult matter I should say that it is in reality quite easy. Bear in mind that I am talking about the pick-up on the ultra-short-wave aerial. The construction and operation of the

(Continued on next page.)

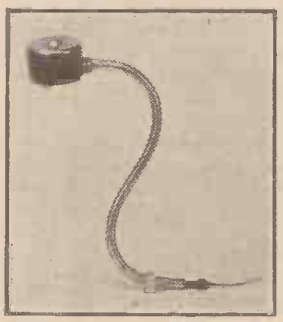
A USEFUL CONNECTOR

IN many otherwise quite well-engineered radio sets there is often to be found a rather weak spot. We refer to the connection to the top of an S.G. valve. Even if the lead itself is substantial and is well insulated it frequently happens that there is bare metal at the terminal itself to give careless fingers a minor shock.

And should the lead become disconnected accidentally or by the valve temporarily being removed there is a "live" wire which may give an unpleasant reminder of the damage that can be done by stray H.T.! True, the H.T. should always be disconnected before valves are removed; but even if that is always done there is still the danger of an accidental disconnection of the dangerous lead.

All such troubles and risks are entirely eliminated by a new device which has recently been produced by Messrs. Belling & Lee, Ltd., Cambridge Arterial Road, Enfield, Middlesex.

This is a Screened Valve-Top Connection which replaces the normal anode connector and its ordinary lead. At the one end is a hood which slips over the top terminal of the valve and makes an efficient contact. The hood is metal shielded and is lined with bakelite to prevent it from making a noisy contact with the metallising of a metallised valve.



NEAT AND EFFICIENT

The Belling-Lee screened valve-top connection has a flexible shielded cable for wiring-up purposes. A clip on the cable enables the shielding to be readily earthed.

A special insulating material known as Keramot is used in the top of the hood in order to keep the dielectric losses low. The cable has a flexible metal sheathing for shielding purposes, and special beads are employed to give the cable good spacing and so maintain the low-loss efficiency of the fitment.

A small clip affair renders it a simple matter to earth the cable shielding.

From all this it might well be gathered that the device is a fairly expensive affair, but actually the price is only 1s. 6d., and that is very reasonable in the circumstances. It is a thoughtfully designed and well-made gadget which should prove a very good investment for the owners of all sets in which it could be used.

It should, perhaps, be mentioned that the shielding of an anode lead to an S.G. valve, which is incidentally provided by the Belling & Lee Top Connection, is often a complete cure for incipient or even for quite serious instability.

BERLIN IS TELEVISION MINDED

(*Continued from page* 271.)

the future prosperity of the service to enlist the active interest of ordinary listeners. This is a fact the Germans fully appreciate.

You must not imagine that they are smugly satisfied with their 180-line service. They are rightly proud of having started up the first television service in the world on ultra-short waves. At the same time, our Committee's activity is being very closely watched.

Talk of 360 Lines.

Already the decision to start with 240-line pictures has greatly influenced the trend of experiment. They are now talking of 360 lines as being the minimum for really satisfactory pictures. They recognise that 180-line pictures have good demonstration value, but not sustained entertainment value.

The iconoscope is very much to the fore in Berlin. For transmission of 360-line pictures this device is considered the vital key. One well-known firm, Loewe Radio, has already developed its own iconoscope—without access to any of the American secrets, of which so little is known on this side of the Atlantic.

Why 360 lines—when the iconoscope makes even 500 lines possible? The answer is that the German engineers think there is an economic limit to definition in pictures—just as there is in the frequency gamut of broadcast sound.

With 360 lines a picture can, they say, be looked at quite closely without loss of detail or entertainment value. At that limit it is feasible to produce apparatus that can be sold at something like a reasonable price. Above that limit the cost, with present knowledge, would be prohibitive.

Cathode-ray tubes are now being made in Germany with remarkable characteristics. Much research work has been done. A hard tube can now be made to sell at about £3, they say, and it will give 2,000 hours' life.

Mobile Transmitting Van.

While united efforts are being made to pool resources and to market cheap television sets, the technique of transmission is going ahead. One of the most striking aspects of this part of the work is the mobile intermediate-film van.

This is going around Berlin relaying scenes to the Funk tower for re-transmission on the short wavelength already mentioned. They are using a wavelength of 8 metres for the relay, which is done on much lower power than the main transmission.

As one of the van's engineers pointed out, there is nothing to prevent a looker from picking up the van's transmission direct if his set will tune up slightly higher than the official wavelength. For those living in the vicinity of the van's operations it might even be better to do so.

The idea of using micro-waves, as has been suggested over here, does not seem to have caught on. The technique of 6 to 8 metres is well understood, and perhaps that is why, for the moment, the Germans are concentrating on such a band for their relays.

Film and Television Interests.

The film interests and the television authorities are going to be very closely allied in Germany. Hadamovsky has shrewdly pointed out that the two art forms are inseparable—especially if, as he suggests, the time comes when people go to cinemas *to see televised films*.

My stay here confirms the impression that, technically speaking, we are well up in the television race. What I am wondering is whether, in our so much more free-and-easy way, we shall be able to get together the various vested interests to forward the service aspect of television.

Whatever may be one's views about the present regime in Germany, its effect in co-ordinating private enterprises in a common ideal of public service cannot be denied. No better example of this ideology could be cited than television as it is progressing in Germany to-day.

"A VALUABLE CONTRIBUTION TO BETTER BROADCASTING"

says: "POPULAR WIRELESS"

Day by day, from all directions, comes further evidence of the amazing improvement this new speaker brings to broadcast reproduction. Technical journals are enthusiastic in its praise; eminent designers unhesitatingly recommend it; and delighted users constantly write telling us of the remarkable volume and new realism a "Stentorian" has brought to their broadcast entertainment.

Stentorian Senior (PMS1) 100 per cent. dust protection. Oversize cone 42/-

Stentorian Standard (PMS2) 32/6

Stentorian Baby (PMS6) 22/6

Hear one on your set *to-day*. Notice the increased sensitivity the *exclusive* magnetic material brings. Listen to the startling new "life" in your set's performance. You will never again be content with your old speaker!

STENTORIAN

PERMANENT MAGNET MOVING-COIL SPEAKER

Whiteley Electrical Radio Co., Ltd., Information Dept., Radio Works, Mansfield, Notts.

Sole Agents in Scotland: Radiovision Ltd., 233, St. Vincent Street, Glasgow, C.2.

Sole Agents in I.F.S.: Kelly and Shiel, Ltd., 47, Fleet Street, Dublin.

TECHNICAL JOTTINGS

(Continued from previous page.)

ultra-short-wave receiver to be used with this is another matter.

That Licence Fee.

There has been some talk about increasing the B.B.C. licence fee when the present Charter expires, which it does at the end of next year, from the present 10s. up to £1 per annum. Whether there is any foundation for this rumour remains to be seen. One's first reaction is that, inasmuch as the B.B.C. is able to hand back a large proportion of its revenue to the Postmaster-General, it would seem that its revenue is already too large and that the present 10s. licence could well be reduced. However, there will undoubtedly be very heavy additional expenditure involved in establishing and running the new television service, and the other activities and enterprises of the B.B.C. are continually being extended, so I have no doubt that they can find plenty of use for additional revenue.

B.B.C. Enterprises.

In this connection it has been pointed out that the broadcast licence fee in some European countries is much higher than it is in this country. This may be true, but on the other hand there are broadcast services in some parts of the world, notably

NEXT WEEK

Full details for building

A UNIVERSAL MAINS AMPLIFIER

Works with pick-up or microphone on A.C. or D.C. mains

POPULAR WIRELESS

NEXT WEDNESDAY

in the United States, which cost the listener much *less* or which are entirely free.

Anyway, it remains to be seen whether any increase will be made in the licence fee and in the meantime I think that most listeners will agree that, even if the fee were increased to £1 per year, it would not be at all unreasonable, provided the B.B.C. would only give us some sort of programmes that we like—especially on Sundays!

Potted Television.

The other day I saw a device which you could describe as a kind of television radiogram. That is to say, just as the radiogram combines the radio and also the sound record, so this instrument combines the television receiver and also a kind of television gramophone record. You will see the principle quite readily. The incoming television signals (which can, of course, be converted into sound if passed through a loudspeaker, albeit meaningless sound) are recorded on a disc record in the ordinary way. When this record is "played" the signals are reproduced, and by the use of an electrical pick-up they can be reconverted into modulating signals and fed into a television receiver.

Twin-track Records.

The idea eventually is to use a record having a twin track, one track carrying the sound and the other the vision. In another form of the device the record is of the film variety, but instead of having any pictures on it, it has the two photographic sound tracks; one of these is capable of being reconverted by the usual photo-electric pick-up into the synchronised sound, whilst the other comprises the television impulses and can be reconverted into television pictures in the way just indicated above.

Pictures versus Scanning.

Whether there will be any large market for "potted television" is a matter on which it is very difficult to form an opinion, but judging by the enormous market for potted sound one would think that there should be a very large market for it. On the other hand, the critics say that whereas we have only one method of potting sound, or rather perhaps I should say only one method of reproducing it, we have two entirely different methods of reproducing pictures: one is by the scanning system, using potted television signals, and the other is by means of an ordinary cinematograph film.

The latter is so simple and the technique so thoroughly well known that it does seem perhaps rather doubtful whether the former method will have much chance against it. In other words, the potted television and synchronised-sound arrangement amounts to nothing more than a talking film, and the latter has many obvious advantages.

At any rate, from the point of view of novelty there is a good deal to be said for it, and I have no doubt that we shall in due course see it on the market.

Car Radio.

Just now there is an increasing interest in radio receiving sets adapted to be used on motor-cars. As you know, in the United States several of the leading motor-car manufacturers are installing radio sets as standard equipment in their cars. The fashion, it is quite likely, may establish itself in this country too, and I dare say some of you have got sets in your cars; those of you who have not have probably heard sets in stationary cars on the road, and so on. I think this is quite a good scheme, and one which deserves to catch on. In fact, I think there is quite a considerable future for car radio, especially now that most of the snags have been ironed out.

Suppressing Interference.

You know that it isn't all beer and skittles just fitting a radio into a car. In the first place, there is the question of some sort of aerial for picking up signals; and secondly, there is the close presence of the magneto, sparking plugs and generator to be considered. The main offenders are the sparking plugs, but various firms have now produced "suppressors" which practically eliminate this interference.

Although it is not commonly realised, the aeroplane manufacturers have had to face up to this problem for years past, and a good deal of the spadework has already been done by them. The aeroplane problem

(Continued on next page.)

Easy Terms

ALL MANUFACTURERS' COMPONENTS and ACCESSORIES in STOCK. SEND US YOUR ENQUIRIES

W.B. STENTORIAN SENIOR

TYPE PMS1.

2/6 DOWN

For Power, Pentode and Class B. Send only 2/6, balance in 11 monthly payments of 4/-. Cash or C.O.D. Carriage Paid. £2/2/0.

W.B. Stentorian *Standard* Model. Cash or C.O.D. Carriage Paid. £1/12/6, or 2/6 deposit and 11 monthly payments of 3/-. W.B. Stentorian *Baby* Model. Cash or C.O.D. Carriage Paid. £1/2/6, or 2/6 deposit and 9 monthly payments of 2/6.

BARGAIN

GUARANTEED BRAND NEW IN MAKER'S CARTON.

BURGOYNE *CLASS "B" 3*

LIST PRICE £6:10:0 BARGAIN PRICE £3:19:6

Cash or C.O.D. *Carriage Paid.*

5/- DOWN and 16 monthly payments of 6/-

Complete with H.T. and L.T. Batteries and Detector, Driver and Class "B" B.V.A. Valves. Ready to play. Latest 3-valve Class "B" circuit. Moving-Coil speaker. Low battery consumption. "One-Glance" tuning dial. In exquisite walnut polished cabinet.

● SEND FOR LISTS OF BARGAINS IN RADIO.

AVOMINOR NEW UNIVERSAL MODEL **TEST METER**

TEN TESTING INSTRUMENTS IN ONE!

Measures 0-6, 0-30, 0-120 m.a., 0-6, 0-120, 0-300 volts, 0-10,000, 0-60,000, 0-1,200,000 ohms, and 0-3 megohms. Complete with leads. Send only 2/6; balance in 10 monthly payments of 4/3. Cash or C.O.D. Carr. Pd., £2/0/0.

2/6 DOWN

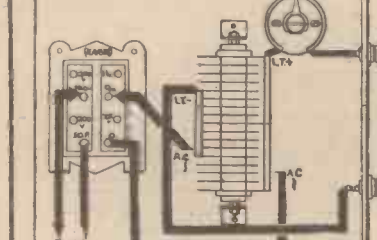
SEND FOR LATEST LISTS

New Times Sales Co.

56, P.W.15, LUDGATE HILL, LONDON, E.C.4.

PLEASE be sure to mention "POPULAR WIRELESS" when communicating with Advertisers. THANKS!

BATTERY CHARGERS!!



Follow this diagram and build your own Battery Charger from a Heayberd Kit of Parts in FIFTEEN MINUTES.

PRICES FROM 30/6

Send this advt., together with 3d. in stamps, for latest Radio Handbook, "Mains Power for your Radio." P.W.

F. C. HEAYBERD & Co. 10, FINSBURY ST., LONDON, E.C.2.

ELECTRADIX

Microphones and P.R. Outfits

"Popular Wireless" 2-Valve Amplifier Microphone No. 12T (as illus.) 18/6

P.W.11 TABLE MIKE is a Pedestal Microphone for speech. 2-in. Mike and Transformer in a bakelite case on a pedestal. Switch and plug sockets, 15/-. Pedestal Mike No. 10B 10-in. high, 12/6. No. 12B Ring Pedestal, 18/6. Ellsel famous P.A. and Band Mike (Reisz Principle), 55/-. Stand 15/- extra. Screened imped. matched Transformer, 7/6.
NEW PIEZO CRYSTAL MIKE. High fidelity. Uniform response. Can be obtained from us only, £5/17/6. *Illus Mike List free.*
PUBLIC ADDRESS OUTFITS. Mobile type, complete with batteries and convertor in case, mike and P.A. horn-speaker, £28/10/0. 3-watt all-mains P.A. amplifier outfit and speaker, complete, £12/10/0. 5-watt, £14/10/0. 10-watt with gramo., £20/0/0. 20-watt, with gramo., £27/10/0.

ELECTRADIX RADIOS,
218, UPPER THAMES STREET, LONDON, E.C.4.
'Phone: Central 4611.

CABINETS. *Write for Free List.*
GILBERT, Cabinet Maker, **SWINDON.**

EASY TERMS

Everything Radio supplied on the lowest terms. Send list of requirements for keen quotation. Prompt delivery. Carriage Paid.

Revitalise your set with the new

W.B. P.M. STENTORIAN SPEAKER

Senior P.M. Speaker.
Cash Price £2/2/0, or 2/6 with order and 11 monthly payments of 4/-

Standard P.M. Speaker.
Cash Price £1/12/6, or 2/6 with order and 11 monthly payments of 3/-.

5/- Secures delivery.

Atlas T 10/30 H.T. Eliminator and Trickle Charger combined. Cash price, £3/9/6, or 5/- with order and 12 monthly payments of 5/11.

Estd. 1925 THE 'PHONE: NATIONAL 1977

LONDON RADIO SUPPLY COMPANY

11 OAT LANE·NOBLE STREET·LONDON,E.C.2

All applications for Advertising Space in POPULAR WIRELESS must be addressed to the Advertising Department, John Carpenter House, John Carpenter Street, London, E.C.4.

TECHNICAL JOTTINGS

(Continued from previous page.)

is more serious than the car problem, because in the aeroplane you have to transmit as well as receive, and this means something more respectable in the shape of an aerial.

Resistance and Temperature.

We are so accustomed to electrical conductors obeying Ohm's Law that we are apt to overlook the fact that there are many substances, which must be classed as conductors, which depart very materially from the usual characteristics. Most conductors increase in resistance as the temperature is raised, but there are some the resistance of which actually decreases as the temperature is raised. You can see what would happen if such a substance were connected to a fixed voltage, say 240 volts of the mains. As the temperature rose, so the resistance would decrease, the current would increase, and therefore the temperature would continue to increase at an increasing rate.

In other words, the whole thing would be unstable, and in a very short time the substance would simply burn out or explode. Filaments having these negative temperature-resistance characteristics have actually been made from mixtures of rare-earth oxides, but it is always necessary to put in a ballast resistance to check the ultimate value of the current and counteract the instability referred to.

Protecting the Set!

I have some information before me with regard to a new substance, specially made for the purpose of lightning protectors and so on, in which this principle is made use of. Metallic oxide powder is mixed with insulating material, such as clay, and the whole thing baked into suitable rods of resistance material. These have practically no conductivity at low voltages, but their conductivity increases very rapidly with the voltage applied to them.

In the case of a very high voltage due to a lightning flash the substance acts as a very good conductor, and so forms a safety valve, whilst not causing any leak at low voltages. There are many important applications for "delayed" conductors of this kind, and no doubt a good deal of work will be done on them in the immediate future.

The Need for Decoupling.

In any radio circuit there are always some parts of the circuit which are common to all the valves. This unavoidable condition leads to interaction taking place between one part and another, and in some cases, if the interaction is excessive, the set will become unstable and some sort of oscillation—often taking the form of motor-boating—will occur. The remedy is, of course, to decouple the parts which are likely to couple themselves in this way.

Decoupling may be broadly described as a method of preventing stray alternating currents from getting into the wrong parts of the circuit and sending them to earth instead.

There are various decoupling methods, but usually decoupling depends upon the use of a resistance and condenser, the value of these components differing according to the part of the circuit to which they are to be applied.

A Common Offender.

One of the commonest sources of interaction is the high-tension battery, as this is usually common to all the anodes, and therefore the various high-tension positive leads should all be separately decoupled.

In some sets the grid circuits require attention, whilst the bias circuit is decoupled in most mains sets.

Where a decoupling resistance is used the ohmic value of this resistance depends upon the voltage which is used and upon the current drawn by each valve. The basic principle is to make the value of the resistance as high as possible, subject to an ample supply of current reaching the valve. In this connection you will remember that for every 1,000 ohms in the resistance, if a current of 1 milliamp is passing, there will be a voltage drop of 1 volt.

As regards the condenser, this will vary in value from about one-tenth of a microfarad to half a microfarad for high-frequency circuits, and about 1 to 2 microfarads for low-frequency circuits. Incidentally, the capacity of the condenser required depends partly upon the resistance which is used.

BULGIN SUPPRESSOR ADAPTOR

MESSRS. A. F. BULGIN & CO., Ltd., Abbey Road, Barking, Essex, have sent us a sample of one of their new A49 Suppressor Adaptors. This useful article retails at 2s. 6d. It comprises the well-known series condenser arrangement.

There are two ·1-mfd. fixed condensers permanently built into a neat bakelite casing. These two condensers are joined together and their free ends go to two red terminals. The junction between the two condensers is taken to a black terminal in

The Bulgin Suppressor Adaptor is encased in a bakelite moulding with coloured indicating terminals.

accordance with the standard code recommended by the Radio Component Manufacturers' Association.

The method of connecting the adaptor is to join the two red terminals to the mains-input leads of a set (making sure that the fuses are on the mains side), the black terminal being taken to earth.

For many kinds of mains-borne interference this adaptor is a complete cure. Its qualities in this regard are in effect vouchsafed by the Post Office, for the scheme which it embodies is officially recommended by the P.O.

Book of Practical Radio 2

Printed in Great Britain and published every Wednesday by the Proprietors, THE AMALGAMATED PRESS, LTD., The Fleetway House, Farringdon Street, London, E.C.4. Advertisement Offices: John Carpenter House, John Carpenter Street, London, E.C.4. Registered for transmission by Canadian Magazine Post. Subscription Rates: Inland and Canada, 17/6 per annum. Abroad (except Canada), 19/6 per annum. Sole Agents for Australia and New Zealand: Messrs. Gordon & Gotch, Ltd.; and for South Africa: Central News Agency, Ltd. Saturday, May 18th, 1935. S.S.

MISCELLANEOUS ADVERTISEMENTS

3d. per Word

6d. per word for first words in heavy type.
6/- per line for displayed lines (12 pt. type).

Minimum Charge 3/-

Remittance must accompany order.

Advertisements for these columns are accepted up to first post WEDNESDAY MORNING for following week's issue.

Radio components and accessories advertised in these columns at below list price do not carry manufacturers' guarantee.

The Proprietors have the right to refuse or withdraw advertisements at their discretion.

Postal orders in payment for advertisements should be made payable to the Amalgamated Press, Ltd., and crossed.

All communications should be addressed to:—Advertisement Department, "Popular Wireless," John Carpenter House, John Carpenter Street, London, E.C.4.

PEARL & PEARL,
190, Bishopsgate, London, E.C.2. All the following Bargains, guaranteed new goods. Cash or C.O.D. Carriage Paid in British Isles.
TELSEN Receivers (1935 Models). Guaranteed new, in original cartons. 6-valve Super-het, A.C. model. List 14 gns. Our price 9 gns. Battery model with batteries complete. List 14 gns. Our price 9 gns.
BURGOYNE Receivers. 3-Valve Class B model. Complete with Mullard valves; Exide H.T. and L.T. batteries. M/c speaker. Artistic cabinet of highly polished walnut. Chromium fittings. Brand new in original cartons: 1935 model. List £6/10/-. Our price £3/18/6. Carr. Paid.
CROMWELL Cabinets (for set and speaker combined). Horizontal type 23in. wide, 8in. deep, 11½ in. high. Polished walnut veneer, additional baffle behind speaker grille. Only 4/11 each. Carriage fwd.
SPECIAL. Telsen Radiomag (Latest Edition) 64 pages. 4 Full-size Blue Prints for the "Economy Three," "Short-Wave Three." "Super Four" Battery receivers, and a "Quality 3-valve Amplifier." Full constructional details, many other articles of interest, sent Post Paid for 6d.
TELSEN Chokes, Coils, Condensers, etc., all at Special Reduced Prices. List "P.T." on request.
HUNDREDS of Bargains in Free List "N."
All Mail Orders Direct to
PEARL & PEARL,
190, Bishopsgate, London, E.C.2.
Telephone: Bishopsgate 1212.

WOBURN RADIO OFFER FOLLOWING LINES:
SHORT-WAVE Condensers: ·0001, ·00015, ·00016, ·0002, ·00025, 2/- each, with Slow-Motion dial, 3/-. Reaction condensers, mica dielectric, ·0001, ·0002, ·0003, ·0005, ·00075, 1/-. Differentials, all sizes, 1/2.
POPULAR iron-cored canned coils, dual range, boxed, with diagram, 2/6. Radiophone semi-curved dials with twin dial lights, bronze escutcheon, dial marked in wavelengths and degrees, 3/9.
WESTINGHOUSE H.T.8 and 9 rectifiers, 8/11. H.T.8 Transformers made by Standard Telephones, with 4-v. 4-a. centre tap, 7/6. 30H. 30 m/a., 2/6. 150H. 60 m/a., 8/6. Dubilier Electrolytics, dry, 8-mfd., 500-v. peak, 2/10. T.C.C. electrolytics, 25-mfd. 25-v., 50-mfd. 12-v., 15-mfd. 100-v., 2 mfd. 200-v., 1/3. 6-mfd. 50-v., 7d.
ELECTRIC SOLDERING IRONS: Fully guaranteed, 200/250-v., complete with flex and adaptor, boxed, 1/11, post 6d. Fresh supply now in order immediately, as previous consignment sold out in three weeks.
WESTERN ELECTRIC MIKES: 2/3. Transformers for same ratio 100/1, 2/3. **Tubular**, ·01, ·02, ·1, 6d. Chassis mounting valve holders, 4-5 pin, 1/3 half dozen.
TRADE LIST NOW READY. Send business heading and stamp.
WOBURN RADIO CO., 9, Sandland Street, W.C.1, Holborn 7289. (First turning on right up Red Lion Street from Holborn.)

G.P.O. ENGINEERING DEPT. (No experience required.) Commencing £4 per week. Age 17–23. Excellent prospects. Free details of Entrance Exam. from **B.I.E.T.** (Dept. 568), 31, Oxford Street, W.1.

SPEAKER repairs, new cones, coils and centres fitted, 5/-. Complete re-winding service mains transformers, etc. Work guaranteed.—Write Dept. X, Weedon P.L.R. Co., 80, Lonsdale Avenue, London, E.6. (Maryland 1782.)

CASH ALLOWANCES made on your old wireless goods in part-exchange for any new receiver on easy terms. After deducting deposit we pay you balance of allowance in spot cash. Components and Peto-Scott kits supplied for cash or part-exchange. Highest allowances.—R. Wigfield, Furlong Road, Goldthorpe, Yorks.

SOUTHERN RADIO'S WIRELESS BARGAINS. Every Article Guaranteed New, Perfect, and Sent Post Paid.
RECEIVERS. Telsen Radiograms. Model 3550/R.G.A. Latest 1935 6-Valve Superhet. A.C. This Receiver embodies the very latest in radio. Complete with 6 valves. Mains Energised Speaker. Contained in Exquisite Cabinet with Garrard Electric Record Changer. In original Sealed Cases, £18 10 (List 32 Guineas).
TELSEN THREE-VALVE BATTERY SETS. Model S93 complete with 3 Mazda valves, in attractive Bakelite Cabinet, 30/- (List 75/-).
TELSEN "AIRMARSHAL 3" 3-Valve Battery Sets. Complete with 3 Mazda Valves, Speaker. In attractive Walnut Cabinet. 47/6 (List 98/6).
BURGOYNE CLASS B THREE-VALVE SETS. Complete with 3 Mullard Valves, Exide Batteries and Accumulator. Magnavox Moving Coil Speaker. In Magnificent Cabinet, finished in Chromium. £3 9 6.
SPEAKERS. Blue Spot Permanent-Magnet Speakers. With Universal Transformers to Suit any Circuit. 1935 Series. 99 P.M. 24/6. 45 P.M. 20/-. Celestion P.P.M.W. 16/6. Celestion Soundex, 11/- All in sealed Cartons.
ELIMINATORS. Regentone 1935 Series New and Boxed for A.C. Mains 200/250 Volts. Type W.5a, complete with Trickle Charger, 39/6. Type W1a (less Trickle Charger) to carry 30 Milliamps, 33/-. W1C (less Trickle Charger), 30/-.
CONDENSERS. Plessy 4-Gang Superhet Condensers. 0·0005 Fully Screened with Trimmers, 7/3.
Lotus 0·0005 Condensers, Fully Screened with Trimmers. Complete with Escutcheons, Dials, Knobs. 3-Gang, 11/-, 2-Gang, 7/3.
COILS. Igranic Superhet 4-Coil Set (1 Osc.), 2 I.F. (with Pigtails) and 1 I.F. (Plain), 9/- per set (list 50/-). Varley Square Peak Coils with all Accessories, Type B.P.5, 2/3. Telsen Twin Matched Coils, W287, screened with switch, 7/9. Triple Matched, W288, 10/9. Telsen Twin Coil Unit, W478, 12/6. Triple W476, 17/6; W477, 17/6.
MISCELLANEOUS. Biflo Static Cut-Outs. Definitely eliminates all Interference, 2/-. Lewcos Spaghetti Resistances. Assorted Capacities. New and Boxed, 1/6 per dozen. Telsen Binocular H.F. Chokes, 2/-. Telsen Ace L.F. Transformers, 3:1 and 5:1, 2/9 each.
STOCKTAKING BARGAIN PARCELS. After our recent stocktaking, we gathered at our Head Office a very large number of odd lines from our various Branches. We are offering these in Parcel Lots as under:
5/- Parcel containing Components to the value of at least 20/-, including Condensers, Resistances, Coils, Wire, etc. 10 Different Ready Radio and Telsen Circuits are included with each parcel.
10/- Parcel contains Components to the value of at least 45/-, and includes Transformers, Variable Condensers, etc., also Circuits as above.
Every article contained in these Bargain Parcels are of Present Day Radio use, and are Brand New and Boxed.
SOUTHERN RADIO. Branches at 271/275, High Road, Willesden Green; 46, Lisle Street, W.C.2. All Mail Orders to 323, Euston Road, London, N.W.1.
SOUTHERN RADIO, 323, Euston Road, London, N.W.1.
(Near Warren Street Tube). 'Phone Museum 6324.

BIRMINGHAM RADIOMART

SPECIALISTS IN SHORT-WAVE AND QUALITY COMPONENTS AT LOWEST PRICES.
Our stock is much too large to itemise here: From a soldering tag to a superhet, we can supply everything, and, what is more, you won't be "Caught"! Send 1½d. stamp for our latest **CATALOGUE.** No firm has larger stocks or is cheaper than

THE SQUARE DEALERS,

BIRMINGHAM RADIOMART,
19, John Bright Street, Birmingham.

MODERN RADIO OFFERS THE FOLLOWING RADIO BARGAINS.
MAJESTIC RADIO GRAM. Cost 27 gns., 9 gns. to clear. Majestic Midget. Cost 9 gns., £3 to clear. Cromwell B34 Battery Set (less batteries), 50/- to clear. Decca Convertogram A.C. Model. Cost £3 15s., 50/- to clear. Collaro Gram Unit. Letter-box type. Cost 10 gns., 60/- to clear. Majestic Car Radio set. Cost £20, £8 10s. to clear. Atlanta Battery Three-Valve set, less batteries (503), 50/- to clear. K.B. Battery set, less batteries. Cost 6 gns., 50/- to clear. Ferranti Class B Converter. Cost 63/-, 35/- to clear.
ELIMINATORS in perfect order. Ekco K12, 25/-; Ekco A.C.18, 20/-; Regentone W.I.F., 20/-.
EKCO D.C. Receiver, type D.C.64. Cost £11 11s., £5 to clear. All goods carriage forward C.O.D. Write: **MR. F. W. WARREN**, 15, Connaught Street, Northampton.

VAUXHALL. Magnavox permanent-magnet speakers, universal for Class B power, pentode or push-pull, 7-in. cone, 16/6; 10-in., 22/-.
VAUXHALL. Magnavox energised types, 2,500 or 6,500, 10-in. cone, 22/-; 7-in. cone, 15/3. All brand new, complete with hum-bucking coils, state power or pentode. Other speakers. Send for particulars.
VAUXHALL. New Lists just issued, 3,000 bargains. New goods. Limited number available free.
VAUXHALL. Immediate delivery of all goods advertised in previous issues.
VAUXHALL-UTILITIES, 163a, Strand, London, W.C.2. Over Dennys the Booksellers, Temple Bar 9338.

CLARION VALVES.—All brand new; battery types, 2-volt, H.F.2, L.F.2, L.P.2, 1/9; Super-power, P.P.2, 2/6 screens and pentodes, 3/9; A.C. Mains, 4-volt 1-amp., general purpose, 3/3; power, 4/-; screens and pentodes, 4/6; full-wave rectifier, 3/6; postage paid, cash with order, or C.O.D. over 10/-.—Clarion Valves, Dept. 5, 885, Tyburn Road, Erdington, Birmingham.

RADIO CRYSTALS. The famous "NEUTRON" Crystals, 1/- per tin; the oldest and best. Obtainable from: V. Zeitlin & Sons, Ltd., 144, Theobald's Road, London, W.C.1; Expert Radio Service, 266, High Street, Stratford, E.15; Real Radio Service, 61, Cannon Street, E.C.4; etc., etc.

LOUDSPEAKERS REPAIRED, 4/-. Blue Spot a Speciality. Transformers and Headphones, 4/-. Eliminators, Mains Transformers and Moving Coils quoted for. 24-Hour Service. Trade Discount. Clerkenwell 9069.—E. Mason, 44, East Road, London, N.1.

GUARANTEED KITS.—S.T.600, £3/0/0. Silver King, £6/4/0. Jubilee 3, £1/6/0. Also W.B. Speakers from 18/-. Old sets taken in part exchange for latest models.—Servwell Wireless Supplies, 64, Prestbury Road, London, E.7.

ALL goods advertised in last week's issue still available.
WARD, 46, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

BANKRUPT BARGAINS. List free. Drummer 1935 14-gn. A.C. Superhets, £7. Lampex 1935 A.C. 4-v. 3-pentode M.C., £4/10/0. Telsen 3-v., with Mazdas, 27/6. Telsen A.C. eliminators, 28 m/a., 28/6. Regentone 30 m/a., 32/6. Lissen 2-v. D.C. sets, complete, 45/-. Quotes.—Butlin, 143B, Preston Road, Brighton.

PREMIER SUPPLY STORES (Dept. P.A.), 20-22, High Street, Clapham, S.W.4.
ALL BARGAINS previously advised still available. Send for illustrated list.

PLEASE BE SURE to mention POPULAR WIRELESS when replying to advertisers.

ORDER FORM

The Advertisement Manager, "Popular Wireless,"
John Carpenter House, John Carpenter Street,
London, E.C.4.

Please insert our/my advertisement in "Popular Wireless" for..... insertions at a charge of £ s. d. per insertion. Remittance herewith.

Signed.....

Address.....

Date.....

SUPERB JUBILEE SOUVENIR BOOK

Bound in Royal Blue Suède Leather Cloth inset with Silver Panels

OUR KING and QUEEN

OUR KING AND QUEEN is one of the foremost of Royal Biographies ever published, recording, in a vivid and arresting manner, the most outstanding events in the lives of our beloved Monarchs.

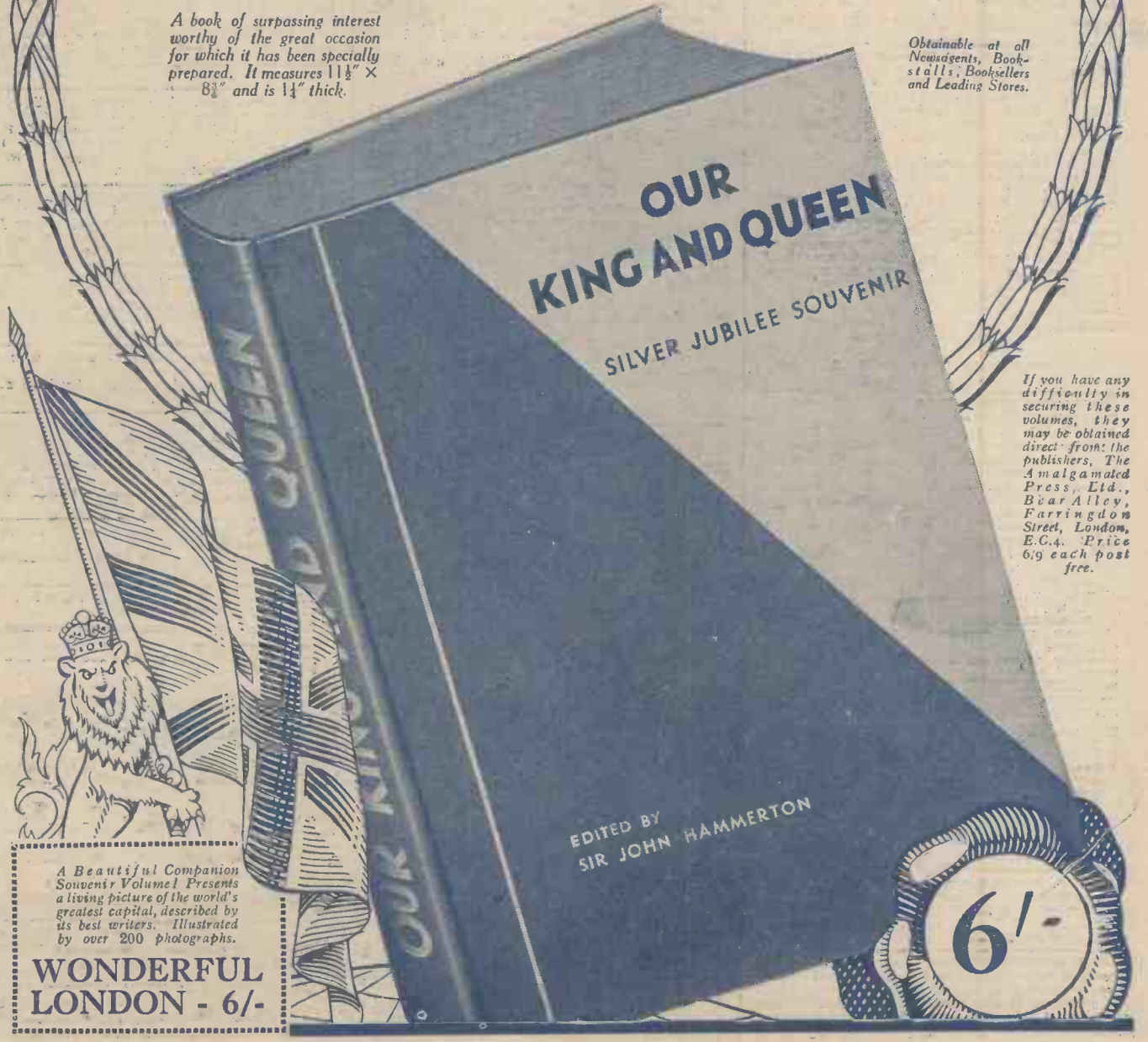
Edited by Sir John Hammerton, it contains nearly 500 PHOTOGRAPHIC ILLUSTRATIONS, a special method of printing being employed to show them on a much larger scale than is usual in a work of this size. In addition, there are

18 Magnificent FULL COLOUR PICTURES

It is a book to treasure for all time; no finer souvenir of a great historic occasion could be devised.

A book of surpassing interest worthy of the great occasion for which it has been specially prepared. It measures 11½" × 8¾" and is 1¼" thick.

Obtainable at all Newsagents, Bookstalls, Booksellers and Leading Stores.



If you have any difficulty in securing these volumes, they may be obtained direct from the publishers, The Amalgamated Press, Ltd., Bear Alley, Farringdon Street, London, E.C.4. Price 6/9 each post free.

A Beautiful Companion Souvenir Volume! Presents a living picture of the world's greatest capital, described by its best writers. Illustrated by over 200 photographs.

WONDERFUL LONDON - 6/-

POPULAR WIRELESS, May 25th, 1935. REGISTERED AT THE G.P.O. AS A NEWSPAPER

A SIMPLE PICK-UP CORRECTOR

Popular Wireless

AND TELEVISION TIMES

MORE ABOUT THE CATHODE-RAY TUBE
★ ★
LOCATING OUTSIDE INTERFERENCE
★ ★
YOUR RADIO METER

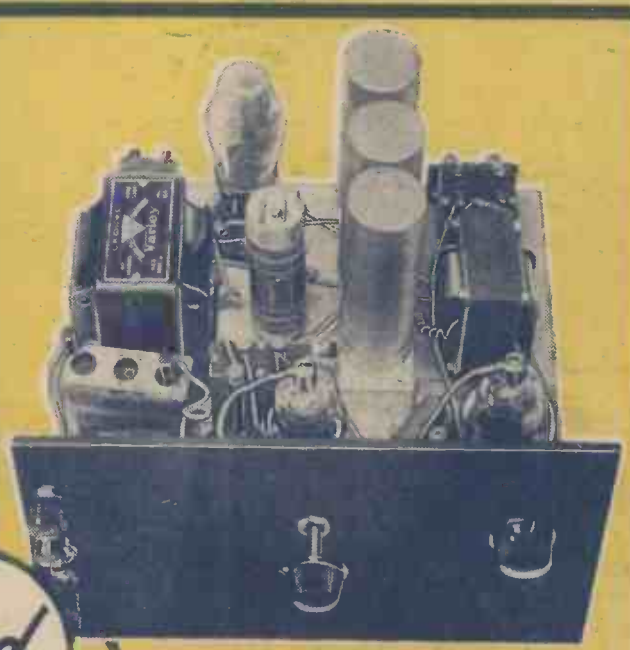
EVERY WEDNESDAY PRICE 3D

No. 677.
Vol. XXVII.
May 25th, 1935.

The NEW MIDLAND REGIONAL

and

by Alan Hunter



HOW TO BUILD

a Universal Mains Amplifier

T.M.C.-HYDRA CONDENSERS

Accurate
Reliable
Uniform

They are carefully made —stringently tested, and sealed by a special process that prevents penetration of moisture.

FROM ALL GOOD RADIO DEALERS

Write for a copy of illustrated price list

T.M.C.-HARWELL (SALES) LTD.

Britannia House, 233 Shaftesbury Avenue London, W.C.2 (A few doors from New Oxford Street)

Telephone: Temple Bar 0055 (3 lines)

Made by TELEPHONE MANUFACTURING Co. Ltd.

10

TIMES AS EFFICIENT AS ANY OTHER ADAPTOR I HAVE EVER TRIED

says

JOHN SCOTT-TAGGART, M.I.E.E., F.Inst.P., Fel.I.R.E.

about his

First Home-Constructors' Short-Wave Design

THE "HEXOVERTER"

This Remarkable Adaptor is

FULLY DESCRIBED WITH SPECIAL FULL-SIZE "JIG-PRINTS"

IN THE JUNE ISSUE OF

WIRELESS AND TELEVISION REVIEW

ON SALE EVERYWHERE PRICE **6d.**

POPULAR WIRELESS AND TELEVISION TIMES

MANAGING EDITOR: N. F. EDWARDS. TECHNICAL EDITOR: G. V. DOWDING ASSOC. I.E.E.

ON 175 METRES
WHERE'S FRED MOBBS?
CRYSTAL RECORD?
SORTING MORSE

RADIO NOTES & NEWS

"SMASHING" SUCCESS
NATIVE NEWS
THAMES RADIO
NEW S.A. STATION

French Television.

INVESTIGATORS of the queer sounds that emanate on 200 metres and thereabouts may wonder what all the row is on about 175 metres, when the Paris P.T.T. station starts up. That, my hearties, is French television.

Parallel with the sound entertainment, the Paris engineers are going to put out test vision broadcasts. My hasty inquiry as to what sort has elicited the reply "twenty-five a second." The number of lines is 60, I believe.

Daventry Doings.

YOU will probably not be surprised to learn that the B.B.C. is going ahead with extensions at Daventry. The idea is to provide two new short-wave transmitters for the Empire Service, with improved aerials. New masts are to be built for these, the tests of the past two years or so having suggested some promising lines of experiment in directional transmission.

The power to be employed is some 50 or 60 kilowatts, which is more than double the punch behind the existing transmissions, moreover, the beams are to be narrower, so the increased energy, arriving without unnecessary dissipation, will arrive on the distant aerials à la ton of bricks!

Fred Mobbs.

THOSE realistic "Scrapbook" broadcasts which Leslie Baily arranges may well sound authentic, for he goes to endless trouble to get at the facts.

In a forthcoming "Scrapbook for 1905" he hopes to recall the death of Sir Henry Irving at Bradford. It is known that after his last curtain the great actor signed a sketch for a boy named Fred Mobbs. The last time that Irving wrote his name was on this sketch, but the fact had been lost sight of until the indefatigable Leslie Baily appealed to know if Fred Mobbs can now be traced.

He would be over 40 now, and if you know him perhaps you will tell Fred Mobbs that he can be of service in helping to make the next "Scrapbook" as realistic as its predecessors.

Any news concerning him would be useful, of course.

Short and Sweet.

THE Director of the Benjamin Franklin Memorial and the Franklin Institute, Philadelphia, has announced the award of the Franklin Medal to Dr. Einstein and Sir Ambrose Fleming for their respective work in relativity and wireless research.

* * *

The success of the Lagos radio service has decided Sierra Leone to try one on similar lines.

ON OTHER PAGES

	Page
Rectifying A.C.	299
A Universal Mains Amplifier	301
More About the Cathode-Ray Tube	303
Your Radio Meter	305

4,250 Miles on Crystal!

SEVERAL readers have afforded me instances of long-distance reception on crystal sets, but so far the palm goes to Mr. Ferguson, of 40, Walnut Road, Torquay.

He reports:

"Whilst serving as wireless operator in the s.s. Gazana in 1920 I received almost nightly, and duly passed on to the chart-room, time signals from the spark transmitter at F.L. Tower until we were 230 miles west of Bombay City, the distance of reception being approximately 4,250 miles. The receiver was a Marconi 31A, crystal only. These signals were received under ordinary service conditions—'X's,' shipboard noises, etc."

This is a whale of a distance—4,250 miles exceeds my most optimistic expectations! Any advance on 4,250?

Long-lived Morse.

WHEN I referred recently to the decline and fall of Morse telegraphy I was laying myself open to a perfect example of the cussedness of things. For ever since then I have been receiving evidence that Morse, in one way or another, is very much alive.

One specially good example is the exhibition of a new instrument, produced in Germany, called the "H" Radio Printer.

It will take down Morse, at speeds up to fifty words a minute, through a continuous barrage of roaring and rip-snorting atmospherics. Robustly constructed and measuring only 14 in. by 10 in. by 8 in., this box of tricks is said to lap up the Morse letters, but unerringly cold shoulder all the "X's" without fail or fuss. I don't know why they call it "H"—but that is certainly where all "X's" have been consigned since radio began!

Hospital Radio.

IT is pleasing to learn that the Stock Exchange Dramatic and Operatic Society has been doing a good deal—out of hours.

Turning from bull-ish and bear-ish ways, it got in touch with the Medical Research Council, as a result of which the society is providing £4,000 for research into the curative powers of short-wave radiations.

The Council will act as trustee, and the money will go towards research at the London Hospital, where so much good pioneering work has been done in the past.

(*Continued on next page.*)

"NOISES OFF" AT THE B.B.C.

B.B.C. EFFECTS No. 6. The sounds made by a giant locomotive are imitated by propelling a roller skate along the surface of a galvanised-iron tank. Note the whistle in the mouth of the effects engineer.

B.B.C. MUTILATION OF OUR "MOTHAH" TONGUE

A Good "Stunt."

WHAT will these advertising people think of next? One of their brightest dodges seems to have been successful in Germany, where an interesting court case gained much publicity because of its curious circumstances.

It appeared that a wireless firm sold a set on the instalment system, but the hirer could not pay the instalments. When a representative of the company went round to the house to take the set away the irate owner threw it out of the window—if he couldn't have it nobody else should, he said. When summoned to pay for the damage it transpired that only a small fine could be inflicted, because the set was still in good working order, despite its rough treatment. And then the rumour got round that the whole affair was just an elaborate advertisement for the set in question!

Race in Licences.

NOT long ago I inferred that if the B.B.C. wanted to keep the proud distinction of leading Europe in the number of licences issued it would have to hoist its hosiery.

Since then Germany has published the March-to-April totals, and they are impressive. Well over 4,000 licences per day are being taken out in the Fatherland, the respective figures for these months being as follows: On April 1st, 1935—6,725,216 licences; on March 1st, 1935—6,599,721 licences. Increase, 125,495 in one month.

REGINALD FOORT IN AMERICA

Reginald Foort is at present playing at the New York Paramount Theatre, Times Square, where he is having a big success. The organ is a 4-manual 36-unit Wurlitzer, which Mr. Foort describes as "a perfectly glorious instrument and an absolute joy to play."

He originally intended to play at the Paramount for a few weeks and possibly do a short tour through some of the principal cities in America, but he has now been asked to stay on indefinitely at the Paramount. The management are going to arrange for him to broadcast, and he hopes that it will also be possible for one or two of these transmissions to be relayed to England.

The Mystery of News.

THE pageantry of the Jubilee broadcasts has already brought me some appreciative letters, but I expect my main crop about mid-July—some of them have probably just started from places like Sarawak and Sabang.

One interesting point that has cropped up again, as it does at almost every Empire broadcast, is in connection with the so-called "wireless of the jungle." "Can I suggest," asks Lieut.-Col. R. A. E., "how natives, cut off from all 'telegraphs,' as we know them, can yet communicate news over hundreds of miles in a few hours?"

I have heard dozens of explanations, such as drum-beating, stone-clapping under water and so forth; but the only things that seem certain about these primitive wireless methods is that they do exist, and that the natives are reticent about them. Which is natural—for what true miracle-worker would give away the secrets of his prestige?

Not my Pigeon.

A BIRKENHEAD reader has maliciously sent me a news cutting about pigeons and how they are affected by radiations from a wireless transmitting station.

It says that the French experiment with homing pigeons, which I reported, and which was expected to throw light on the subject, has been repeated. And this time the results of the tests have been quite different from those obtained before, so nobody is any the wiser!

I disagree with this conclusion, for I myself am wiser, and in future shall be specially careful when reporting experiments with carrier pigeons.

Kill that Fly.

ONE of those cranks who periodically write to the newspapers about crazy notions with a pseudo-scientific basis has heard that ultra-short-wave wireless will kill insects. He urges that broadcasting stations should be employed in their off-duty hours in "radiating a wave of an intensity calculated to kill or stun the common house fly."

"Any noxious insect can be rendered harmless," he says, "by employing the correct individual wavelength." If only this individual's own wavelength were known many an amateur transmitting station would be sending out a "kill-or-stun" wavelength for his special benefit.

The Watch on the Thames.

WE all know of the Watch on the Rhine, but how many have heard of the Watch on the Thames?

It is kept by the two hundred men of the Thames Police, who constantly patrol the waters from Teddington Lock to Erith, with Wapping as the headquarters.

To discourage pilferers, pirates, smugglers and bad lads of all kinds it has been decided to fit the police supervision boats with two-way wireless. Already many boats have been equipped with radio receivers, which have proved their worth again and again in the varied duties that fall on the Water Bobs.

The New Toulouse.

STILL further evidence of the French revolution in broadcasting is afforded by the news that the new Toulouse station is completed. It should be heard testing any time now, under the title Toulouse-Pyrénées, but I haven't yet discovered what wavelength will be selected.

The old Toulouse P.T.T. station was on 386·6 metres. This wavelength is shared with Stalino and Fredrikstad, who probably won't welcome a powerful cuckoo in *their* nest.

While on the subject of Toulouse let us turn to 328·6 metres for a moment to congratulate our old friend Radio Toulouse on reaching his tenth birthday. Many a man will remember the pride that possessed him, years ago, when he tuned for 2ZY (Manchester) and found instead a robust and lively Toulouse programme coming over. A fine old friendly station, this—may his bell never crack!

"THE MYSTERY OF THE SEVEN CAFÉS"

Following hot upon the introduction of the new Russian feature, "The Red Sarafan," comes the Variety Director's new musical serial, called "The Mystery of the Seven Cafés," which is a musical thriller written by Holt Marvell and Sydney Horler, the well-known writer of mystery stories. This amusing series will open on June 20th with a prologue lasting fifteen minutes, which will explain in music and words the manner of presentation and the line which this musical mystery will take. The first instalment proper will be on June 23rd, and afterwards at approximately fortnightly intervals.

Walford Hayden's orchestra will play the music of the cafés, and the production will be approximately half music and half dialogue.

Radio House for Jo'burg.

WHAT is said to be the most ambitious building devoted to radio in the Southern Hemisphere has been planned for Johannesburg. A site has been secured near the centre of the city, costing best part of £50,000 and covering more than half an acre.

The idea is to erect an eight-storey building, occupying a whole block, though part of the premises will be leased to other businesses to begin with.

The plans allow for thirteen studios—instead of the seven at present available—and every modern broadcasting principle is being considered for embodiment.

Verbal Torture.

MOST people realise that an announcer's work is not too easy, and that the B.B.C.'s Pronunciation Committee has plenty to think about. But one gathers that a writer in the "Saturday Review" takes an unfavourable view. "Nobody but a student and lover of pure English can appreciate the tortures that a simple word like 'butter' has to suffer by the time it has been predigested by the Committee and ejaculated by one or other of the announcing staff," he says. And he concludes his protest against the "B.B.C. accent" by stating: "I find it difficult to acquiesce in the mutilation of my mothah tongue by a bunch of officials who should know bettah. And if I want to speak my mahind I shell speak my mahind"!

ARIEL.

The NEW MIDLAND REGIONAL

Alan Hunter revisits the National station at Droitwich and has a look at the Midland transmitter that was installed after the long-waver had commenced operations.

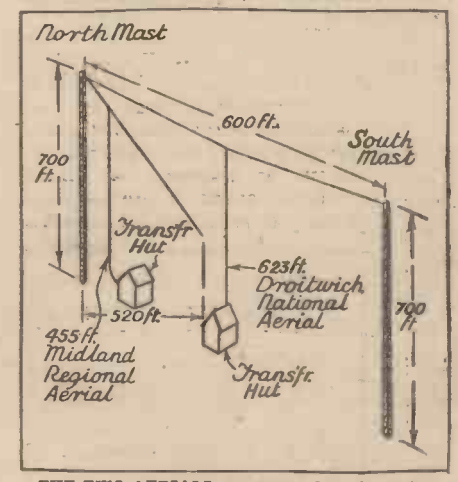
FACING the gleaming panels of the National transmitter in the imposing Droitwich station building's gallery, I saw—last autumn—a vast emptiness. "That's where we shall put the new Midland Regional," smiled an engineer, noting the query of my upraised eyebrow.

Old history now. Midland Regional chez Droitwich has been on the air long enough to justify the hopes—and, let it be whispered, the fears—of its designers.

Equally gleaming panels for Midland Regional's 50-kilowatter now face the National's panel. The gallery, as I saw on a recent revisit, is one of the sights of British broadcasting. Unlike anything else in the whole of the system.

The transmitter hall on the ground level is equally unique, for in it rest practically

ONLY TWO MASTS



THE TWO AERIALS are arranged as shown in this diagram. A stay wire supports the vertical aerial of the Midland Regional.

all the high-tension machines. The idea of this arrangement is a good one. The engineers on duty at the near-by control tables—the veritable nerve centres of the transmitters—can keep a watchful eye on the machines at the same time. Those for the new Midland are immediately beneath the part of the gallery supporting the transmitter panels of this medium-wave transmitter.

Avoiding Lightning Trouble.

Such are the obvious differences now. Differences, I mean, that anyone who went up to the opening of Droitwich National would notice on going again under present conditions.

It is outside the station building that the most interesting developments have taken place, to my mind. You remember there are two 700-ft. lattice steel masts, supporting between them a vertical T aerial from which the National long-wave signals are radiated. These being the highest masts in use at any B.C.C. centre—the next highest are only 500 feet.

At the foot of the vertical lead are the aerial circuits for Droitwich National. These are housed in what is called the aerial-transformer house. Actually there are two complete sets of tuning circuits—a safeguard against the possibility of the active one being harmed should the aerial itself be struck by lightning.

Formerly they relied on the usual lightning arrestor, but an experience not so long ago at Brookmans Park, on the relatively low 200-ft.-high aerial, showed that this was not always good enough. A condenser was "holed" rather badly—and it took a little time to put in a new one. The B.B.C. does not like breakdowns. They are blots on the service escutcheon.

A Half-Wave System.

Just near the aerial-transformer house is a steel pylon—quite a grim-looking affair, it is. This carries hefty-sized lightning arrestors, as well as acting as the terminal junction of the down-lead of the vertical aerial wire.

The two masts are known as north and south, the north being the one nearer to the fence by the Worcester-Birmingham road, running parallel with the station site.

And now, as I could see, the north mast is doing two jobs of work. It is helping to hold up the Droitwich National aerial, as before. In addition, it is supporting the new Midland Regional aerial. One is inclined, at first sight, to look on this idea as slightly makeshift—until an engineer explains.

You see, Midland Regional has a half-wave aerial. Its relatively short medium wavelength makes this possible. Among other advantages, the full height of the mast does not have to be used. A triatic arrangement, an engineer called it. Take the earth as the base of a triangle, the mast as its vertical, and then the stay wire supporting the half-wave vertical aerial wire forms the hypotenuse. That seems the easiest way to explain the idea—which in practice is really absurdly simple; easier to look at than to describe, in fact.

Close by the north mast another transformer house for Midland Regional's aerial has now been built. A reflector-wire arrangement adds to the complication here—but it was vitally necessary. It has the effect of favouring signal radiation in a north-easterly direction.

Better in North-East.

Why not a unidirectional radiation? A natural enough question until one looks at a map. At once the reason becomes obvious. Droitwich is much nearer, it is true, to Birmingham and near-by closely populated districts than was old Daventry 5 X X. But the Midland Regional's service area extends beyond Birmingham, to such important centres of population as Derby and Nottingham and Leicester.

All these districts are farther from Droitwich than they are from Daventry. On the face of things, then, they stood to lose by the change-over. Admittedly, the power was increased from 30 to 50 kilowatts; but at the same time Midland Regional's very favourable wavelength had to be given up for the relatively poor wavelength of 296·2 metres.

It was for this reason the B.B.C. forestalled complaints by making the Droitwich medium-waver's aerial slightly directional—in order to favour just those districts likely to lose, meaning those in a north-easterly direction from Droitwich.

Unfortunately, what the north-east has gained the south-east has lost. No one denies the success of the service in the doubtful north-east—I myself have received wonderfully good signals right up in Lincolnshire. Down in the south, where Midland Regional used to provide such a reliable alternative to the local, the service is now definitely poor.

Actually we cannot with justice complain.

(*Continued on page* 310.)

IN THE TRANSMITTER HALL

THE CONTROL DESKS allow the engineers full view of the two transmitting panels and also a good view of the generators in the hall below.

HOW A CONDENSER WORKS

An interesting description of the whys and wherefores of a familiar radio component.

By G. LENNIE, B.Sc.

THERE is an old experiment, relic of our schooldays, perhaps, which tells us that if we rub a piece of sealing wax on our clothes the wax will become electrified. It is then capable of picking up small pieces of paper.

We say that the wax has been electrified because it has been charged with electricity. Moreover, this charge we call a negative charge, since, during the process of rubbing, some of the electrons on the cloth have been transferred to the sealing wax. The sealing wax has therefore an excess of negative particles (electrons) over its normal quantity, and so is negatively charged.

As sealing wax and cloth are insulating materials, the charges which they have obtained do not spread over the material, but remain at the points where rubbing took place.

If, in place of the wax, we had used a piece of metal, the electric charge would immediately have "soaked" the metal. Further, if the metal had been held in the hand the charge would have travelled to earth via our body.

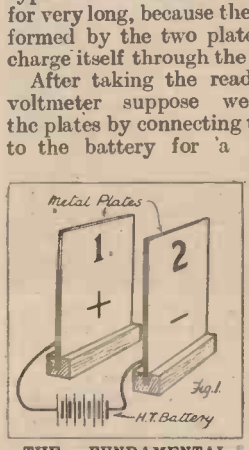
Let us now take sheets of metal and place them close to each other. These sheets must be insulated from each other and from the table on which they stand. See Fig. 1.

If we temporarily connect these plates to an H.T. battery as shown, then Plate 1 receives a positive potential and Plate 2 a negative potential. The battery is now removed, but the plates remain positive and negative. This can be proved by connecting a voltmeter across the plates.

Recharging the Plates.

If the meter is of the wire-wound type this indication will not last for very long, because the condenser, formed by the two plates, will discharge itself through the voltmeter.

After taking the reading on the voltmeter suppose we recharge the plates by connecting them again to the battery for a few seconds. We again have Plate 1 with a positive charge and Plate 2 with a negative charge. It is well known that like charges of electricity repel each other; unlike charges attract. Hence there now exists an attractive force between the plates.



THE FUNDAMENTAL PARTS of a condenser, showing how the opposite charges are developed on the two plates.

This force is assumed to lie in lines or strands between the plates, and these lines are called Lines of Force. They may be likened to strands of elastic: they tend to pull the plates together. This is pictured in Fig. 2.

So long as this field of force remains, so long will there be a voltage between the plates. If we do anything to this field we shall change the voltage. If the plates always remain insulated, then the original charges remain. That is, Plate 2 has a certain quantity of negative electricity and Plate 1 a corresponding quantity of positive electricity, or, as it can be viewed, Plate 1 has a corresponding lack of negative electricity.

Difficult to Visualise.

This picture of a quantity of electricity may be difficult to visualise. A quantity exists, nevertheless, because just as electrons leave the filament of a valve, so electrons have left the positive plate and piled up on the negative plate.

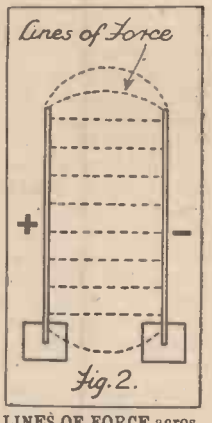
And the greater the number of electrons which flow the greater is the quantity of electricity. The unit of quantity of electricity is called the "Coulomb," and it has been found that there are 6 million million million electrons in one coulomb.

Thus, if there is on the negative plate a charge of 1 coulomb, the plate contains the above number of extra electrons. There will be, on the positive plate, a corresponding deficit of this number of electrons.

This is the modern view, though in the beginning of the science theories about fluids and so on were common. Some day, perhaps, the electron idea may become obsolete. In any case, we see that when this number of electrons has travelled, the plates, as a pair, have a charge of 1 coulomb of electricity. Furthermore, if the applied voltage had been doubled the number of electrons, or the charge, would also have been doubled.

From this we deduce the fact that the number of coulombs is proportional to the voltage applied. At this point we may try an experiment—a truly amazing experiment.

We measure, by an electro-static voltmeter—that is, a voltmeter which consumes no current—the potential difference across the plates. Let us suppose it to be 150 volts. The plates are now separated by twice the original distance, and what do we find? The voltage reading is now 300 volts.



LINES OF FORCE across the space between the plates are set up in accordance with this sketch

This result may be explained by the fact that the lines of force have been stretched to twice their original lengths, and so the strain between the plates is twice what it was. Hence the potential has doubled.

The ratio of quantity of electricity over the voltage is called the capacity of the condenser. The name given to the unit of capacity is the farad, and 1 farad is the capacity of a condenser which, when 1 volt is applied to its terminals, takes on a charge of 1 coulomb. The farad is thus measured as coulombs per volt.

The number of coulombs which flow per second is also given a name. That is, an ampere. So that if 1 ampere flows for 1 second the quantity of electricity is 1 coulomb.

AT BROADCASTING HOUSE

MISS PAULA GREEN singing before the microphone during a recent broadcast by the B.B.C. Note the streamline type of "mike" now in use.

"THANK YOU, B.B.C."

The excellent broadcasts of the Jubilee celebrations receives due recognition from our Broadcasting Critic.

IN view of my remarks last week it isn't surprising that this week I have gone all Jubilee. On Jubilee Day itself I was faced with the problem of deciding whether, through the medium of the loudspeaker, to take part in the London celebrations or to go out and enjoy those organised by my own local Town Council. The loudspeaker made the bigger appeal. Most provincials were in the same dilemma as myself.

* * *

As it happened, I did both. I listened to London till the Thanksgiving Service at St. Paul's. Then I went out. Taking up my stand in a main thoroughfare, I waited for the local procession to pass. As I did so a kindly resident obliged with the rest of the London do. He had flung his windows wide open. We heard perfectly.

Outstanding Items.

The most outstanding and memorable items of the London celebrations, as far as broadcasting is concerned, were the King's message to the Empire on Jubilee night and his reply to the loyal addresses from the two Houses of Parliament later in the week. I don't wish to belittle the excellence of the work of the anonymous commentator at Temple Bar or of Stephen King-Hall at St. Paul's. Both gave examples of ideal commentating, perfect complements to those unforgettable sound-pictures created by the thousands who demonstrated their loyalty along the processional route.

* * *

I listened with more than a thrill to the 25 Years Dramatic Survey at 6.30. It was with wonder that

(*Continued on page* 310.)

TELEVISION

A RECEIVER FOR ULTRA-SHORT WAVES

Details for constructing a receiver which will enable you to get the "feel" of the new television wavelengths.

By L. H. THOMAS

A LITTLE while ago I described, on this page, a suitable detector circuit for 5- and 7-metre reception, and suggested that readers might profitably fill up their spare time by getting used to the ultra-short wavelengths.

That page brought me in more letters than any other television article I have yet written, and nearly all of them demanded a full and detailed layout for a receiver of the type shown.

The ultra-short-wave television receiver of the future is going to be a fairly large affair, and the detector circuit will be a very small section of it; but it is safe to say that it will be one of the most important, and I am, therefore, expanding my remarks this week.

A Highly Successful Circuit.

The diagram on this page shows a suggested layout for a 5- or 7-metre detector stage. It is *not* based on pure imagination (as one imagines that many published layouts must be, from the look of them!), but is actually a sketch of a highly successful arrangement that several of us have been using for quite a long time.

Its simplicity should be reassuring to those who are not looking forward to ultra-short-wave work with any particular joy. They can take it from me that they really haven't anything to worry about, and that the whole thing is easy if one uses a little common sense and takes notice of a few practical hints.

With one or two minor exceptions the circuit is the same as that given on page 118 of the April 6th issue of "P.W." The chief differences are the change in the number of turns in the coils and the substitution of a 1-mfd. condenser across the reaction control for the previous ·001 across the phones *and* resistance.

The tuning condenser, unless it is of the small series-gap type, must be bushed or mounted on an insulated panel, since both sides are "live." The conventional tuned-grid circuit is more difficult to operate down on 5 metres than the split series-fed affair shown.

The Split Coil.

Analysing the circuit, you will note that it may be regarded as having one continuous coil from grid to anode; it is, however, split in the centre for the insertion of a ·0001 fixed condenser, which is, so to speak, hung from the two ends, filling the "gap" in the coil.

This is necessitated by the fact that we want to apply our H.T. to the anode through one half of the coil and to return the grid to earth via the other half. Accordingly, the bottom end of the grid coil goes, through the grid leak, to the negative filament terminal, and the bottom end of the anode coil goes, through the choke, reaction control and phones, to H.T. positive.

The whole split coil is tuned by a small variable condenser. The one I use is an Eddystone ·000015, which covers a fairly wide band of frequencies. Using four-turn coils, as shown, wound on a pencil and allowed to spring out to about ½-in. diameter, the detector will tune roughly from 4·5 to 6 metres, giving the 5-metre amateur band near the middle of the scale.

Using two coils of six turns each, the future television band is covered nicely, the actual range being something like 6–8 metres.

In the case shown the aerial is coupled through a very small condenser to the top end of the grid coil. Don't imagine that a "preset" condenser with ·0001 maximum will be suitable; the minimum, low as it is, will probably be too big. A good neutralising condenser, used nearly "all out," gives quite adequate coupling.

The H.F. choke consists of about 20 turns wound on a small ebonite former. The one I use is a slotted affair of ⅜-in. diameter, but doubtless an ordinary length of ½-in. ebonite rod, with the turns slightly spaced, would be just as good.

Resistance control of reaction is popular on these high frequencies, since it has little effect upon the tuning. Capacity control is apt to lead one into trouble by producing dead spots at certain parts of the range.

Some makes of variable resistance are reasonably quiet without a by-pass condenser, but it is as well to connect a 1-mfd. condenser across this control to ensure complete silence.

Superhets Will Be Used.

Although this layout shows the detector only, I am not suggesting that you should necessarily try to listen on this alone. Unless you have some 5-metre amateur transmitters very close to you, you aren't likely to hear very much. The amateurs, of course, almost invariably add a "quench" stage to the detector, which, in a state of super-regeneration, becomes tremendously sensitive and, also, unfortunately pretty noisy.

A stage of resistance-coupled L.F. after the detector is decidedly useful, and I am getting to prefer it to the super-regenerative receiver.

When we come to the complete television receiver we shall almost certainly have to think in terms of superhets. In this case the detector will not be of the regenerative type; it will simply have a tuned-grid circuit.

The layout I have shown, however, minus the headphones, will be used for the beat-note oscillator, which will be coupled in some appropriate way to the detector. My own experimental model uses a layout similar to that in the diagram, but the condenser is ganged with another similar one tuning the detector grid coil. The "cathode-injection" scheme is used for mixing the output of the oscillator with that of the detector.

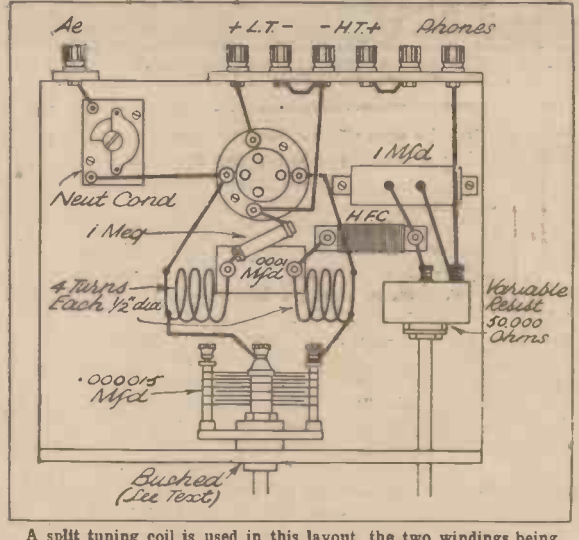
Listening for Transmissions.

The I.F. stages are a complete story in themselves, but finality has not been reached or even approached just yet, so that part of it will have to keep.

Don't assume that I am suggesting this as the only suitable circuit and layout. The conventional tuned-grid detector circuit does work beautifully down to 2½ metres or lower, but this split circuit seems a little easier to manage. Where a tuned-grid circuit refuses to oscillate, this starts up like a bird, and I am, therefore, recommending it as a beginning.

Any London reader constructing a detector of this type should be able to hear 5-metre amateurs with it. The times at which one has the best chance are from 11 p.m. till midnight, particularly on Monday and Thursday evenings. Stations in South London and North Kent are active every evening. You might even hear an experimental television transmission.

SIMPLE TO MAKE AND WORK



A split tuning coil is used in this layout, the two windings being joined by the ·0001-mfd. fixed condenser.

WITH the cheers of the crowds and the ringing of bells on Jubilee Day still echoing in my ears I turn to the latest lists of records to find still more Jubilee memorials in the form of tunes of the past, Empire airs and other commemorative issues.

One of the finest is the *Jubilee Scrapbook*, a Columbia record devised by Leslie Baily, of B.B.C. Scrapbook fame, and presented by him in conjunction with Charles Brewer. This Scrapbook is not one of the "annual" series, but an extra arranged specially in commemoration of the last 25 years of the country's history, the years of the King's reign.

Compèred by Patrick Curwen, the record takes us from the Accession and Coronation to the first Royal Command Performance, with Clarice Mayne singing her command number, the late Lord Roberts on National Service, Florrie Forde giving us the first of "Tipperary," the outbreak of war, the Countess of Oxford and Asquith and the Ultimatum, the First Broadcast (Norman Long), Sir Alan Cobham on Empire Air Routes and so forth.

Many of the prominent personages speak in person; others are represented by excerpts from records they have made in the past. It is a good record, well conceived and well put into practice. Leslie Baily is certainly carving a name for himself, no less in the wax of the recording studio than he is in the ether. Col. DX686.

* * *

H.M.V. have also been active in the production of historical reminiscence records, and this month there is an impressive "cavalcade" of Jubilee memories under the famous label.

A Great Array.

In the *Cavalcade of Famous Artists*, including such famous names as Paderewski, McCormack, Melba, Caruso, Kreisler, Cortot and Elgar, the world can indeed feel proud of having produced such a famous array of musicians during the last 25 years (DB2454–DB2455). *Jubilee Music Hall Parade* (C2739 and C2740) and *Jubilee Dance Memories* (C2738) show how tastes have changed in music-hall and ballroom. These records contain such favourites as "I do like to be beside the seaside," "Pack up your troubles," "Ours is a nice 'ouse, ours is" and "Sally" (sung by Gracie Fields). Dance tunes include "Charmaine," "Broadway Melody," "Stormy Weather" and "Let's have a Jubilee."

The Coldstream Guards Band play *Accession Memories* in their usual impeccable style. *The Nation's Loyalty* is an "His Master's Voice" record which attempts to show how loyalty to the Throne forms a part of all branches of the National Life: in the home, in the tavern, on the parade ground, in the fortress, in the Law Courts, at the show.

The record includes excerpts from the "Ceremony of the Keys" at the Tower of London, the old loyal chorus song—"Here's a health unto his Majesty"—and "Down among the Dead Men," the Oath of Allegiance taken by a Justice of the Peace, the Trooping of the Colour on Horse Guards Parade on the King's Birthday, the Armistice Day Festival of Remembrance at the Albert Hall and the Finale of the Aldershot Tattoo. (C2733.)

Some Impressive Recordings.

The Light Symphony Orchestra plays *Homage March*, a fine new composition by Haydn Wood, which ends with the National Anthem (C2734). Finally, there is a most impressive record of Elgar's *Coronation March*, composed for the Coronation of his Majesty the King, and German's *Coronation March and Hymn*, which was performed in Westminster Abbey during the Coronation Service. These are wonderfully played by the London Philharmonic Orchestra, conducted by Sir Landon Ronald (DB2437 and DB2438).

* * *

It is a long time since we have had a record by the inimitable Maurice Chevalier, but this month H.M.V. make up for lost time by issuing two of first-class order from his new film, "The Man from the Folie Bergere." The first is *Rhythm of the Rain* and *Singing a happy song* (B8305), the second is *I was lucky* and *You took the words right out of my mouth* (B8306). Both of these have that indescribable appeal that makes this great artist so popular.

* * *

What did you think of *Gentlemen, The King?* You have heard it probably several times lately, and it was composed in honour of the Jubilee as the result of a challenge made by Cicely Courtneidge, the famous stage and film artist.

At a recent gathering of musical people Cicely was deprecating the glut of sickly songs about "coloured moons," "sweeties" and so on, and she deplored the absence of a really worth-while English patriotic song.

She threw out a challenge to song writers for a real hit number of this type, at the same time wagering £100 that a suitable song would not be forthcoming. Dozens of songs were quickly submitted and rejected, and then Cyril Ray and Ivor McLaren brought along a number they had written specially for Miss Courtenidge, entitled *Gentlemen, The King.*

This immediately appealed to her, and she included it in a broadcast shortly after. A recording session was arranged by H.M.V., with the result that we shall soon be listening to the number on our gramophones.

* * *

Do you like yodellers? The real Swiss full-blooded variety, I mean, not the English imitation that we hear on the concert party platform and the third-rate stage. If you do, you should hear Regal-Zono MR1657—the first yodelling dance record to be made.

No, it is not a mixture of normal dance number and yodel, it is a proper performance of the Swiss variety by Wild and his Jolly Swiss Yodelling Boys. These boys are well known to tourists in Switzerland.

Yodelling at Its Best.

In the daytime the genial, high-spirited Mr. Wild takes his "gang" up the mountains and their harmonious vocalisms echo for many miles among the glaciers.

At night, when festivities are in full swing in the hotels they augment their yodelling with instruments, and soon have everybody dancing to the lilting strains. On the record they have sung *The Jolly Yodellers* and *Yodelling Serenade.*

* * *

And while we are on Continental music, what about *The Girls of Karlstadt* and *The Jolly Tars?* Two old-fashioned-type waltzes played by the International Novelty Orchestra. Very enjoyable music when you are in the mood. Regal-Zono MR1656.

K. D. R.

MANTOVANI AND HIS ORCHESTRA

Mantovani and his Tipica Orchestra, the popular artists who record on Regal-Zonophone, are here seen listening to a Cossor radio receiver.

TELEVISION JOTTINGS

Some opinions and rumours.

I WAS chatting with a well-known man in the radio trade during the week, and he put forward his own feelings about television. Since his point of view was rather original, I think I ought to quote a few of his remarks.

First of all, he said, the whole thing has happened "back to front." The Committee's report ought to have been made in strict confidence, approved by the P.M.G. and the B.B.C., and not allowed to leak out. (We know it would have done, anyway, but it shouldn't!) Then, he says, the B.B.C. or one of the companies whose system was approved should have carried on quietly with transmissions, the existence of which was only known (officially) to the radio trade.

Tubes Still Growing.

Had that been done, the trade would have been able to design and go into production with receivers in ample time for the first of the new transmissions. As it is, the radio trade is completely "up a gumtree," with the exception of the two firms who are going to be responsible for the transmissions, and therefore know just how to design the receivers.

The above is not, of course, a disinterested opinion. Far from it, in fact; but it does represent a perfectly reasonable point of view, and, as such, I felt that I ought to put it forward.

Cathode-ray tubes continue to grow, the latest report reaching me concerning one of 24 in. diameter! What will be the limit? It is quite certain that nothing so unwieldy as that will have much practical use for the home receiver.

External Projection Suggested.

Another rumour (from the U.S.A. this time) concerns some weird and wonderful method of projecting pictures *through* a special screen on the end of a cathode-ray tube, the actual pictures appearing on a much larger screen a foot or so away from it. This sounds suspiciously like a Ripley (believe it or not) tale; but so have many others that have ultimately turned out to be true.

If such a system were possible it would probably be considerably cheaper than those involving the use of giant tubes like the one I mentioned in the previous paragraph.

My friend with the complete high-def. receiver is still patiently waiting for some suitable signal to arrive down his aerial! Superhuman patience is necessary, especially as he hasn't the faintest idea whether the thing is going to work when he does receive his first transmission.

I have been testing out an ultra-short-wave superhet with special I.F. stages giving the necessary band-width for television. Listening to the amateur 5-metre band with it is a very funny business; but it certainly works, for I receive ten or twelve 5-metre transmissions on top of one another when all the South London stations are on! The normal sharply tuning superhet, of course, gives quite a large silent area between each pair of transmissions.

Firms Getting Ready.

Several new methods of I.F. coupling are being evolved, and I believe that quite half a dozen firms are ready with a commercial product that will do the job. None of them will release details, however, for pretty obvious reasons. I know definitely of one type that gives a band-width of 1 megacycle and a stage gain not far short of that obtained with the ordinary 110-kc. transformers. My own receiver uses two flatly tuned stages and one aperiodic stage, and seems to do the job well. L. H. T.

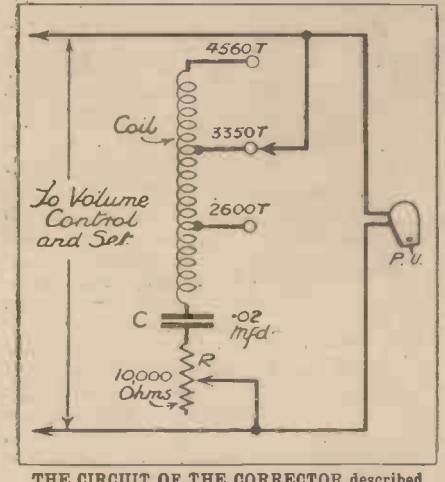
A Simple PICK-UP CORRECTOR

Here are details of a simple-to-build unit which is applicable to every radiogramophone.

By F. N. GANDON

NEARLY every pick-up has what is called a resonant point or "peak" in its characteristic curve, which means that it over-accentuates certain notes in a definite though narrow region of the musical scale. This disproportion is sometimes quite severe, and usually occurs in a part of the scale where it is noticeable to the ear—between 1,500 to 3,500 cycles. A bad peak is usually the cause of that shrill jarring character of certain high notes due to the unbalanced upper register.

VERY SIMPLE



THE CIRCUIT OF THE CORRECTOR described in this article. Note how it is connected across the pick-up.

In order to rectify matters and obtain balanced reproduction it is plain that the accentuated notes must be reduced to their proper level, and in such a way that the frequencies above and below the offending point are not interfered with to any extent.

The Question of Needle Scratch.

Of almost equal importance to balanced reproduction is the removal of unnecessary needle scratch. Unfortunately, it is not possible to do this completely and to retain good quality, because needle scratch spreads over a fairly wide section of the higher notes and to cut it out would mean cutting out the high notes as well.

This is what happens when using the ordinary scratch filter, which usually has a sharp cut-off at about 2,500 cycles, causing a "woofy" result without life or brilliance—in other words, the high notes have vanished. The B.B.C. has practically eliminated scratch with a complicated network of correctors and adjusted pick-ups, but even so it is noticeable at times.

Effect of the Resonant Point.

It has been found, however, that scratch is particularly apt to creep in at the resonant point of a pick-up, so that by reducing the peak with a corrector we should expect to find a reduction of needle scratch, and this is certainly borne out by test.

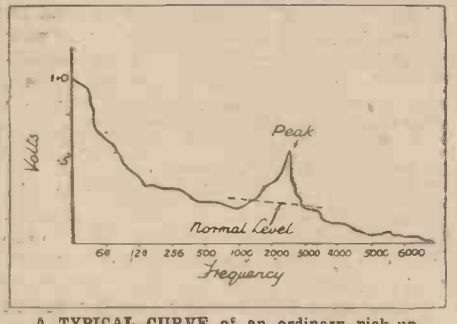
The corrector consists of a filter circuit comprising an inductance, a condenser and a variable resistance connected in series, the inductance being tapped to cover three frequency ranges. As shown in the diagram, it is connected in parallel with the pick-up and before the volume control, care being taken to disconnect scratch filters or other gadgets which may upset its working.

The variable resistance does not affect the frequency range, but only controls the amount of absorption or cut-off.

With the full 10,000 ohms in circuit the corrector has practically no effect; but as the resistance is gradually reduced so the absorption becomes greater, until with minimum resistance it will absorb nearly all the output at the frequency to which it is set.

The connections of the corrector are brought out to four plugs and sockets, three on one side of the panel and one on the other. The single socket is connected permanently to one side of the pick-up,

AN UNWANTED PEAK



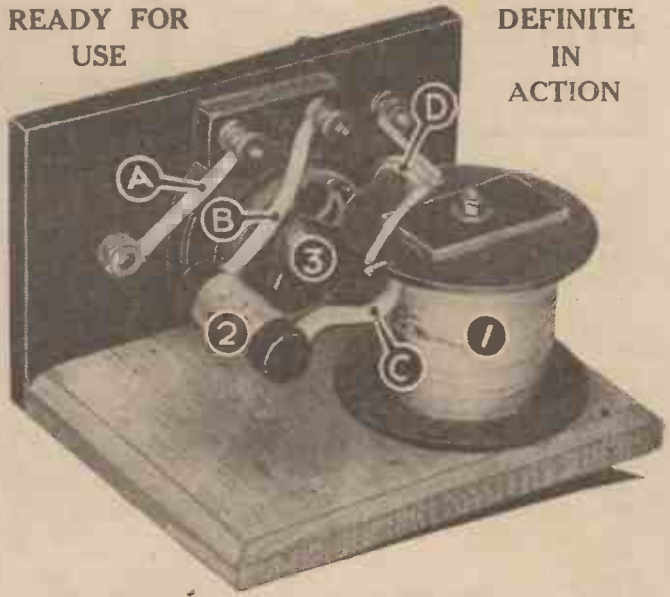
A TYPICAL CURVE of an ordinary pick-up, showing the peak where needle resonance causes scratch to be heard loudly.

while the other side of the pick-up goes to one of the group of three sockets, according to the frequency cut-off desired, i.e. top

(*Continued on page* 309)

READY FOR USE

DEFINITE IN ACTION



THE COMPACT UNIT. No. 1 is the inductance of 4,560 turns; No. 2 is the ·02-mfd. condenser; No. 3 is the 10,000-ohm volume control used as a variable resistance. A and B are the leads from the resistance to the pick-up terminal and to the condenser respectively, the former lead going to the slider. C connects the ·02-mfd. condenser to the end of the coil, and D indicates the three tappings.

BIAS IN THE PROGRAMMES

Not very long ago we used to hear frequent cries against one-sided B.B.C. talks and programmes, and the controversy has recently been revived.

WHENEVER the B.B.C. is attacked for supposed bias in its talks and other programmes, this bias turns out to be Socialist or even Communist. Very rarely do we hear accusations that the talks have a Conservative bias, although without any doubt they have!

The latest outcry, so far as talks are concerned, came as a result of the "Youth Looks Ahead" series, which quite naturally expressed the sometimes extreme views of modern youth. Those who listened seriously to these rather enlightening talks realised that the B.B.C. had been wise to give the speakers their head, for this series proved more of an entertainment than an education. At the same time, wherever national problems have had to be discussed, there has never once, so far as I can remember, been a trace of any bias against the strictly constitutional.

The Striving after Impartiality.

In 1934 the British Empire was discussed in more than a score of talks. Here extreme prominence was given to the most orthodox views from prominent Government supporters, and I cannot believe that Broadcasting House received many letters from indignant constitutionalists regarding this series. The same orthodox views persist throughout many other departments of talks, even the present talks on foreign affairs being calculated to appease rather than to give any hint of unorthodox views.

In many cases the striving after impartiality has succeeded only in killing all interest which certain items might hold. The News Bulletins, for example.

In a recent article, Charles Siepmann, of the B.B.C. Talks Department, said: *Few people at first blush would admit that the News Service was an educational service, and yet by implication it carries a very definite message. It stands for a rigid adherence to accuracy and truth, to the elimination of bias, to the avoidance of sensationalism. If, as a response to such service, equivalent expectations are inculcated among listeners, something educational has been achieved.*

Many Judge Unfairly.

There are many people who wish that the News Service were a little less educational and a little more controversial. Better, they say, for the B.B.C. to be hunted as a tiger than to be treated with familiar contempt as a very tame rabbit.

But the fact remains that anyone who cared to take the trouble to listen to a whole series of talks could, by discarding those which argued against his case, prove conclusively that the B.B.C. was definitely biased towards almost any shade of opinion! And the trouble is that the majority of listeners who listen for entertainment do *not* hear a whole series of talks and are only too eager to judge the whole by one or two isolated parts.

However careful the B.B.C. is to maintain a fair balance between all important shades of opinion, there is never any assurance that the man who listens to Lord Blank in talk number one will also hear Bill Smith in talk number five. In fact, I can well believe that the gentleman from the Talks Department who has just lately been appointed to take over from Gerald Cock the control of Outside Broadcasts must be congratulating himself upon his transference from a very thankless task.

A Banned Word.

In other programme departments the B.B.C. is always willing to defer to the particular susceptibilities of every shade of opinion, political, religious or social. Only the other day, for instance, a listener wrote to Henry Hall to suggest that Mohammedans might well be offended by the title "Allah's Holiday" of a jazz classic. So the word Allah is now banned, and Henry Hall announces the title as "Eastern Holiday."

Every week, too, listeners in Wales have a part of the National programme devoted to items exclusively in the Welsh language which, since English is the national language, is probably the best example of B.B.C. impartiality.

All of which makes it harder to understand the B.B.C.'s attitude in refusing, without giving any official reason, to entertain the request made by Roman Catholics in this country that part at least of the ceremonies in connection with the canonisation of John Fisher and Thomas More might be relayed from Rome.

The census figures show that in the British Isles there are some 4,000,000 Catholics, while the total for the Empire is in the neighbourhood of 16½ millions. Despite the request of Bishop Amigo, of Southwark, appealing on behalf of the Vatican, the B.B.C. continued in its refusal. Except for an eye-witness account from Rome in the News Bulletin nothing was to be arranged.

The Vatican was willing that the ceremony should be relayed to the British Empire, and there were present in Rome at that time many English-speaking prelates who could undertake a commentary. The event is of greater importance to English Catholics than any other ceremony which the B.B.C. has previously relayed from Rome.

Divided Opinions.

These facts, with a mass of others from associations and influential individuals, will be laid before the Commission which is now sitting, under Lord Ullswater, to examine "the constitution, control and finance of broadcasting in this country, and report and advise generally on the conditions under which this service . . . should be conducted after December 31st, 1936."

There are some who favour a return to the earlier days of broadcasting, when controversial matter was barred. There are some who would favour going to even greater lengths and banning any opinion which went against the established Government, the established language and the established Church. But more, probably, feel that, although the B.B.C. may make many mistakes in the realm of tact and expediency, the present system is best. **P. C.**

INVESTIGATING THE B.B.C.

THE NEW COMMITTEE, which is to advise as to the future policy of British Broadcasting. Left to right (seated), Major Astor, Lady Reading, Major Attlee and Lord Ullswater (Chairman); left to right (standing), H. G. G. Welch, Mr. Graham White, Mr. Clement Davies, Lord Selsdon and Lord Elton.

FASCINATING NEW GAME

A FASCINATING new dice game called "Alfa-Kubes" has just made its bow to the public. It is a game that will tax your ingenuity and knowledge to the utmost. Six dice are used, and on each side of all the dice is printed one of the letters of the alphabet, together with the numerical value that has been fixed for each letter. Thus "H" is worth 2 points, "A" 6 points, and so on. You throw your six dice, and then skill and quick thinking come to your aid. You have three throws; you use those letters which have high markings and yet will be useful to you. If necessary, you reject and throw again the dice which have turned up unfavourably.

Great Fun For All.

When you have had your three throws you piece the letters together into a word that will give you the most points. It is not necessary to be a good speller to play well.

The beauty of the game is that it can be played by any number of people, and it really is great fun. "Alfa-Kubes" costs only 1s., and can be obtained from all booksellers, newsagents, and toyshops.

ON THE SHORT WAVES

SHORT WAVES THIS SUMMER

There is every indication that we are at the commencement of a period of good conditions for short-wave reception, suggests W. L. S.

I HAVE often referred in these notes to the Eleven-Year Sunspot Cycle, but I have not for quite a long time explained just what it is and why it affects us as it does. I don't propose now to enter into a long discussion on the subject, but I just want to make one or two facts quite clear.

For years past scientists have known that sunspot activity occurs in cycles with a period of roughly eleven years. This has been definitely established, and curves for the past twenty-two years have been published, as well as a predicted curve for the next eleven.

The Sunspot Cycle.

'Way back in 1925, I think it was, someone suggested that this sunspot cycle must have an effect upon radio, and particularly upon short-wave radio, which relies entirely upon the reflected wave. Since then our knowledge has advanced quite a lot, and we know now that the Heaviside and Appleton Layers, upon which we depend for our reflected wave, are affected by phases of the moon, by meteoric showers and, above all, by sunspots.

We, down here on the earth, are rather apt to regard a sunspot as a mere bagatelle. Ask an astronomer, though, and he will tell you that they are solar disturbances of an almost unbelievable magnitude.

It has been proved up to the hilt, long before this, that the existence of sunspots on the surface of the sun facing in our direction has a very marked effect upon the two ionised reflecting layers, and that short-wave reception improves enormously under those conditions.

1927 a "Peak" Year.

Very well, then; add to these facts two more. 1927 was, I believe, the year of maximum solar activity, and it certainly was the "peak" year for short-wave reception. The winter of 1927–8 will never be forgotten by those who were fortunate enough to be keen on short waves then. In 1928 throughout the summer it was possible to receive the U.S.A. and South Africa on 10 metres—a feat which was repeated unreliably in the next year, but has not been done since.

(In passing, I understand that we may expect something of the sort this summer, since 10 metres is giving a reflected wave between Australia and the U.S.A. already.)

If the existence of the eleven-year cycle is assumed the next "peak" year will not be till 1938; but we are already well past the "trough" which occurred in 1933, and conditions are improving most noticeably.

Now we come to the main point of this article. In the past few weeks we have had a foretaste of what things may be like this summer. Americans, Australians, Japs, Hawaiians and all the rest of the real "DX" stations have been pouring in in the early mornings; American amateur telephony, in the evenings on 20 metres, has presented a real problem—that of separating one station from t'other. Short-wave broadcast, particularly below 30 metres, is getting stronger week by week.

And this is still three years from the supposed "peak" year! It should be pretty obvious by now that we are all going to have a thin time unless we go in for really selective receivers. I'm not advocating "Single-Signal Superhets" for all, but I do know how appallingly inselective some of these short-wavers are. I've heard some of them!

Just try a test next Sunday afternoon on the 31-metre band. If you listen at about 2.45 (B.S.T.) you will probably find D J N (31·45 metres), D J A (31·38 metres) and I 2 R O (31·25 metres) all going strong. D J A and 2 R O are actually 30 kc. apart. Can you find a silent point in between them? If you can't, what good is your receiver going to be when you want to find Sydney (V K 2 M E), who is only 10 kc. away from 2 R O?

I am much derided in certain quarters for daring to suggest that a good straight receiver can give the superhet a run for its money; but I *do* suggest right here that most readers of these notes can still improve their detectors quite a lot from the selectivity point of view, and that it's time they did.

A superhet, really, cannot be any better than its first detector. It's no good using sharp-tuning intermediate circuits if the signal that the first detector pushes into them is already carrying interference with it. So get down to your detectors first.

More Selectivity Needed.

Above all things, loosen off that aerial coupling! Don't try to get sixpenny signals out of a twopenny set, and everything will improve until it's worth a shilling or more! If you lose a little strength by sharpening up the tuning, why worry? What good is sheer strength if you can't separate two strong stations? Isn't it better to hear either of them at will, weakly?

Very shortly I hope to start off again on the subject of H.F. amplification in short-wave receivers, which is going to become absolutely essential, so far as I can see, in the next year or so.

The construction of a screened-grid H.F. stage, its tuning control ganged with that of the detector, is a very simple business, although many people seem to fight shy of it for some reason or other. The untuned H.F. stage, of course, is a valuable asset from the point of view of stability, but it doesn't help us at all with selectivity—rather the opposite!

The Best Method.

In my humble opinion, the short-wave superhet is no good these days without a signal-frequency stage of H.F., so before we start talking about supers we must get down to the first two valves and get them working really well. They form a perfectly good headphone receiver, and it is the best way to tackle the problem of a large receiver—build it in sections and get them working one by one.

Yes, short waves are going to be exciting this summer, and next summer, *and* the summer after that; so much so that by the time 1938 arrives our ideas of suitable receivers will probably have changed beyond all recognition.

A GATHERING OF THE "CLAN"

Some of the members present at a meeting of the Anglo-American Radio and Television Society. The receiver on the small table to the right is built from one of W. L. S.'s designs.

ON THE SHORT WAVES—*Page 2.*

Points from the POST-BAG

TWO readers report hearing the station at Suva, Fiji (call-signs V P D and V P 1 A), on 22·94 metres. One of them is G. C. A. (S.E.16), the winner of the B.E.R.U. Receiving Contest for two years running. The other is J. M. (Sherborne), a 16-year-old reader whose name is new to me. So far as I know, these are the only reports that have yet reached me.

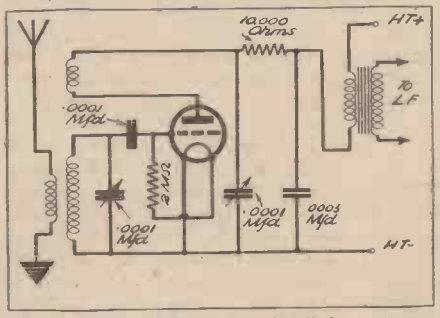
The latter wants to get into touch with other short-wavers in the district. His full address is: John Morcombe, Kingsbury, Milborne Road, Sherborne, Dorset.

R. J. B. (Southampton) wants identification of a station saying "Hullo, London, Cape Town calling," received low down on a 2-turn coil. Beyond that he can't help me with regard to wavelength. I presume it is one of the 13-metre telephony stations.

Springfield's Call Sign.

G. L. B. (Worksop) puts paid to the suggestion, recently made by another reader, that conditions at the end of March were bad. He sends in a terrific log for the period. He also calls my attention to the fact that

IMPROVING REACTION



Readers who are in trouble with their reaction control, owing to the use of a transformer stage after the detector, might note the scheme shown in the above circuit. A 10,000-ohm resistance is used instead of an H.F. choke, and the "dead end" is by-passed to earth.

Springfield, W 1 X A Z, is announcing himself as W 1 X K when he is not relaying W B Z and W B Z A.

There has been an unfortunate misunderstanding about the recent suggestion from a reader that a "World Map" can be obtained from the I.D.A. via Mr. Warner, of Exeter. It appears that no such map exists, and Mr. Warner has been snowed under with letters from readers.

There is, however, a publication issued by the I.D.A., entitled "Distances from Greenwich," which can be obtained for a 2d. stamp from Mr. W. Warner, 56, East Grove Road, St. Leonards, Exeter.

Another Huge Log.

R. D. E. (Standon) sends in another huge log, but he hasn't been lucky enough to bag V P 1 A yet. I believe the only time this station can be heard is between 6 and 8 a.m., but he's certain to improve within the next few weeks, when the West Coast Americans start coming over in the mornings.

R. D. E.'s log of amateur telephony includes the following: W 6 A T K and W 7 Q C (West Coast, U.S.A.); C O 6 O M, C O 2 W W, C O 2 H Y (Cubans); H H5PA (Haiti); V P 6 Y B (Barbados); all on 20 metres. Also T I 2 R C, T I 2 H Y (Costa Rica); H C 1 F G (Ecuador); L U 4 B C (Argentina); H P 1 A (Panama); and C O 5 R V (Cuba); all on 40 metres.

He, in common with many others, complains that many stations ask for verifications, and one sends an international reply coupon and even then doesn't get a Q S L.

From a Convert.

J. W. (Hillingdon) has recently become a convert to the short waves, and has made a receiver out of various old parts. Without even using a slow-motion dial he has logged quite a number of stations and found that there are new thrills to be had from radio, after all.

L. C. (Preston) is up against the old, old trouble of bad reaction control. This is so scarce nowadays that I've almost forgotten what I used to prescribe for it. He has tried other grid leaks, so I suggest that it's either due to the valve or to downright instability. A modern valve with the minimum of H.T. simply *must* give good reaction control if used in a reasonable circuit.

O. B., a seafaring reader with one of these "round-the-world" sets, is in trouble with other short-wavers on the same boat, and wants to fit an H.F. stage to one or more receivers to lessen the interaction. I hope to deal with this very shortly. He concludes: "The final argument in our mess is W. L. S. says so!" What a responsibility I have to carry these days!

Sending Q S L's. to American Amateurs.

P. M. B. (Middlesex) sends a prodigious log of American stations received both on short and medium waves. With regard to the latter he says: "I know you are a short-wave writer, but I have decided to tell you about my medium-wave results because you're interested in 'D X' work." Sufficient to say that he has identified nearly twenty of them, including K N X, Los Angeles!

Several readers inquire about sending Q S L's. to American amateur telephony stations. I can't possibly give the addresses of all the better-known stations, but I think it is safe to say that cards and letters will be forwarded if sent c/o American Radio Relay League, 38, La Salle Road, West Hartford, Conn., U.S.A.

Readers, Please Note!

Lastly, will readers who have written recently and received no reply please note that a large batch of letters forwarded to me from the Query Department has unfortunately gone astray in the post? I am hoping that they will turn up, but these things do happen once or twice in a lifetime!

If any important matter has not been dealt with I should be glad if the readers would write once more.

Also, will those readers who are still keeping long-period logs on individual stations please try to let me have them during June, as I want to start comparing them and seeing whether anything can be found out from them.

I have kept one for nearly three years on two or three stations with whom I co-operate on the amateur bands, and up to the present they follow the variations in conditions on the broadcast bands closely.

SHORT-WAVE NEWS

THERE is plenty of evidence of activity among the local short-wave clubs this year—most of them having become television and short-wave clubs—and I am receiving a good many letters from readers who would be glad to join one if they knew of one in their locality.

Will secretaries please write to me and acquaint me with their existence? I shall probably be able to supply many of them with ready-made members.

Here are two announcements: It is the intention of a few enthusiastic short-wave fans in Strathaven, Lanarkshire, to form a club in the district, and anyone interested is asked to get into touch with Mr. W. L. Howat, 11, Kirkland Park Avenue, Strathaven.

Next, the Whitstable Short- and Ultra-short-wave Club. Anyone in the Whitstable and Tankerton district who would like to join a local society is asked to write to Mr. W. Crossland, "Griz-Nez," Queen's Road, Tankerton, Kent.

An Amusing Competition.

Mr. Leslie W. Orton, of the Anglo-American Radio and Television Society, tells me that the last meeting was a great success, and that certain novel features were introduced. Among them was an amusing competition to decide which of the members present had the best microphone voice. The "mike" was in an adjoining room, and many members appeared to be potential B.B.C. announcers.

MOUNTED ON THE PANEL

Most home-constructed American receivers nowadays incorporate the speaker in the set itself, and small moving-coil speakers are often mounted on the front panel, as shown in this sketch.

The Empire station's newly introduced "Transmission Six" to Western Canada has now been regularised and takes its place as a definite service for that area. Transmissions take place between 3 and 4 a.m., G.M.T., on each Sunday, Monday, Wednesday and Friday. A news bulletin will be included at 3.45 a.m. These times, of course, correspond with the previous evening in Canada.

Another new Empire feature is a regular service from St. Paul's Cathedral, to be given at 1.15 p.m., G.M.T., on the second Sunday of each month. The full choir of the Cathedral will be taking part in these services.

Conditions recently have been very good, but "patchy" for certain districts. The Americans are consistently good, as usual, and V K 2 M E seems to be the same Sunday after Sunday. The less easily received parts of the world, however, have been a little elusive. Bombay varies, and so does Nairobi.

Readers' logs have already been dealt with, and they seem to indicate that conditions do not vary much between one part of the British Isles and another.

W.L.S.

Rectifying A.C.

HOW THIS IMPORTANT FUNCTION IS CARRIED OUT IN A MAINS SET.

By

BERNARD BARNARD

MOST wireless users are very ready to acknowledge the enormous debt they owe to the valve: in every stage of a modern receiver it is obvious that each refinement and component "hangs" on its associated valve. Indeed, it is true to say that the development of radio has been no more and no less than the development of the thermionic valve.

That we can draw almost unlimited H.T. from electric-supply mains is originally to the credit of the valve, although nowadays it has a close rival in the metal rectifier.

It is no small task to break down 200 volts A.C.—and "raw" A.C. at that—to some 150 volts D.C., smoothed and suitable for driving a sensitive radio receiver.

The Simplest Form.

Strangely enough, the valve used for this intricate job is an adaptation of the first—one might almost say the grandfather—of all valves, Professor Fleming's two-electrode valve, and it is some measure of the quality of that genius that his original diode persists in these days of bi-grids, pentodes and hexodes!

The simplest form of mains-rectifier circuit consists of one diode valve connected up as shown in Fig. 1. It is easy to follow the working of this arrangement.

The anode is fed with mains A.C. via the mains transformer. During the periods when the anode is positive emission will take place from the filament; but when a positive half-cycle is completed (1/100

A HALF-WAVE CIRCUIT

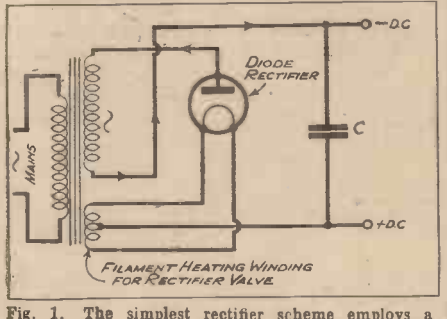


Fig. 1. The simplest rectifier scheme employs a single diode valve.

second on 50-cycle mains) the anode will be negatively charged and will remain so during the next 1/100 second. Obviously, while the plate is negative no emission will take place.

The output from the valve, then, is in short bursts of direct current separated by equal periods of no current.

The condenser—C in the diagram—is charged up while the current is flowing, and automatically discharges itself into the circuit as soon as the current starts to fall off.

It therefore has a balancing or "reservoir" effect on the current so that it never falls below a certain minimum—that minimum depending, among other things, on the capacity of C.

The actual current output from this arrangement is a sensibly smooth D.C. which can be applied after further smoothing for operating the receiver.

FOR "FULL-WAVE"

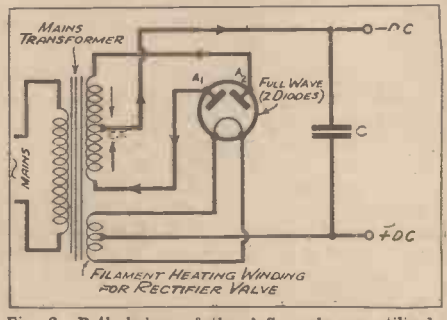


Fig. 2. Both halves of the A.C. cycle are utilised with this circuit.

The single-diode valve connected up in this way is known as a "half-wave rectifier," since it rectifies only half of each mains A.C. impulse or cycle.

The development from this simple device to "full-wave" rectification is fairly obvious. The output from the half-wave rectifier is very limited, doubtfully smooth (since such large current gaps have to be filled by the condenser) and is uneconomical.

Modern valve-rectifying circuits normally use two half-wave rectifiers in "push-pull" so that each half-cycle of A.C. is rectified.

Two 2-electrode valves are used, and these are usually both housed in the one bulb.

The circuit for full-wave rectification is shown in Fig. 2.

More Economical System.

You will notice that, since the anodes are joined to opposite ends of the mains-transformer secondary, they will be oppositely charged, so that while one is resting (i.e. negatively charged) the other will be drawing current from the filament and supplying this into the D.C. circuit.

At first sight it appears that current will always be flowing, but this is not so. The accompanying table of voltages shows that there are instants when both anodes are at zero volts and consequently the D.C. circuit is momentarily "dead."

This state of affairs lasts for only a fraction of the "dead" period experienced with a half-wave rectifier, however, and the reservoir condenser is easily able to discharge itself to keep a steady supply of D.C. And since the discharge persists for such a short time it follows that the average of current maintained will be much higher than in the case of half-wave circuits.

The Regulation Curve.

Notice how the emission of the valve flows through each half of the transformer secondary in turn, reaching the common negative busbar via the centre tap.

The design of a mains unit which is to employ a valve rectifier involves the careful consideration of two factors, namely the maximum D.C. voltage required and the maximum direct-current drain to be imposed on the unit.

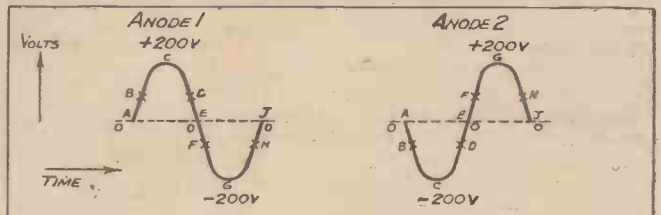
For supplying H.T. to small sets the voltage is not likely to exceed 200 and the maximum current may be in the neighbourhood of 30 m/a.

To provide for 200 volts smoothed D.C. at the H.T. terminals it is necessary to allow for a voltage drop across such smoothing chokes as will be used; a transformer secondary that will give about 225 volts each side of the centre tap will therefore be about right, and a rectifier valve rated to stand this voltage at each anode must be used.

For the current supply it is clear that we are dependent upon the emission of the

(Continued on next page.)

HOW THE ANODE VOLTAGES VARY



INSTANT	VOLTS AT ANODE 1	CURRENT AT ANODE 1	VOLTS AT ANODE 2	CURRENT AT ANODE 2
A	ZERO VOLTS	0	ZERO VOLTS	0
B	+100 "	RISING	−100 "	0
C	+200 "	MAX	−200 "	0
D	+100 "	FALLING	−100 "	0
E	ZERO "	0	ZERO "	0
F	−100 "	0	+100 "	RISING
G	−200 "	0	+200 "	MAX
H	−100 "	0	+100 "	FALLING
J	ZERO "	0	ZERO "	0

Fig. 3. Diagrams and table for showing the voltages on the rectifier anodes at various points on the A.C. cycle.

CHECK YOUR TURNTABLE SPEED

Some practical notes on the use of a stroboscope.

FOR true reproduction of gramophone records the correct speed of 78 revs. per minute is essential. When the tune or speech is recorded the recording wax is rotated at constant speed, this being standardised at 78 revs. per minute, and the original sound can only be reproduced truly by the loudspeaker when the gramophone turntable rotates at this speed.

No doubt many listeners think that speed does not matter much so long as the reproduction appears to be all right, but actually a record which runs too slowly or too fast will reproduce sound which differs from the recording in several ways.

A Very Simple Tester.

In the case of musical reproduction, if the record is run too slowly there will be a change of pitch from the original, the music being transposed into a lower key. On the other hand, if the record is run too fast the pitch will be higher. Apart from this change in pitch, the actual playing time of the record will be either greater or less.

It will be seen, therefore, that the turntable speed should be checked. This can be done by a stop watch and counting the number of revolutions of the turntable, and adjusting the brake between each series of counts until it reaches 78 revs. per minute. A better method, however, and taking only a few seconds, is a very simple device which can be used on any motor, electrically driven or clockwork, by those who have electric-light mains, any voltage, at 50-cycles frequency.

If the accompanying illustration is pasted on a piece of card and cut into a circular disc, with a hole cut in the middle to clear the turntable spindle, it can be used as a quick and accurate speed tester, and is known as a stroboscopic indicator.

Place the disc on the turntable over a record and view by the electric light as it is playing. Adjust the speed regulator of the gramophone motor until the ring of black and white divisions appears stationary, when the turntable will be rotating at exactly 78 revs. per minute.

If the turntable is running too fast the divisions will slowly move clockwise, and if running too slowly they will go anti-clockwise.

If this test is applied in the daytime the turntable and lamp must be shaded by some means from direct daylight, otherwise the stroboscopic effect will not show up vividly.

A word or two explaining the working of this simple speed tester may interest readers. If you count the number of black divisions on the disc you will find that there are 77, and of course 77 white spacers.

This is a predetermined number governed by the frequency of the mains supply, which in this case is 50 cycles per second. Now for every cycle two maximum voltages are developed—a maximum positive, through zero, to a maximum negative, so that on 50-cycle supply mains there are 100 such maximum voltage peaks per second.

The electric lamp working on this supply does not indicate the zero points of these cycles by going out, because the filament does not have time to cool before the next maximum voltage peak comes along. Nevertheless, the 100 alternations per second of light intensity are there.

Now at 78 revs. per minute the disc makes 1·3 revs. per second, and in this 1·3 revs. 100 black divisions should pass a given point to give synchronism with the light fluctuations. Therefore for 1 revolution of the disc the number of divisions passing this point will be $100 \div 1{\cdot}3$, which is 76·9.

So for practical reasons we mark 77 black divisions on the disc, which is correct within ·1 per cent. From this little calculation we obtain the straightforward formula to give us the number of black divisions at any frequency. This is as follows:

$$\text{No. of black divisions} = \frac{\text{frequency} \times 2 \times 60}{78}$$

However, as A.C. mains supply is being rapidly standardised at 50 cycles, this will be the only frequency to which the formula will be applied.

L. H.

CUT THIS DIAGRAM OUT

Stick this diagram on a piece of card and use it to check your gramophone-motor speed.

RECTIFYING A.C.

(Continued from previous page.)

valve, and the rectifier must therefore be capable of giving 30 milliamps without overloading.

When any doubt exists as to whether a certain valve is suitable for a given job reference should be made to the "voltage-regulation" curve of the valve in question.

This curve shows voltage output against current drain for various capacities of reservoir condenser, and will show at a glance the maximum milliamps you can take from the valve without reducing the rectified voltage output.

The Reservoir Condenser.

It is interesting to note from these curves that the larger the condenser the greater the direct current available for H.T., since the bigger condenser holds a bigger charge and therefore fills up the current gaps more efficiently.

The reservoir condenser usually has a capacity of 4 mfds., and must be tested to withstand at least twice the normal *working* voltage of the circuit.

The reason for this is that very high voltages will exist momentarily in the rectifier circuit due to current load lagging behind rectification.

For instance, when the set is first switched on power-valve filaments may take longer to reach working temperature than the rectifier filaments. Consequently the rectified voltage is available before any current is taken and will, therefore, build up to a very high-peak value.

Particularly is this so where A.C. valves are used in the receiver, for these may take as long as 20 seconds before they start to operate.

LOAD AND OUTPUT VOLTAGE

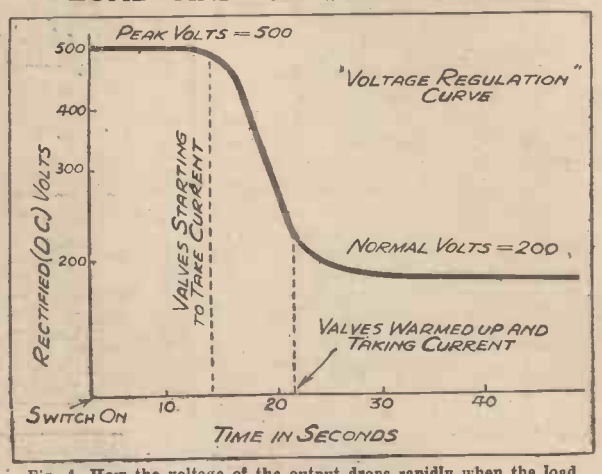


Fig. 4. How the voltage of the output drops rapidly when the load is applied.

Fig. 4 shows how the peak voltage will exist until the receiver begins to draw current and normal conditions obtain.

A Thermal Relay.

Under these circumstances it is usual and wise to insert a delay device which prevents the rectifier valve receiving the mains voltage before the receiver valves are warmed up, or else to use an indirectly-heated rectifier. Remember, 500-volt *test* condensers do not like 500 volts across them for more than a second of so.

Rectifier valves can be relied upon to give very long, useful service provided they are not called upon to give a greater output than that which they are rated to deliver.

HOW TO BUILD A Universal Mains Amplifier

A HIGHLY EFFICIENT UNIT SUITABLE FOR USE ON EITHER D.C. OR A.C. SUPPLIES.

WHEN we gave details of the two-valve amplifier in our last issue we have no doubt that many mains enthusiasts felt a trifle envious of their battery-using brethren, and also somewhat disappointed because a mains version was not included in the same issue.

But we had not forgotten the mains user; it was simply a question of lack of space for two amplifiers in the one issue of "P.W."

Here is the mains version, and we can assure you that it is a remarkably efficient job. Two amplifying valves are employed, together with a Cossor 40 S.U.A. half-wave rectifier.

Now just a few words about these valves. The first one, V1, is an H.F. pentode, used in this case as a low-frequency amplifier.

The second valve, V2, is a straight-forward three-electrode output type, capable of giving an undistorted output at 200 volts of 2 watts.

This, you will agree, is ample—in fact, more than ample—for any ordinary domestic use.

V1, V2 and the rectifier are of the indirectly-heated type, having ·2-amp. heaters, these being wired in series. Hence the amplifier is, as you will have already gathered, suitable for universal use. That is to say, it will work equally well on both A.C. and D.C. mains. There is a very big advantage in possessing an amplifier (or radio set) which is entirely independent of the type of supply.

Suppose you are already on D.C., and that, at some future time, your mains are changed over to A.C. If you have a universal design the change-over will not matter one little bit.

Conversely, if you are at present on A.C. and you move to a D.C. district, or wish to use the amplifier at a friend's house which happens to be on D.C., you will find it comforting to know that both forms of supply are equally suitable, and that your amplifier is not tied down to one particular type of current.

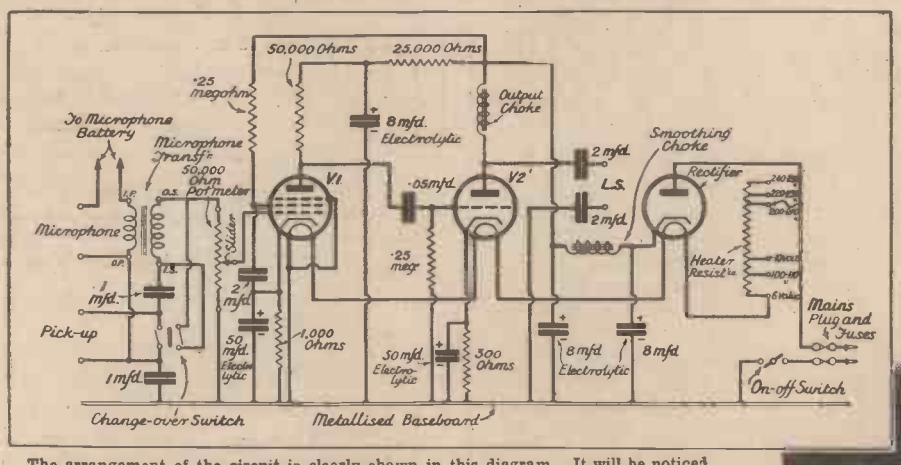
It has Innumerable Uses.

As for the uses to which an amplifier such as this can be put, these are innumerable. For example, the addition of a microphone to the appropriate terminals opens up many possibilities. For instance, the amplifier can be coupled up to an extension speaker and employed as a means of warning mother that baby is crying, as described in the article on the battery version. Other uses suggest themselves according to circumstances.

For gramophone pick-up work the

(*Continued on next page.*)

IT WILL PROVIDE 2 WATTS UNDISTORTED OUTPUT



The arrangement of the circuit is clearly shown in this diagram. It will be noticed that the microphone, pick-up and loudspeaker are completely isolated from the wiring of the amplifier itself, as far as D.C. is concerned. The amplifier is capable of giving an undistorted output of 2 watts.

VALVES AND ACCESSORIES

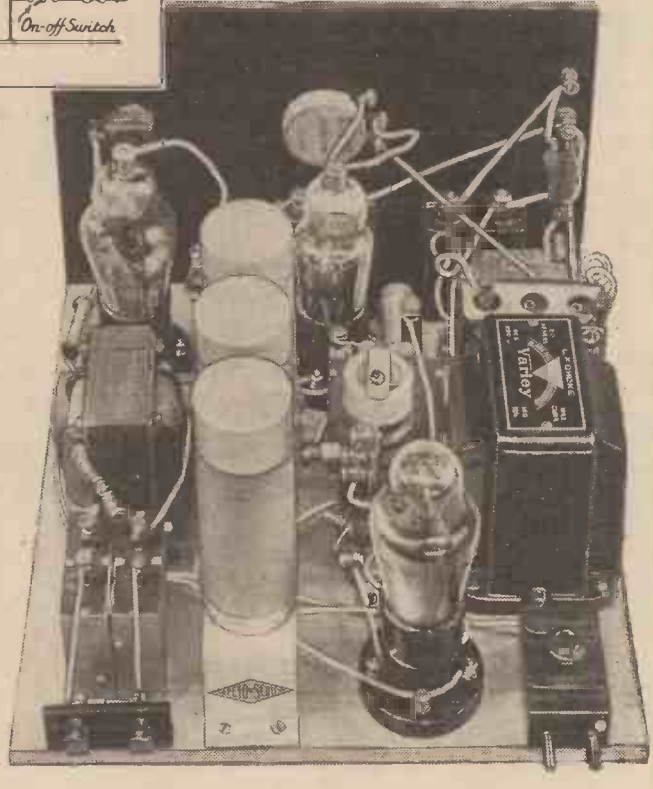
1st L.F.	Output	Rectifier
Cossor	Cossor	Cossor
13 S.P.A.	402 P.	40 S.U.A.

1 4½-volt microphone battery.

Loudspeaker: W.B. "Stentorian."

The three 8-mfd. electrolytic condensers are mounted on a special bracket which is screwed down to the metallised baseboard. The condenser cases are negative, and therefore should make good connection with the bracket and the metal baseboard.

A QUALITY DESIGN



A UNIVERSAL MAINS AMPLIFIER

(Continued from previous page.)

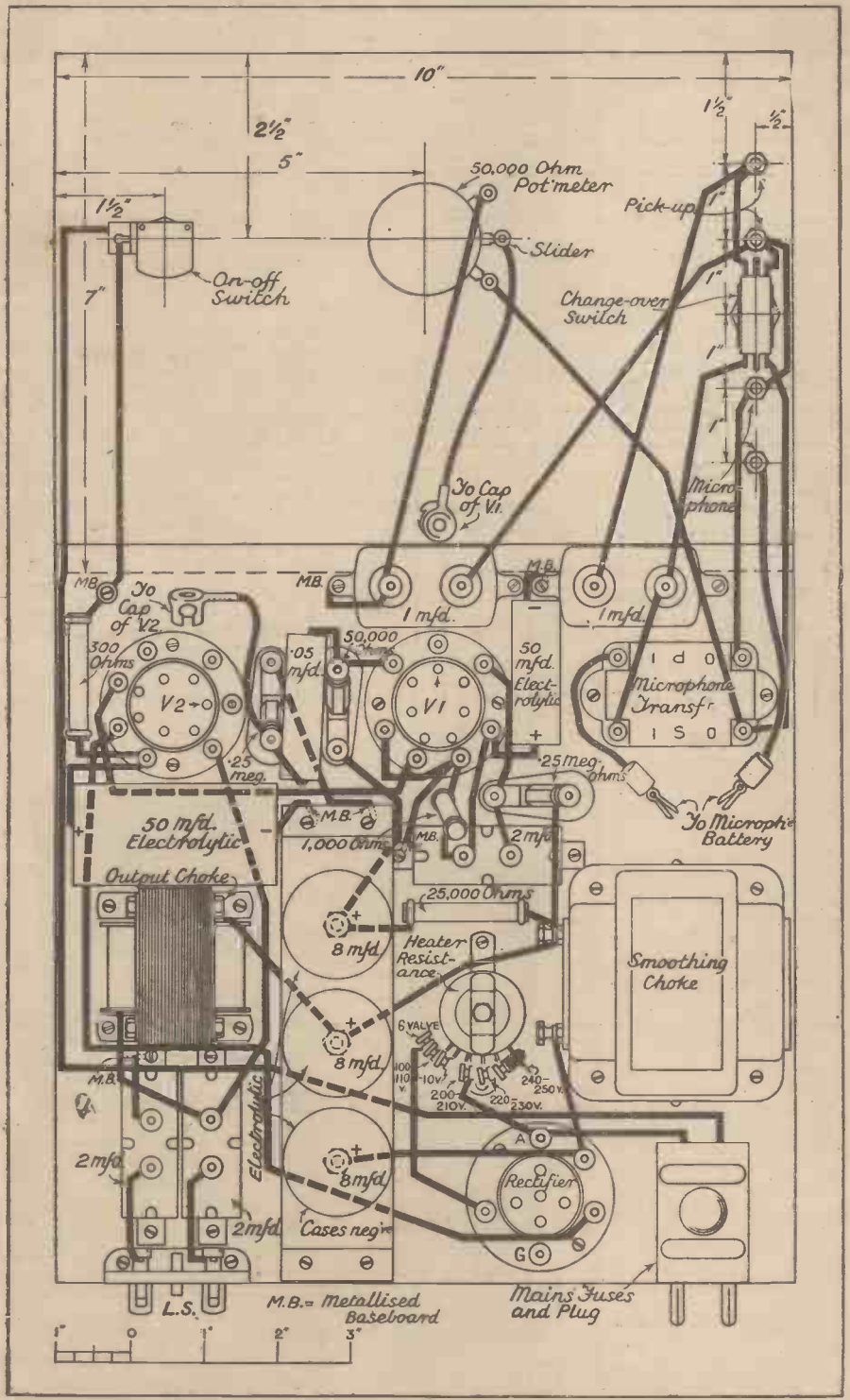
addition of a pick-up is all that is required to convert an existing acoustic instrument into an efficient electrical reproducer, with the big improvement in quality that such a change brings about.

Then there is the question of using the unit purely as an L.F. amplifier in conjunction with experimental "hook-ups." Many constructors like to try out different arrangements of H.F. coupling, and it is a sheer waste of time to build a new L.F. side every time an experiment of this nature is carried out. One good amplifier will suffice, in which case the experimental arrangement need not be taken any further than the detector stage.

The output from the detector has merely to be joined to the pick-up terminals of the amplifier, and the job is done.

Short-wave enthusiasts especially will find many uses for a good amplifier.

PERFECTLY STRAIGHTFORWARD IN CONSTRUCTION



The connections to the heater resistance are quite straightforward. The wire from the left-hand heater-terminal of the rectifier valve holder is joined to the terminal marked "6 valve" on the heater resistance. The connection from "A" on the rectifier valve holder goes to the terminal on the heater resistance corresponding to the voltage of the supply mains. Incidentally, the + end of the 50-mfd. electrolytic condenser between the V1 valve holder and the microphone transformer is marked with a red circle on the component itself.

Little External Apparatus.

And now for a few brief details of the circuit. The first thing you will notice is that the amplifier needs no external apparatus apart from the microphone, pick-up and loudspeaker. It goes without saying that for obvious reasons these could not be included in the unit itself.

The pick-up terminals are isolated, as far as D.C. is concerned, from the unit by the insertion of two 1-mfd. condensers. This also applies to the two loudspeaker terminals, and there is no possibility of direct-current shocks from any external terminals of the amplifier.

THE COMPONENTS REQUIRED

1 Varley L.F. choke, type D.P.10.
1 Bulgin L.F. choke, type L.F.14S.
2 T.C.C. 8-mfd. dry electrolytic condensers, type 902.
1 Dubilier 8-mfd. dry electrolytic condenser, 500-v. working.
1 Dubilier 50-mfd. dry electrolytic condenser, type 3003.
1 T.C.C. 50-mfd. dry electrolytic condenser, type A.W.
3 T.M.C.-Hydra 2-mfd. fixed condensers, type 30.
2 Dubilier 1-mfd. fixed condensers, type B.B.
1 T.M.C.-Hydra ·05-mfd. tubular fixed condenser.
1 Erie 50,000-ohm volume control, graded type.
1 Electradix microphone transformer 100/1 ratio, shronded.
2 W.B. 7-pin baseboard-mounting valve holders.
1 W.B. 5-pin baseboard-mounting valve holder.
1 Bulgin mains resistance, type M.R.36.
1 Bulgin rotary on/off switch, type S.91.
1 Bulgin toggle C/O. switch, type S.81.
2 Graham Farish ·25-meg. 1½-watt "Ohmite" resistances in vertical holders.
1 Graham Farish 50,000-ohm 1½-watt "Ohmite" resistance in vertical holder.
1 Erie 25,000-ohm 1-watt resistance.
1 Erie 1,000-ohm 1-watt resistance.
1 Erie 300-ohm 1-watt resistance.
1 Bulgin fuse holder and mains connector, type F.18.
1 Bulgin 2-pin socket, type P.29.
1 pair Graham Farish "Pop" terminals on bracket.
4 Clix terminals, type A.
1 Peto-Scott triple-electrolytic condenser bracket.
2 Belling and Lee wander-plugs.
1 Peto-Scott ebonite panel, 10 × 7 ins.
1 Peto-Scott "Metaplex" baseboard, 10 × 10 ins.
1 coil B.R.G. "Quikon" connecting wire. Screws, flex, etc.

A change-over switch is provided so that one can switch instantaneously from microphone to pick-up and vice versa, a valuable feature should the host at a party decide to announce the names of records or to say a few words to his guests.

Volume control is carried out by a 50,000-ohm potentiometer joined between the control grid of the V1 valve and the "earth" line (in this case the metallised baseboard). This method, incidentally, does not introduce any distortion—it gives a perfectly uniform variation of volume from maximum to minimum, and, moreover, does not prohibit the use of an additional volume control on the pick-up itself. (We

(*Continued on page* 310.)

More about the Cathode-Ray Tube

by J. C. JEVONS

Here are some further details about modern cathode-ray tube developments by the author of "How the Cathode-Ray Works," which appeared in our issue of March 2nd.

By J. C. JEVONS.

YEARS of patient research separate the cathode-ray as we know it to-day from the tube first used by Crookes in 1878 to study the effect of passing electric discharges through low-pressure gases. Part of the story covers the discovery in 1895 of X-rays by Röntgen and the even more amazing discovery by Sir J. J. Thomson in 1897 of the electron or modern "atom" of electricity.

However, the first to use the cathode-ray tube as an oscillograph or indicator was a German physicist named Braun, who in 1898 applied the magnetic field from a pair of coils to deflect the electron stream as it passed through the tube. By painting the end of the glass tube with fluorescent material he was able to follow the track of the ray across the screen in visible form.

The "Cold" Electrode.

Originally the ray tube was a "cold" tube, the electrons being dragged out of an unheated cathode by the brute force of high voltages. The introduction of a heated cathode increased the volume of the stream and made it necessary to find ways of concentrating the discharge into a narrow beam capable of producing a clear-cut image or "spot" on the fluorescent screen.

CONTROLLING THE ELECTRON STREAM

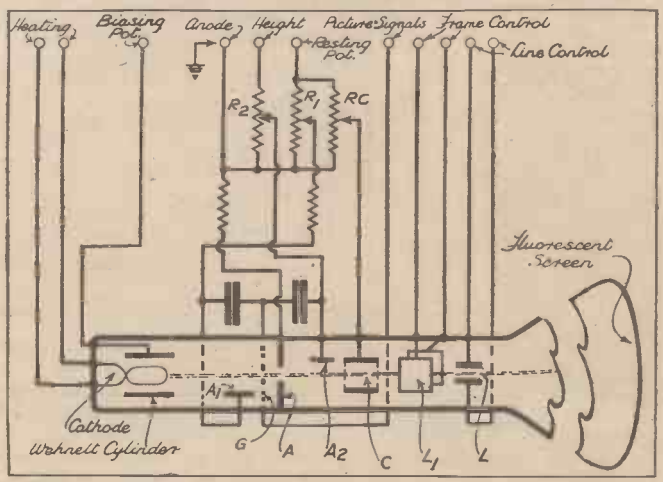


Fig. 2: A skeleton diagram of a modern "hard" tube with its various control circuits.

Until quite recently the tube was also of the "soft" variety. That is to say, it contained a certain amount of free gas—just as the original Crookes tube did. Curiously enough, this serves to focus the rays automatically—up to a certain point.

As it travels through the tube the stream ionises the gas, and in doing so creates a chain of free ions, which holds the electrons together in a straight path instead of allowing them to spread out. Normally they would tend to "spread" because they are all negative charges, and so mutually repel each other.

But this so-called "gas focusing" ceases to be effective when the stream is deflected at high frequencies. Another difficulty is that it is usual in gas-filled tubes to apply the picture signals to the Wehnelt cylinder W, shown in Fig. 1, and it is found that the resulting fluctuations in voltage affect not only the "intensity" of the spot produced in the fluorescent screen (which is what is intended), but also the focusing of the spot (which is very undesirable).

"Hard" Type Much Better.

Accordingly, the present tendency is to abandon the gas-filled tube in favour of the "hard" or highly exhausted tube—just as was done, in fact, with the thermionic valve—and to depend upon the use of higher voltages and auxiliary electrodes to focus the stream by a kind of optical effect. The focusing electrodes carry different biasing voltages, and the electrostatic lines of force set up between them serve to "bend" the electron stream and prevent it from spreading—in much the same way as a curved glass lens will bend or focus a ray of light.

In Practice.

Fig. 2 shows one arrangement used by von Ardenne in a modern "hard" tube using optical focusing. The electrode marked A1 serves to centre the ray in line with the aperture in the anode A. It is also used in conjunction with the electrode marked A2 to adjust the "resting" position of the spot of light relatively to the fluorescent screen.

The incoming picture signals are applied to the control grid or electrode marked G, whilst the line and frame (or picture) synchronising frequencies are led to the two pairs of plates marked L and L1 respectively.

Between the plate A2 and the first pair of scanning electrodes L1, is a second anode or cylinder C, which carries a slightly higher voltage than the first anode A and gives a final focus to the stream.

In practice it is found that any insulated electrode in the vicinity of the stream acquires a potential which depends upon the speed at which the stream passes it. At the same time the space separating it from the nearest electrode has a certain conductivity owing to the presence of free electrons.

INSIDE THE TUBE

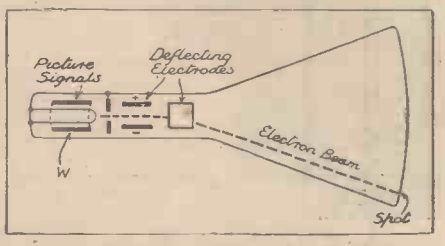


Fig. 1: The main scheme of electrodes in the cathode-ray tube, showing how the beam is deflected.

If the resistance of this "space" path falls below a certain value, compared with the insulation resistance of the electrode, then the original applied voltage will fluctuate and so tend to deflect the ray from its proper path. Accordingly, each of the electrodes A1, A2, and C in Fig. 2 are tapped to a regulating resistance marked R1, R2 and R C respectively, in order to offset this tendency.

Adopted as Standard.

A similar source of trouble has been found to occur between the electrodes, such as those marked L and L1 in Fig. 2, used for applying the line and picture synchronising frequencies, particularly in cathode-ray tubes of the soft type. Owing to the presence of ionised gas molecules the space between the plates acquires a conductivity which varies with the applied voltage and the speed of the stream. This, in turn, causes a voltage-drop across the space between the electrodes, so that some of the full effect of the control voltage is lost.

One scanning line comes out slightly longer or shorter than its neighbour, and the vertical edge of the frame consequently appears to be "ragged" instead of clear-cut. There is also a certain amount of de-focusing due to the deflectors, but this can be overcome by circuital changes.

For these reasons the "hard" ray tube, with electron focusing, is replacing the older gas-filled variety, and is likely to be adopted as standard practice in high-definition receivers for home use.

LOCATING OUTSIDE INTERFERENCE

Details of a new portable outfit that locates the source of interference, even in densely populated districts, in 15 to 20 minutes.

IS IT THE SWITCH ?

The frame aerial can be replaced by a special small search aerial which can be moved about quite close to any suspected item of electrical equipment.

IN much of the existing apparatus for locating sources of "man-made static" certain fundamental disadvantages are inherent, chiefly on account of low sensitivity and of the fact that a frame aerial built into the carrying case is used as a pick-up for the interference waves.

While it is true that, in principle, the direction of the incoming interference waves can be determined simply by rotating the frame, nevertheless only in very few cases will it be found that this direction really agrees with the true direction of the source of interference, this being due to distortion of the electro-magnetic field by such obstructions as iron masses, lighting circuits, etc.

Widely Distributed.

In addition, the interference waves caused by electrical machinery are widely distributed by the electric circuits themselves, and can therefore be detected in the vicinity of practically every lighting circuit closely associated with that of the interfering machinery. In practice, therefore, it has not been usual to rely upon the directional property of the frame, but rather to use the frame simply for conducting preliminary tests on the interference.

Furthermore, many interference locators previously used have been designed so that all means of adjustment were enclosed inside the carrying case. One previous drawback has been the need for opening the case in order to switch off the supply voltages, a feature tending to cause waste of battery current. There is also the effect of the continual interfering noise on the ears of the operator to be considered. Preferably an interference locator should be switched on for short periods only, because in such a case different degrees of loudness are better observed, keeping in mind that locating the interference is best accomplished by searching for such points at which the interference is heard loudest.

These disadvantages have been avoided in a new type of interference locator, and by its aid interference sources can be found within 15 to 20 minutes even in densely populated residential districts.

Very Sensitive Apparatus.

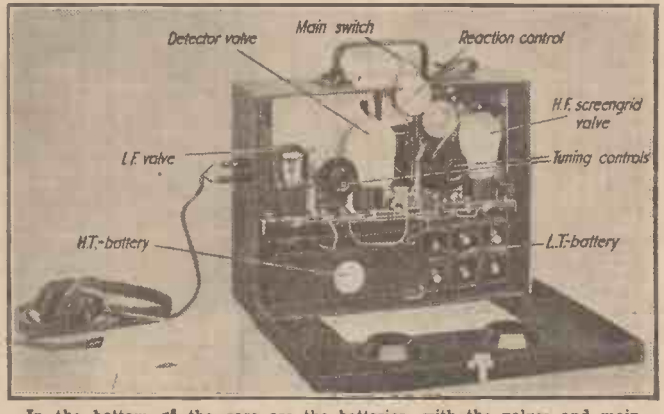
This new apparatus differs from former models mainly in that an H.F. screened-grid valve is used, thus ensuring great sensitivity, and further in that all adjustments can be made with the carrying case closed. The reaction control, as well as the main switch, can be operated by the same hand that carries the case. But what is of greater importance still is that the built-in frame aerial, used for preliminary adjustment, can be replaced by a so-called search aerial, i.e. a lead with a coil at its end.

The process of locating interferences is carried out by holding the search aerial in close proximity to electric door-bell push buttons, electric staircase-lighting switches, etc., and observing the variation of volume, the interference waves being distributed along the electric-light circuits and heard loudest in the house in which the source of interference is located.

Incidentally, the search aerial provides an adequate means for determining the volume. The house wherein lies the source of interference having been found, the search aerial is next held close to the electric-bell push buttons of the individual rooms and so forth. These then act as aperiodic aerials as they pick up the interference waves according to the distance squared, and also pass them on correspondingly.

This new apparatus has been designed by Messrs. Siemens & Halske, of Berlin, and has given excellent results in the tests to which it has been subjected. It is not heavy to carry, and the outfit has already created an enormous amount of interest among radio engineers.

THE INTERNAL ARRANGEMENTS



In the bottom of the case are the batteries, with the valves and main apparatus above them. Note the two recessed holes in the lid to enable the tuning controls to be operated when the case is closed, and the main switch and reaction controls near the carrying handle.

CANADA'S RADIO BROADCASTING

A CONSTRUCTION programme designed to give their broadcasting system complete coverage from coast to coast is being arranged by the Canadian Radio Commission. The programme will entail the erection of new stations, or increasing the power of existing stations, in Nova Scotia, Montreal district, Toronto district to cover Northern Ontario, Saskatchewan and British Columbia.

Action on the plans has been delayed owing to lack of funds. The programme can be carried out for something under £200,000, provision for which will shortly be made. With it will be associated a plan to extend hours of national broadcasting. Execution of the Commission's plans will overcome practically all difficulties and complaints now encountered in carrying on national radio in Canada.

Modern stations of reasonable power will be erected in various sections where coverage has been inadequate and from which complaints about radio conditions have come.

Surveys show such areas exist particularly in the Maritime Provinces (Nova Scotia, New Brunswick and Prince Edward Island), a section of Quebec, a large part of Ontario, Saskatchewan, part of Alberta and practically all the populated part of British Columbia.

Increasing Satisfaction.

With the construction of new stations and the extension of hours of national broadcasting new and modern studios will be provided at points where most of the principal programmes of the Commission are produced. While reports from listeners indicate increasing satisfaction with the national radio, the service is injured by complaints arising out of poor reception conditions and inadequate coverage.

The Commission's plans regarding special reception and the re-broadcasting of British programmes were announced some time ago. The special short-wave reception station at Ottawa on which these programmes are to be received will be a very great boon.

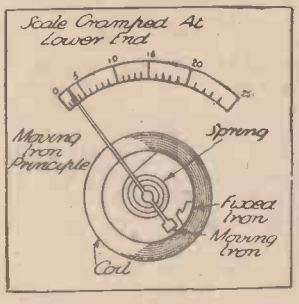
Your RADIO METER

Some Useful Information about Moving-coil and Moving-iron Measuring Instruments

By L. A. HODGES, Grad.I.E.E.

USUALLY, to the intending purchaser of a meter, the only external difference between the moving-iron meter and the moving-coil meter of the same range is the scale and the price tickets underneath them.

The moving-iron type may be 4s. 6d., with its lower-end readings cramped, and the moving coil perhaps might be 25s., with its perfectly uniform scale readings,



WORKS BY REPULSION.

Fig. 1. This diagram shows the repulsion type of moving-iron instrument. The meter operates on the principle that two pieces of soft iron, when similarly magnetised, repel each other.

The simplest of wireless experimenters will know that this difference in price does not represent the difference in price of the two scales.

If both meters were the same price he would unhesitatingly buy the one with the uniform scale for the sake of more accurate and easier reading throughout the length of the scale.

Although the price may tell him that the one instrument is a better one than the other, he may ask himself the question: Why cannot the moving-iron type have a uniform scale? The answer to this question can be explained by referring briefly to the construction and electrical theory of these two types of meters.

Both these types of meters depend for their working on the magnetic effect of an electric current, the simplest application of this being in the moving-iron type.

How It Works.

A general form of this is what is known as the repulsion moving-iron meter. Fig. 1 shows the coil which carries the current, or a certain proportion of it, to be measured. Two pieces of soft iron, with no initial magnetism of their own, are shown inside the coil.

One of these pieces of soft iron is fixed rigidly to the coil frame, which, of course, does not move; and the other iron is mounted on the pointer, the latter turning on a central point against the controlling force of the spring.

When current flows in the coil a magnetic field is set up, the effect of which is to magnetise both pieces of soft iron similarly; hence the moving iron is repelled.

Now, when only a small current flows in the coil in proportion to the current required to give a full-scale deflection the induced magnetism in each piece of iron is proportional to this small current; the distance of repulsion and pointer movement is therefore proportional to the product of the two magnetisms: that is to say, it is proportional to the square of the current.

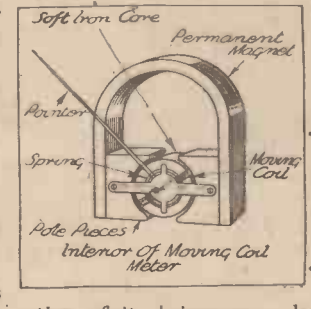
Now, when more current flows in the coil, increasing the strength of the field, the pieces of iron become magnetically influenced to such an extent that this square law no longer holds good, an increase of current in the coil now giving a repulsion distance proportional to the strength of the current only, with the consequent result that the scale readings now become more evenly divided than at the beginning.

A More Delicate Instrument.

This, then, explains the cramped readings at the lower end of the scale in moving-iron meters. This disadvantage, along with the fact that it has a rather high current consumption in itself, making it inaccurate on many measurements, is due to its simple design and construction, the latter points, of course, accounting for its comparative cheapness.

Now, in the case of the moving-coil meter, the movement of the pointer is proportional to the strength of the current in the coil throughout its whole scale range, the scale, of course, being evenly divided. Here, however, a similar principle exists, but permanent magnets are employed along with a more delicate and expensive mechanism.

Briefly, the meter (Fig. 2) consists of a permanent magnet with pole pieces and an iron core clamped so as to leave a small uniform air gap. Encircling the iron core and travelling in the gap is a light framework of aluminium or copper, carrying a coil of fine silk-covered wire, and pivoted so that it can rotate over the whole of the arc covered by the pole pieces, the movement being controlled by a spring.



MOVING COIL METHOD.

Fig. 2. In a moving-coil meter the framework carrying the coil also damps the movement of the needle, and so gives a dead-beat effect.

The coil frame not only acts as a support for the wire which carries the current to be measured, but also damps the motion owing to the eddy currents induced in it by the permanent magnet.

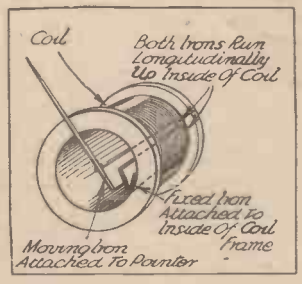
From this description it will be seen that the coil, over the whole of its arc of movement, will be travelling across a field of constant and uniform flux density produced by the permanent magnet, and the torque the coil experiences, together with its pointer, will be exactly proportional to the current in the coil.

Comparing the Two Types.

This is in contrast to the moving-iron meter, where the soft iron pieces have first to become magnetically "soaked" before the movement is just proportional to the current. Having seen that the movement is proportional to the strength of the current, the spring gives a restoring force proportional to the deflection: the scale is therefore evenly divided throughout.

It will be seen, in comparing the construction of the two types of meters (see Figs. 2 and 3), that the moving coil, with its additional components and delicacy, calls for a higher grade of workmanship.

In performance, however, the moving coil is easily the better instrument.



A "CLOSE-UP"

Fig. 3. Here is a view of the coil portion of the moving-iron type of meter, indicating how the iron pole pieces run the full length of the coil.

INCREASING SENSITIVITY WITH AN S.G. DETECTOR

HAVE you ever tried substituting a screen-grid or high-frequency pentode valve, instead of the ordinary triode, as detector? In a set of the "straight" type this can often be done, and sometimes has the effect of making the set much more sensitive.

If you try this out with a set in which the detector stage is followed by a straight transformer coupling, you will probably find that the S.G. or high-frequency pentode valve does not work so well, and it will be better to use the parallel-feed arrangement. For this you can use an anode resistance of, say, 75,000 ohms and a coupling condenser of half a microfarad.

Slight Adjustments Necessary.

It will be necessary to remove the connection which previously went to the anode terminal of the valve-holder and connect it instead to the cap of the screen-grid valve, the anode terminal being supplied with about 30 to 36 volts from the H.T. battery. This latter can be done by means of a separate lead.

It may be found that in order to get the extra sensitivity with this arrangement some voltage and reaction adjustments will have to be made.

RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped, addressed envelope must be sent with every article.

All Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

All inquiries concerning advertising rates, etc., to be addressed to the Advertisement Offices, John Carpenter House, John Carpenter Street, London, E.C.4.

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialties described may be the subjects of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS

VALUE OF THE FUSE IN A CLASS B SET.

S. F. H. (Workington).—"For safety's sake I want to fuse the set thoroughly, but there is one point I do not remember seeing mentioned in 'P.W.,' though it must be one which has puzzled a good many who have had to work out fuse values for a Class B valve.

"The point is—should the 'current to be passed' be taken as the normal (quiescent) current of the valve, or should it be much larger than this, to allow for the surges when big volume is being received on the set?"

You must allow for the big volume, or otherwise you will have to keep on providing new fuses.

Unlike their predecessors, the modern well-made fuses blow with great readiness when their maximum current-carrying rate has been exceeded, so it would be quite useless to insert such a fuse rated at, or a little above, the quiescent current.

USING THE OLD H.T. BATTERY AS WELL AS THE NEW.

P. M. J. (Cardiff).—"My Scottish ancestors must turn in their graves when I throw away so many batteries, but I have proved that it is impossible to get good quality on a Class B set if the battery is allowed to run down too far. But could not the old battery be used for the H.T. + 1 and 2 tappings?

"I believe you gave a method for this in 'P.W.' some time back, but I cannot find it in the back numbers I have kept."

If you connect the new battery up to supply the Class B stage, it will often be found possible to use the old one to supply one or more of the set's other H.T. leads.

For this purpose, all that you have to do in the way of altering connections is to provide a new H.T. — lead from the new H.T. battery's — socket to the — socket on the old battery.

Stand the two batteries side by side, and then transfer one or more of the + tappings from the new battery to the old one.

If it is in moderately good condition when discarded it will be found quite capable of supplying the detector and, possibly, the S.G. stages as well with H.T. without giving rise to distortion; and, of course, any current which it provides in this way will be so much to the good as far as the demand on the new battery is concerned.

In this way the new battery's life is likely to be prolonged to some extent without detriment to quality.

KEEPING OUT THE UNWANTED H.F.

W. W. K. (Leamington).—"Now that the magnification of valves is so high that stray H.F. is always lying in wait to spill into the L.F. circuits and impair the reproduction, we seem to need a simple detector of H.F. currents. And it has occurred to me, why not use a crystal detector and pair of phones for the purpose?

"Many of your readers will, like myself, have the necessary old pair of phones and detector left over from crystal-set days, so if the idea is sound will you say how it could be carried out to ascertain whether H.F. was present in circuits where it ought not to be?

"Recalling how very sensitive to weak currents the crystal and phones have proved to be, I feel sure that such a method of testing would be very useful unless there is some snag which I have overlooked."

We are afraid there *is* a snag which you have overlooked, and that is that the time-honoured use of phones and crystal was not for detecting H.F., but for detecting the L.F. component in an H.F. current. In other words, the combination serves as a detector of modulated H.F.

Since the H.F. of which you were thinking is not necessarily modulated, the phones and crystal would not serve unless the unmodulated H.F. were continually stopping and restarting—a condition not likely to be met with nor easily recognised.

Moreover, the phones and crystal would serve to rectify and reproduce ordinary L.F. currents, so they would be useless in an L.F. amplifier, which is precisely where the trouble referred to is commonest.

VOLUME CONTROL OF EXTRA LOUDSPEAKER.

V. S. (Rochester, Kent).—"It is a mains set, pentode output, and I use the extra loudspeaker terminals to run a lead to the kitchen, where I have installed a small moving-coil loudspeaker.

"Being a small room and a sensitive loudspeaker, it is much too loud, so I want to fit a potentiometer across the leads there, with one speaker connection coming from the slider. The idea is that it can then be adjusted at the required strength without affecting the volume in the other room.

"I suppose there is sure to be some interdependence, but with this potentiometer type of loudspeaker connection it should not be too troublesome, I imagine, if I can get the right value for the potentiometer.

"About what resistance value would you suggest for this?"

A potentiometer with a maximum of about 50,000 or 60,000 ohms should be quite satisfactory. Don't switch on till it is connected up; and don't undo or vary it unnecessarily, as a pentode may suffer from such treatment unless the set is switched off when the alterations are made.

SWITCHING THE S.T.600's PICK-UP.

W. H. (Frinton-on-Sea).—"In the published diagram there does not seem to be a switch for the pick-up, but I do not want to have to connect and disconnect every time, as I shall use the gramophone a lot.

"Can a switch be fitted so that I can leave the pick-up connected up permanently?"

Yes, that is easily managed, as there is room for an ordinary on-off switch to be mounted near the pick-up terminal on the terminal strip. When this has been done join the pick-up lead to the switch instead of to the terminal, and join the other side of the switch to the pick-up terminal instead.

The pick-up can then be left permanently attached, and the switch will make or break the circuit, as desired.

ALTERING THE AUTOMATIC BIAS CONNECTIONS.

F. C. (Shadwell, London, E).—"As an experiment I doubled the capacity across the automatic bias resistance, and this made the set seem quieter at once. But I was afraid to leave the condenser in position, because I thought it might be affecting the number of volts bias applied.

"Is there any objection to altering the grid-bias capacity like this?"

None at all. The bias obtained is the direct result of current flowing through the bias resistance, and the value of bias achieved depends only upon the values of the current and the resistance.

The condenser affects neither of these, so you can safely alter its capacity without fear of altering the bias applied.

FITTING PICK-UP TO A DIODE DETECTOR.

D. E. F. (Gateshead).—"You have given the methods of switching in a pick-up to a valve acting as detector (grid leak), but I have not seen the similar circuit for preceding a diode detector with a gramophone attachment.

"Please say how this can be done."

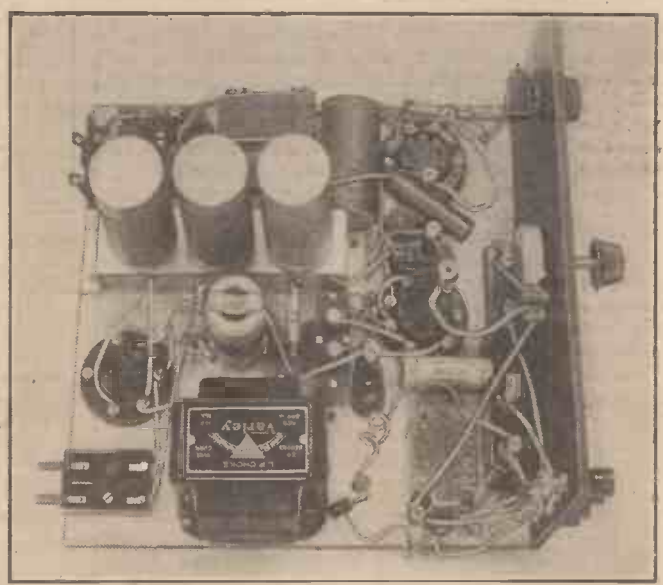
It cannot—at least, not usefully, in the ordinary way. And if you think it over you will see the reason why.

A gramophone pick-up provides a low-frequency input, which is similar to the output from a detector valve or to that from a diode arrangement. Since it generally needs further amplification it is fed into an L.F. amplifying stage, in the same way that the radio set's detected or rectified impulses are followed by L.F. amplification.

But in one respect the diode differs greatly from the ordinary detector valve; for whereas the diode

(*Continued on page* 308.)

THE UNIVERSAL MAINS AMPLIFIER



This photograph of the Universal Mains Amplifier should be used in conjunction with the photograph and wiring diagram elsewhere in this issue. A practical point to note in connection with the unit is that the microphone should be disconnected when not in use, otherwise the microphone battery will run down fairly rapidly.

For a cool, rich smoke...

10D PER OZ.

ALSO AIRMAN MIXTURE and AIRMAN FLAKE 10D oz
AIRMAN NAVY CUT DE-LUXE 11D oz.

L.F. CHOKE (D.P.10) 15/- SPECIFIED FOR THE MAINS AMPLIFIER

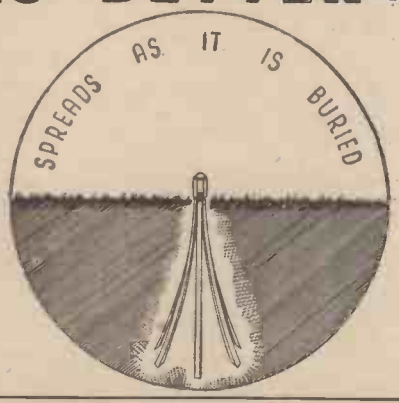
Described in this issue of "Popular Wireless" is a most useful Mains Amplifier. Ideal for use with a pick-up or microphone on either A.C. or D.C. Mains. The Varley L.F. Choke shown here gives the circuit the final touch of excellence. It is unnecessary to enlarge upon the sound construction of the D.P.10, it suffices to say that all the experience gained from 36 years' research goes into every Varley product. Write now for free illustrated catalogue describing this and other Varley products.

Varley

Oliver Pell Control, Ltd, Bloomfield Road, Woolwich, S.E.18. Telephone: Woolwich 2354.

AN EARTH-ROD 6 TIMES BETTER!

Fix a Spread-Bury and forget your earth. Why put up with blurred reproduction and unaccountable noises from your radio when, by so simple a method, you can say good-bye to those things for ever? Six spreading contacts of live copper in one unit, supersedes solid earth rods. Stocked by all radio dealers.



3/- SPREAD-BURY
200% GREATER EARTH CONTACT

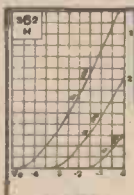
WRITE FOR FULL DETAILS TO DEPT. S.B.2.
Z. ELECTRIC LAMP & SUPPLIES CO., LTD., 21, NEWMAN STREET, LONDON, W.1.

The Paper for the Boy of To-Day!

Such is MODERN BOY. Its every issue is brimful with thrilling stories and articles on the very latest Invention, Adventure, Hobbies, etc. It is the paper for the youth of to-day. Buy it regularly.

MODERN BOY

At all Newsagents and Bookstalls. *Every Saturday* **2d.**



HL2, 3/6

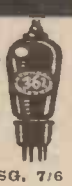
QUALITY above ALL ELSE

Instal 362 and obtain the best possible results from your set (BATTERY OR MAINS). 362 will give you the best of which your set is capable and at far less cost than the next best. Entirely British, Non-Microphonic and No Mains Hum!

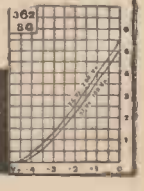
Battery Prices.	Mains Prices.
H, HL and L, 3/6; Power, 4/-; Super Power, 4/6; SG and VS, 7/6; VP2, 9/-; Pentode Type, 10/-; BA and BX, 9/-.	ACHL4, 7/6; P625, 8/-; ACPX4, 9/-; AC8G4 and ACVS4, 12/6; ACME and ACHM, 13/-; RB41, 7/6; RB42, 10/-.

If your dealer is not an appointed 362 Agent, do not be persuaded to buy the next best. Post free direct from makers. Cash with order.

THE 362 RADIO VALVE CO., LTD. (Dept. X), Stoneham Road, London, E.5
'Phone: Clissold 1234



SG, 7/6



THE ONLY VALVE WITH A 6 MONTHS' GUARANTEE

RADIOTORIAL QUESTIONS & ANSWERS

(*Continued from page 306.*)

is a detector, pure and simple, the detector valve is *an L.F. amplifier* as well.

It is, therefore, often advisable to connect the pick-up in front of a valve "detector" to get the benefit of that stage's L.F. amplification. But there is no comparable gain with a diode as detector, so there is no point in connecting the pick-up in front of it.

INCURABLE INTERFERENCE FROM A NEIGHBOURING SET

E. A. (Gorton, Manchester).—"Can you please tell me how to cut out interferences on a short-wave set of a 0–v.–1 type?

"The conditions are thus: next door they have a 0–v.–2 broadcast set, just a simple three-valver. Everything that they receive on their set is also received on my short-waver.

"This is not just the locals, but all the stations they receive. It comes in on my set just at the start of oscillation, and when on reaction; thus it drowns all the signals just when the set is most sensitive.

"This is something that I have never seen in any of your articles, which I have been reading for years. I have tried all sorts of 'cures,' but none has succeeded. The interference can still be heard without aerial or earth and in every part of the house.

"A screened-grid stage makes it louder. I have also tried this on their set with the same result. I have even had *their* set to pieces and rewired it with a slightly different circuit, but it was of no avail.

"Both sets are worked from H.T. accumulators, so that all mains coupling is ruled out. A peculiarity is that our own broadcast set, working about a foot away and completely unscreened from it, has no effect at all. The strength of the breakthrough is simply terrific, overloading the phones easily.

"If you can give me any advice about this I shall be very grateful, as I have been a constant listener for about five to six years now, and it is something short to be without it, but it is a waste of time listening now.

"P.S.—Their set is not oscillating audibly."

You appear to be up against one of those very difficult instances of interaction that occasionally occur, and we are afraid that patience, perseverance, and even, perhaps, good luck will be necessary to cure the trouble.

If we can rule out mains interaction and ordinary radiation due to oscillation of the neighbouring set we must conclude that there is some other cause of feed-back existing. And this is how we should try to find it:

With the kindly co-operation of the owner of the other set we should try the effect of screening it as completely as possible. One good way would be to place it on a large metal tray, and then cover the whole outfit with a large tin bath, thus interposing a screen right round the interfering set.

If this stops the trouble you can experiment with the removal of part of the screening—you may, for example, find that either the tray or the bath is unnecessary—and thus you may eventually find that a reasonable small screen, carefully placed, is sufficient to stop the feed-back.

If, however, the screening does not stop the interference we should turn our attention to the leads connected to the interfering set. Aerial, earth and loudspeaker leads should each be dealt with in turn.

Try the effect of removing them one at a time, and if necessary substituting others.

Try a Different Aerial.

We should rig up an indoor aerial, for instance; or if that set already uses an indoor aerial try a different one. If possible put this in the hall or in the loft instead of where it is at present—it is easy to try several different arrangements of indoor aerial if you have a ¼-lb. reel of, say, 24 D.C.C. wire or a good length of flex to experiment with.

If the aerial is "no go" try a different earth—a counterpoise, for example, or a false earth consisting of flex laid under the carpet or round the skirting board.

It seems a bit complicated, we know, but should not take too long, especially if the owner of the other set is a sport and enters into the spirit of the chase. Two heads are better than one, and between you the chances are that you will soon find that some hitherto untried alteration of the external connections will cure the trouble.

And, above all, be suspicious of concealed conductors that may help to connect the two sets without your knowledge. We have known one case like yours to be due to bell wiring passing close to both sets—one set was radiating into this in one room and the other set was picking up the effect in another part of the house altogether, the hidden wiring conducting the interference just as strongly as though it had been arranged for the purpose!

In other instances gas pipes, electric-light conduits, gutter pipes, lightning conductors and similar harmless-looking fittings were responsible, so you will have to be suspicious of any metal which might lead from the neighbourhood of one set to that of the other.

H.T. + ON THE FILAMENT.

D. M. (Tenby, S. Wales).—"The diagram is perfectly clear, but is there a mistake in the marking of the H.T. + and H.T. — terminals?

"Perhaps I am wrong in asking, but not having used a valve rectifier I am naturally interested in the circuit, and I find, to my surprise, that the lead from the *filament* transformer's centre tapping is marked 'H.T. +' after it has passed through the smoothing choke.

"And the other lead, which comes from the centre of the *high-voltage* winding on the input transformer, is connected straight to the output terminal marked 'H.T. —.' Is this right?"

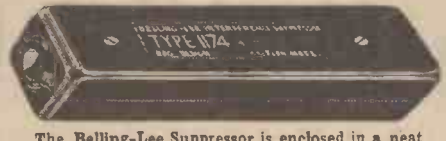
Yes, the marking is correct as shown on your diagram. Although it looks topsy-turvy to an unaccustomed eye the output from a rectifier valve is always such that the "anode" end of the valve's circuit is the H.T. — and the "cathode" side of the valve is the H.T. + end of the output.

A USEFUL SUPPRESSOR

MESSRS. BELLING & LEE, LTD., have introduced a very useful new type of interference suppressor. It is for connecting in the flex lead to any piece of electrical apparatus of a portable nature, such as vacuum cleaners, fans, hair-dryers, drills, and so on, which have no earth connections to their frames or cases.

It is emphasised that the suppressor has been especially designed for such purposes, and that its efficiency is not as high if an earth connection is used.

As can be seen from the accompanying photograph, the Belling-Lee Flex Lead Suppressor is a neat little article, and when it is



The Belling-Lee Suppressor is enclosed in a neat bakelite case and retails at 6s.

connected into a lead it is no more noticeable than a small junction box or switch.

It is strongly constructed and substantial bakelite mouldings are used. Properly connected up there could be no danger of shock.

There are two condensers built into it, one is of ·1 mfd. tested at 1,500 volts, and the other a ·01 mfd. tested at 2,250 volts. Thus breakdowns are virtually impossible.

The circuit is a simple if effective one. It is arranged that the ·1-mfd. condenser parallels the supply mains, while one of these is joined to the ·01-mfd. condenser, the other side of which is taken to the frame of the electric appliance.

Very full instructions for fitting the suppressor are supplied with it. The retail price is 6s., and a guarantee of one year is given.

THE LURE OF THE SHORT WAVES

WHAT is it that keeps radio men of all ages up at all hours? The short waves.

What is it that gives radio enthusiasts a feeling of contemptuous superiority over their brethren? The short waves.

What branch of radio has maintained the strongest and most lasting hold on its devotees? The short waves. . . .

* * *

Why do the short waves cast a spell on the listener, persuading him that even third-rate reception is fascinating and thrilling? Of course, the allegedly cow-faced British general public cannot be persuaded that whistles, fading, distortion and weak signals can thrill them to the marrow. Only the true initiate can tolerate what the unemotional member of the public would regard as the catsmeat of the ether.

It is, of course, distance that lends enchantment to the programme. A faint, fading, futile phonograph is an excitement and an inspiration if it is scratching a livelihood in Terra del Fuego. Nor does it matter that the garbled warble from one of the Empire stations is mistaken for Brazil. It all helps. If you think it is Brazil you find it awesome; when you find out that it is an Empire station you think it is awful.

The reason is that short-wave enthusiasts apply to short-wave reception standards entirely different from those applicable to medium and long-wave reception. In fact, the average short-wave enthusiast is in the position of the broadcast enthusiast of thirteen years ago who was so thrilled to get anything at all that he put up with the poorest results. . .

* * *

My own attitude towards the short waves has been consistently the same, and it has been reflected in my published designs. I have always maintained and still maintain that the short waves do not provide entertainment value in any way to be compared with that regularly available on the medium and long waves.

I have avoided rubbing in this viewpoint because there is no doubt that a great deal of interest exists in short-wave reception, and this is altogether to the good. If there were no interest in development until perfection had been reached, progress would be considerably slower.

It is, however, only by frankly recognising the limitations of short-wave reception that this phase of radio can be placed upon a sound basis. It is certainly high time that someone debunked the short waves, so that a genuine interest founded on reasonable expectations may be built up and kept up. . .

* * *

As I have already indicated, I myself take a much more practical view of short-wave reception, and now declare roundly that fiddling, fugitive and fading signals do not fascinate me in the slightest. I want signals to be robust, regular and reliable.

It is in this frame of mind that I designed the "Hexoverter." . . .

The "Hexoverter" is not a cheap adaptor. It is an aristocrat of adaptors, but there is not a penny needlessly spent on its components. It is ten times as efficient as any other adaptor I have ever tried.

These are excerpts from an article by John Scott-Taggart, describing his wonder short-wave adaptor in the June issue of "Wireless." Get a copy at once to read this trenchant article in full, and to obtain full details of a most remarkable short-wave unit.

WEARITE COILS

Three of the latest screened units available to home-constructors.

YOU will doubtless remember the Wearite iron-cored wavetrap coil, which we recently reviewed. It is designed to cover both medium and long wavelengths, and it retails at the attractive price of 5s.

This coil is unscreened, and, as the makers point out, screening is quite unnecessary when only one coil is used. But there is a screened model available at 7s. 6d. This has the list number of I.C.S.6.

When sending us a sample of this highly efficient screened trap coil, Messrs. Wright and

The W.L. coils shown here are available singly or as ganged assemblies. The windings are of the air-cored type, low-loss construction being employed throughout.

Weaire also submitted two gang assemblies of other types. The first is of their Air-Core W.L. Coils.

The full range of these comprises five types, and they are as follows: P, Q, R, S and T. The price is 7s. 6d. in each case. They are, of course, screened coils, and are very good ones, being well designed and neatly and efficiently constructed.

The medium wave secondaries, for example, are of stranded wire wound on special low-loss bobbins, and a special wave-form method of winding has been adopted for the long-wave windings.

Supplied for Ganging.

Coil P is an aerial coil, and can be used in conjunction with the S or T coils in sets in which there are one or more H.F. stages.

Coil Q is also an aerial coil, and with coil R constitutes a capacity-coupled band-pass tuner.

Coil S is an H.F. transformer with the standard ratio of 1 to 2.

Coil T is similar to S, but has a reaction winding and a centre-tapped medium-wave section. It is also fitted with a screened pigtail for connection to the anode of an S.G. valve or H.F. pentode.

Messrs. Wright and Weaire supply these coils in any desired ganged combination. Each of the coils has a wave-change switch mechanism

A ganged unit comprising three superhet coils for 110 kc. working. They are designed for the aerial, grid and oscillator circuits, and are used in conjunction with I.F. transformers giving an 8 kc. band width.

built into its base, and the ganging is accomplished merely by slipping a length of D-section spindle through them, this spindle being supplied in the suitable lengths.

As regular readers of P.W. will no doubt realise, these Wearite W.L. type coils have appeared in several of our set designs, and we have been glad to use them, for they are, as we have said, first-rate productions, and properly used are capable of providing excellent performances.

Special Types for Superhets.

The other coils which are illustrated are Wearite 110 kc. superhet coils. These too are retailed at 7s. 6d., and can be ganged in suitable formations. The range includes an aerial coil and a grid coil and an oscillator, which can be modified for different valve and circuit conditions. There are two I.F. transformers, one with and one without a pigtail, and these are wound to have a fixed band width of approximately 8 kc. Trimmer screws are fitted to enable exact settings to be obtained when the coils are built into a set. It should be mentioned that there is also an H.F. transformer type in the range.

As we have said, these Wearite superhet coils can be ganged into any desired formation. This is made possible by the adoption of the same switch principle as is embodied in the W.L. coils mentioned earlier in this article.

Readers will shortly obtain a practical introduction to the Wearite superhet coils, for they are to be included in a forthcoming superhet set of a special character, and that fact surely renders it quite unnecessary for us to say what we think about them on this occasion!

The screened model of the well-known Wearite iron-cored wavetrap coil. It costs 7s. 6d.

A SIMPLE PICK-UP CORRECTOR

(*Continued from page* 295.)

socket 3,500 cycles, middle 2,500 cycles, lowest 1,500 cycles.

For correct adjustment it is useful to know the approximate frequency at which your pick-up resonates, but unfortunately this can only be found by laboratory methods. Many of the better-known manufacturers, however, give a characteristic curve in the literature packed with their goods or they will supply the information on request.

The resonant point usually takes the form of a steep and narrow hump in the curve between about 2,000 to 3,500 cycles, indicating a considerable rise in the voltage output at this point.

Choosing the Right Tapping.

In order to reduce this excess voltage the corrector is adjusted to the tapping which most nearly corresponds to the frequency of the peak, and, starting with the resistance at maximum, it is gradually reduced until the most satisfactory setting is found.

If details of the resonant point of your pick-up are not obtainable the best plan is to make a quick test of all three adjustments of the corrector, starting with the top socket and turning the resistance from maximum to minimum each time. In almost every case a setting will be found which gives the best balance of tone with minimum needle scratch.

The corrector tends to reduce the output of the pick-up slightly at all frequencies, and it is usually necessary to turn up the volume control a little higher than normal. Another effect which is often noticed is an apparent increase of bass.

How the Unit is Wired.

The components are wired in series, as shown in the diagram. Connect one terminal of the variable resistance to the single socket on the panel and the second terminal of the resistance to one side of the condenser. The other side of the condenser goes to the inside winding (the beginning) of the coil.

The first tapping of the coil (2,600 turns) goes to the top socket of the three; the second tapping (3,350 turns) to the middle socket; and the finish of the coil (4,560 turns) to the lowest socket.

PETO-SCOTT'S
END OF SEASON
CLEARANCE SALE

Every item guaranteed in perfect condition and shop soiled only. Orders 20/- or over post free; under 20/-, post 6d. extra (unless otherwise stated).

PERMANENT MAGNET MOVING-COIL SPEAKER (Full-size Model—not a Midget). British Made, very sensitive and splendid frequency response. *Perfect condition.* Listed at 35/-. — OUR PRICE **12/6**

H.T. ELIMINATOR for A.C. Mains, 200/250 volts 40/100 cycles. Output 25 m.a. at 150 volts. Tapping for S.G., Det. and either Super Power, Pentode or Class B valves. Ideal for all types of 3 or 4-valve sets. *Shop soiled only.* List Price £2/19/6. — OUR PRICE **30/-**

BRITISH MADE ELECTRIC GRAMOPHONE MOTOR for A.C. Mains, 200/250 volts 50 cycles. Silent induction motor, 12" Turntable, compact and easy to install. Every motor tested before despatch. Well worth 45/-. — OUR PRICE **27/6**

All above items delivered Cash or C.O.D. Carriage Paid to your door.

	List Price	Our Price
Lissen Iron Core Coils, Type LN 5392	12/6	3/6
Telsen .0005 Air-spaced Condenser with disc drive	8/6	2/6
Do., two-gang	16/6	7/6
Slektun 3-1 L.F. Transformers	5/6	2/6
3 British Valves: S.G., Det., and Super Power	20/9	10/-
Packets of 6 Resistances or small capacity Condensers. All values	3/-	1/-
Telsen DR3 L.F. Transformers	8/6	3/9
Peto-Scott L.T. Accumulator, 2-volt, 40 A.H.	5/6	3/-
Packets of 12 assorted Insulated Terminals	3/-	1/-
B.R.G. Binocular H.F. Chokes	3/6	1/-
Keystone .00025-mfd. Air-spaced Tuning and Reaction Condenser	8/6	2/-
Multitone Class B L.F. Transformer	9/6	4/9
B.R.G. .0005-mfd. Condensers, with disc drive	6/6	2/-
Do., two-gang	15/-	6/6
B.R.G. L.F. Super Transformer	8/-	3/6
B.R.G. Class B Driver Transformer	8/6	4/-
Peto-Scott Band-Pass Units, convert your set to Band-Pass Tuning	25/-	7/6
Peto-Scott Class B 4 Kit "A." Complete with full-size Blue Print. Less Valves and Cabinet	70/-	35/-
B.R.G. Gramophone Pick-up and Tone-arm	17/6	10/6

Wide selection of MAINS TRANSFORMERS. All best makes from 5/-. Send specification of your needs.

ONLY A FEW OF OUR ASTOUNDING BARGAINS. ENORMOUS STOCKS TO CHOOSE FROM. LET US KNOW YOUR REQUIREMENTS. WE WILL QUOTE YOU BY RETURN. SEND FOR LISTS OF BARGAINS IN EVERYTHING RADIO.

PETO-SCOTT CO., LTD.,
77 (P.W.25), CITY ROAD, LONDON, E.C.1.
West End Showrooms: 62 (P.W.25), High Holborn, W.C.1.

SALE OFFER
69/6 CABINET FOR ONLY **49/6**

ONLY WHILE STOCKS LAST

Specification of our "Westminster."

3' 3" high, 2' 6" wide, 1' 4" deep. Made to take all makes of pick-ups, turntables, motor and speakers; also sets up to 18" × 8". Holes will be drilled for vignettes, free of charge. Side cupboards will take both 10" and 12" records. Complete with chromium handles and guaranteed clock. Supplied in walnut, oak or mahogany.

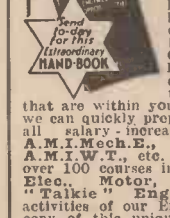
Direct from—

CASH WITH ORDER **49/6** C.O.D. 1/6 EXTRA.

W. S. WILKIN,
Nelson Mews, Southend.
ESSEX. *Phone:* 4330.

ONLY GUARANTEE—SATISFACTION OR MONEY RETURNED.

ENGINEERS!
LISTEN...



There are thousands of opportunities around you, but unless you know where they are, and just how to prepare for them, your opportunities will pass by unheeded.

Our unique Guide, "ENGINEERING OPPORTUNITIES," clearly explains the steps you *must* take to secure one of the good jobs that are within your reach. The book explains how we can quickly prepare you, in your own home, for all salary-increasing qualifications, such as A.M.I.Mech.E., A.M.I.E.E., A.M.I.A.E., A.M.I.W.T., etc. The guide also gives details of over 100 courses in all branches of Civil, Mech., Elec., Motor, Radio, Television and "Talkie" Engineering, and outlines the activities of our Employment Dept. Send for your copy of this unique Hand-book to-day FREE and without obligation. The book must benefit you.

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY,
101, Shakespeare House, 29/31 Oxford Street, London, W.1

MICROPHONES AND P.A. OUTFITS.

ELECTRADIX

Specified for "Popular Wireless" Two-Valve Amplifier

Illustration shows MICROPHONE No. 12.T. 18/6, and TRANSFORMER, 4/6, as specified.

P.W.11 TABLE MIKE is a Pedestal Microphone for speech. 2-in. Mike and Transformer in a bakelite case on a pedestal. Switch and plug sockets, 15/-. Pedestal Mike No. 10B, 10-in. high, 12/6. No. 12B Ring Pedestal, 18/6. Eisel famous P.A. and Band Mike (Reisz Principle), 55/-. Stand 15/- extra. Screened imped. matched Transformer, 7/6.

HEADPHONES. 120-ohm Sullivan Headphones, W.D. model, at a tenth of cost. For circuit testing, fault spotting, broadcast listening, microphone experiments. Aluminium body and headbands. Maker's price to-day is 15/-. Our price 2/9 per pair. 3d. postage.

PUBLIC ADDRESS OUTFITS. Mobile type, complete with batteries and convertor in case, mike and P.A. horn speaker, £28/10/0. 3-watt all-mains P.A. amplifier outfit and speaker, complete, £12/10/0. 5-watt, £14/10/0. 10-watt, with gramo., £20/0/0. 20-watt, with gramo., £27/10/0.

1,000 other bargains in New Sale List "N," post free.

ELECTRADIX RADIOS,

218, UPPER THAMES STREET, LONDON, E.C.4.

'Phone: Central 4611.

The Game of the Century!

Made by John Waddington Ltd., Makers of LEXICON, GRANDFATHER'S WHISKERS, etc.

The World's Biggest Jig-Saw and the World's Greatest Travel Game

Thrilling! Exciting! Enthralling! Instructive! This jolly game is all that and more. It takes you round the world, to lands of romance and mysticism, gives you hours of fun and entertainment and teaches you all sorts of interesting things about the positions of the most important places of the globe. In all there are 500 square inches of Jig-Saw puzzle to be made into a Map of the World. It is an education in itself.

MAPPA-MUNDI

At all Stationers, Toyshops and Booksellers **3/6**

THE NEW MIDLAND REGIONAL

(*Continued from page* 291.)

Because, of course, Midland Regional is primarily designed to serve the Midland area, which, with its 50 kilowatts and half-wave aerial, it is succeeding in doing very well. Television enthusiasts who are experimenting with the 30-line transmissions from London National complain of poor sound accompaniment from the new Midland Regional. Apart from that—all quiet!

Droitwich differs as a centre of programme radiation from all other B.B.C. stations in having an ample reserve of power. I was again reminded of this fact when I went up there to see the new Midland Regional.

At present Droitwich National works with a power of 150 kilowatts—the Lucerne maximum for stations over 1,000 metres. It is not a maximum being very religiously adhered to, as we can see from the 500-kilowatt Moscow No. 1 and the proposed 150-kilowatt Motala. When Droitwich's adjacent wavelength neighbours exceed the nominal maximum the B.B.C. may be compelled to push up Droitwich's power. It is a comfort to know that they can.

Stations Want More Power.

Similarly with the new Midland Regional. Being a single medium-waver, and not a "twin," as at other centres, it has an extra reserve of power. What an irony it is that the station least likely to need a power increase should have the greatest facility to get it!

Brookmans Park, which certainly ought to be able to provide for twin 100-kilowatt transmitters to cope with the present ether competition, is running at its absolute limit with 50 kilowatts apiece. I am wondering whether, now that the Nationals have been reduced to 20 kilowatts, the Regionals might not be pushed up to 70 kilowatts. Other things being possible, the Diesels could certainly take the load.

As I drove away from Droitwich, I said to myself: "Well, that's the end of the Regional Scheme as first planned. Now let's begin all over again!"

"THANK YOU, B.B.C."

(*Continued from page* 292.)

I devoured the Empire's tribute that followed. Among much that was so good I was particularly struck with the Nottingham farmer and the Tyneside. Each and every tribute, both from home and abroad, touched one by its obvious sincerity. There was the Prime Minister's masterly speech, too, a fitting prelude to the King's most eloquent and moving one. The arrangement of all this was perfect.

* * *

Public tributes have been paid to the police, buskers, a hundred and one officials, and, indeed, to the crowds themselves. All well merited, of course. But what about the B.B.C.? Without the British Broadcasting Corporation we provincials would have had to be content with reading about London's marvellous Jubilee Day the next day. As it was, we "saw" most of it—very much more than did many actually present there. To the B.B.C. we owe a very great debt, and while congratulating them on their remarkable achievements we would add our thanks.

* * *

The B.B.C. arrangements on the entertainment side were not in the same class. The fare provided was good, but not uniformly good. The big music of the week was first class. Music lovers will recognise that. But take, for instance, that much-boosted All-Star Variety programme from Brighton Corn Exchange on Jubilee Day evening. Here is my honest opinion of it. The tit-bit of the programme was Leonard Henry's opening remark about the corn he had to exchange. Full marks for that, Leonard. But those are the only marks I did give. The Dancing Daughters danced well.

* * *

Norman Long might have had some better songs to sing and newer jokes to crack. Neither were good enough for the occasion. Elsie and Doris Waters, while trying to be sentimental as befitting the occasion, as they thought, were third rate. Became their first-rate selves immediately they reverted to Gert and Daisy characters. Anona Winn was her usual good and clever self. Nosmo King reproduced an old act. He did the identical thing on his last appearance. True, he doesn't broadcast frequently, but his style is so unique that it sticks in one's memory. He should have done something new on this great occasion.

* * *

Leonard Henry compered well, but unfortunately this was the major part of his contribution. His turn was hurried. He seemed anxious to be off, either to finish his supper (?) or to give Jack Payne his chance before the Royal Society banquet speeches bagged the wavelength. The closing stages of this variety bill were marred by the double shuffle that took place.

* * *

Then there was the radio version of "The Desert Song." It wasn't a patch on the original stage production. Though I have long pleaded for such musical plays as "The Desert Song" on the air, I say quite frankly that I prefer not to have them at all if to have them necessitates such drastic pruning. It is quite obvious that they mustn't be got through in an hour and a quarter. They lose such a lot by being cut.

In the broadcast "Desert Song" we only had a skeleton libretto. Several of the greatest moments of the play were just wiped out. For instance, the duel scene between General Birabeau and Pierre (which I think is one of the best things in the play) was over before you could say knife. There was no tenseness here. The song on the Edge of the Desert was ruthlessly cut out, as were lines and lines of good libretto. And what about all the comedy? Benny's part wasn't worth doing, and there was such a good man to do it.

* * *

Of course, there was much that I did like. I liked Harry Welchman as Pierre. He brought out his dual character well, which must have been more difficult for him on the air than it was on the stage. Edith Day as Margot sang well. The "Military" was danced well by the Dancing Daughters, but they weren't given a chance with the "It" number dance. That was cut. I hope that amateur dramatic societies listening to this radio version, and who intend doing "The Desert Song" next year, weren't put off. "Desert Song" is a much better thing than the radio version of it would lead you to believe.

C. B.

A UNIVERSAL MAINS AMPLIFIER

(*Continued from page* 302.)

mention this fact because a volume control is sometimes supplied integral with the pick-up.)

The H.F. pentode is resistance-capacity-coupled to the output valve, which is choke-capacity-coupled to the loudspeaker—an ideal arrangement for quality reproduction. It is assumed, of course, that where a moving-coil speaker is used this will be of the modern type, in which the input transformer is fitted to the chassis.

Since the amplifier is mains operated throughout it is necessary to employ a small dry battery of 4½ volts for the microphone itself.

It will be understood that this small voltage cannot economically be obtained from the mains.

Incidentally, it is advisable to disconnect the microphone from its terminals when it is not in use to save running down the battery.

Simple Construction.

There is very little to say about the actual construction because this is perfectly straightforward. Don't forget that some of the leads are taken direct to the metallised covering on the baseboard. These points are marked M.B. on the diagram. Also you will notice that some of the terminals on the valveholders have no leads joined to them. Don't let this worry you—the terminals in question are not required in this particular unit, and are therefore left blank.

TECHNICAL JOTTINGS

Items of interest to all readers

By Dr. J. H. T. ROBERTS, F.Inst.P.

This Year's Radio Features.

Every year we have a fresh crop of radio improvements, and there are several good ones in the offing for the next Radio Show. I mustn't say anything about these, however, until the time comes, otherwise I should spoil the surprise.

One of the most interesting innovations we have had lately is the popular visual tuning, and another is S.A.V.C. This is not exactly new, but until recently it was only used on what you might call the more expensive sets. It has now been extended to practically all superhet receivers. I should say, however, that with regard to this I think there is still room for improvement, because its efficiency depends very much upon the proper amount of control being available.

Second-Channel Interference.

Another very important recent development is the improvement in the superheterodyne receiver whereby the second-channel interference, which has always been a bugbear, has been for all practical purposes cut out. It is not so long ago that you got double settings all round the dial on a superhet, and in some cases a powerful station would come in at even more positions. By the suppression of the second-channel interference this has all been done away with, and it is a most valuable improvement, particularly in view of the ever-increasing popularity of the superheterodyne type of receiver.

Battery Economy.

Several readers have told me from time to time that they think that the standard type of high-tension batteries so frequently supplied with powerful battery sets are not up to the work which they are called on to do, and that makers would do much better to supply double- or triple-capacity batteries and to enlarge the cabinet so as to contain them.

There seems to be a good deal of sense in this. A modern powerful battery set will consume, say, 10 or 12 milliamps, and if you work it out you will soon see that an ordinary standard-capacity high-tension battery, working four or five hours a day, is not going to last very long at this rate.

It is always open to the user to buy himself a super-capacity battery as soon as the one supplied has petered out; but if the set is very compactly arranged, and there is only room for a standard-capacity battery, it means either that the new battery has to be of lower voltage or that it cannot be accommodated in the cabinet and has to be used outside, which is untidy and generally unsatisfactory. A very deplorable state of affairs.

Cabinets for Super-Capacity Batteries.

If manufacturers of battery sets do not see their way to supply super-capacity batteries with the sets—owing to the need for keeping down the overall cost as low as possible—they can at least so design the cabinet that there will be room for a high-capacity battery if and when the user chooses to put one in. Everyone knows that it is more economical to use, say, a triple-capacity battery than one of standard capacity, but comparative figures naturally vary according to the conditions of use. It has been estimated that on the average you pay about half the price for your high-tension juice from a high-capacity battery that you do from a standard-capacity battery.

That "Boomy" Reproduction.

Many people nowadays seem to prefer the low, boomy type of reproduction, although often enough this is not really by any means a faithful reproduction of the original. I do not know all the B.B.C. announcers, but those that I have met certainly have *not* got that tremendous double basso-profundo sort of voice that you so often hear from home receivers.

Harmonics and Quality.

A good rule to remember is that it is the harmonics or overtones which give "quality" to sound, and these harmonics or overtones are always of higher frequency than the fundamental. Consequently, if you suppress, even partly, the upper tones you are bound to lose a good deal of the brilliancy and quality of the sound.

The human voice is particularly rich in overtones, and that is why it is so easy to distinguish one voice from another. Certain musical instruments also give plenty of overtones or harmonics. For instance, stringed instruments generally give more harmonics, the frequency of which is one, two or three times the fundamental frequency, whilst in the case of reed and wind instruments you often get a mixture of overtones. In passing I should mention that some people distinguish between overtones and harmonics, although these two terms are generally regarded as synonymous.

Is the Grid Leak Important?

The grid leak is such a familiar component that we are apt to take it for granted and overlook its fundamental importance in the circuit. We spend a good deal of time and thought in choosing, say, a variable-mu valve of suitable characteristics and in matching the impedance of the speaker to the output of the set, whilst often enough we forget that the correct value for the grid leak has quite as much effect upon the overall performance of the set as any other single factor.

It is hardly necessary to say that the function of the grid leak is to allow the charge on the grid to leak away, whilst at the same time maintaining the grid at a suitable electrical potential. The resistance of the grid leak, therefore, must be high enough to maintain the proper potential and yet low enough to ensure that the grid does not become choked.

(*Continued on next page.*)

The Reliability you Need!

SPECIFIED for

"A Universal Mains Amplifier"

The **ERIE**

Volume Control

ERIE RESISTORS *SPECIFIED*

Be sure to use Eries. Their quality is a definite step ahead, giving absolute stability. All designers and manufacturers specify Eries.

★*FREE*—**Send for the "Erie Resistor Service Instruction Booklet." Post Free.**

This better variable resistance is a big asset to your set. It will never develop faults. It is permanently noiseless. There are no hop-off noises. The Erie resistance element and precision construction give smooth and positive contact for a life-time's use. Specified by all designers. All sizes, 50,000 ohms to 2 megohms.

3/6 **AT ALL DEALERS** *or with built-in mains switch - 5/-*

THE RADIO RESISTOR Co.Ltd. 1, Golden Square, London, W.1

Get this 1/- book

The latest and most authoritative manual on

INTERFERENCE SUPPRESSION

76 pages of authoritative text, illustrations, and diagrams; with supplement fully describing Belling-Lee new range of suppression devices.

	£	s	d
Condenser Suppressor		10	6
For Small Unearthed Motors		8	6
D.C. Hum Suppressor	3	7	6
For Flashing Signs		11	6
,, Neon ,,	3	15	0
Lift Suppressor	3	15	0
Choke and Condenser Units from 2 to 30 amps, from	3	5	0
Single Chokes from ½ to 300-amps.			
Car Radio: Suppression Kits 4-cyl. kit		15	6
6- ,,	1	0	0
Line Suppressor		17	6
Flex Lead Suppressor		6	0
Set Input		17	6
Appliance Plug Suppressor		16	6
Rejectostat (Belling-Lee type) Aerial Kit, less Cable	1	7	6

BELLING & LEE LTD CAMBRIDGE ARTERIAL ROAD ENFIELD, MIDDX

BLOCK LETTERS PLEASE

Please send your new book "Interference Suppression." One shilling remittance.

NAME.....

ADDRESS.....

.....

Pop.W. 25/5/35.

TECHNICAL JOTTINGS

(Continued from previous page.)

Maximum Efficiency.

It is safe to say that a great many sets do not operate at maximum efficiency owing to an incorrect value of grid-leak resistance. It is always worth while, if you are making any change in the receiver, to try slight adjustments in the value of the grid leak to find out the value which best suits the valve used.

Of course, you may say that the real solution to the whole thing is to use a variable grid leak, and, as many of you will remember, variable grid leaks were very popular a few years back. Unfortunately, however, they never seemed to be absolutely reliable, and there was a great tendency for the resistance value of the leak to change gradually over a lengthy period. However that may be, variable grid leaks soon went out of fashion, and the great majority of people to-day use fixed

NEXT WEEK.

How To Build THE A.C./D.C. S.T.600

A universal mains model of the famous set designer's recent triumph. Specially described for mains users

BY

John Scott-Taggart

M.I.E.E., F.Inst.P., Fel. I.R.E.

Don't miss the June 1st issue of

"POPULAR WIRELESS"

On Sale May 29th. Price 3d.

ORDER YOUR COPY NOW.

grid leaks, and if any change is necessary they try out different values of leak and fix on one.

Try a Variable Leak.

For those of you who want to do any experimenting with variable grid leaks it is quite a simple matter to try the old dodge of a thick line of Indian ink on a little strip of cardboard for the resistance element, this being brought up well into contact with a terminal at one end, whilst a spring clip, such as a paper fastener, will serve for the "sliding contact." A dodge like this will at any rate show you how much the efficiency of the circuit depends upon a suitable value of grid leak. You can, in fact, use this permanently, once you have got the best value, but it will be necessary to varnish it over with shellac or cellulose varnish to prevent moisture and atmospheric effects from upsetting it.

Ether Searching.

In these days, if you are doing any "touring," you want every ounce of selectivity which you can get, and it may be that the set, especially if an unduly large aerial is used, will not be selective enough for all purposes. I have even known this to be the case where the set had two tuned stages, and it often enough happens where there is only one tuned stage.

As you know, selectivity can be improved by putting a preset condenser in the aerial lead, the maximum value of the preset being, say, 0·0003 microfarad. This very simple dodge will do the trick in many cases, but there are some cases in which it is not sufficient, and you will need an additional tuned stage.

Adding a Tuned Stage.

For the purpose of the extra tuned stage you can use a tuning condenser and screened coil, similar to those which are already used in the other tuned stages. The grid terminal of the coil in the new stage is connected to the fixed vanes of its associated condenser, and both are connected to the fixed vanes of the first tuning condenser in the set, the connection being made through the medium of a small fixed condenser having a capacity of, say, 20 to 30 micro-microfarads. The aerial will, of course, be disconnected from the original aerial terminal and connected to the aerial terminal of the coil in the additional tuned stage.

Look Over the Trimming.

Whilst on this subject of selectivity I should like to mention a fault which occurs much more often than is commonly realised, and that is the inaccurate trimming of the ganged condensers, in a set where these are employed.

Some people think that once the ganged condensers have been trimmed they may be left alone for good and all, but there are various reasons why they may get out of adjustment, and it is a good plan to go over the trimming every so often and make sure that it is quite in order. Another thing is that if you put a new valve into the high-frequency part of the circuit it will be necessary to retrim the condensers in any case.

Renting Radio.

There is a growing business in the hiring, or rather letting out on hire, of radio receivers. Many people prefer to pay so much a month for the hire of a receiver, on the basis that the owners of the set will maintain it and keep it always in tip-top condition, rather than to buy their own set and have the responsibility of looking after it. The maintenance includes free service and the replacement of any defective or damaged valves. In a way this is an answer to the introduction of the radio relay services, which are proving increasingly popular in all parts of the country.

The fact that some hundreds of thousands of people are prepared to pay anything from 1s. to 2s. per week for a wired service, which is completely automatic except for simple switching on and off, shows that there is a large public for some kind of absolutely maintained and trouble-free radio reception. It is only natural that the set manufacturers should find a reply to this in the shape of a receiver hiring service, where the user has all the advantages of the other, with the further advantage that he can tune in a large number of stations.

Receiving on the Electric Mains.

Talking about radio relays, by the way, I daresay you know that it is quite possible, so far as the technical side of the thing is concerned, to send programmes over the electric-light mains, and that all you need for receiving the programme is some kind of a selective device, so as to separate one programme from another, and a loudspeaker for the actual reproduction.

A number of different firms have been working on this system for a long time past, and there seems to be no doubt that technically it is quite O.K. To put it into practice, however, means that the sanction of the various authorities has to be obtained, and this ultimately means the sanction of Parliament. If all goes well, and arrangements are made for broadcasting the programmes by electric-light mains, it will mean a great increase in this form of radio-relay listening. On the present radio-relay system it is necessary to run a wire specially to the subscriber's house, in the same way as the telephone wires.

Advertiser's Correction.—Readers are requested to note that on page 264, in our May 11th issue the advertisement of Woburn Radio concerning Electric Soldering Irons, gave the price as 1/1d.; this should have read 1/11d. plus 6d. postage.

MISCELLANEOUS ADVERTISEMENTS

3d. per Word

6d. per word for first words in heavy type. 6/- per line for displayed lines (12 pt. type).

Minimum Charge 3/-

Remittance must accompany order.

Advertisements for these columns are accepted up to first post WEDNESDAY MORNING for following week's issue.

Radio components and accessories advertised in these columns at below list price do not carry manufacturers' guarantee.

The Proprietors have the right to refuse or withdraw advertisements at their discretion.

Postal orders in payment for advertisements should be made payable to the Amalgamated Press, Ltd., and crossed.

All communications should be addressed to:—Advertisement Department, "Popular Wireless," John Carpenter House, John Carpenter Street, London, E.C.4.

PEARL & PEARL,

190, Bishopsgate, London, E.C.2. All the following Bargains, guaranteed new goods. Cash or C.O.D. Carriage Paid in British Isles.

TELSEN Receivers (1935 Models). Guaranteed new, in original cartons. 6-valve Super-het, A.C. model. List 14 gns. Our price 9 gns. Battery model with batteries complete. List 14 gns. Our price 9 gns.

BURGOYNE Receivers. 3-Valve Class B model. Complete with Mullard valves; Exide H.T. and L.T. batteries. M/c speaker. Artistic cabinet of highly polished walnut. Chromium fittings. Brand new in original cartons: 1935 model. List £6/10/-. Our price £3/18/6. Carr. Paid.

CROMWELL Cabinets (for set and speaker combined). Horizontal type 23in. wide, 8in. deep, 11½ in. high. Polished walnut veneer, additional baffle behind speaker grille. Only 4/11 each. Carriage fwd.

SPECIAL. Telsen Radiomag (Latest Edition) 64 pages. 4 Full-size Blue Prints for the "Economy Three," "Short-Wave Three." "Super Four" Battery receivers, and a "Quality 3-valve Amplifier." Full constructional details, many other articles of interest, sent Post Paid for 6d.

TELSEN Chokes, Coils, Condensers, etc., all at Special Reduced Prices. List "P.T." on request.

HUNDREDS of Bargains in Free List "N."

All Mail Orders Direct to

PEARL & PEARL,

190, Bishopsgate, London, E.C.2.

Telephone: Bishopsgate 1212.

Book of Practical Radio 3

Printed in Great Britain and published every Wednesday by the Proprietors, THE AMALGAMATED PRESS, LTD., The Fleetway House, Farringdon Street, London, E.C.4. Advertisement Offices: John Carpenter House, John Carpenter Street, London, E.C.4. Registered for transmission by Canadian Magazine Post. Subscription Rates: Inland and Canada, 17/6 per annum. Abroad (except Canada), 19/6 per annum. Sole Agents for Australia and New Zealand: Messrs. Gordon & Gotch, Ltd.; and for South Africa: Central News Agency, Ltd. Saturday, May 25th, 1935. S.S.

SOUTHERN RADIO'S WIRELESS BARGAINS. Every Article Guaranteed New, Perfect, and Sent Post Paid.
RECEIVERS. Telsen Radiograms. Model 3550/R.G.A. Latest 1935 6-Valve Superhet. A.C. This Receiver embodies the very latest in radio. Complete with 6 valves. Mains Energised Speaker. Contained in Exquisite Cabinet with Garrard Electric Record Changer. In original Sealed Cases, £18 10 (List 32 Guineas).
TELSEN THREE-VALVE BATTERY SETS. Model S93 complete with 3 Mazda valves, in attractive Bakelite Cabinet, 30/- (List 75/-).
TELSEN "AIRMARSHAL 3" 3-Valve Battery Sets. Complete with 3 Mazda Valves, Speaker. In attractive Walnut Cabinet, 47/6 (List 98/6).
BURGOYNE CLASS B THREE-VALVE SETS. Complete with 3 Mullard Valves, Exide Batteries and Accumulator. Magnavox Moving Coil Speaker. In Magnificent Cabinet, finished in Chromium. £3 9 6.
SPEAKERS. Blue Spot Permanent-Magnet Speakers. With Universal Transformers to Suit any Circuit. 1935 Series. 99 P.M. 24/6. 45 P.M. 20/-. Celestion P.P.M.W. 16/6. Celestion Soundex, 11/- All in sealed Cartons.
ELIMINATORS. Regentone 1935 Series New and Boxed for A.C. Mains 200/250 Volts. Type W.5a, complete with Trickle Charger, 39/6. Type W1a (less Trickle Charger) to carry 30 Milliamps, 33/-. W1C (less Trickle Charger), 30/-.
CONDENSERS. Plessy 4-Gang Superhet Condensers. 0·0005 Fully Screened with Trimmers, 7/3.
Lotus 0·0005 Condensers, Fully Screened with Trimmers. Complete with Escutcheons, Dials, Knobs. 3-Gang, 11/-, 2-Gang, 7/3.
COILS. Igranic Superhet 4-Coil Set (1 Osc.), 2 I.F. (with Pigtails) and 1 I.F. (Plain), 9/- per set (list 50/-). Varley Square Peak Coils with all Accessories, Type B.P.5, 2/3. Telsen Twin Matched Coils, W287, screened with switch, 7/9. Triple Matched, W288, 10/9. Telsen Twin Coil Unit, W478, 12/6. Triple W476, 17/6; W477, 17/6.
MISCELLANEOUS. Biflo Static Cut-Outs. Definitely eliminates all Interference, 2/-. Lewcos Spaghetti Resistances. Assorted Capacities. New and Boxed, 1/6 per dozen. Telsen Binocular H.F. Chokes, 2/-. Telsen Ace L.F. Transformers, 3:1 and 5:1, 2/9 each.
STOCKTAKING BARGAIN PARCELS. After our recent stocktaking, we gathered at our Head Office a very large number of odd lines from our various Branches. We are offering these in Parcel Lots as under:
5/- Parcel containing Components to the value of at least 20/-, including Condensers, Resistances, Coils, Wire, etc. 10 Different Ready Radio and Telsen Circuits are included with each parcel.
10/- Parcel contains Components to the value of at least 45/-, and includes Transformers, Variable Condensers, etc., etc., also Circuits as above.
Every article contained in these Bargain Parcels are of Present Day Radio use, and are Brand New and Boxed.
SOUTHERN RADIO. Branches at 271/275, High Road, Willesden Green; 46, Lisle Street, W.C.2. All Mail Orders to 323, Euston Road, London, N.W.1.
SOUTHERN RADIO, 323, Euston Road, London, N.W.1.
(Near Warren Street Tube). 'Phone Museum 6324.

BIRMINGHAM RADIOMART

SPECIALISTS IN SHORT-WAVE AND QUALITY COMPONENTS AT LOWEST PRICES.
Our stock is much too large to itemise here: From a soldering tag to a superhet, we can supply everything, and, what is more, you won't be "Caught"! Send 1½d. stamp for our latest **CATALOGUE.** No firm has larger stocks or is cheaper than

THE SQUARE DEALERS,

BIRMINGHAM RADIOMART,
19, John Bright Street, Birmingham.

VAUXHALL. Magnavox permanent-magnet speakers, universal for Class B power, pentode or push-pull, 7-in. cone, 16/6; 10-in., 22/-.
VAUXHALL. Magnavox energised types, 2,500 or 6,500, 10-in. cone, 22/-; 7-in. cone, 15/3. All brand new, complete with hum-bucking coils, state power or pentode. Other speakers. Send for particulars.
VAUXHALL. New Lists just issued, 3,000 bargains. New goods. Limited number available free.
VAUXHALL. Immediate delivery of all goods advertised in previous issues.
VAUXHALL-UTILITIES, 163a, Strand, London, W.C.2. Over Dennys the Booksellers. Temple Bar 9338.

G.P.O. ENGINEERING DEPT. (No experience required.) Commencing £4 per week. Age 17-23. Excellent prospects. Free details of Entrance Exam. from **B.I.E.T.** (Dept. 568), 31, Oxford Street, W. 1.

SPEAKER repairs, new cones, coils and centres fitted. 5/-. Complete re-winding service mains transformers, etc. Work guaranteed.—Write Dept. X, Weedon P.L.R. Co., 80, Lonsdale Avenue, London, E.6. (Maryland 1782.)

PREMIER SUPPLY STORES (Dept. P.A.), 20-22, High Street, Clapham, S.W.4.
ALL BARGAINS previously advised still available. Send for latest illustrated list.

Here is some real news for every Short Wave and Television fan—due out of the hat at the end of next week. Until then it is shrouded in mystery, but let us have your name and address for the useful notes which we have prepared.

P.S. ***We expect a rush from the superhet enthusiasts!***

SEND A CARD TO THE VALVE DEPARTMENT, THE MARCONIPHONE COMPANY LIMITED, RADIO HOUSE, 210-212, TOTTENHAM COURT RD., LONDON.

MARCONI VALVES

THE CHOICE OF THE EXPERTS

The following unused Set Manufacturers' Surplus: All goods guaranteed perfect; immediate delivery.
ERIE resistors, 1-watt type, 7d.; 2-watt type, 1/2; Marconi 25 pick-ups, 22/6.
WESTINGHOUSE rectifiers, HT8, 9/6; HT9, HT10, LT4, LT5, 11/-. Regentone transformers for HT8 or HT9 with 4v.-4a. L.T. winding, 7/6.
MAINS transformers, 350-0-350v., 60 m.a., 4v.-4a., 4v.-2a., 12/6. Eliminators, outputs, 150v., 25 m.a., S.G. and detector. A.C. type with Westinghouse rectifiers, 25/-. D.C. type, 12/6. Collaro gramophone motors, 100-250v. A.C., 34/-.
ROTOROHM volume controls with switch, 2/6.
MAGNAVOX speakers, complete with hum-bucking coils, output transformers, etc., 152 (9-in. cone), 22/6; 154 (7-in. cone), 15/9. All with 2,500 or 6,500 ohm fields. Magnavox PM254, 18/-. Carriage paid, cash with order or C.O.D.
WE can supply complete Kits of specified components for the A.C. S.T.600 at a competitive price.
WARD, 46, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

CASH ALLOWANCES made on your old wireless goods in part-exchange for any new receiver on easy terms. After deducting deposit we pay you balance of allowance in spot cash. Components and Peto-Scott kits supplied for cash or part-exchange. Highest allowances.—R. Wigfield, Furlong Road, Goldthorpe, Yorks.

RADIO CRYSTALS. The famous "NEUTRON" Crystals, 1/- per tin; the oldest and best. Obtainable from: V. Zeitlin & Sons, Ltd., 144, Theobald's Road, London, W.C.1; Expert Radio Service, 266, High Street, Stratford, E.15; Real Radio Service, 61, Cannon Street, E.C.4; etc., etc.

WOBURN RADIO OFFER FOLLOWING GOODS:
ELECTRIC SOLDERING IRONS: 200/250-v. copper bit complete with flex and adaptor, 1/11, post 6d. Immediate delivery.
SHORT-WAVE CONDENSERS.—Air-spaced ·0001, ·00015, ·00016, ·0002, ·00025, 2/-; with slow-motion dial, 3/-. Popular iron-cored canned coils, dual-range, boxed, with instructions, 2/6. Dubilier and Erie resistances, all values, 6d. Truwind wire-wound colour-coded, all values to 50,000 ohms, 3½d. Western Electric Microphones, 2/3. Transformer for same ratio 100/1, 2/3. Rothermel Speakers, 7 in. cone, power and pentode transformer, new and boxed, listed 39/6, 17/6.
TRADE LIST NOW READY. Send stamp and trade letter heading.
WOBURN RADIO CO., 9, Sandland Street, W.C.1. Holborn 7289.

LOUDSPEAKERS REPAIRED, 4/-. Blue Spot a Speciality. Transformers and Headphones, 4/-. Eliminators, Mains Transformers and Moving Coils quoted for. 24-Hour Service. Trade Discount. Clerkenwell 9069.—E. Mason, 44, East Road, London, N.1.

CLARION VALVES.—All brand new; battery types, 2-volt, H.F.2, L.F.2, L.P. 2, 1/9; Super-power, P.P.2, 2/6; screens and pentodes, 3/9; A.C. Mains, 4-volt 1-amp., general purpose, 3/3; power, 4/-; screens and pentodes, 4/6; full-wave rectifier, 3/6; postage paid, cash with order, or C.O.D. over 10/-.—Clarion Valves, Dept. 5, 885, Tyburn Road, Erdington, Birmingham.

BANKRUPT BARGAINS. List free. Will quote for anything radio. Mains, battery sets, components, keenest prices.—Butlin 143,b Preston Road, Brighton.

RARE BOOKS, English and Foreign, every subject. State wants.—P. O. Dane, 64, Stanley Street, Liverpool, 1.

ORDER FORM

The Advertisement Manager,
POPULAR WIRELESS,
John Carpenter House,
London :: E.C.4.

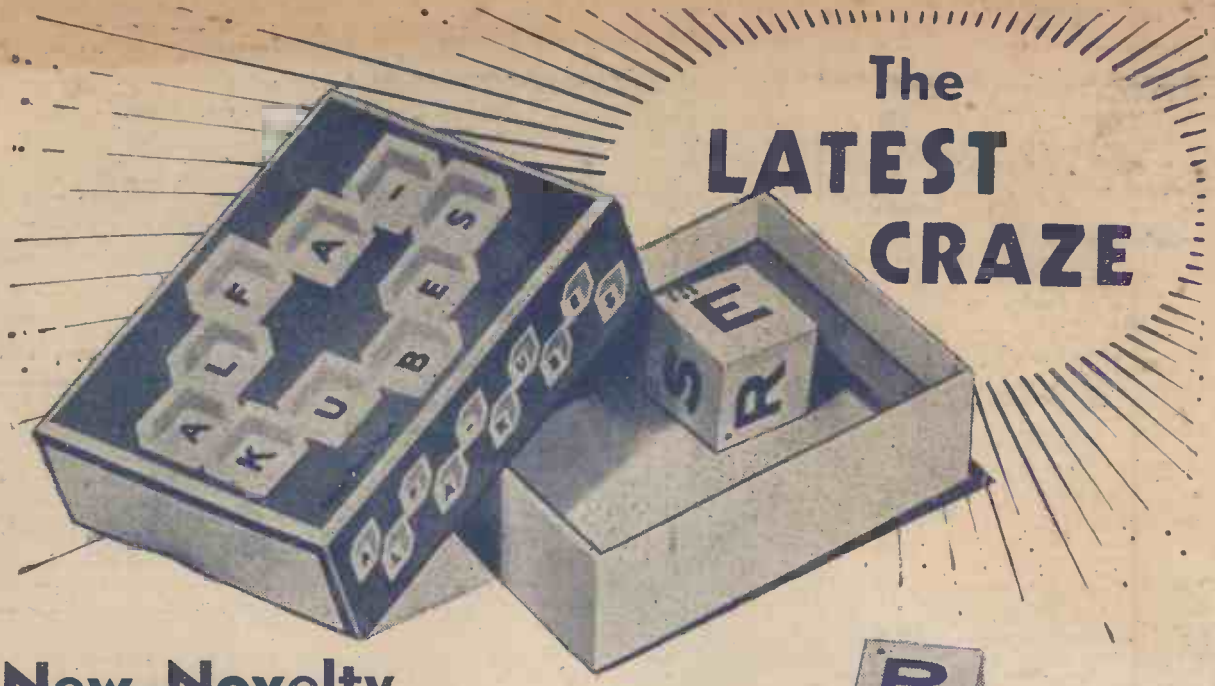
Please insert our/my advertisement in "Popular Wireless" for..... insertions at a charge of £ s. d. per insertion. Remittance herewith.

Signed.....

Address.....

.....

Date.....



The LATEST CRAZE

New Novelty Word-Making Dice Game

Fun from A to Z—Witty, Wise and Wheezy—Easy, Too

Can you spell ? You don't need to be a first-class speller to enjoy the new and breezy game of making words and scoring points with ALFA-KUBES, but the better you spell—and the more quickly—the bigger will be your score. ALFA-KUBES are six square dice, each with six different letters, and each letter is given a numerical value from one to six. The game is just to throw your ALFA-KUBES as you would ordinary dice, and then make up a word quickly from the letters turned up. You score by adding together the " pips " on each letter of the word you make. That's where skill comes in again. Different words have different value, and those who jump quickest to the highest scoring combination win the game.

Simple, isn't it ? And you can see plenty of fun in the offing ! What about those bad spellers ? What about those who choose a five-letter word thinking that it will count more than one with four ? It may not ; it's the " pips " that score. See how it goes ! Any number can play. It's a game that can be enjoyed at any time, both by adults and children. All the family can join in. It costs 1/- only, and the excitement and thrills you can get out of it will be worth that modest sum many times over. ALFA-KUBES will cast its spell on all who play it. Why not invest in a set to-day ?

Trade Enquiries to The CHAD VALLEY Co., Ltd., Harborne, Birmingham.

ALFA-KUBES

1/-

Of all Newsagents, Booksellers, Stores and Toyshops.