Wireless Weekly, 6d. Net. Wednesday January 28th, 1925

Wireless Weekly

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No. 15

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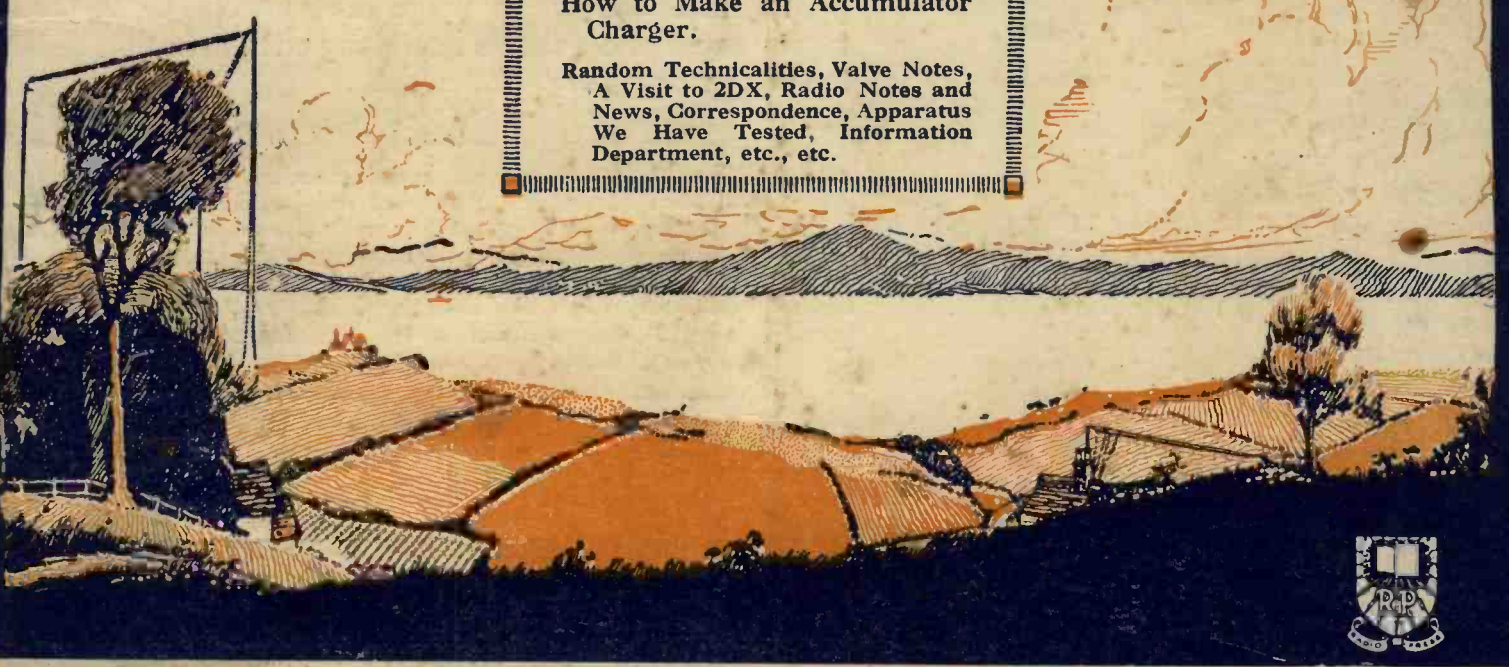

How I Work with Australia *(Illustrated)*

By W. K. ALFORD.

Burndept Coils cover all wave-lengths from 80 to 25,000 metres

This is one of the Burndept single-layer Concert Coils. Note the neat wrapping, and the clear marking of the coil number.

Set of 4 Extra Short Wave Coils, one A, two B one C (80-150 metres) .. .. **16s.**
Set of 4 Concert Coils, S.1, S.2, S.3, S.4, (150-800 metres) .. .. **16s.**
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FOR reception on all wave-lengths from 80 to 25,000 metres, use Burndept Coils in your tuning apparatus. These Coils are most efficient and their use is a distinct factor in securing perfect reception. Experimenters and amateurs all over the world are using them and the fact that the reputation of these Coils is based on good results should convince you of the desirability of employing them in your apparatus.

Burndept Coils have extremely low self-capacity and high-frequency resistance and are consequently particularly suitable for short-wave reception. The principles of construction to which their high efficiency is due are protected by Patents 168249 and 191550. The spring socket fittings are non-reversible and make perfect electrical contact.

Write for Publication No. 44, which gives full particulars of the whole range of Burndept Coils, together with prices and an interesting chart indicating the wave-length range of the Coils.

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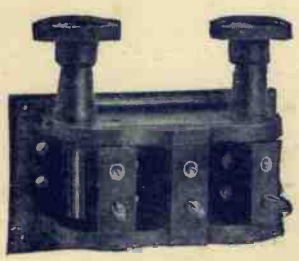
THESE coil-holders are very neat in appearance, being moulded in solid black bakelite, highly polished and beautifully finished. The moving holders are operated by means of a concealed 5 to 1 gear, the action being particularly smooth and giving vernier adjustment. The constructor who studies neatness as well as the efficiency of his apparatus will be very pleased with Burndept Coil-Holders. Since their introduction in 1921, their popularity has been unchallenged. Burndept Coil-Holders were the first to be made in England.



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Wireless Weekly

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The Post Office and Inventions

IT is characteristic of the British race to take things as they are and to suffer inconveniences willingly. Newcomers to wireless find it impossible to realise that only a few years ago considerable pressure of public opinion had to be exerted upon the Post Office before they would permit even a quarter of an hour's broadcasting from a low-power station near Chelmsford. On previous occasions we have commented upon several absurd regulations by which the British experimenter is bound, and which make him the laughing stock of our Transatlantic cousins. One anomalous regulation, perhaps more important than is generally realised, is that pertaining to the inspection of amateur transmitting stations by Post Office officials. As the regulations stand, the Post Office can, at any time, inspect in detail the apparatus and arrangements at any amateur wireless station, and, indeed, does make a practice of visiting experimental transmitting stations from time to time.

Transmitting licences, nominally, at any rate, are granted only to experimenters who have proved their *bona fides* and have proved their ability to conduct serious experiments. It is from such men that new inventions are likely to emanate, inventions which may have an important bearing upon the commercial development of the art, and which, quite conceivably, may solve many of the problems which confront those responsible for the conduct of high-power and long-distance wireless services.

At the present time long-distance services are being conducted in this country by a commercial company and by the Post Office themselves. It is common knowledge that the Rugby station, now being erected, will be one of the most powerful in the world, and if, as is the intention of the Post Office, this station is to conduct a regular service over great distances, then they will need to use many new inventions before a perfect service is obtained. They should, in fact, be glad to acquire, at reasonable sums, rights in good and valid patents which may be taken out.

Few inventors there are who do not hope some day to turn their inventions to some financial account. In the domain of broadcasting and the making of apparatus there exists quite an important market for wireless inventions, but in matters pertaining to long-distance and commercial services the likely buyers are few. Indeed, so far as this country is concerned, the possible buyers are limited to one or two commercial companies and the Government.

As matters now stand, the inventor must be prepared to lay his station open to the inspection of one of the possible purchasers of his invention. Let it be said right away that we do not question the integrity or courtesy of any inspectors to whom the Government entrusts this work. We are merely pointing out the anomalous position which exists. To the expert, quite frequently, a single glance at the transmitting set will indicate the line of research being undertaken, and may suggest ideas and possibilities which otherwise would not occur to him. Can it be wondered at that in a very large number of cases the knowledge that a Government inspector may visit the station causes the owner to make drastic alterations to his apparatus (temporarily, of course), with a result that the Government inspection becomes a farce.

The form of application for a transmitting licence calls for a statement by the applicant of the exact nature of the experiments he is desiring to conduct, together with full particulars of the circuit he intends to use. The farcical nature of this regulation is apparent to all, for if the licence is being genuinely granted for experimental work, then the applicant cannot possibly tell beforehand where his researches will lead him, or even the circuit which, in his particular circumstances, will prove to be most suitable at the moment.

Owners of existing transmitting licences, when applying for permission to experiment upon the shorter wavelengths which have aroused so much interest, are again required to state the exact purpose of the experiments they desire to conduct.

Finally, we would like to know just why the British amateur (as if he had not worries enough already) should have to submit to the arbitrary limitation of the size of his aerial to 100 feet in length? We can conceive of no technical reason for this limitation, and can only suppose that it was inflicted upon us some time ago for a reason which, whatever it may have been, no longer exists, and has been retained on the good old British principle: "There it is, let it be."

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American Reception on a Frame Aerial

By A. D. COWPER, M.Sc., Staff Editor.

Just what can be done with a " straight " circuit in expert hands is shown in Mr. Cowper's article below. At the same time, experiments of this kind need great patience and care and should not be attempted by the beginner on an outdoor aerial.

LOFTY claims are made by the advocates of some types of elaborate multi-valve receivers, particularly in connection with feats of reception on small frame aerials, which would appear to demonstrate their immense superiority to a straight single-valve-with-reaction circuit.

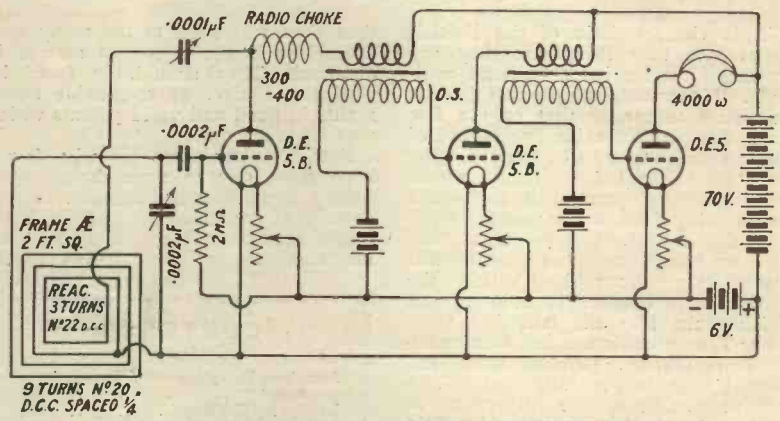
Observers, however, gifted with some patience and sense of fine tuning, and aided by the wavemeter, have long known that two, at least, of the many local broadcast stations can be picked up at intelligible strength in any reasonably favourable circumstances, on a small frame aerial and with a single valve. The experience of the writer is that with super-regenerative circuits the wave of the station can always be heard faintly by ordinary auto-dyne reception on a single valve, if useful signals are going to be given by super-regeneration.

The Ultraudion

Some time ago I described some experiments with a modification of the well-known De Forest Ultraudion circuit, by which it was possible, with patience and with a light hand, to go the rounds of a number of B.B.C. stations on a short vertical earth lead alone, that is to say, without aerial, and to hear some of these on a small frame aerial, all being on one valve.

The Personal Factor

The principal reason for the current low standard of reception on ordinary outside aerials, with detector valve alone, is (apart from the personal factor and the dearth of wavemeters) the impracticability of really fine tuning on a receiver fitted with the ordinary swinging reaction coil, and with high-resistance fine-wire inductances with heavy losses. The use of large parallel tuning condensers accentuates the trouble. With such equipment the heavy damping of the outside aerial, together with the resistance and dielectric losses in the coils and their mountings, involve so much loss of energy that excessive reaction has to be used to overcome it, a large reaction coil close-coupled with the A.T.I. being required. The result is familiar to any careful operator in that a continuous change of tuning with every adjustment of reaction coupling is called for, so that even an " easy " nearby station (such as Bournemouth, Paris, or Glasgow, in London), which gives a ferocious wave, cannot be isolated and resolved, except after an exasperating game of hide-and-seek.



A three-valve frame aerial circuit used by Mr. Cowper.

Reaction

Direct reaction on a frame aerial is readily managed in a number of ways, but the simplest is perhaps by means of the Reinartz device, such as a small fixed reaction coil fed *via* a variable reaction condenser from the plate of the detector valve; in a more refined form a radio choke is used in the plate circuit to divert the H.F. impulses this way. In this case, if low-resistance and low-loss inductances are used, without heavy aerial-damping, a surprisingly small reaction coil and reaction condenser capacity can be used. The immediate result of this is an extremely refined and sensitive control, and also complete removal of that irritating effect (produced by variation of reaction coupling) on the main tuning. The reaction requirements are, alas, much more independent of wavelength than usual. Those listeners who have never experimented with Reinartz reaction can have no conception as to the immense increase in power and range this one factor implies.

Reinartz Reaction

Accordingly, with Reinartz reaction applied to a small, low-resistance frame aerial, and with a high degree of audio frequency amplification beyond it to bring the feeble signals up to comfortable 'phone strength, one has a receiver of surprising power and range. The limiting factor appears to be rather the

problem of providing perfectly *silent* stages of L.F. amplification, and, of course, the usual atmospherics and Morse disturbances, rather than any natural limitation of the valve as a detector when operating with grid leak and condenser. Where the efficient multi-valve receiver should score is in (A) selectivity, over and above what modern selective tuners will give with a simple detector valve, or what a frame aerial naturally supplies; (B) silent amplification by using super-audio amplification as in the Armstrong super-heterodyne.

L.F. Amplification

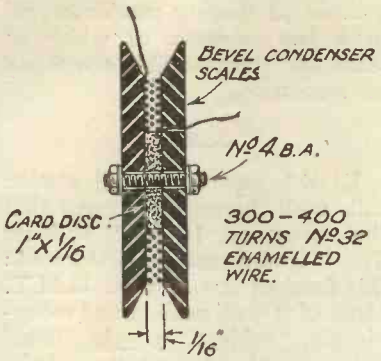
Experiment shows that with really high-factor L.F. amplifying valves, efficiently coupled with high ratio transformers of a design which minimises distortion, and properly operated as to H.T. and grid-bias values, an enormous degree of audio-frequency amplification can be obtained in *three* stages, *i.e.*, high-ratio detector valve followed by two high ratio note magnifying valves without introducing valve noises to a degree which compares unfavourably with the expected signals. By carefully weeding out the H.T. battery, which for such purposes should consist of easily renewable small units, and not of the conventional block of many cells, with grid cells in good order and with careful wiring, very little stray noise will be heard in such a circuit as shown in the diagram here, although the amplification is such that one must be extremely careful with a buzzer wavemeter in the same room, if one values one's ear drums; and an incautious touch or scratch on the panel, or even the slamming of the door of the room, produces an alarming roar by microphonic action.

A Check

With such equipment, therefore, it became possible to check up the surprising claims of some much more elaborate circuits, and to judge to what extent there is in operation any other factor than straight audio-frequency amplification following a sensitive detector valve.

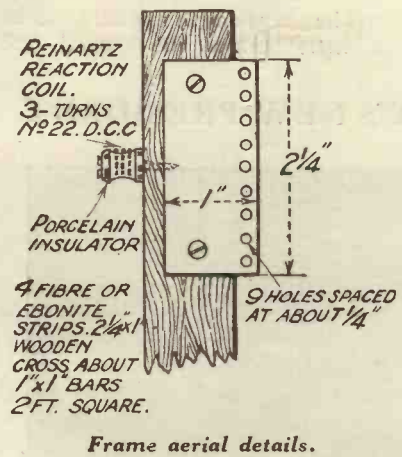
Actual Hook-up

The practical details of an experimental receiver are indicated in the diagrams. There is nothing very particular to note with regard to arrangement, or operation. The two-feet square frame aerial was chosen of nine turns, though the writer would have preferred to use more inductance here, and this size



The radio choke.

requires a .0003 μF tuning-condenser (or more in some cases) to cover effectively the upper broadcast band; this frame was chosen because many existing types of frame aerials are made of about these dimensions. The tuning condenser used was a J.B. ebonite end .0002 μF; the



Frame aerial details.

reaction condenser one of .0001 μF of the same make; these were mounted on a small vertical panel at one end of a large baseboard, on which the rest of the circuit was arranged. The radio-choke was a compact one of the type indicated, and mounted directly on the reaction condenser for convenience by a bent strip of brass nipped under the nut and centre terminal respectively. A No. 250 plug-in coil will replace this quite well. The first L.F. transformer was a high ratio Pye, the second one of lower ratio. Great care had to be taken with grid bias, etc., to avoid low-frequency oscillation, and the operator was best connected to local "earth" by a wire from the H.T. plus to the exposed metal telephone band for this reason. Nothing could be done in fine searching until the grid leak was taken to the L.T. minus, instead of the plus, as is more usual, on account of buzzing when just oscillating. As with all frame-aerial circuits without "earth" connection, casual body capacity effects were very marked, and 9-in. tuning handles, together with the removal of the frame aerial to a remote table with carefully arranged leads, are demanded. Merely handing the 'phones to another observer, or moving about the small room, would at times cause complete fading of a strong American station, or at least a howl.

Reaction Coil

It will be noticed that the reaction coil on the frame aerial consisted merely of three turns of No. 22 S.W.G. d.c.c. wire wound on small porcelain insulators at the back of the wooden cross which carried the aerial. The usual fibre or ebonite spacing-strips are used for the latter.

Trials

As it was familiar to the writer that reception over a few hundred miles was not extraordinary on a two-feet frame with a single valve, no time was wasted in picking up the local or near European stations, but search was made from just after midnight to about 2 a.m. on a frosty, rather foggy night (but with clear skies overhead), the receiver being located on the first floor of a small brick-and-tile cottage situated on high ground in rural Essex, but with some local screening. (It is in general a good position for reception, as more than twenty broadcast stations can be picked up any winter night on a really good aerial.) The lead-in of the usual aerial was some 15 ft.

away, and on the ground floor; experiment showed that it did not make any appreciable difference whether this aerial was short-circuited to earth or left tuned to 2LO. It was not lowered for the tests, as it might be taken to represent to some extent the "casual" relaying aerials which may vitiate any frame aerial test unless carried out in a balloon or on a mountain-top.

D.E.5B. valves were used for the first two stages, for their fine M of 20; the last was a D.E.5, which has a fairly high M and avoids distortion.

Results

Between midnight and one o'clock on the night of January 10-11 two strong waves were heard, with the frame aerial pointing east and west. The one was resolved into intelligible telephony, a children's hour talk by a man "Now then, girls and boys——," and by a woman later; parts of a children's story about a horse and his tail, etc., were heard later on, subject to the usual fading and some terrible jamming by noisy Morse.

Selectivity

The selectivity, as regards Morse stations, was much less than is usually expected, and there were many faint stations audible. An extremely noisy telephony station blurted in for a brief interval, just above 300 metres, but no call-sign was given. After 1 a.m. things were more lively, and on one occasion nine distinct waves were counted from just below 300 to about 370 metres, the upper limit of the aerial with a .0002 μF tuning condenser, all in a few seconds, of which at least two gave audible telephony on resolution.

KDKA

KDKA gave their full station call, with the announcement that the overture from "William Tell" would now be performed: this finished at 1.41 a.m., G.M.T. Most of it was audible and recognisable, subject to the usual fading, and was, on the whole, distinctly better than any of the early attempts exhibited via "S.B." by the B.B.C. A few minutes later the announcer said that Mr. —— Lloyd, the well-known Pittsburg singer, would sing two songs, and would first read the words of the songs, which were heard, though not clearly.

Other Stations

The wavelength appeared to be a little below the usual 326 metres. Between this time and 2 a.m. two other stations were resolved, one just below 300 metres, the other the familiar WBZ, whose music and station call were clearly heard. At times the strength of these stations was of the order that many people accept as comfortably loud for daily broadcast reception. Of course, tuning was extremely fine; and, as indicated, a station might fade out on handing over the 'phones to another observer (who checked several of the items), necessitating a slight retuning.

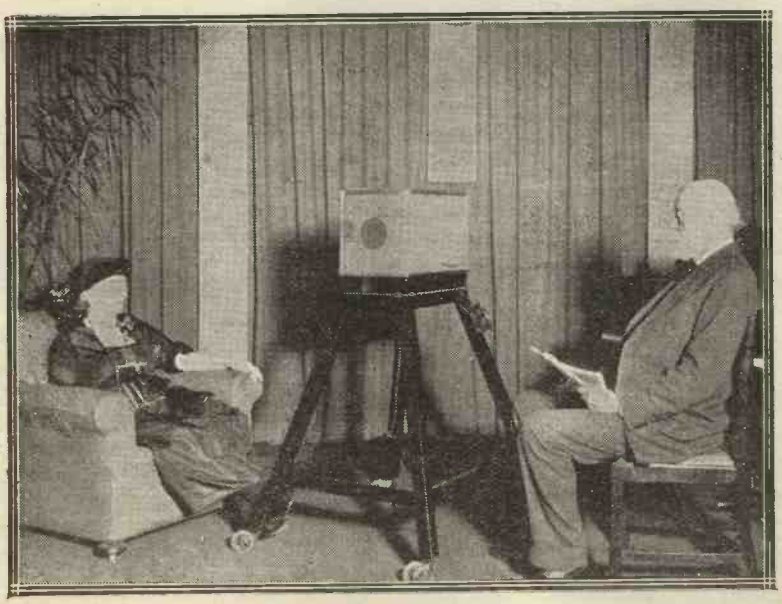
Conclusions

There seemed to be no purpose in going further with this, as the point appeared to be fairly well established that a simple valve with reaction *is* capable of receiving stations at 3,000 miles on a two-foot frame aerial, provided that efficient audio frequency amplification is used to bring the feeble signals up to a reasonable strength, and that accordingly there is, as the writer had long suspected, no specially great radio frequency amplification or other process of special efficiency operating in these much-advertised complex multi-valve circuits.

No Re-radiation

It is not suggested that these results could necessarily be duplicated in a town bristling with aerials and chimneys, etc. On the other hand, the hypothesis of re-radiation is ruled out by the relative isolation of the point of observation, and the consistency and number of the results obtained. During the two hours only two oscillators were noticed, and these but faintly.

THE RADIO SOCIETY'S NEW PRESIDENT



Sir Oliver Lodge, who has just accepted the presidency of the Radio Society of Great Britain, seated before the microphone at 2LO.

Record Wireless Feat in Pacific

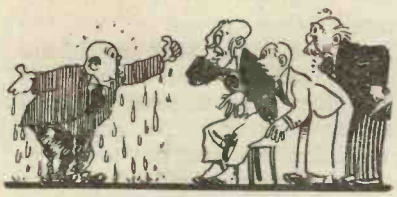
The Government wireless station on Esteban Island, British Columbia, has established a new record for communication with ships crossing the Pacific. It maintained two-way communication with the Royal Mail steamer *Makura* throughout her entire journey of 6,657 miles from Victoria to Sydney, Australia.

JOTTINGS BY THE WAY

By Wireless Wayfarer

In the Swim

LITTLE PUDDLETON has not gone scathless during the rains, tempests, storms and floods which have marked the coming of the glad New Year. Dozens of aerials have been torn up by the roots and deposited in greenhouses, chicken runs, and other people's gardens. For several days it was necessary to don gum boots in order to do one's shopping in the High Street, and then came the period of waders when the water rose another foot or so. But even this state of affairs did not deter the



. . . *"Why, we're afloat!" shouted Poddleby* . . .

stalwart members of the wireless club from attending meetings in the cosy ex-Army hut, which forms our premises. I am going to tell you the story of a wonderful adventure which befel us during this very exciting period. Bumpleby Brown had just finished a very seasonable lecture on the importance of keeping your earth wet, and Poddleby, who is rather an early bird, announced his intention of wading home. With a cheery good night he passed out through the door, his exit being followed by a resounding splash. In a few moments an exceedingly wet Poddleby returned to the club house gasping and spluttering and waving his arms wildly. When we had applied first aid to the apparently drowned by standing him upon his head in order to let the water which he had swallowed run out, slapping him hard on the back and working his arms and legs violently whilst kneeling on his chest, Poddleby's voice returned to him. "I say, you fellows," he gasped, "here's a pretty kettle of fish." "What's the matter?" we cried in unison. "Why, we're *afloat!*" shouted Poddleby. He explained that on making his exit duly provided with waders he had stepped into what should have been three feet of water, only to find himself completely submerged. When he rose to the surface he saw the club house rapidly receding from him, and it was only by superhuman efforts with the use of his best trudgeon stroke that he managed to regain it.

Little Puddleton's Ark

We rushed to the door. Poddleby's words were only too true. As we looked out we saw that we were passing Simla Villa, the General's residence, at a rate of knots. We shouted for help, but no help was, or could be, forthcoming. As we flashed down the High Street the inhabitants, who had retreated to their top floor rooms, either raised their hands aloft in horror or shouted to wish us *bon voyage*. In a matter of minutes we had left Little Puddleton behind, and there we were, a ship without a rudder alone on a waste of waters. Members of other clubs finding themselves in such an amazing predicament would probably have burst unanimously into tears or done something silly of that kind. But as you know, we of Little Puddleton have stout hearts, and it was resolved at once that we must make the best of a rather alarming situation. The first thing to do, of course, was to organise both ourselves and our resources.

The Admiral as Captain

Luckily the Admiral was amongst us, and he, being appointed without a single dissentient voice captain of our little barque, at once took charge of things.

Trippers First

Amongst the other members there was a lamentable lack of seafaring experience. But what we lacked in knowledge we made up for by our enthusiasm and will to win through. The Admiral ap-

. . . *Professor Goop was feeling a little seasick* . . .

pointed the General, who, after all, had made several voyages to and from India, as first mate and myself as second. My own knowledge of navigation is not extensive, though in my young days, when living in London, I always favoured the penny steamboats, which were then running, to trams or buses.

Settling down to it

As we were now aship the Admiral decided that iron discipline must prevail, and everything must be shipshape. The first necessity was to show the proper navigating lights. Gubsworthy had brought a hurricane lantern with him, and this was run up to the masthead, that is to say, to the top of one of the aerial poles, Snaggsby, who is

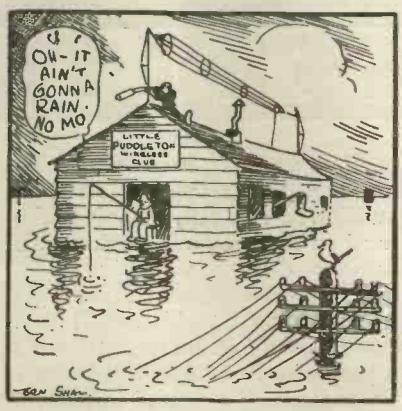
something of a climber, accomplishing the feat. The question of side lights was rather a difficult one. My own suggestion was that the General, whose ruddy countenance had not paled even in this predicament, should take his stand with his head protruding from a window on the port side, and that Professor Goop, who was feeling a little seasick, might be similarly stationed to starboard to provide the required green. As a matter of fact, I was the only one who could really get hold of the idea of port and starboard; the rest, going by their colours, would insist on calling them positive and negative.

The Port Light

Eventually, after some consultation, we found that Breadsnapp had a red pocket handkerchief, whilst Winklesworth, who is something of a dandy, was wearing green socks. He made quite a fuss at first about sacrificing one of these, but on my pointing out to him in stern words and with dark hints about a belaying-pin that his sacrifice was for the common good, he reluctantly consented. The handkerchief and the sock were draped over a couple of valves attached by a length of flex to the club accumulator and hung from the proper windows.

Land Ho!

The Admiral now proceeded to take his bearings by means of the stars. This was a little difficult since there were no stars. After some consideration he announced that his sense of direction told him that we were heading nor'-nor'-east. The rest of us felt instinctively that we were going west. It really did not matter very greatly in which direction we were proceeding since we had no means either of regulating our speed or of directing our course. My watch was first to be set, and I ordered Poddleby, who was already so wet that he could not get any wetter, to get on to the roof and to take the first spell as look-out man. Poddleby showed distinct signs of insubordination, but he cut so pathetic a figure that my heart was softened, and I stationed Gubbsworthy instead at one of the windows. The night passed rather drearily, though we tried to keep our spirits up by singing "The Animals Went In Two by Two" and "It ain't agonna Rain no Mo'." Just as daylight was filtering through, whilst the Admiral was working out with the aid of a map showing the



Keeping our spirits up by singing

world's wireless stations where he could eventually expect to beach her, there was a rousing cry from Bumpleby Brown, who was at this time doing duty as look-out. "Land ho!" he shouted, and we all leaped to the windows.

The Desert Isle

There could be no doubt about it. Right across our bows there was a stretch of the real solid stuff, and, before long, with a shock that threw us on to the floor, or rather I should say to the deck, we grounded. By this time we had got the transmitting plant working, and Poddleby was busy getting into touch with direction-finding stations. So far as we could gather from the bearings that they sent us, we appeared to be in the middle

Bumpleby Brown's "signal of distress" was nailed to the mast

of the Bay of Biscay. This, however, appeared improbable since islands there are few and far between, and most of us felt quite sure that we had arrived at Ararat. However, we landed and proceeded to explore. The territory to which we had come appeared to be an island about half a mile in circumference, and as the food question had by this time become acute we were relieved to find that the island was inhabited by quite a number of hens.

The Simple Life

These we chased and captured, and at the end of an hour you might have seen the General engaged in trying to remember how Boy Scouts light fires with damp wood, Professor Goop plucking a chicken and getting his whiskers full of feathers, Poddleby fishing with a hook made from his tiepin, and Snaggsby affixing Bumpleby Brown's shirt to the masthead as a flag of distress. I was on watch ready to give instant warning of the approach of savage tribes. Meantime we kept ourselves amused by means of the receiving set which, as the port and starboard lights were no longer required, we were able to bring into action.

Saved

At the end of three days there were distinct signs that the waters were receding; on the fourth we found that our island had ceased to be an island, and that there was a road of sorts leading from it. An exploring expedition was sent out to reconnoitre under my leadership. On reaching the summit of what had once been a neighbouring island, but was now a hill, we found ourselves looking down into a town that somehow seemed familiar. "Is it . . .? Can it . . .? Surely . . . yes," I said, "Why, it's Bilgewater Magna!" We descended into the town, told our story, which nobody believed, and returned with a lorry for the remainder of the party. All's well that ends well, but in this case the end was not all that could be desired. It is true that we were safely conveyed back to Little Puddleton and restored to the bosoms of our families; but what about our club house? It now rests in a field on the outskirts of Bilgewater Magna, and so far as we can see, unless a fresh flood kindly comes along and brings it back again, we shall have to walk six miles to attend our meetings.

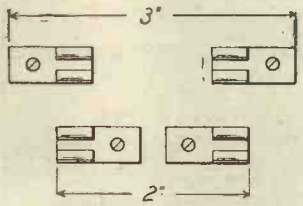
WIRELESS WAYFARER.

A Tip for Saving Space

WHEN one is making up either a complete receiving set or some small piece of apparatus the question of space is frequently rather an important one. Even such small parts as grid-leaks and fixed condensers of the clip-in type take up a great deal more room than they look at first sight as if they ought to require. If the clips for a fixed condenser are arranged in the ordinary way, as shown in the upper drawing, they require a space of no less than 3 in. long by ½ in. wide to accommodate them. By reversing the clips and mounting them as shown in the lower drawing, the necessary length over all can be reduced to about 2 in. The same method of space saving may be applied to the clips of grid-leaks and anode resistances.

Other Methods

Fixed condensers in moulded cases are provided with two lugs for fixing screws. Mounted in the ordinary way with a screw at each end, they require a panel space of 2½ in. by 1 in. As a matter of fact, one screw is quite sufficient to hold a fixed condenser firmly in position, and ⅜ in. can be saved by cutting off one of the lugs. Where wiring is done by means of square copper wire both lugs may be removed, the condenser being quite firmly secured by the two leads soldered to it. If treated



The lower diagram shows how fixed condenser clips may be mounted to economise in space.

in this way the condenser can be reduced in length to 1¾ in., a saving of ¾ in. in the panel space required.

R. W. H.

Making a Down-lead Join

WHEN erecting a twin wire aerial it is necessary to provide a sound join between the two wires constituting the down-lead, and some doubt is often experienced as to the best method of making this join both mechanically strong and electrically efficient. An ordinary soldered join, if well made, is quite satisfactory, but the following method is useful and ensures a reliable and neat join.

Take a brass crystal cup of the kind provided with three screws for fixing the crystal. Remove these screws, and, if necessary, enlarge the three holes so that a piece of 7/22 stranded copper aerial wire will just pass through each. Thoroughly clean the inside of the cup with emery paper, then cut short the screw passing through the base of the cup so that when it is inserted and screwed up tightly it just projects into the inside of the cup. Make one of the down-lead wires long enough to reach the lead-in device, and thread the crystal cup on to this

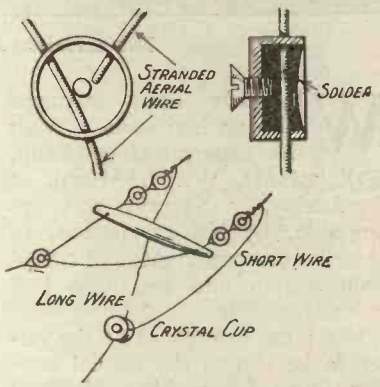


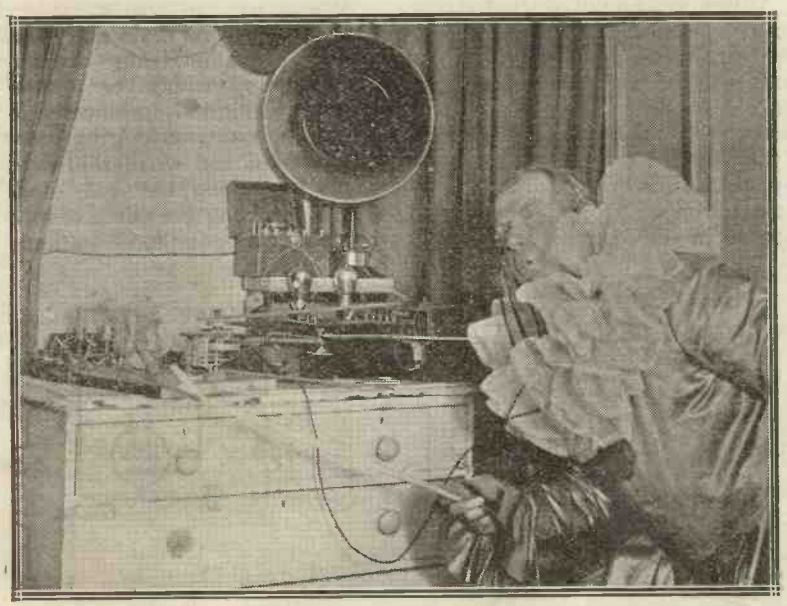
Diagram illustrating how the join is made.

through two of the holes in the side as shown in the above diagram. Into the other hole push the end of the shorter down-lead wire, hold it tightly in this position, and pull the crystal cup along the longer wire until the wires are arranged Y-shaped. Having found the position for the cup, note it, and then clean thoroughly with emery paper those portions of the wires which will be inside the cup.

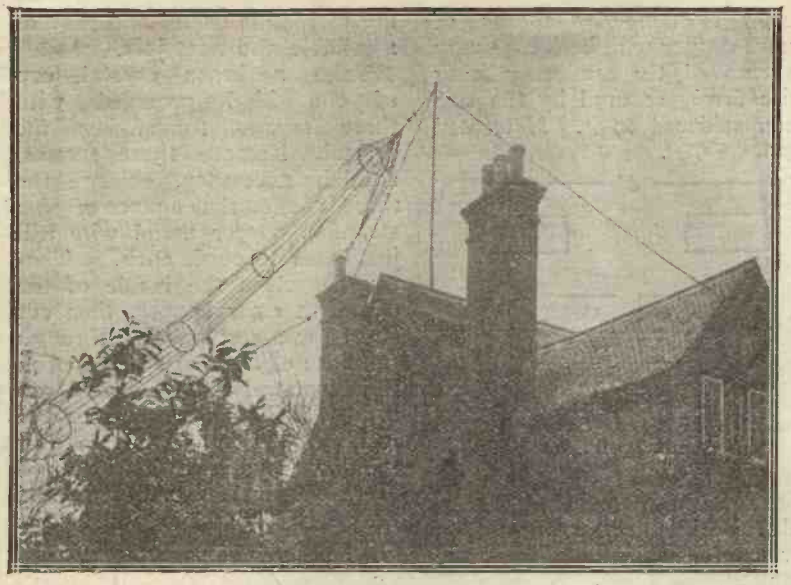
To complete the join, place a *small* quantity of Fluxite on the wires and the inside of the cup, hold a thick stick of solder over the cup, and, using a very hot soldering iron, melt into the cup sufficient solder to fill it, making sure that the solder adheres properly to the cup and to the wires.

A joint made in this manner will scarcely be affected by atmospheric corrosion, and it will not be necessary to varnish it or bind it with waterproof tape.

D. J. S. H.



Our photograph shows Mr. Dave Burnaby, of the "Co-optimists," tuning in KDKA with Mr. Harris' "Low-Loss Tuner for Short Waves."



The aerial at 2DX, Camberley.

"How I Worked Australia"

An Interview with Mr. W. K. ALFORD.

Including a description of the interesting transmitting and receiving station 2DX.

WE have been favoured with an invitation to visit the experimental station, 2DX, of Mr. W. K. Alford, at Camberley, in Surrey, and we are able, by his permission, to describe our experiences of actual transmission and reception just as we found it.

We were interested at the offset to be shown the official confirmation, from Mr. Maxwell Howden, Melbourne, Australia, of successful two-way working with his station on the evening of November 24 last—a distance of over 11,000 miles—and we understand that this constitutes a record, as yet unconfirmed, in that only 68 watts were employed, the aerial current being only .75 amperes on a wavelength of 98 metres. It appears that the previous evening Mr. Alford had performed a number of experiments with various modifications of the transmitting circuits in conjunction with 7EC of Copenhagen—the actual observed aerial current being kept constant throughout. One adjustment was reported as producing an extraordinary increase in signal strength, and this adjustment still existed when 3BQ was worked the following evening.

Real Measurements

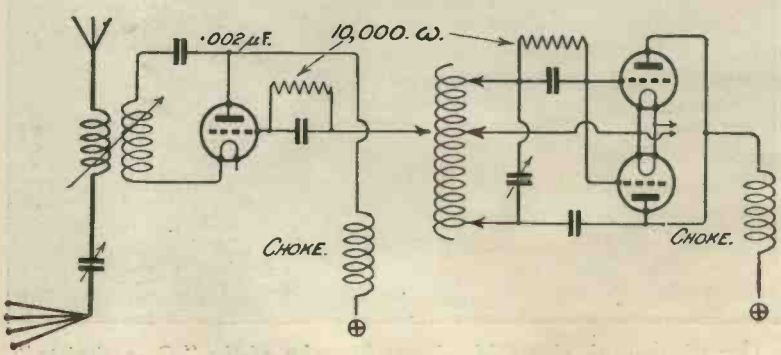
On arrival in Mr. Alford's "chamber of mysteries," we found an interesting array of everything pertaining to the wireless science, and were particularly struck by the large number of measuring instruments which must be of inestimable use. We noticed a particularly beautiful little instrument for the rapid determination of valve characteristics—this gave simultaneous readings of H.T., L.T., and grid voltage, together with anode and filament current—reducing the process, as Mr. Alford put it, to the simplicity of reading a gas meter! We also noticed an Elliott six-range substandard instrument and a very fine Telefunken standard variable condenser.

The Supersonic Receiver

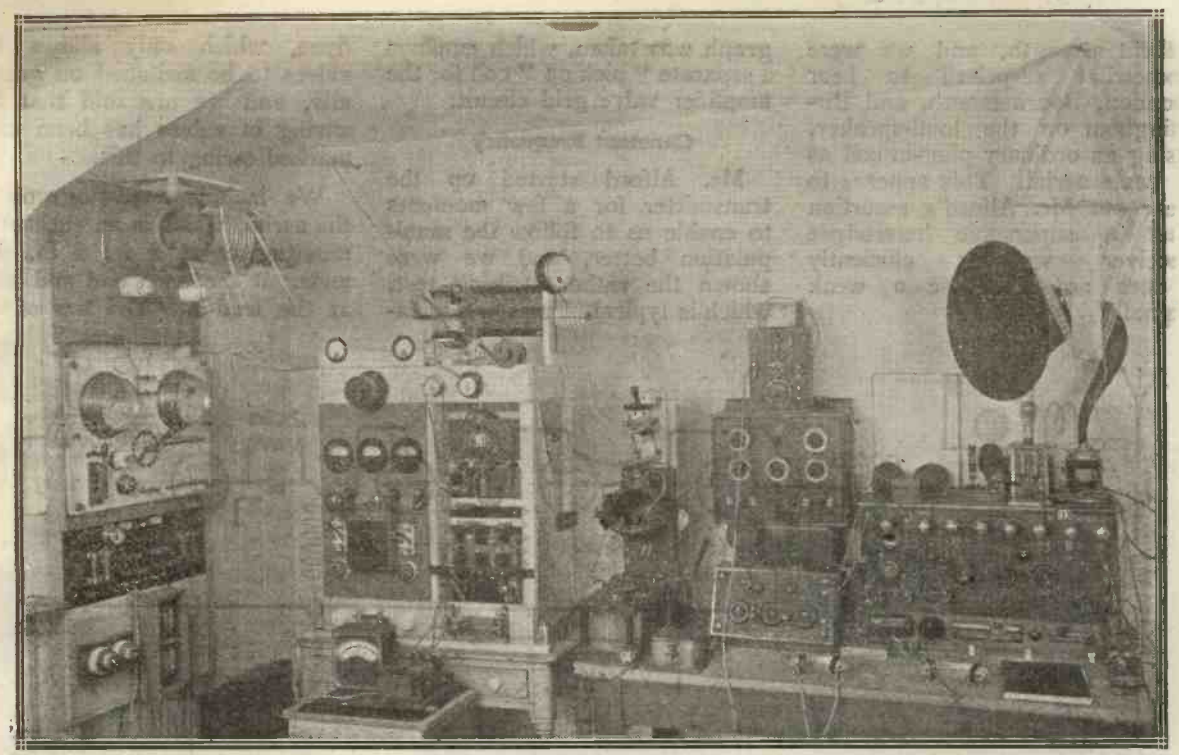
When we finally settled down to a systematic examination of the transmitting and receiving apparatus, we at once recognised an old friend in the form of the Armstrong Supersonic Heterodyne, designed and constructed by Mr. Alford, and of which a description with photographs appeared in the March, 1924, issue of *Modern Wireless*. We were informed that it had undergone considerable modification since that date in order that it might successfully function on ultra-short wavelengths. It now operates quite efficiently down to 18 metres, and Mr. Alford demonstrated to us the rather remarkable fact that an ordinary R type valve, complete in its cap, can be made to oscillate freely at this frequency. This valve, of course, functions as the frequency-changer in the super-heterodyne.

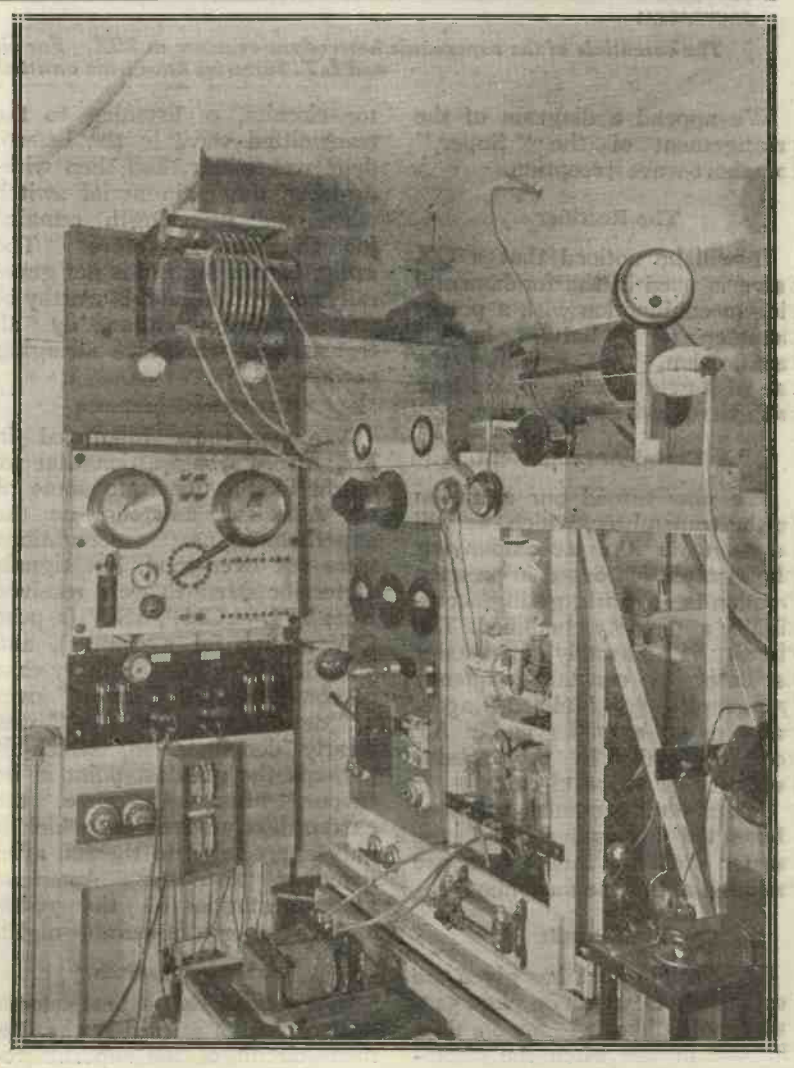
A Special Instrument

We were shown a second super-heterodyne in an unfinished condition embodying Igranic components, which we understood is designed specifically for operation on wavelengths below 100 metres, and which will eventually supersede the old model which is feeling the effect of more or less continuous modification.



The Master Oscillator circuit used at 2DX.





Above: The transmitting and receiving apparatus at 2DX. Notice the supersonic heterodyne receiver on the right.

Below: A close-up of the transmitting apparatus.

The general layout of the receiving apparatus is shown in the accompanying photograph.

Broadcast Reception

A demonstration of ordinary broadcast reception followed, using the " fundamental " end of the super-heterodyne as a H.F. and rect. receiver, and we were at once struck with the extraordinary volume and purity of 2 LO at 35 miles distant on the senior Magnavox loud-speaker. On inquiry, we found that the cause was the small instrument seen standing on the superheterodyne and next to the Magnavox. and incorporating two Myers' valves and an L.S.5. This, it appears, is a modified form of resistance capacity note magnifier, in which the second Myers' valve is used as a " grid-damper " to the L.S.5.

We hope that we may hear more of this after the formalities of patenting are complete.

Mr. Alford now changed over to the supersonic method of reception, using the loop aerial shown in the photograph. All the main stations came in at ex-

cellent strength, and we were somewhat surprised to hear London, Bournemouth, and Birmingham on the loud-speaker, using an ordinary plug-in coil as a frame aerial. This appears to bear out Mr. Alford's assertion that a supersonic heterodyne receiver working efficiently "does not recognise a weak signal."

graph was taken, which employs a separate "pick up" coil for the amplifier valve grid circuit.

Constant Frequency

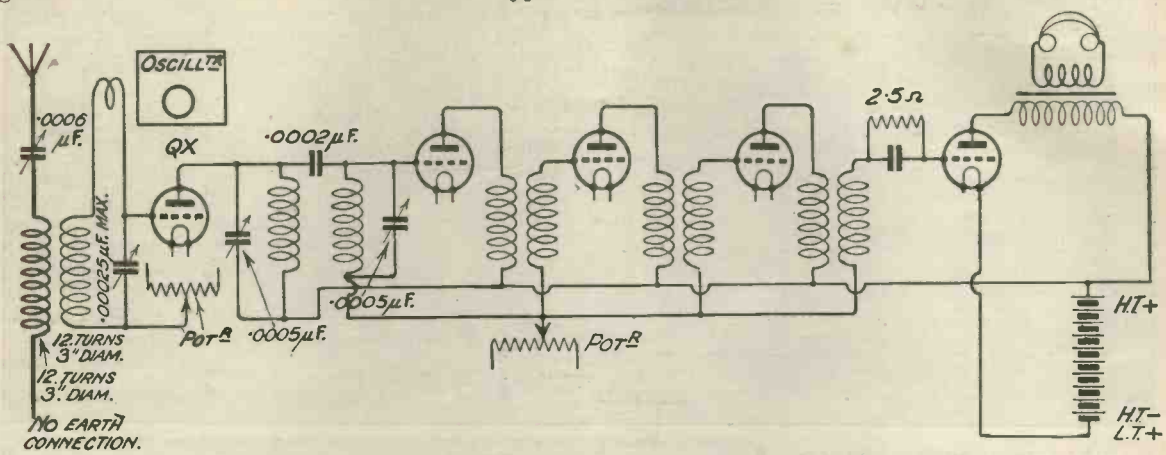
Mr. Alford started up the transmitter for a few moments to enable us to follow the manipulation better, and we were shown the rather striking test, which is typical of master oscillator circuits, of listening to the transmitted wave in the heterodyne wavemeter, and then withdrawing the main aerial switch when the wavelength remains just the same as before. The utility of this feature is not generally recognised, and is worthy of considerable attention by all transmitters who have swinging aerials.

dyne, which only allows the valves to be switched on gradually, and we are told that the saving in valves has been most marked owing to this.

We include a photograph of the aerial, which is an eight-wire tapering cage, 4 ft. 6 in. diameter at the open end and 1 ft. at the lead-in. The top of the pole on the house is about 70 ft. above the ground.

An eight-wire fan counterpoise is disposed directly beneath the aerial, and is adequately insulated, as is the aerial itself, with large "drip-ring" insulators.

"My work with Australia," said Mr. Alford, "was carried out without great difficulty simply because I have always made a point of adjusting every part of the installation—aerial counterpoise, transmitter, receiver, batteries—everything, in fact, so that it can be relied upon to work efficiently at all times, and not to let me down just when favourable conditions occur. Nothing is more exasperating than to find that a quarter of an hour's work is required to get the transmitter going, and that, after that time has elapsed, the good conditions have completely vanished."



The essentials of the supersonic heterodyne receiver at 2DX. For simplicity the filament connections and L.T. batteries have been omitted.

We append a diagram of the arrangement of the "Super" for short-wave reception.

The Rectifier

It will be noticed that a QX valve is used in the fundamental side in conjunction with a potentiometer for "bottom bend" rectification, thus avoiding the use of a grid condenser and leak with the possibility of noise.

A Useful Arrangement

We now turned our attention to the transmitter, which, as will be seen in the accompanying photograph, is housed in an open wooden framework, giving accessibility and safety combined. The circuit is normally a master oscillator or constant-frequency type employing a Mullard O.250c. valve as an amplifier and 2 AT 40's in parallel in the master oscillator or drive circuit.

The main inductances are seen above the big valve, and the master oscillator inductances are mounted above the switchboard.

The Circuit

The circuit which has given the best results is shown on page 542, but is more difficult to handle than the one in use when the photo-

American Amateurs

We were now interested in Mr. Alford's suggestion that we might like to listen to some of the American amateurs on the superheterodyne. Conditions were not over-good, but signals of terrific strength were received from 1PL—1CMP, 1SW (a pure CW station for a change), and 3CHG. The extraordinary ease of control of the "super" over a "detector and one step" was clearly demonstrated, which is perhaps the greatest point in its favour, after, of course, the extraordinary selectivity which is only appreciated to the full after listening to the American amateur stations on the 75-80-metre band on a favourable night.

A Master Switch

We noticed that a neat master control switch is used in the filament circuit of the superhetero-

THE INSTITUTION OF ELECTRICAL ENGINEERS

Wireless Section Meeting,

On Wednesday, 4th February, 1925, at 6 p.m.
(Light refreshments at 5.30 p.m.)
"The Optimum Damping in the Auditive Reception of Wireless Telegraph Signals."
By L. B. TURNER, M.A., and F. P. BEST, M.Sc.

Valve Notes

By

JOHN SCOTT-TAGGART,

F.Inst.P., A.M.I.E.E.

More Selectivity Notes

THERE is undoubtedly a greater tendency towards selectivity than ever before. This, no doubt, is due partly to the innate tendency in all real experimenters to extend their range and partly to the rapid increase in the number of broadcasting stations working on closely adjacent wavelengths. In the United States—the land of long-range reception — more importance has been attached to selectivity than has been the case in the British Isles. In many

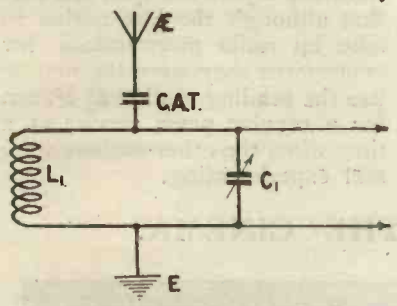


Fig. 1.—The C.A.T. method of increasing sharpness of tuning.

American towns there are sometimes several broadcasting stations working within a few hundred yards of each other and with wavelengths not far separated. I have a shrewd suspicion that there is more interference than we generally hear about, but, nevertheless, the American listener usually employs more selective apparatus than we do. It is, of course, only a natural stage in the forward movement, to develop selective receivers; but these, in my opinion, should possess selectivity without extra controls. The trouble with the old standard "loose-coupled" circuit is that there are two or three controls, whereas the popular single circuit arrangement possesses the very desirable feature of simplicity.

Some Suitable Circuits

To combine simplicity of tuning with selectivity is the ideal aim, and, fortunately, several methods of improving the selec-

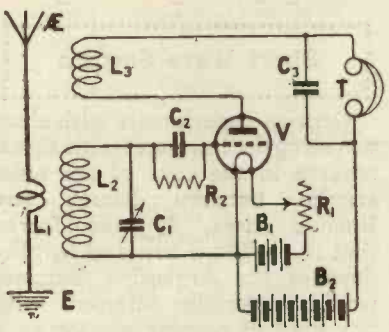


Fig. 2. — This arrangement gives good selectivity with little loss of signal strength.

tivity of the "single-circuit" tuner have been evolved.

Fig. 1 shows my C.A.T. tuning arrangement, which not only gives a big range of wavelengths with the parallel variable condenser, and ensures the readier reproduction of given designs, but greatly increases the selectivity of the receiver.

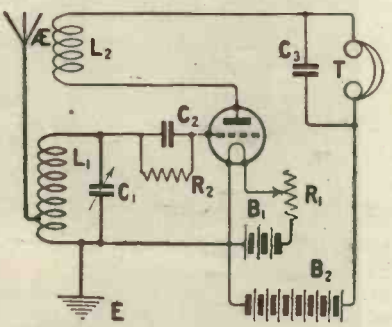


Fig. 3.—Another selective arrangement, which cannot however be applied to ordinary plug-in coils.

The free single circuit, consisting of an inductance and variable condenser, to which reaction is applied, forms a very selective arrangement and many devices for improving selectivity depend upon leaving the single oscillation circuit freer.

"Aperiodic" Aerial

Fig. 2 differs from the older loose-coupled circuit in that the aerial is (so called) aperiodic—there being no direct adjustable tuning of the aerial circuit. This aperiodic aerial arrange-

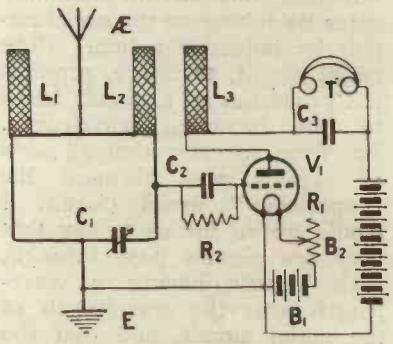


Fig. 4.—A circuit which, using plug-in coils, gives very fine selectivity.

ment gives greater selectivity with little loss of signal strength, and the figure shows reaction applied to the grid circuit, which is tuned.

The Aerial Circuit

The aerial circuit is often regarded as a general oscillator of signals which pass indiscriminately through L1 and are gracefully sorted out by the circuit L2 C1, which selects the desired signal. Others regard the aerial circuit as approximately tuned, the final selectivity being left to the tuned circuit.

Personally, I disagree with the first idea, and only partially with the second, which can only hold water when the coil L1 and the aerial capacity give a wavelength in the neighbourhood of that of the signals to be received. Usually, however, the coil L1 in

Fig. 2 is so small that the ordinary "wavelength" of the aerial circuit would be, say, only a third of that to be received. Yet the circuit will work excellently.

Inductive Tuning

My own opinion is that not only is the circuit L2 C1 tuned,

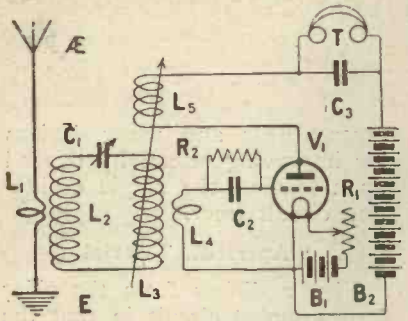


Fig. 5.—An extremely selective circuit which is very popular in America.

but that this circuit communicates its tuning to the aerial circuit by inductive action. The aerial circuit, therefore, acquires the properties of a circuit tuned to the incoming wavelength. Far from agreeing that all sorts of signals pass through the "aperiodic" aerial circuit, I would go so far as to say that very few signals pass through, such signals having a wavelength near the wavelength of the aerial circuit, and that the actual desired signals do not pass through the aerial circuit *until* and *unless* the circuit L2 C1 is tuned to their wavelength.

The whole subject of "inductive tuning" is intensely fascinating and largely unexplored. The trap coupling and aerial tuning devices described in these notes recently lend great importance to the little used principle.

Further Circuits

The arrangement of Fig. 2 has been developed into a number of selective circuits having a common principle. The Reinartz, Haynes and other circuits involve the same idea. Fig. 3 shows the aerial and earth connected not to a separate coil but to a bit of the grid coil L1. The disadvantage usually attributed to this circuit is that it is not applicable to plug-in coils. Nevertheless, the arrangement of Fig. 4 solves the problem, and also provides a variable tapping as the smaller coil L1 may be made any desired size. The coils L1 and L2 may be tried coupled together.

An American Circuit

Fig. 5 shows a circuit which is used in the U.S.A. for extreme selectivity. It will be seen that an intermediate circuit L2, L3, C1 is used, the aerial coil L1 being coupled to L2 and L4 to L3, both L1 and L4 consisting of very few turns.

Trap Tuning

Fig. 6 is a circuit using the new trap tuning described in these notes last week, which is exceptionally selective.

□ □ □

Short Wave Success

German experiments with short wavelengths have met with signal success in the case of the news service between Nauen and Buenos Aires. It was feared that the brilliant sun and lengthy days of the Argentine summer would materially interfere with any kind of regular service on a wavelength of 70 metres using an energy of only two kilowatts over the distance of 7,500 miles that lies between Nauen and the

These circuits are by no means final, but they will afford much scope for experiment and for far more selective results.

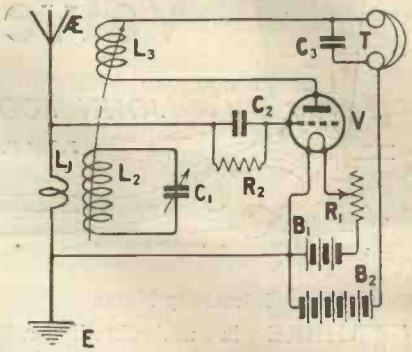
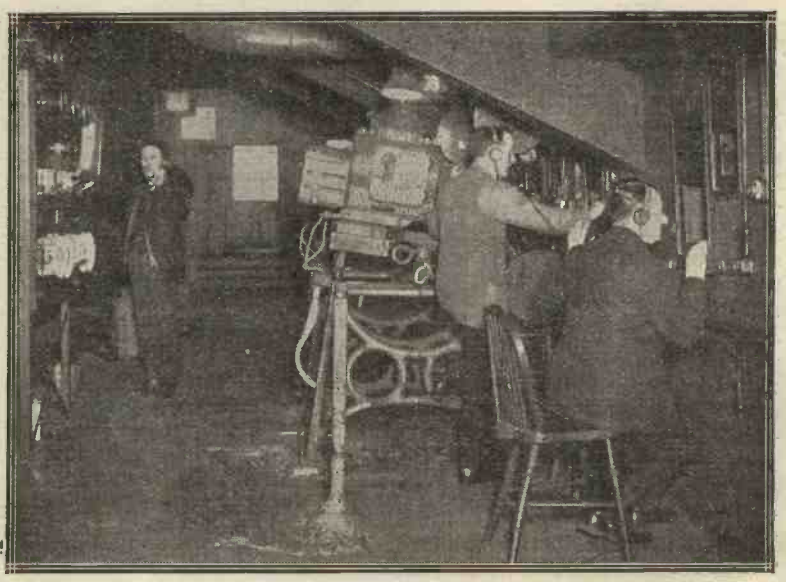


Fig. 6.—A circuit employing trap tuning is also a very effective means of obtaining selectivity.

□ □ □

receiving station at Villa Elisa. But by working during the Argentine night, irrespective of the time in Germany, it has been found possible to keep up a regular ten-hour service, using no higher energy than before, but on a wavelength of 30 metres. Germans lay stress upon the fact that although the last nation to take up radio programmes for amusement they were the first to use the sending station at Nauen for a regular news service at a time when the other nations were still experimenting.

RADIO AND THE CINEMA.



The operating room at the Shepherd's Bush Pavilion, where the synchronisation of Andre Charlot's revue with a film was tried recently. The operators showing the film were provided with headphones, whilst a loud-speaker was on the stage. Our photograph shows the manager on the right, watching the screen.

LISSENIUM

Is the high potential end of your coil well separated from the low potential end?—

YOUR coil is not as good as it ought to be if its high and low potential ends are close together. Have a look at your coils—then take a look at LISSENAGON (pronounced LISSEN-AGON) coils.

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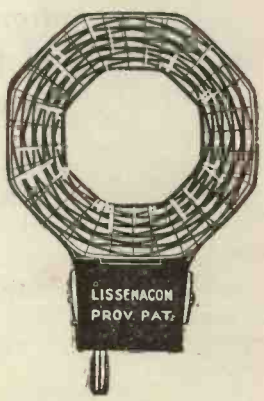
Note the Intermediate Coils 30, 40 and 60.

TABLE I. Wavelength range when used as Primary Coils with Standard P.M.G. Aerial and .001 mfd. condenser in parallel.			TABLE II. Wavelength range when used as Secondary Coils with .001 mfd. condenser in parallel.		
No. of Coil.	Minimum Wave-length.	Maximum Wave-length.	Minimum Wave-length.	Maximum Wave-length.	PRICE.
25	185	350	100	325	4/10
30	235	440	130	425	4/10
35	285	530	160	490	4/10
40	360	675	200	635	4/10
50	480	850	250	800	5/-
60	500	950	295	900	5/4
75	600	1,300	360	1,100	5/4
100	820	1,700	500	1,550	6/9
150	965	2,300	700	2,150	7/7
200	1,885	3,200	925	3,000	8/5
250	2,300	3,800	1,100	3,600	8/9
300	2,500	4,600	1,400	4,300	9/2



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Random Technicalities

By PERCY W. HARRIS, Assistant Editor.

Some Notes of general interest to the Home Constructor and Experimenter.

EVERY now and then we find a boom in some special circuit or component part which, whatever the merits may be that attach to the particular device or method, is accompanied by claims which give a false impression of the real state of affairs. Take, for instance, the question of distortion in low-frequency amplification.

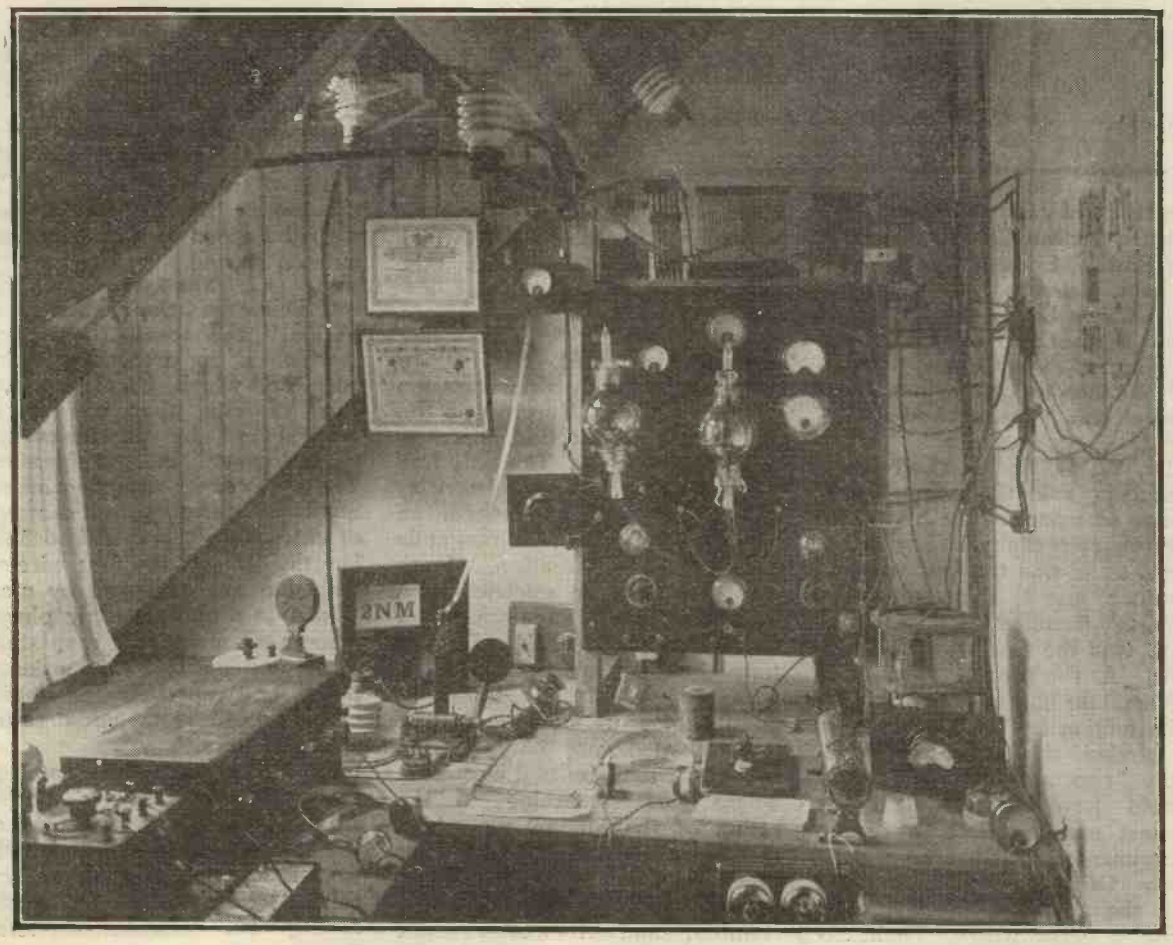
Every maker of an inter-valve transformer claims his to be distortionless, while a firm which is marketing a resistance coupling unit boldly announces that if you buy iron core transformers you are buying distortion. The tyro can well be pardoned a certain mystification, for one side or the other must be mistaken.

As a matter of fact, neither side is right. What the man in the street is concerned about is not the theoretical aspect of the case, but just what kind of results he, personally, is likely to obtain.

* * *

I have heard sets using resistance coupled note magnifiers giving horrible distortion, and on the other hand I have known sets with two stages of transformer amplification in which it was impossible for the average man to detect any distortion

BRITISH AMATEUR WORKS BRAZIL



2NM, the station of Mr. Gerald Marcuse, at Caterham, referred to in our notes on page 563.

whatever. Very often distortion occurs before the signals reach the note magnifying stages, and the impassioned advocates of resistance coupling entirely ignore the fact that there is not a single loud-speaker on the market without iron in its electro-magnetic circuit.

* * *

The great virtue of resistance capacity coupling for low-frequency amplification is that it is far easier to obtain distortionless, or nearly distortionless, reproduction by its use than by using transformers, but with a well-designed transformer amplifier, in which the transformer has been chosen to suit the valves (there is more in this than most people think), the reproduction can be particularly fine. The wonderful loud-speaker reproduction at the Albert Hall Wireless Exhibition was given by means of apparatus which had a good deal of iron in its make-up.

Much distortion in low-frequency amplification arises from the use of high-tension batteries which have developed an internal resistance far in excess of that they should normally possess. Many receivers will give excellent results with, say, 80 volts on the plates of the amplifying valves, and frequently such sets are used with a 120-volt battery. As this battery gets old, it will develop a high internal resistance which will cause a drop in voltage between terminals. The voltage, for example, may drop from 120 to 80—a still high enough figure to give good results. There is, however, a great deal of difference in the results obtained from a high-tension battery, nominally 120 volts but actually 80, and that given by a new high-tension battery whose nominal and actual voltage is 80. Shunting such a battery with a large condenser only partly eliminates the trouble.

Much distortion, too, arises from overloaded valves. With a large outdoor aerial near a broadcasting station, a set with one high frequency, a detector and two note magnifying valves may be grossly overloaded, and far better and purer results will be obtained by cutting out the high-frequency valve altogether. A very highly satisfactory set for use on the local broadcasting station, when this is not more than four or five miles away, is a crystal detector, one resistance coupled and one transformer coupled stage of note magnification. The two valves can be, for example, a DE 5B, and a B4 (or its equivalent in other makes). The current consumption of the set will then be only half an ampere, and the purity of reproduction, as well as the volume (if you use a good inter-valve transformer), will be all you can desire.

□ □ □

Matter and Radiation

Sir OLIVER LODGE'S Lecture to the R.S.G.B.

SIR OLIVER LODGE, the newly-elected president of the Radio Society of Great Britain, delivered his presidential address before the society at the Institution of Electrical Engineers, Savoy Place, W.C.2, on Wednesday, 21st inst. His subject was "Matter and Radiation."

Dr. W. H. Eccles, the retiring president, said the name Oliver Lodge was part of the history of wireless telegraphy. They might say that he was the first wireless amateur, just as their only other honorary member, Senator Marconi, was the first wireless engineer. At the present time, when the amateur had attracted universal attention by his contributions to wireless science, it was especially appropriate that they should have as president the earliest and greatest of radio experimenters. (Cheers.)

Sir Oliver Lodge remarked that the amateurs to-day were doing a great work. Their experiments were continuous, and it seemed that in ten years' time there would be seen a further advance as immense as that which had taken place already since he began his own experiments.

Radiation

Radiation, said Sir Oliver Lodge, was purely a phenomenon of the ether. There was no mechanical connection between ether and matter. The only link between them lay in electricity and magnetism; but neither an electric charge nor a magnetic field generated radiation. There must be both—an electric and a magnetic field superposed at right angles to each other. Then they had radiation, travelling with the velocity of light, at right angles to both. Atoms, when jostled, not only emitted radiation; they emitted electrons. There was something in the retina of the human eye which responded in this way, flinging away electrons at characteristic speed when it felt luminous tremors, and it was to that strange and, at present, hardly accountable, emission, that vision was due. He doubted if the electric tremors affected the nerves directly; they stimulated something specially adapted to respond to the vibrations. What stimulated the nerves was the shock of the electrons ejected by the atoms, which struck them with the speed of some thousand miles a second.

The Eye

"This is the Theory of Vision," the speaker remarked, "which is in process of being born, and which, I feel sure, contains the clue that has to be worked out by physicists and physiologists in combination. The eye is like a receiving instrument for detecting radio waves of extremely short and definite length. It was the first wireless receiving set employed by man. Vision is a photo-electric phenomenon. I make that rash statement, and say that the burden of proof, and especially the burden of disproof, rests upon future experimenters."

In seconding the vote of thanks proposed by Dr. Eccles, Admiral Sir Henry Jackson took the opportunity of expressing the Society's appreciation of the excellent work done by Dr. Eccles during his presidential term. This was referred to in our Editorial of January 7.

Plug-in H.F. or Neutrodyne Transformers.

The latest Peto-Scott H.F. Transformer with windings in six slots. Very selective tuning and particularly efficient for long-distance work. Only the highest grade ebonite used in its construction.

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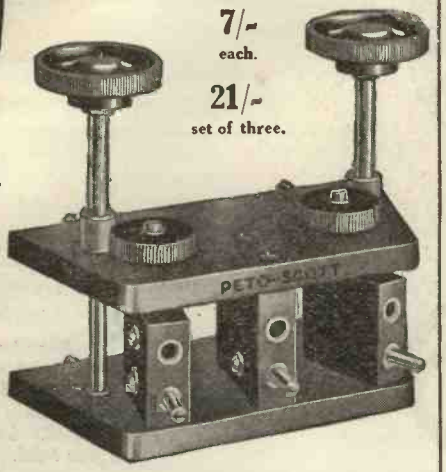

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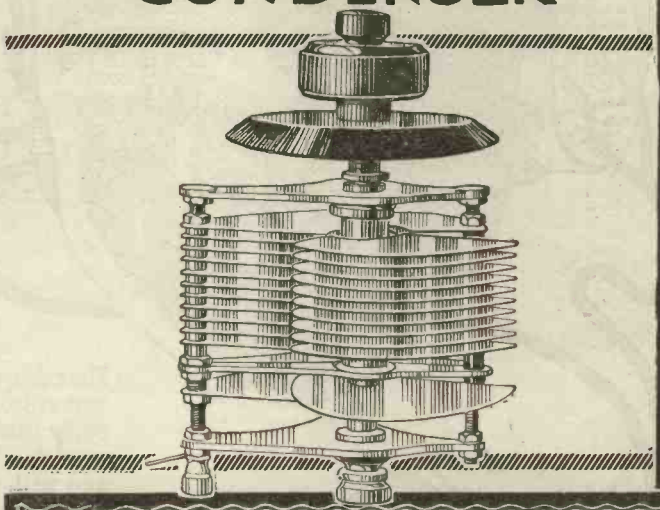

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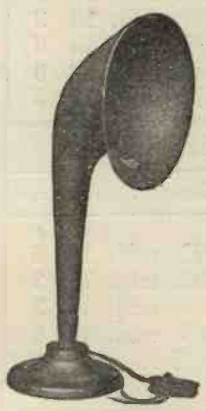

The *Table-Talker* is another Brandes quality product at moderate price. Designed to meet the need for a simple radio loud-speaking device to entertain a group of people in an average size room, its full round tones are wonderfully clear and pleasing. It is matched to the unit so that the air resistance produced will exactly balance the mechanical power of the diaphragm. This means beautiful sound-balance. Gracefully simple of line, it is finished a shade of neutral brown and is twenty-one inches high 42/-

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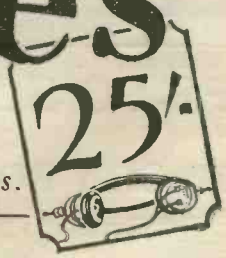

ACCEPTED AS STANDARD FOR SIXTEEN YEARS

How to Charge Accumulators from A.C. Mains

By J. E. CARPENTER.

Full constructional details are given of how to build a satisfactory home charging plant for your accumulator.

SINCE broadcasting has become popular more and more people have become owners of accumulators and heirs to their attendant inconveniences, the chief of which is fetching and carrying from the charging station. Many people would buy charging sets but that they are rather expensive for the average pocket.

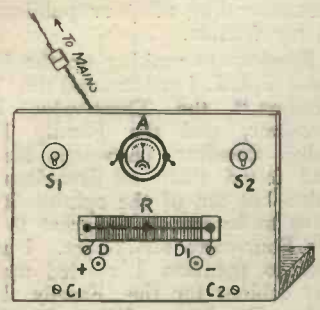

Fig. 1.—The lay-out of the board.

The charger described below was designed to charge accumulators from A.C. mains (in the writer's case 200 volts). It is economical and efficient, costing about three halfpence an hour to run and charging two 6-volt 60-amp. accumulators in about ten hours, *i.e.*, at a total cost of about eightpence each.

The Rectifier

The rectifier is of the chemical type, which, in spite of all that is said derogatory to it, proves quite efficient. The charger as described below has been used by the writer for over a year, requiring no attention during that time except an occasional fill-up with water, and has given excellent service.

The complete set should not cost more than about £3 to install.

Components Required

1. Transformer: Primary to suit mains (in the writer's case 200 volt 50 cycle); sec., 30 volt 8 amperes.

2. Switchboard: 1 ft. 6 in. long by 1 ft. broad by ¾ in. thick (mahogany or any hard wood).

Baseboard: 1 ft. 6 in. long by 1 ft. broad by 1 in. thick (deal).

3. Ammeter: 1-10 amperes (any reliable make).

4. Two ordinary tumbler switches.

5. Variable resistance, 10 ohms (this may be omitted).

6. 8 in. by 6 in. of aluminium sheet. 8 in. by 6 in. of lead sheet.

7. Four 2-lb. jam jars.

8. 1 lb. of ammonium phosphate.

Screws, wire, terminals, etc.

Construction of Switchboard

The switchboard is screwed to the baseboard at C1, C2; the transformer is mounted on the baseboard behind the panel. The ammeter is mounted in the centre of the switchboard two inches from the top, and each switch is mounted three inches from the side nearest to it and the top of the board. The two terminals D and D1 are mounted in any convenient position.

The whole lay-out may be altered to suit individual needs if necessary, but the above is convenient, and gives a symmetrical appearance (see Fig. 1).

If the resistance is included it is mounted above D and D1.

Details of the Chemical Rectifier

The chemical rectifier consists of plates of aluminium and lead immersed in a solution of ammonium phosphate—it is not advisable to use common borax, although it is cheaper, because it is not so efficient as ammonium phosphate.

Four lead and four aluminium plates are now cut each 2 in. by 6 in. One end of each plate is bored to take a 4 B.A. terminal.

The four jars are filled with solution—1 lb. of ammonium phosphate dissolved in water will be found to give a sufficiently concentrated solution. One aluminium plate and one lead plate are now placed in each jar, their ends being bent over the side of the jar to keep them in position opposite each other. Each pair of cells are now connected in parallel, *i.e.*, one lead plate is connected to the other lead plate and the one aluminium plate is connected to the other aluminium plate.

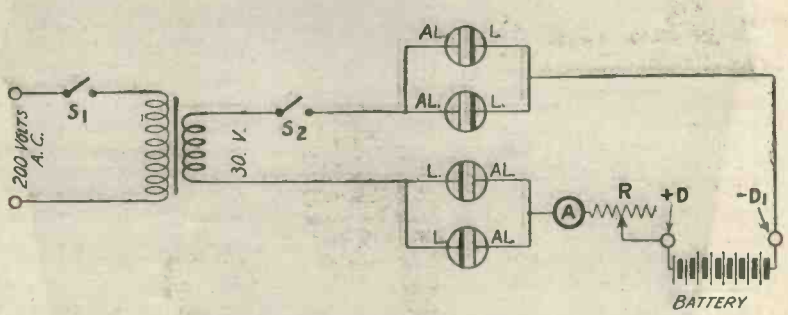

Fig. 2.—The circuit arrangement.

Assembly and Connections

The primary of the transformer is connected through the switch S1 to an ordinary lampholder through an adapter. All the connections on the switchboard are made through holes bored

through the switchboard and are carried behind it. One end of the secondary of the transformer is taken through the switch S2 to the aluminium plates of the first pair of cells of the rectifier. The other end of the secondary is connected to the lead plates of the second pair of cells of the rectifier. The lead plates of the first pair of cells are connected to the minus terminal on the switchboard. The aluminium plates of the second two cells are connected via the ammeter and the resistance to the plus terminal on the switchboard.

A glance at the circuit diagram (Fig. 2) will make these connections clear.

Performance and Upkeep

Without any resistance in circuit a direct current of 5 amperes at 20 volts is available for charging purposes at the two terminals D and D1. The accumulator should be connected to the charger as follows: The positive terminal of the accumulator should be connected to the terminal marked + on the switchboard and the negative terminal of the accumulator to the terminal marked −. Replace acid spilt from accumulators with pure acid of the correct specific gravity, but replace loss through evaporation with pure distilled water. The current delivered by the charger is suitable for charging two six-volt accumulators in series.

Control of Charging Rate

When the current is first switched on the ammeter will only indicate a current of about one ampere, but this will, however, have crept up to a steady five amperes at the end of fifteen minutes or so. The amperage may, of course, be varied by the resistance if that is included in the design. This is very useful when accumulators of small capacity are to be charged, for which five amperes is a rather heavy charging rate.

The only precaution necessary to ensure the efficient working of the charger is occasionally to fill up the rectifier jars with clean water to replace that lost by evaporation.

The handsome 4-valve T.A.T. receiver made by Mr. W. Lester; another photograph of the receiver is given on page 557.

A Reader's Four-Valve T.A.T. Receiver

SIR,—I am sending you photographs of my Four-valve T.A.T. Receiver which I made up from the description given by Mr. John Scott-Taggart in the issue of *Modern Wireless* for December, 1924. I am delighted with the results so far obtained, especially for loud-speaker work.

I only took up wireless for a hobby about ten months ago, during which time I have taken in all issues of *Wireless Weekly, Modern Wireless,* and *The Wireless Constructor.* I am glad to say all my knowledge of wireless has been gained through reading your most valuable books. I find them all full of sound, instructive, and very interesting reading from beginning to end, and have much pleasure in recommending all your publications to my friends.

Previous to making up the Four-valve T.A.T. I constructed the "All-Concert," the Three-valve Dual Receiver, and the Family Four-valve Receiver (Envelope No. 2), and found them all first-class circuits, but am of the opinion it will have to be something great to beat the Four-valve T.A.T. set. I would like to mention I started making the cabinet for the Family Four-valve Receiver. When I got my December issue of *Modern Wireless* and saw the T.A.T. set, which struck me as something good, and decided to wire it up on a 24-in. by 14-in. panel to suit the cabinet. The latter is 4 ft. high, 3 ft. 6 in. across the front, and 1 ft. 9 in. wide, made in oak, and is entirely my own design.

I use a switch in the L.T. circuit for lighting all valves, as it saves time when the filament rheostats are once adjusted. It will be seen from the photographs that I have fitted a plate-glass window in the centre of the front of the cabinet, and also a reflector inside, which enables a clear view of all the wiring to be obtained.

This is the first cabinet or piece of furniture I have made, beyond following constructional details in *Wireless Weekly* and *Modern Wireless* of small cabinets. When one's tools are very limited, as in my case, I consider such constructional hints very helpful.

All my friends say it is the best loud-speaker receiver they have heard, and they call it a "Rolls-Royce" wireless set.—Yours faithfully,

W. LESTER.

Uxbridge, Middlesex.

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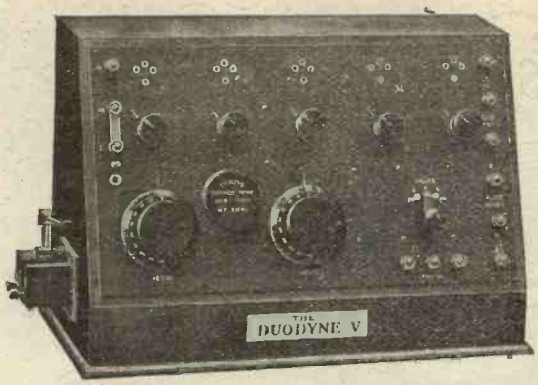

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12 × 12 × ¼ .. 8/6	12 × 6 × ¼ .. 4/6	10 × 9 × ¼ .. 5/8
14 × 12 × ¼ .. 10/-	22 × 11 × ¼ .. 15/3	9 × 5¾ × ¼ .. 3/5
16 × 12 × ¼ .. 11/6	16 × 9 × ¼ .. 9/-	10 × 5 × ¼ .. 3/3
18 × 12 × ¼ .. 13/-	12 × 11 × ¼ .. 8/3	12½ × 9¾ .. ¼ .. 7/6
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"On test, the capacities came out quite close enough to the nominal for ordinary radio purposes, the .001 uF nominal samples being about .00103 and .00091 respectively, and the .0003 uF nominal being actually around .00033 and .00026 respectively. **There was observed but a negligible greater high-frequency loss in this type than in a standard air-diaelectic condenser.**

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"As this one piece casing offers apparently considerable advantages as to permanency and independence of damp, high temperature, etc., an exceedingly strenuous test was applied to one of the samples, which was actually placed in water nearly at the boiling point for the better part of an hour. After this heroic treatment, the condenser showed a capacity which did not differ materially from that shown before, and it was still possible to get a valve to oscillate readily with this as the main tuning capacity across the grid-tuning-inductance. Evidently there need be no fears as to possible deterioration in stock of these 'Paragon-Curtis' fixed condensers."

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Making a Start in Transmission.

By PERCY W. HARRIS, M.I.R.E., Assistant Editor.

In this article further constructional details of a standardised transmission panel are given.

(Continued from page 524 of previous issue)

IN my last article I gave photographs of an experimental transmitting panel which I have found very useful in experimental transmission work. This week some constructional details and drawings are given. I do not propose to publish complete wiring diagrams of each transmission circuit, as the experimenter who has gained a licence for transmitting is quite capable of carrying out such wiring himself, provided certain technical data is made available.

Mounting Gridleaks

The " Zenite " resistance rods are sold as what appear to be porcelain tubes with flexible wires projecting through the vitrified surface. In order that they may be used in the present instrument, it is necessary to provide some form of mounting, and this, I have found, can conveniently be made as follows :—

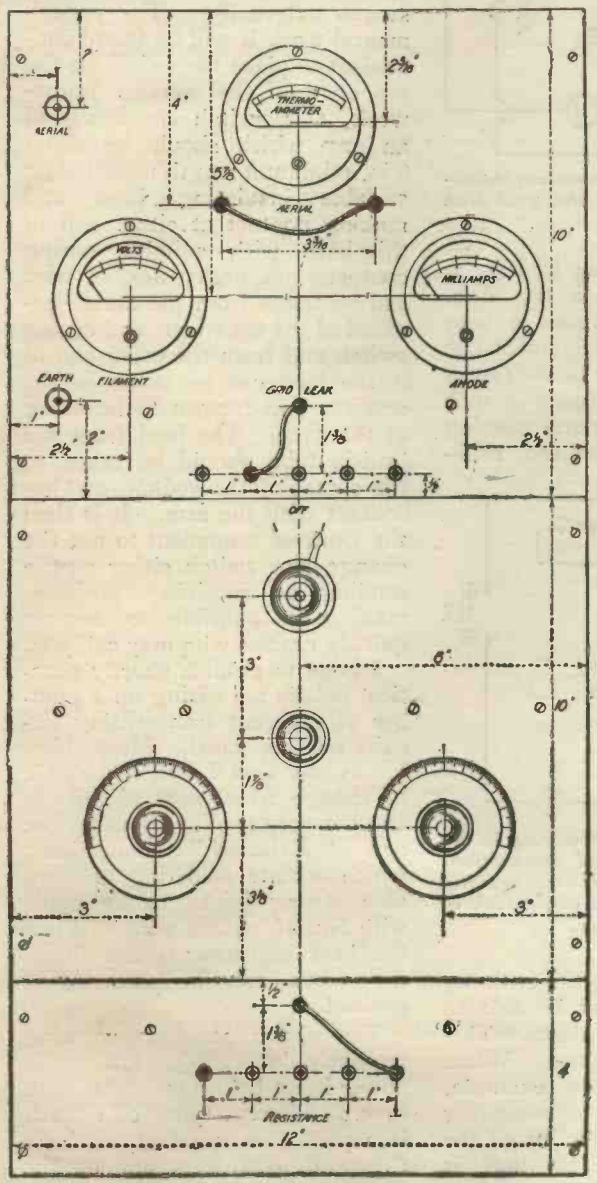


Fig. 1.—Dimensioned drawing of front of panel.

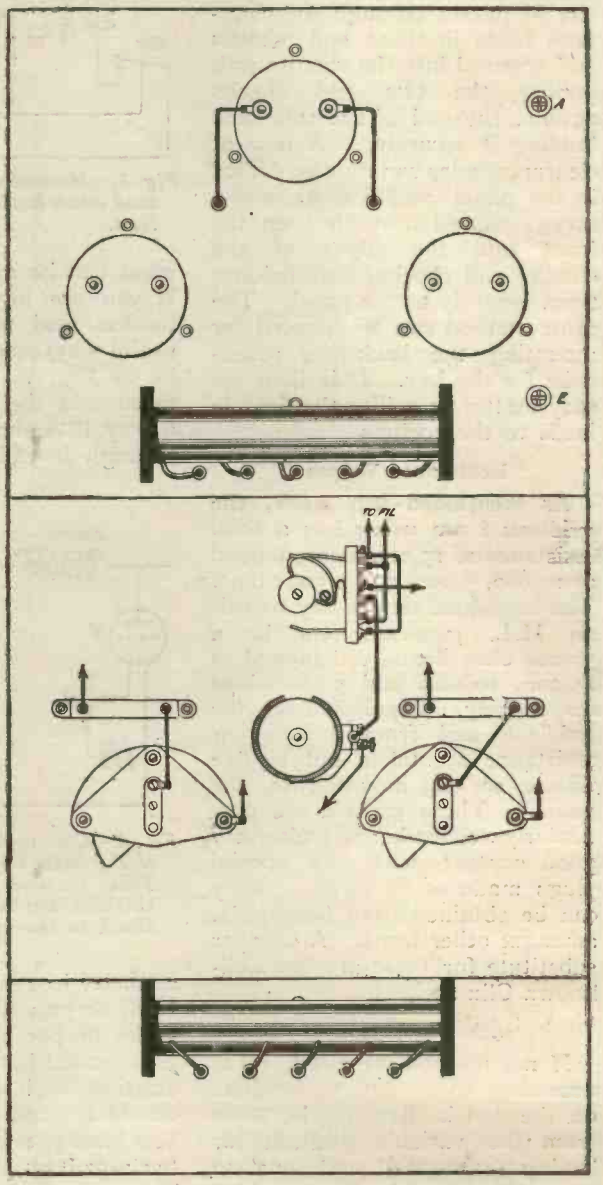


Fig. 2—Disposition of parts on back of panel.

Take two pieces of ¼-in. ebonite sheet, measuring 1½ in. square. Drill through the centre of each of these pieces a clearance hole for a 4 B.A. metal screw. Now take a piece of ⅜-in. ebonite rod, and cut it off to such a length that when inserted in the grid-leak tube it does not project at either end, but is slightly shorter than the tube itself. Now tap a hole at each end of this ebonite rod to take a 4 B.A. metal screw, and in one edge of each of the two ebonite squares tap a further hole to take a 6 B.A. metal screw.

Fixing

If, now, the two end pieces of ebonite are placed at each end of the gridleak tube with the ebonite rod inside, metal screws can be passed through the clearance holes in these end cheeks and screwed into the ebonite rod, pulling the two end cheeks against the end of the tube and holding it securely. A pair of clearance holes can now be drilled in the panel and 6 B.A. metal screws passed through from the front into the edges of the ebonite end cheeks, thus holding them securely to the panel. The same method can be adopted for mounting the back-load resistance for the key. It is then an easy matter to solder the flexible leads to the sockets.

Resistance Values

As mentioned last week, the gridleak I am using has a total resistance of 15,000 ohms, tapped at 10,000, 5,000, and 2,500 ohms. The back-load on the key to suit an M.L. generator can be a 30,000 ohm Zenite rod tapped at 15,000, 10,000, and 5,000 ohms respectively. Tappings from the gridleak and from the keying resistance are taken out to five Gibson sockets mounted in the panel. These sockets are particularly well made and make very good contact with the special plugs made to fit them. They can be obtained from Gamage's, amongst other firms. A cheaper substitute for these are the well-known Clix sockets.

Sockets

If my method is used, it is necessary to mount *six* sockets on the panels, five for the leads from the variable gridleak (or keying resistance), and one to take the flexible lead which makes contact with the grid leak or resistance. Two Gibson sockets are also used to enable the thermo-ammeter in the aerial to be shorted.

Details of Key Back-Loading

The position of the resistance in the circuit for back-loading the key will depend upon the particular keying arrangement used. If, for example, one is keying in the gridleak lead, then the arrangement can be made as in Fig. 3. If you are keying in the high-tension lead (sometimes a very useful way), the arrangement can be as Fig. 4. It is necessary to connect the resistance in such a way that the currents passing through it will affect the milli-

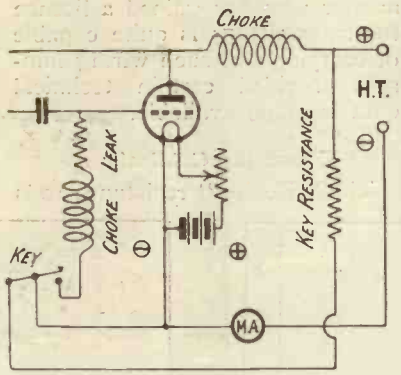


Fig. 3.—Method of connecting back-load when keying in the grid leak lead.

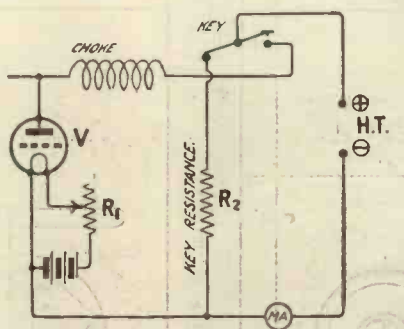


Fig. 4.—One method of keying in the H.T., with back-load connection. This method needs a carefully shielded keylever to avoid risk of shock to the operator.

ammeter just as does the ordinary load, or you will not be able to make proper adjustments. This is indicated in the figure. When starting work with, for example, an M.L. converter (presuming you have previously adjusted the back-load resistance so that it passes a current exactly equal to the ordinary load current), it is only necessary to vary the starting resistance of the machine until you get exactly the current you require (say, 30 milliamps), when the key is up. You can then rest assured of starting up on the power you want without a lot of preliminary adjustments "on the air," which are very annoying to other users and make your own work sound rather "sloppy."

Change-Over Switch

It will be noticed that no provision has been made in the set itself for a change-over switch for sending and receiving. This was not considered advisable, as it is always better to mount this switch externally. For experimental work it will be found convenient to place the switch on the top edge of the wooden framework, this switch consisting of an arm which should be about 6 in. minimum length mounted on suitable insulating base and making contact at either end of this base with suitable spring contacts. A heavy flexible wire can be taken from the aerial terminal of the set to one end of this switch and from the other end of it the lead can be taken to the receiver you happen to be using at the time. The lead from the lead-in tube should be taken to the centre of the switch, making contact with the arm. It is then the work of a moment to put the change-over switch either on the sending or receiving position, making it possible to answer quickly anyone who may call you.

I hope to publish shortly practical details for wiring up a number of different transmitting circuits on this panel. Meanwhile, I may say that I find it possible to change from one circuit to another very rapidly by using the new "Kriscros" connections, which obviate soldering and enable strong joints to be made with No. 16 square wire. When the best adjustments are found the wires can be soldered if desired.

The above panel is working regularly at 2MQ, and with power input below 10 watts, with several different types of circuit, is reported at good strength in Cornwall, Aberdeen, and on the Tyne.

Broadcasting in Czecho-Slovakia

By Capt. L. F. PLUGGE, B.Sc., F.R.Ast.Soc., F.R.Met.S.

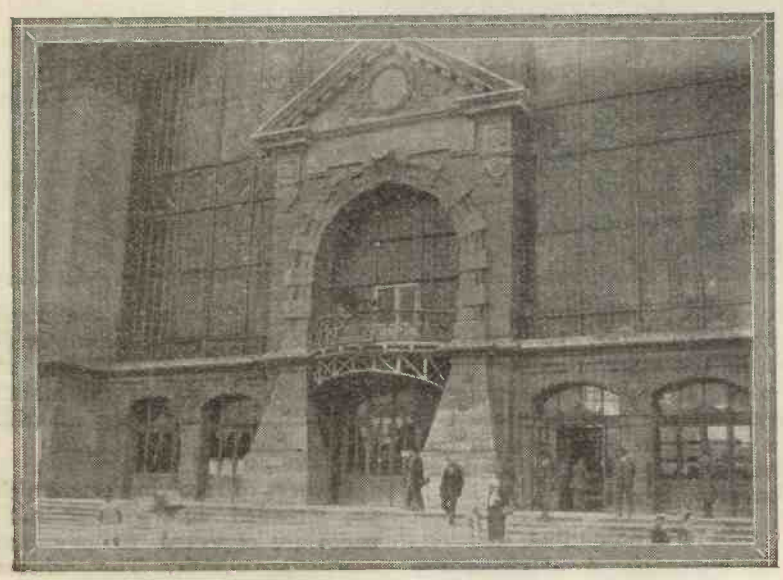
IT is only quite recently that Czecho-Slovakia has been gifted with what one might call a real broadcasting service. The driving energy behind the movement has been the *Radio Journal*.

The *Radio Journal* was the first wireless periodical to be published in Prague, and ever since its existence it has not ceased to fight Government Departments and other bodies, who were opposed to public wireless transmissions, for permission to form a broadcasting company and thus provide listeners over there with such entertainment.

The pavilion of the "Radio Journal" Co. at the Exhibition which was held at Prague recently.

The *Radio Journal* Broadcasting Co.

However, successfully overcoming the considerable number of difficulties, a company was finally formed under the name of the *Radio Journal* Broadcasting Company, Ltd. Funds were small at first, and the company had to make use of anything they could get hold of. For this reason the first station was erected at Kbel. Kbel is a name given to an aerodrome in the neighbourhood of Prague, on the landing ground of which a spark transmitting station on 900 metres had already been in use for some time during the war for aeronautical work. The officials of the *Radio Journal* made use of such gear as they possibly could, and, after a few months, they were able to send out their first programme on telephony. Results completely justified their efforts, and the interest taken in the matter generally, and as well as possibilities of the scheme, finally dawned on the local authorities. The company at last was granted a monopoly from the Government, and quite recently its capital has been increased to one million crowns (£7,000 approximately), the Government insisting, however, on holding 51 per cent. of these shares.



An Amplion loud-speaker placed on the gallery of the Industrial Palace of the Exhibition for the purpose of broadcasting the opening speeches.

The Kbel Station

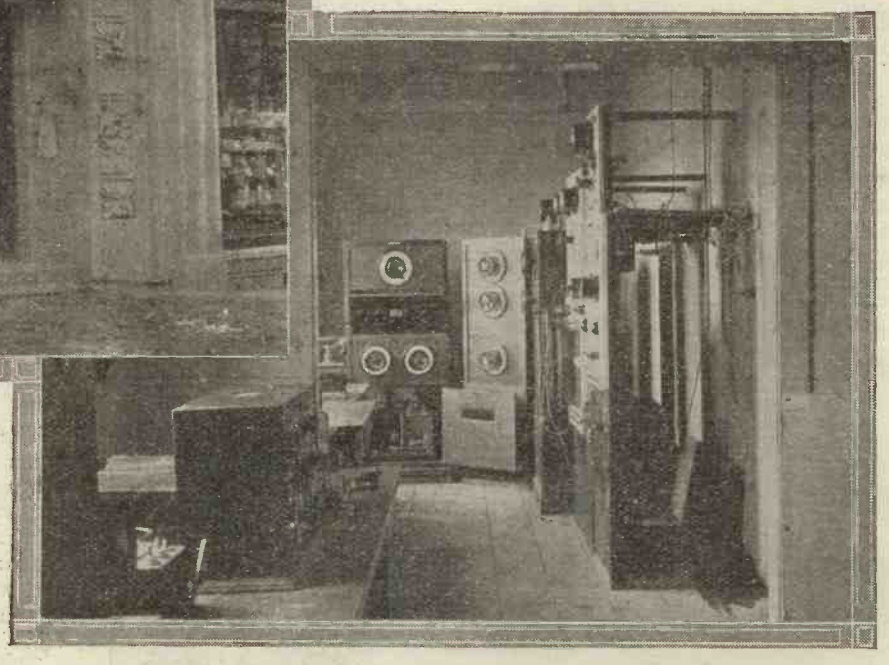
The Kbel broadcasting station is now working regularly on a 1,150 metre wavelength, and the power is approximately one kilowatt. Particulars of the concerts, Exchange quotations, and weather reports can be found in the current number of *Modern Wireless*.

The success attended by the Kbel station decided the company to erect a second station at Komarow, near Brno, Moravia. This station is transmitting at present daily weather reports, but a daily transmission of concerts has not yet been arranged. The wavelength of this station is 1,800 metres, and the power used is approximately the same as that used for the company's station at Kbel.

Special Transmissions

Although it has not been possible for the *Radio Journal* Broadcasting Company to carry out any outside broadcast on the scale that we are used to in this country, the company has, nevertheless, sent out special transmissions on different occasions. For instance, a special performance was given on the occasion of the centenary festival of the great Czechian music composer, Smetana. The opening ceremony of the Congress of Bimco was broadcast (the First International Management Congress), and also a course of lectures from the Esperanto Institute.

The entrance to the offices of the "Radio Journal" Broadcasting Co. at Prague.



The 1 KW transmitter at the Kbel aerodrome station near Prague. This transmitter is of German manufacture.

Experimental Stages

Broadcasting in Czecho-Slovakia can be regarded as just emerging from its experimental stage. Another station near Prague is nearing completion. The transmitting gear to be used will be French, and supplied by the Société Française Radio-Electrique. This station, which will be erected at Strasnice, will adopt a wavelength of 450 metres and the power will be 500 watts. This station is expected to start transmitting within the next two or three weeks. It may be interesting to note that the gear at present in use at Kbel is of German manufacture, being made by the Huth Company, Berlin.

An Exhibition

An international exhibition was recently held at Prague, and the *Radio Journal* arranged a subsection where radio instruments made by firms or amateurs could be exhibited. It is in no small way due to this display, which helped to bring wireless to the notice of the public, that the difficulties put forward by the Government were overcome. In addition to this, the *Radio Journal* Broadcasting Company arranged for the broadcasting all over the exhibition of the opening addresses, transmitting them via their Kbel station. Up to date, however, the Ministry of Postes et Telegraphs, according to an early regulation still in force, controls and works all wireless transmissions in general. From the modulation down to the microphone, including amplification, the work is carried out by the company, as are the concerts in the studio and the arrangements for the Exchange and weather reports.

Finance

Funds for covering the expenses of the service are obtained in a manner similar to that used in our country, *e.g.*, by subscription. The price of a licence at present is 20 crowns per month (approximately 4s. per month).

Licences

Owners of receiving sets which are intended for greater audiences are expected to pay 100 crowns per month. This includes the use of Exchange reports, which are at present sent in code.

Among the plans which the Government of Czecho-Slovakia have in view is the erection at Prague of a high-powered station which will use approximately 5 kilowatts, with a view of covering a range which would include the whole of Bohemia and Moravia. The erection of stations is also contemplated at Bratislava (the town of three names—also called Pressburg and Pozsony—and at Kosice, Slovensko. It is expected, however, that several months will elapse before these stations will be transmitting regular programmes.

Although the Czecho-Slovakian programmes do not, as a rule, contain any events of striking importance, they are mostly of a sound musical character, and are especially filled with classical items.

Experimental Anode Resistances and Grid Leaks

By JOHN W. BARBER.

WHEN experimenting with resistance - capacity coupled amplifiers, it is often desirable to try the effect of a little higher or lower value of resistance, either in the anode circuit or as a grid leak. Some types of resistance sold commercially, while being excellent in every way, do not permit one to add or take away a little resistance. A very simple yet effective form of resistance may be made from "scrap," and may be varied quite easily, until the best value has been arrived at. All that is required will be two terminals, some Indian ink, and a piece of paste-board, such as a visiting-card.

Anode Resistances

For an anode resistance, make two holes ¾ in. apart, and paint round the holes with Indian ink. Insert the terminals, and ensure that the ink rings extend just beyond the base of the terminals. A nut should be screwed on to the shank of each terminal in order that good contact may be made. A pencil line may now be drawn across the card, between the terminals, and its thickness increased until the best value is found. A quickly applied coat of shellac varnish will keep the resistance reasonably constant.

Instead of pencil lines, Indian ink may be used, and is less noisy after some use.

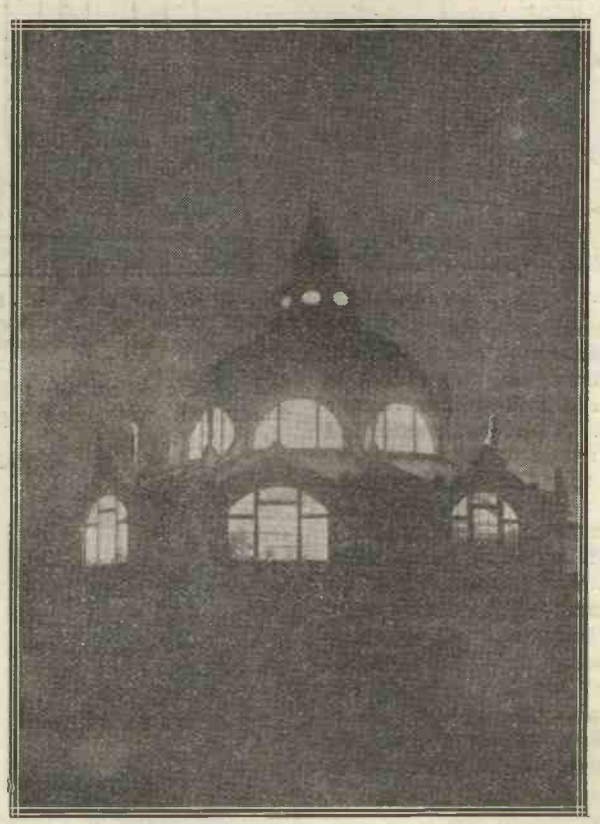
For a grid leak the terminals should be 1½ in. apart. In this manner the best value of resistance and leak may be found and the resistance amplifier operated at its best.

A Useful Measuring Unit

CALIBRATION

THE instrument described in Vol. 5, No. 13, must, of course, be calibrated from some standard before it can be used as a wave - meter for transmitting purposes. The method to be adopted will depend upon the nature of the standard, *i.e.*, whether it is a buzzer or heterodyne instrument. When a buzzer wave-meter is used for the operation, the milliammeter of the measuring instrument should be replaced with a pair of 'phones, after which the two instruments may be placed fairly close together, and it will be found that the usual buzz will be heard when the new instrument is in resonance with the standard. A calibration of fair accuracy can be obtained in this way, but a heterodyne standard is to be preferred. In this case a dip in the milliammeter reading will be the indication of resonance between the standard and the new unit, and the usual series of points should be plotted.

THE PRAGUE EXHIBITION



The pavilion at night. Night concerts were given by the "Radio Journal" before large audiences—British, French and Swiss stations being received on loud-speakers.

How to Build a Sensitive . . . . . Milliammeter

By J. F. CASTLE.

This instrument, of which full constructional details are given, may be made for the modest sum of five shillings.

AT first sight the cost of this instrument may seem absurd, as the prospect did to me at first. However, I am thoroughly satisfied with the performance of the finished instrument. It is of the moving coil type, and has a scale about 6 cm. in radius. The list of materials is as follows :—One piece of copper foil, 5 in. by 1 in., ½ oz. No. 40 S.W.G. copper wire enamelled; one half-metre of phosphor-bronze strip, about ½ mm. wide; one ex-army type magnet from telephone magneto

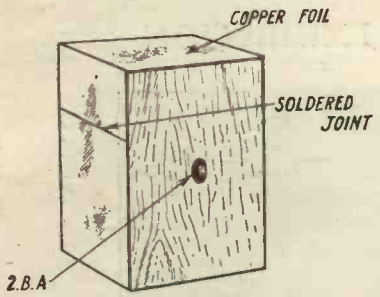


Fig. 1 shows details of the former on which the coil is wound.

(I think); a piece of fine aluminium wire about 30 S.W.G., about 10 cm. long; wood, screws, and two terminals. The coil is wound on a rectangular copper foil frame. A piece of copper foil is placed round a wooden block, as in Fig. 1, and soldered to make the frame. The dimensions must suit the magnet you obtain. I should not have the coil more than 1 in. wide on account of its large moment of inertia and consequent oscillation. The frame being made, put two pieces of card, one on each side of the wooden frame, and bore a hole to take a 2B.A. rod in the middle to act as a spindle for winding the coil.

Winding the Coil

Now fill up the angles with paraffin wax, so that the wire will not go down between the wood and the cardboard. Wind this

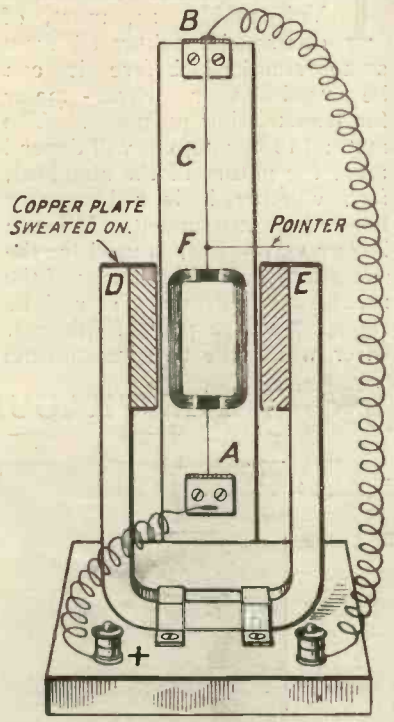


Fig. 2.—Illustrating how the component parts are arranged in the complete instrument.

full of the ½ oz. of 40 S.W.G. enamelled wire, leaving about

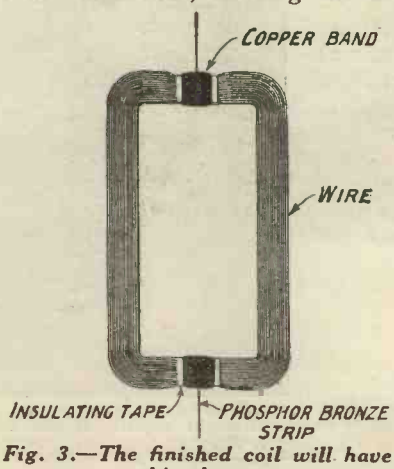


Fig. 3.—The finished coil will have this shape.

1 in. or so to make connections. Shellac the coil, and remove it from its wooden former. At the top and bottom wrap a narrow strip about ¼ in. wide of insulating tape, and over this a ring of annealed copper foil. Solder the two ends of the coil to these rings, and Fig. 3 will indicate the appearance of the finished coil.

The Magnet

The next thing is the magnet. This has to be fitted with iron pole pieces the same length as the coil. These may be filed to shape, and a copper plate sweated on

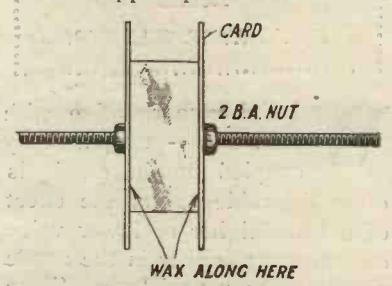


Fig. 4.—How the side supports for the coil-former are mounted.

the top to hold them to the magnet. It is useless to try and drill the magnet. I broke two drills while trying, and had to resort to the above method. The magnet has then to be mounted in a vertical position so that the coil is free to rotate between the pole pieces. A piece of phosphor bronze strip is soldered to a brass plate A (Fig. 2), which is attached to one terminal of the instrument. The other end of this piece is soldered to the ring at one end of the coil. This is a delicate job, and is best done with a very hot iron. The remaining strip is soldered, one end to the other ring on the coil, and the other end to a brass strip B on the wooden pillar C. This brass strip forms the other terminal.

A suitable scale is made of

cardboard, to be glued on the poles of the magnet at D and E. The pointer is made up of a piece of aluminium wire, flattened at one end to make the actual pointer, and at the other end as in Fig. 5. This is clamped on the phosphor bronze strip just above the coil at F. The brass strips A and B (Fig. 2) are then connected to the terminals of the instrument. The tension of the phosphor bronze may be adjusted by bending B. It is best to have it just tight enough to hold the coil fairly rigid laterally. It will be found that it turns easily enough.

Action

A word as to its performance. If an old flash lamp battery is taken to pieces and one cell is connected, the coil will be found to turn right over one way or another. By reversing the connections, it may be made to go the right way across the scale.

The positive terminal is then marked in some way. I have connected this in a two valve set to measure the plate current, and it sends the pointer right across the scale for about two or three milliamps. When the set oscillates it drops back about 2 cm.

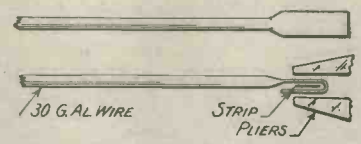


Fig. 5.—Details of the pointer.

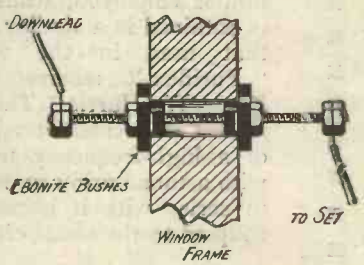
across the scale. The effect of grid bias can be shown most clearly. If you touch the high tension positive with a damp finger the needle goes right across the scale. This instrument can easily be calibrated with a borrowed milliammeter, and I am finding it most useful.

I hope these few suggestions will be of interest to fellow experimenters who have more enthusiasm than money. If anyone has any difficulty in making it I should be only too pleased to answer any queries in my power.

The luxurious 4-valve T.A.T. receiver, made by Mr. Lester, of which another photograph appears elsewhere.

A Simple Lead-In

A LEAD-IN which is simple to make, and very effective, is shown in the accompanying illustration. A suitable length of 2 B.A. screwed brass rod, six 2 B.A. nuts, and two ebonite bushes are all the materials required. The ebonite bushes should have 2 B.A. clearance holes drilled in them, or even larger holes would be an advantage. First drill a hole in a convenient place through the window sash or wooden framework of the window. This should be of such size as to provide a tight fit for the ebonite bushes, which are fitted in as shown. The 2 B.A. rod is then passed through and secured on each side by a nut.



The lead-in.

If the holes in the bushes are larger than 2 B.A. clearance, washers should be placed under each nut, the rod being arranged concentrically in the holes, and the nuts screwed up tightly. Two nuts are then placed on each end of the rod; the down-lead of the aerial is securely clamped between the two nuts on the outside, while the lead to the set is clamped between those on the inside.

If it is desired, the down-lead and the lead to the set may be soldered to the brass rod in their respective positions. If this is not done it will be advisable to keep these contacts clean, and tighten them up occasionally.

D. J. S. H.

A Two-Valv for Pure

By STANLEY G. RATTE

Full constructional details are her and economical receiver em

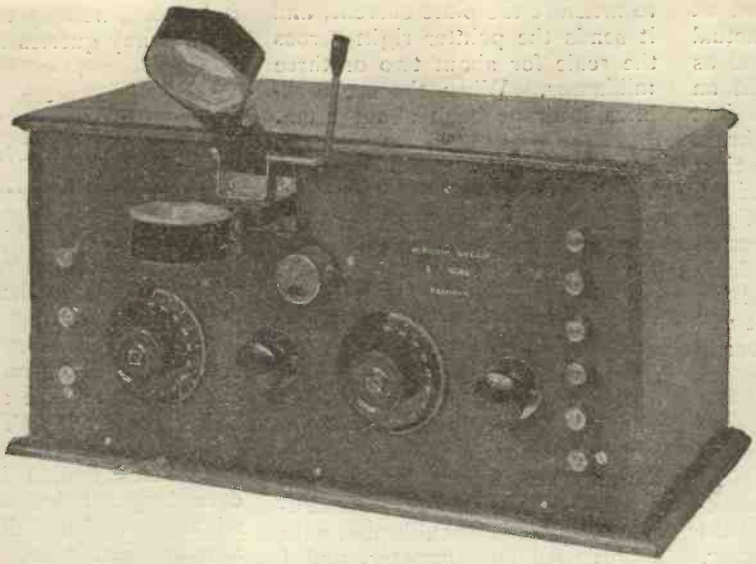


Fig. 1.—The handsome appearance of the receiver may be seen in this photograph. The novel form of crystal detector seen in the centre of the panel should be noted.

THE receiver illustrated in the photographs possesses two rather interesting features in that crystal rectification is employed, whilst reaction is obtained in a similar manner to that used in the well-known "Puriflex" receiver by Mr. Percy W. Harris. This method, it will be remembered, consists of a high-frequency transformer with a tuned primary, and having in series with it a reaction coil coupled to the aerial circuit.

Instability

Using this arrangement it may be found that the receiver has a tendency to oscillate, but with average careful handling, some regard to the value of H.T. used, and the inclusion of as small a reaction coil as possible, this tendency will in no way be more objectionable than in other circuits where reaction is incorporated. In order that there may be no difficulty in making the receiver oscillate with a small reaction coil, constant aerial tuning is used should it be desired.

Reaction

With this arrangement, though the reaction coil is in series with the primary of the H.F. transformer, it is not actually in the tuned circuit of the transformer, making therefore very little change in the tuning of that circuit when the coupling with the aerial circuit is varied. Another point is that, should the first valve show any tendency towards oscillating of its own accord, reversing the connections to the reaction coil will at once remedy the fault.

Design

The general make up of the receiver may be gathered from the photographs. Looking at the first illustration, the arrangement of the terminals is to this effect: The three to the left of the panel are for aerial and earth, with or without constant aerial tuning, whilst those on the right hand side are for the telephones and batteries; the valves, together with the transformer, are mounted at the back of the panel, accessibility being obtained by lifting the lid of the containing box. The crystal detector, which is of a new and ingenious pattern, is mounted as seen on the exposed face of the panel.

The Circuit

The circuit of the receiver is given in the theoretical diagram, wherein it will be seen that the aerial inductance is shunted by a variable condenser in the usual way, whilst coupled to that inductance is the reaction coil L_4. The high-frequency transformer is represented by L_2 L_3, with the primary L_2 shunted by the condenser C_2 of .0003 μF capacity; across the secondary of the transformer are the crystal detector and primary of an L.F. transformer.

Components

The receiver illustrated is made with the following components, and, though these may be of any good make, the names of the manufacturers are given for the information of those readers who desire to build a set to the specifications of the original receiver. Though the makes of the components are left to the choice and discretion of the reader the values must be as stated in the following list:—

One ebonite panel, 16 in. by 8 in. by $\frac{1}{4}$ in. (S. A. Cutters).

One 0.0005 μF variable condenser (square law) (Peto-Scott).

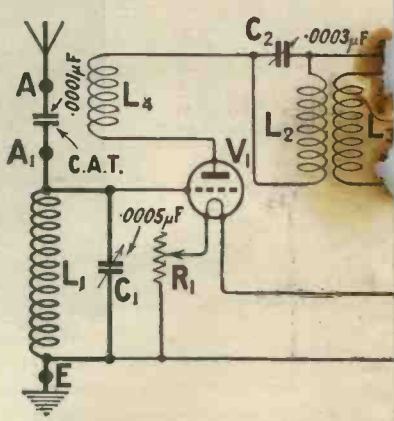


Fig. 2.—The theoretical circuit

ve Receiver Reception

E, M.I.R.E., Staff Editor

e given of how to build a compact ploying crystal rectification

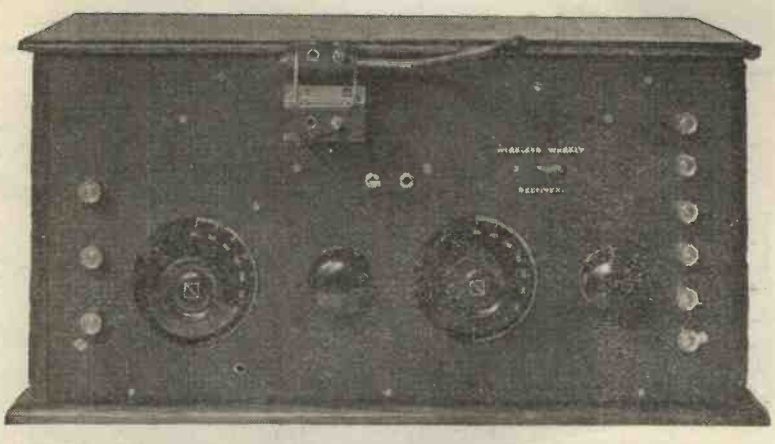
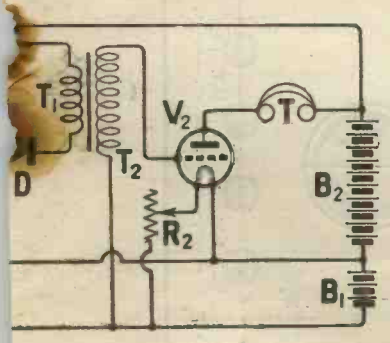


Fig. 3.—The receiver without its coils and with the crystal detector removed. The valves are fitted at the back of the panel, the box having a hinged lid.

One 0.0003 μF variable condenser (square law) (Peto-Scott).
One 0.0001 μF fixed condenser (Dubilier).
One crystal detector (Harlie Bros.).
One two-coil holder (Burne Jones).
Two H.F. transformers, 300-600 m. and 1,100-2,600 m.
Three anti-capacity valve holders (Burne Jones).
Two dual filament rheostats (Burndept).
One L.F. transformer (Radio Instruments).
Nine brass or nickel-plated terminals.
Set of plug-in coils for the wavelengths desired.
Quantity of square No. 16 wire for connecting purposes.

The Panel

This is made from the ebonite appearing first in the list of components, and is drilled in accordance with the instructions given in the panel layout.



arrangement of the receivers

Precaution

There are now on the market certain makes of ebonite which, besides having a glossy finish, are guaranteed to be free from surface leakage, and readers when buying ebonite should assure themselves whether or not the material purchased bears that guarantee. In cases where this specially prepared ebonite is not supplied, then the panel must be subjected, after the drill holes have been made, to a thorough rubbing on both sides with fine emery cloth in order to remove any impurities which may be embedded in the surface as a result of the tinfoil treatment which constitutes a part of the manufacture of most ebonite.

Wiring Up

The wiring of the receiver may be seen in the photographs showing the underside of the panel, and may be more clearly followed in the practical wiring diagram. It will be observed that stiff wire is used for connecting purposes, but in cases where readers prefer to use the somewhat easier method of soft wire and insulating sleeving there is no reason why this latter method should not be used so long as all leads are kept as short as possible, and are well spaced.

H.F. Transformer

The connections to the H.F. transformer are as given in the wiring diagram to give satisfactory results with the transformers tried, namely, a Magnum, McMichael, Ediswan, and Formo, but it may be experienced that with other makes these connections may be improved upon, and in any case before finally connecting the receiver the practice of changing over the connections should be tried, meaning IP or OP to the reaction coil IS or OS to crystal.

Coils for B.B.C. Wavelengths

The operating of this instrument is much the same as when using any other H.F. detector and L.F. combination, with the exception that with this receiver a little more careful manipulation is called for to obtain the best results.

For the reception of the B.B.C. stations using wavelengths up to 420 metres the aerial should be connected for constant aerial tuning—that is, to the terminal marked A in the panel layout, and the earth should be connected to the terminal marked E. A No. 50 plug-in coil should be inserted in the aerial coil socket, and a No. 25 coil in the reaction coil socket.

Operating the Receiver

The aerial and reaction coils should be turned to a right angle position and the H.T. battery connected. Plug a suitable H.F. transformer in the middle valve holder, and light the valves to a suitable degree of brilliance; it should be noted that the average H.F. transformer for broadcast-

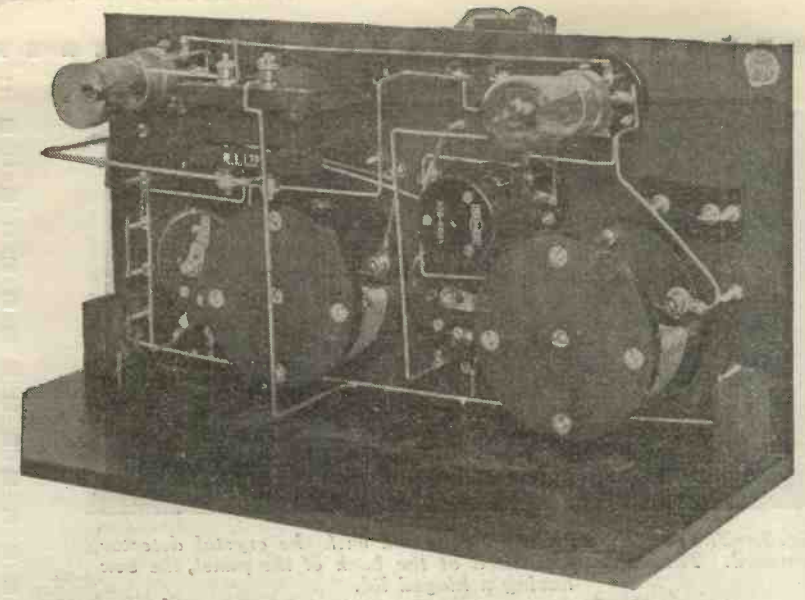


Fig. 4.—The panel is secured to a baseboard by means of two pieces of wood, and may therefore be removed from the box without the necessity of removing screws.

ing is wound to cover wavelengths from 300 to 600 metres, with a .0003 μF condenser, so for the reception of the B.B.C. stations, excluding the 1,600 metre station, only one transformer is required.

The next operation is to adjust the crystal detector until a really sensitive spot is found, and with the detector illustrated this is done by slightly turning a little black button in a clockwise direction.

To tune to the desired station the aerial tuning condenser is varied in conjunction with the condenser connected across the primary of the transformer, both of which are shown as C1 and C2 in the panel layout and wiring diagram. If the receiver shows any tendency to oscillate as the desired signals are approaching maximum strength the H.T. voltage should be reduced and the set retuned for the best results. With the maximum signal strength obtained in this way the moving coil should be brought nearer to the fixed coil, taking care that the set is not made to oscillate, and slight adjustments made on the condensers C1 and C2.

Should any tendency of the set to oscillate be uncontrollable, then the connections to the reaction coil should be reversed and the coil moved nearer to the aerial coil.

For the reception of the B.B.C. stations with wavelengths above 420 metres, the operation is precisely the same, but using in the aerial socket, coil No. 50 or 75 and coil No. 25 for reaction.

The 1,600 Metre Station

For the B.B.C. station on 1,600 metres the aerial coil should be a No. 150 (without constant aerial tuning) and a 100 or 150 for reaction, whilst the transformer should also be changed for one covering that wavelength. When receiving wavelengths above 600 metres the aerial connection may always be changed from the constant aerial tuning terminal A and connected to the terminal marked A1. If the receiver with

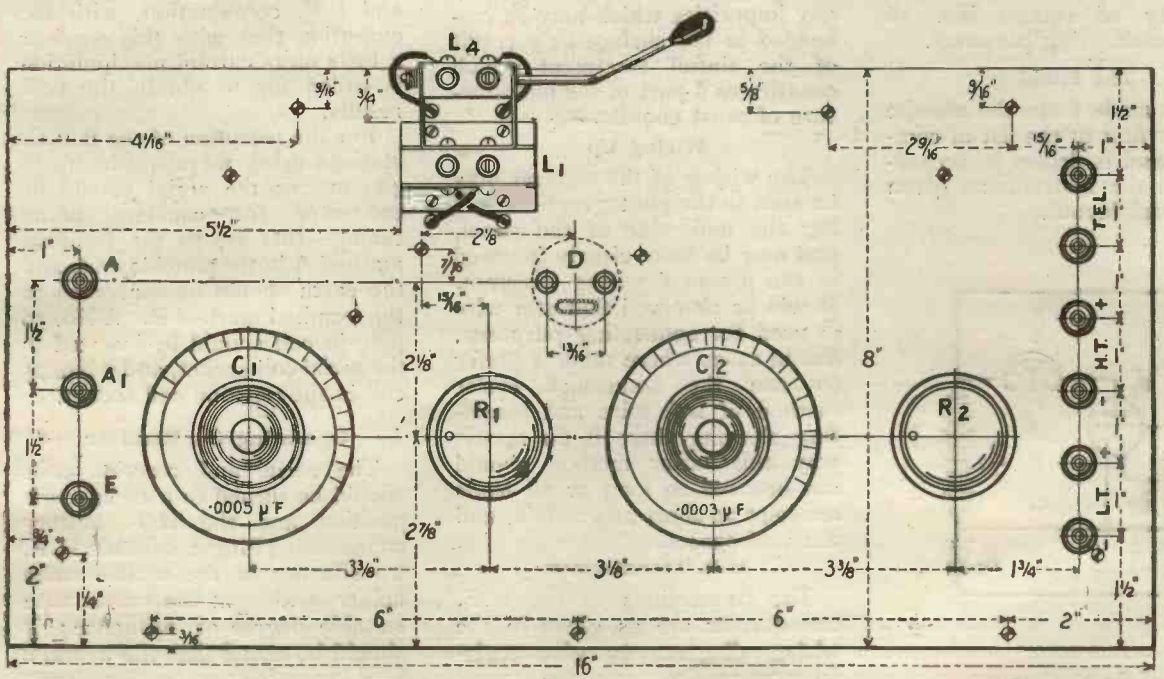


Fig. 5.—The layout of the panel together with drilling dimensions. The uses for the various terminals are also indicated. Blueprint No. 95a.

this arrangement shows any tendency towards self-oscillation, then the reaction coil should be changed to an even smaller number. It may, in fact, be understood that the smaller the reaction coil the less likely is self-oscillation to take place.

Radio Paris

For the reception of Radio Paris the same transformer and coils are used as in the reception of the 1,600 metre station. On indoor aerials, however, one size larger aerial coil may be needed for these longer waves.

Valves

It may be taken that any general-purpose receiving valve may be used with this receiver, and since suitable filament resistances are fitted these remarks also cover the range of dull-emitting valves. Care must be taken when using this receiver that no excess of H.T. voltage is applied to the plates of the valves, otherwise the operator will experience considerable difficulty in obtaining that fine adjustment of reaction which is so desirable in the reception of distant stations.

Test Report

Using the receiver in S.E. London with a No. 50 coil in the aerial and a No. 25 for reaction, loud-speaker signals were received from 2LO, whilst good telephone results were obtained from Cardiff, Bournemouth, Brussels, Petit Parisien, and Madrid. On changing the No. 50 for a No. 75, Birmingham and several German stations of unknown origin were received at good strength. Rome, Glasgow, Ecole Superieure, and a German station (probably Breslau) were received at fair strength after very critical tuning.

On the longer wavelengths 5XX was received at good volume using a No. 150 coil in the aerial without C.A.T., and a No. 100 coil for reaction. Radio Paris was also received when using these coils with slight interference from 5XX, whilst after very careful adjustment of the reaction coupling this interference was eliminated.

The receiver on the whole is critical in its control of reaction and as selective as one can hope for without the use of wavetraps. Any fresh adjustment of the crystal detector necessitates, of course, further adjustments to be made upon the two variable condensers, and at times calls for a variation in the coupling of the aerial and reaction circuits.

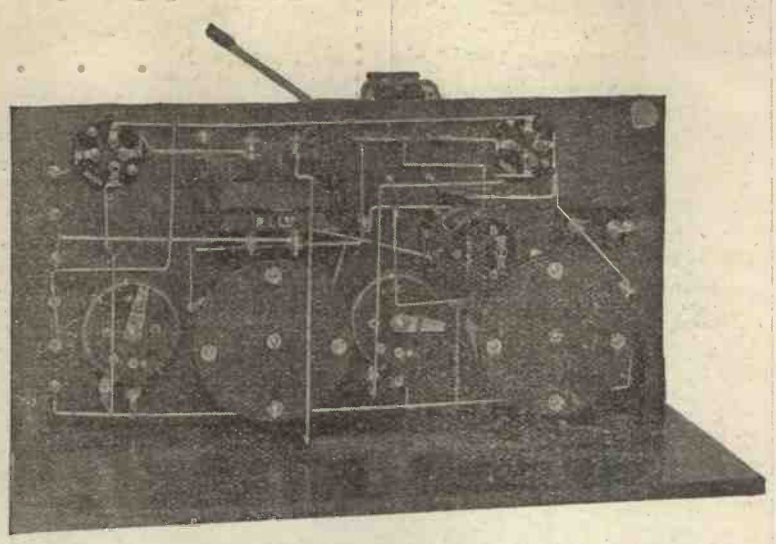


Fig. 7.—This photograph shows the wiring of the receiver and the disposition of the components.

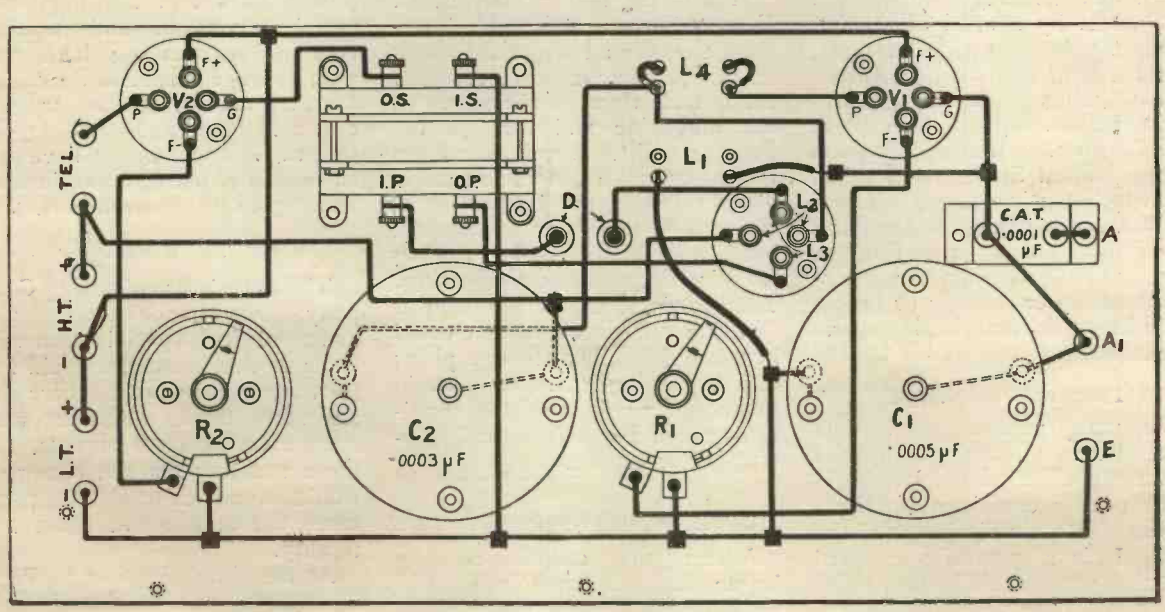
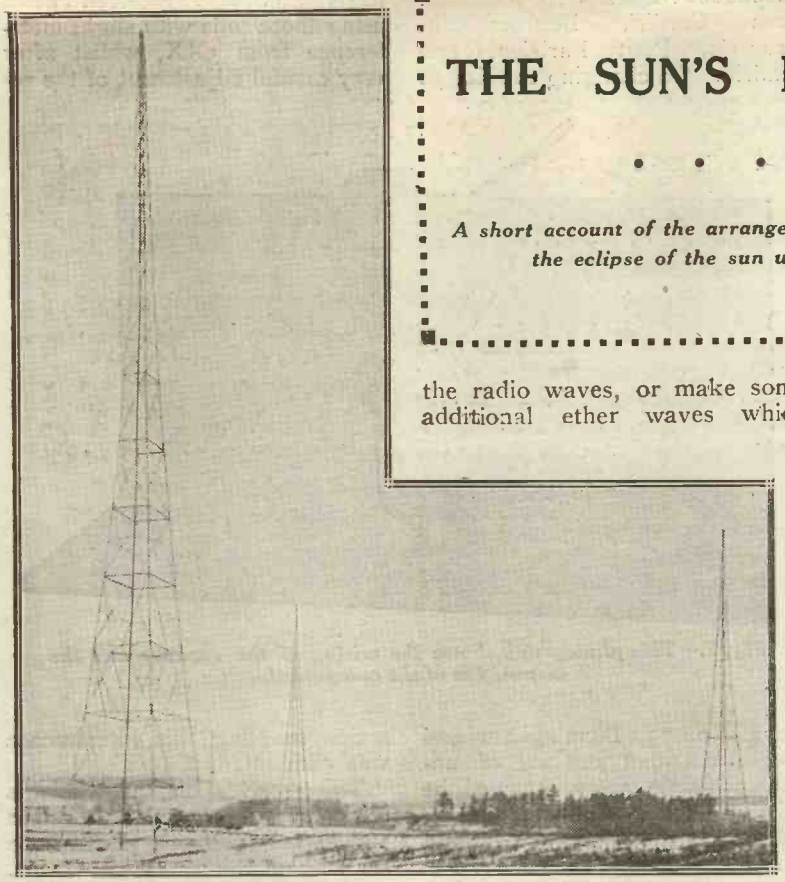


Fig. 6.—Practical back-of-panel wiring, of which full-sized drawings may be obtained upon quoting Blueprint No. 95b.

THE SUN'S EFFECT ON . . . . . WIRELESS

A short account of the arrangements made for observations during the eclipse of the sun which occurred on January 24.



Our photograph shows the new masts at the G.E.C. Works, Schenectady, N.Y., whence broadcasting is to commence shortly.

WHEN the sun was totally eclipsed on Saturday, January 24, over a certain section of the United States, a new sort of investigation was put into effect by several of the big American broadcasting stations, and the staff of *Scientific American,* working with the government meteorological bureau in Washington. Radio amateurs of the United States were called upon to listen in and see whether there was any change in receiving conditions during the time of totality, and whether the reception was better during, or before and after, this remarkable natural phenomenon.

Electronic Discharge

For many years now scientists have been advancing theories about the effect of the bombardment of the earth's atmosphere by the electronic discharge of the sun. It is a generally accepted fact that reception is better during the night time than during the hours of sunlight, and that the sun must in some way influence the radio waves, or make some additional ether waves which cause fading, frying, or other parasitic noises, and reduce the distance over which messages can be received.

It was the idea of Dr. E. E. Free, editor of *Scientific American,* to make an organised check on this peculiar effect of the sun. He issued, through the pages of the magazine and through the Press, a call to all radio amateurs and broadcast listeners to tune in shortly before the beginning of the eclipse, and listen to a special broadcast which several of the big American stations were giving. The broadcast was in the form of slowly read speech, which could be taken down by a stenographer; and beginning early, one could get a general idea of the conditions prevailing before the beginning of the eclipse.

Moon's Shadow

When the eclipse actually began and the moon's shadow passed across a narrow band of the earth's surface, listeners were able to note any change in the intensity, clarity, or regularity of reception, noting it down as the speech continued, until such time as conditions became normal—that is, as they were before the eclipse began. All these results will be tabulated carefully, and a full report will be published in one of the later issues of *Scientific American.*

Amateur Co-operation

Experimenters were asked to note with the utmost possible exactitude their location, the direction to the smallest degree of parasitic noises, or any other changes in reception conditions; the most minute description of their circuits, input, number of valves, etc., the exact seconds of time when there were any noticeable phenomena, if any; and the most accurate and clear description of any phenomena noted was required. Other supplementary information, such as the nearest power lines and lighting lines, aerial dimensions and position, type of surrounding landscape, with average reception conditions for that part of the country was also asked for, and anything else that the amateur might have considered of either direct or indirect bearing on his observations.

The B.B.C.

The British Broadcasting Company, we understand, also arranged for special transmissions so that amateurs could find for themselves whether there was any strengthening of what were comparatively local signals. If there was any marked change it would have been at about 4 p.m., when the eclipse was nearest to totality.

At the time of going to Press no reports upon results obtained are available, though we hope to publish these in our next issue.

Radio Notes and News

Three New Stations in Germany

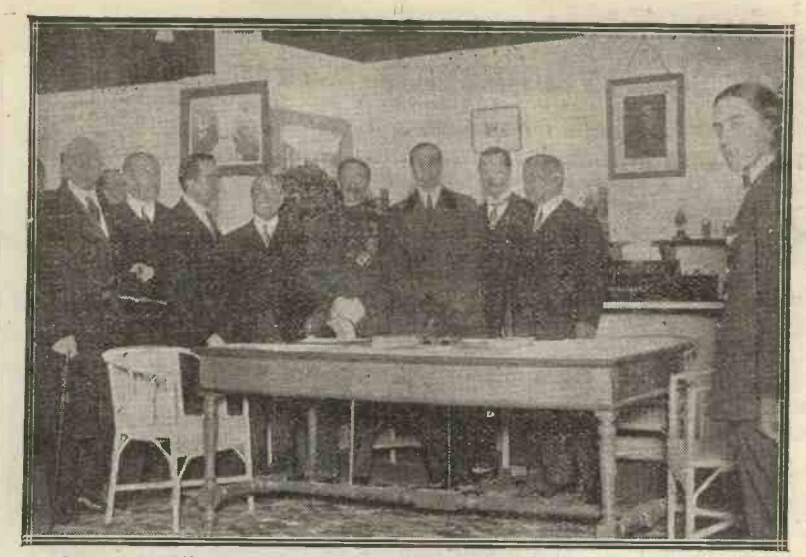
BROADCASTING is advancing by leaps and bounds in Germany. The comparatively new station working on 295 metres has recently been finished at Hanover; and plans have been completed for two other stations, one at Kassel and one at Dresden, both of which will be started shortly.

General Ferrie on History of Radio

That without the advent of radio, the famous Eiffel Tower would by now have been a thing of the past was one of the interesting statements made by General Gustave Ferrié, Chief of Radio Communications of the French Army, in a recent lecture before the Amitiés Françaises, in Liège. General Ferrié pointed out that the Eiffel Tower would have been of little value had it not been found that the aerial of the great radio station could be swung from its top, to make one of the finest radio aerials in the world.

General Ferrié called attention to the fact that while radio appears to an outsider to be rather a dry subject, full of mathematics and strange terms, there is actually no science in the world which has had the romantic and almost poetic development of this one.

Waves now have a place in all sciences, he continued, and showed to what vast futures the present development of radio and the consequent study of waves and wave-trains might point. In medicine, in communication, in power transmission, in lighting, in heating, and in fact in every conceivable branch of study, waves were part of the fundamental theory of the work. He was optimistic about the future of radio, and predicted that the year 1925 would see some very important events in radio history.



Our photograph shows H.M. the King of Spain (centre) at the stand of the Compania Nacional de Telegrafia sin Hilos at the Madrid Wireless Exhibition which was held recently.

Short Wave Work at Tunis

The military post at Tunis has been continuing its experiments in transmitting messages on short wavelengths. They are broadcasting regularly each week on a wavelength of 92 metres Morse signals, programmes of music and lectures.

Another Use for Valves

According to the *Daily Express,* thermionic valves, it has been discovered, can be used to melt masses of steel into white-hot liquid. This discovery was revealed recently by Dr. C. H. Desch, Dean of the Faculty of Metallurgy at the University of Sheffield.

"Two years ago," said Dr. Desch, "nobody would have dreamed of thermionic valves being used for furnaces, but within a few months there will be furnaces in Sheffield worked by these valves.

"Furnaces have actually been built in which the power for melting the metal is supplied by large thermionic valves, which are of special use in the manufacture of certain kinds of nickel alloys."

It was explained that a 200-volt direct current is passed into the valves, which convert it into alternating current of extremely high frequency—much higher in fact than can be obtained from a mechanical generator of alternating current. This current is passed through the metal, which may be said to melt itself.

"The melting metal," Dr. Desch added, "is often far hotter than the crucible in which it is being heated. A piece of Swedish iron was melted in this way before the crucible in which it was contained was thoroughly warm."

Amateur works Brazil

Perhaps the most fascinating of all wireless romances occurred recently when Mr. Gerald Marcuse established communication with the Rice Expedition in Brazil, a distance of approximately 7,000 miles.

The expedition, headed by Mr. Hamilton Rice, an American, left London last summer to search for the legendary "white Indians," supposed to exist somewhere in South America. It is now 1,000 miles up the Amazon.

Radio in Spain.

Spain was almost the last of the older nations to take up radio seriously; but now over 100,000 licences have been issued for the installing of receiving sets. There are many amateur broadcasting stations in the towns, employing up to the maximum power, which is 100 watts. It is prohibited for an amateur to use a set with a wavelength below 120 metres, so that very short wave transmission is practically impossible for them. All amateur transmitting sets are subject to a tax of 200 pesetas, which must be paid to the Spanish Government annually.

Recent Developments in Transmitting Valve Design

RECENT years have seen considerable developments in the design and construction of valves for wireless transmitting apparatus, the chief reason for this being the increase in the capacity of transmitting stations, which results in a demand for units of larger capacity.

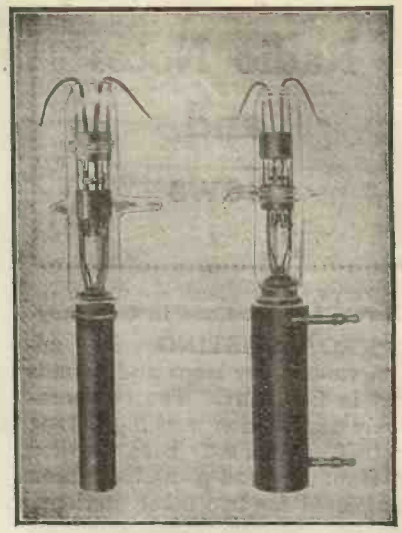
Valves in Parallel

Although a fair amount of success has been attained by connecting a number of ordinary transmitting valves in parallel, the capacity of these valves has been limited by the difficulty in dissipating the heat generated by the electronic bombardment of the anode. It has been found that the heat generated in each valve (in some cases from 1 to 2 kilowatts) is so great that the size of the bulb containing the electrodes must be considerably increased, not only to prevent the glass from melting, but to ensure that the extremely high vacuum inside the valve is not impaired; this results in inconveniently large bulbs which are extremely difficult to handle.

Water Cooling

The solution to the problem was obviously the design and construction of a valve in which the anode had not to lose its heat by radiation, but by some method of direct cooling, for example, by water. After extensive experiments and research work, such valves were produced by the research engineers of the M.O. Valve Co., Ltd.

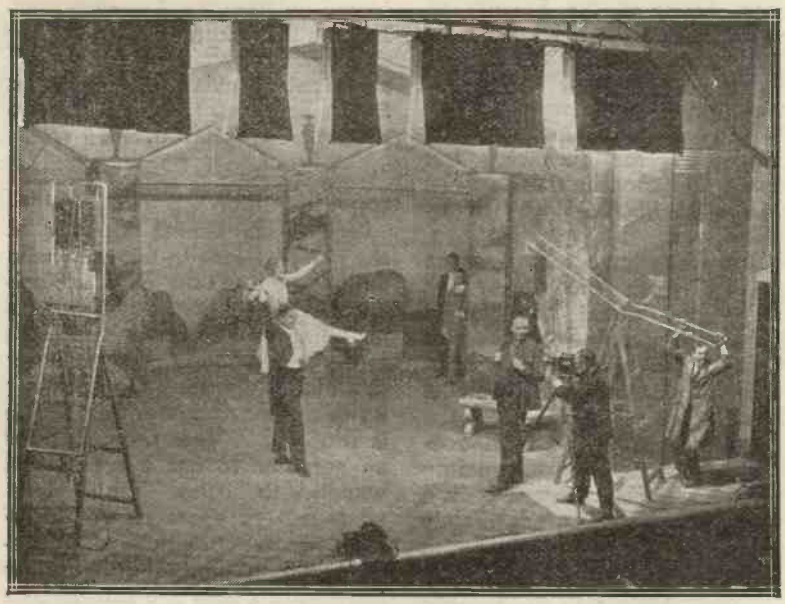
In the photograph is illustrated a "Marconi" water-cooled valve. On the left of the photograph the anode is shown. The anode is a copper tube 23 cms. long with an external diameter of 5 cms.; the tube is closed at one end, and on the other end is brazed a ring of nickel iron, on to which the large glass tube 70 mm. in diameter is sealed. Extensive experiments were involved in the determination of a suitable alloy of nickel and iron having approximately the same co-efficient of expansion as glass —an essential factor to obviate successfully strains in the glass which may cause it to crack. The cathode and grid are fitted inside the anode.



The Marconi water-cooled transmitting valve, showing anode on the left and the anode water jacket on the right.

On the right of the photograph is illustrated the complete valve unit and water jacket in which the anode is placed. Although the latter is at a high potential above earth (10,000 volts), no particular difficulty is found in preventing electrical leakage through the cooling water.

The British Broadcasting Company's high-power broadcasting station at Chelmsford is equipped with "Marconi" water-cooled valves, which are as illustrated and described here.

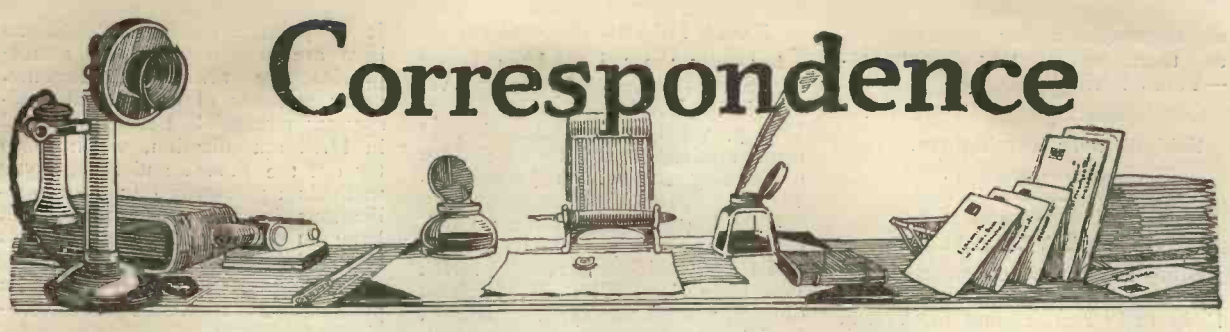


Our photograph shows the filming of a scene from Charlot's revue, taken with a view to synchronising the action of the film in cinema theatres with the music of the revue recently relayed to and broadcast from 2LO.

Wireless and the Vatican

A special wireless set for the reception of broadcasting has been presented to His Holiness the Pope, through his secretary of State, Cardinal Gasparri, by the Marconi Company. The apparatus, which has been installed in the Vatican, consists of a Marconiphone receiver and loud-speaker combination, with which His Holiness should be able to listen-in to all the capitals of Europe.

Appreciation for the set, which is one of the finest ever made, has been expressed to the Marconi Company by Cardinal Gasparri, on behalf of the Pope.



BROADCASTING AND ADVERTISING

SIR,—Without in any way wishing to contradict your editorial in the issue of December 31 last, I should like to raise a few points in connection with the broadcasting of concerts provided by others than the B.B.C., and also to reply generally to recent complaints and criticisms of the quality of British broadcasting.

It has always been the aim of the B.B.C. to cater for the maximum number of listeners, and we are apt to forget that that maximum is composed mainly of crystal set users and not of wealthy valve set owners and musical critics. When we grumble because we are not getting our money's worth let us remember that to the majority that money's worth is 30s. and not 50 guineas. When we scowl at a popular song or a latest dance hit or a promenade type funny man, let us think for a moment of the great army of 30s. broadcatchers who love popular songs, long to hear the latest dance hits and spend a fortnight each year listening to and laughing at a promenade funny man. And then perhaps we may forget our 50 guineas' worth and our preludes and fugues and enjoy a popular programme.

And so in furtherance of a policy of "the greatest happiness of the greatest number," the B.B.C. opened more relay stations, and again catering not only for numbers, but also for varied tastes, they determined to give the crystal user an alternative programme, and have therefore now built a temporary high-power station at Chelmsford.

Undoubtedly that is a fine policy, but it is an expensive one, and not being a philanthropic society, they are entitled to cut down expenditure by accepting good concerts when they are supplied free. There can be no question of sacrificing public interests, nor will such concerts be made disagreeable to the most exacting listeners by frequent reiteration of the name of the donors. Such a concert may, and, indeed, must, be an advertisement in so far as everything given to the public is an advertisement. But it must be borne in mind that the very fact of such a concert being a method of advertising will ensure that its quality is good—that and the control of the B.B.C.

And so I am sure that the 30s. majority will not throw down the headphones because a newspaper is

about to give a first-class concert, and therefore he must not complain.—Yours faithfully,

R. GOODE.

Solihull, near Birmingham.

ONE-VALVE REFLEX

SIR,—I recently constructed the one-valve reflex described by E. Redpath in Nos. 18 and 19, Vol. 4, which gives excellent results.

My object in writing is to point out an additional advantage I discovered in the set, which might interest others who have constructed it.

As there were no switches for cutting out the valve for use of plain crystal reception, I mounted a separate crystal and 'phone terminals on another piece of ebonite to connect to the A. and E. terminals, but afterwards discovered that this was quite unnecessary, as *by attaching the 'phones to the A. and E. terminals direct, with batteries disconnected, I got the ordinary crystal reception without altering the tuning.*

Wishing you every success.—Yours faithfully,

E. DENYER

Sydenham, S.E.

KDKA HEARD IN MALTA

SIR,—*Re* the "Low Loss Tuner for Short Waves," by Percy W. Harris in *Wireless Weekly*, No. 5, Vol. 5, we beg to enclose list of some stations heard to date since completing the set on January 1, 1925.

KDKA (three successive nights), G6LJ, 11 a.m.; G2NM, G6NF, G2FU, G2NB, G2KZ, NKF, WGH, 2XI, F8CN, H. Nicholls of Stocksfield-on-Tyne. G5NN, G5CC, 5 a.m.; unknown call, address 108, Abington Street, Northampton, 8AZ, 8EV, F8DI, 8AO, F8MT, OLL, ONL.

All the above were received strength 8 to 9. Weaker signals were not read, as those named above have occupied our time spent in listening on short waves.

With regard to ST100, this circuit gives excellent results here. 2LO and 6BM, etc., at really good 'phone strength. 5XX is pleasantly audible on the home-made loud-speaker described in *Wireless Weekly* some few weeks back. Using the first valve only of ST100, 2LO has been received at good 'phone strength, while 5XX is really excellent. As to crystal reception, using a Burndept crystal detector in a loose-coupled circuit, 5XX is intelligibly audible, as also are Radio-Paris and Radiofonica Italiana. It is pointed out that conditions here are semi-tropical and atmospherics are always troublesome, being at times of exceptional loud-speaker strength! Being interested in H.F. amplification, we hope to try out the T.A.T. and Neutrodyne methods as described in your publications in the near future, and hope to forward you results obtained.

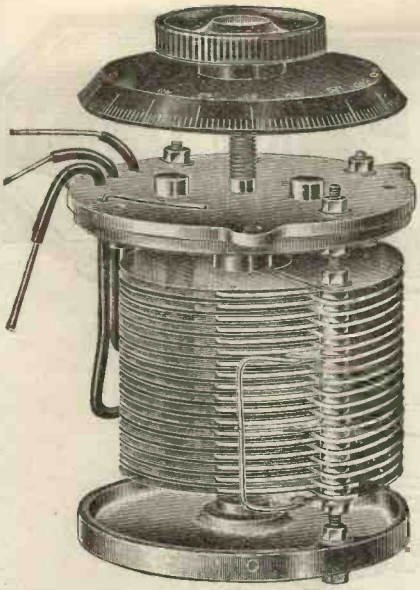
Wishing Radio Press and its publications continued success.—Yours faithfully,

OPERATORS-MALTA.

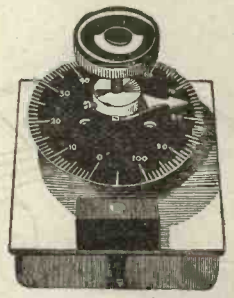
RECEPTION OF CNRA

SIR,—Observing in January 7 issue of *Wireless Weekly* that the new Canadian station CNRA had been picked up in Ireland, I thought it would interest you to know that at 3 a.m. on January 7 I picked up that same station in time to hear his final announcements. Signal strength was good, signals being audible 6 ft. from loud-speaker.

The set used was one described in *Modern Wireless*, No. 3, 1923, namely, the four-valve receiver with wavelength range 200-5,000 metres, page 214. On it I have received all B.B.C. main stations, all French



POLAR VARIABLE CONDENSERS



MULTIPLE CIRCUIT TUNING.

THE POLAR DUAL CONDENSER

Efficiency in reception depends to a very great extent on the sensitiveness of tuning circuits. Simultaneous tuning of two circuits, such as, for instance, two stages of high frequency amplification is a tedious process unless a dual condenser is used.

A dual condenser consists of two matched condensers mounted on the same spindle. The successful matching of two condensers entails precision work of the highest degree. The Polar Dual Condenser represents the last word in such precision work.

Scientifically designed by leading Radio Engineers, it is of robust construction, high insulation (each vane is insulated by means of an additional mica vane), fully enclosed and totally screened.

Minimum capacity of one section .00007 mfds.
Maximum capacity of one section .00026 mfds.

PRICE £1-8s., complete with knob and dial.

THE POLAR TRIPLE CONDENSER.

For simultaneous tuning of three circuits a Polar Triple condenser is required. It is built on the same principle as the Dual Condenser but with three matched condensers mounted on the same spindle instead of two.

PRICE £1-8s., complete with knob and dial. (Illustrated above with dust-proof cover removed.)

The use of these two condensers is not confined to any type of circuit. By connecting the sections in series or parallel a variable condenser is obtained having extremely wide capacity limits.

THE POLAR VARIABLE CONDENSER

constitutes an important advance in condenser design. It is a great improvement on the ordinary type of condenser in that the lower portion of the scale, which should always be used in tuning, gives for a large knob movement a small change in capacity.

Thus the crowding of capacity in the first half of the scale is avoided and A UNIFORM VARIATION OF WAVE FREQUENCY IS OBTAINED.

The Polar Variable condenser, being specially designed for the rigorous requirements of marine work, is the best type of instrument one can have for experimenting purposes.

It is wonderfully compact, its overall dimensions being only 3 in. × 3. in. × 1 in.

Apart from robust construction, high insulation, wide capacity limits and low price, the Polar Variable Condenser has the following advantage :

IT DOES NOT REQUIRE AN ADDITIONAL MICROMETER CONDENSER IN PARALLEL for precise tuning.

Every condenser is guaranteed.

The following capacities are available :

.001, .0005, .0003, .00025, .0002 microfarads.
All capacities are one size and one price : **10/6.**

WIRELESS OPERATORS WANTED.

There are now vacancies on our Seagoing Staff for Junior Wireless Operators trained on our apparatus. Youths of good education, preferably between 17 and 25 years of age, wishing to enter the Wireless Profession should communicate with the Managing Director, London Radio College, 82-83, High Street, Brentford, Middlesex, who will be pleased to furnish particulars of the training course necessary to qualify for our service.

POLAR BLOK 5-VALVE SUPERSONIC RECEIVER.

The 5-Valve Supersonic Receiver, designed by Mr. John Scott-Taggart and described in WIRELESS WEEKLY, has been built on the Polar Blok principle.

The set proved exceptionally sensitive and selective.

The cost of parts for this set is £11 10s.

RADIO COMMUNICATION CO., LTD., 34-35, NORFOLK ST., STRAND, W.C.2.

stations, SBR, Zurich, Hilversum, Berlin, Frankfurt, Bremen, Nuremburg, Madrid, and, lastly, the stations WBZ, KDKA, WGY and CNRA. In conclusion, I wish to express my appreciation of the Radio Press publications.—Yours faithfully,

BERNARD C. BOWMAN.

Forfar.

AMERICAN RECEPTION ON THE ST100

SIR,—It will interest you to know that, using the ST100 circuit, I am able to receive all the B.B.C. stations, including Nottingham and Swansea. Madrid, Chelmsford, Bournemouth and, of course, 5PY come in very well on an Amplion loud-speaker. WBZ and WGY come in at good crystal strength when conditions are favourable. These two American stations can nearly always be got between 1 a.m. and 3 a.m. if conditions favour.

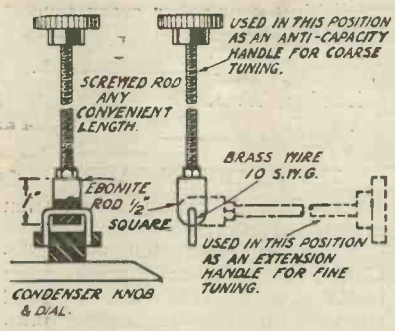
My aerial and earth system are good, but I use a 80,000 instead of the 100,000 ohm resistance. You are to be congratulated on the ST100 and many other circuits I have tried.—Yours faithfully,

R. ELWOOD.

Plymouth.

A NOVEL EXTENSION HANDLE

SIR,—I have pleasure in enclosing herewith a sketch of a small "gadget" which I trust you may find space for in your valuable paper. The sketch is almost self-explanatory. The construction is of the simplest, and fifteen minutes' work should suffice to produce the article.



The extension handle suggested by Mr. Gladney.

Two holes are required in the condenser knob, as shown, into which the ends of the brass "stirrup" are introduced. With the handle in a vertical position, it may be used for coarse tuning, and may then be swung through 90 deg., when it serves as an extension handle for fine tuning, and, as will be seen, is instantly removable from the condenser knob.—Yours faithfully,

H. GLADNEY.

Bolton.

SWEDISH AMATEUR'S TWO-WAY COMMUNICATION WITH AMERICA

SIR,—We have pleasure in informing you that the first two-way connection between Sweden and America was established on December 29, 1924.

The Swedish amateur station was SMZS, operated by Teknolog T. Elmquist, and the American 1CI; the power of the Swedish station being 150 watt and wavelength 80 m.—Yours faithfully,

E. M. EKLUND.

Stockholm.

SPARK INTERFERENCE

SIR,—I was very glad to see Mr. Harris's remarks *re* spark interference in his "Random Technicalities" in the January 7 issue of *Wireless Weekly*. Here in Liverpool, although I have a five-valve set, it is almost impossible to listen to any stations except Manchester

and Liverpool. There is a station with a very powerful spark which can be heard on Manchester's wavelength, is strongest between 550 and 650 metres (approximately) and absolutely blots out Birmingham, Belfast, etc., and even 5XX and Radiola. It is not the Seaforth station. This does not work so often and not for such long periods, but this other station is always on and off.

I am sure something could be done if people would write and give you their experiences, so that you would have something to go on.—Yours faithfully,

H. C. GRENSIDE.

Liverpool.

A LOW LOSS TUNER FOR SHORT WAVES

SIR,—With reference to your short wave receiver published in *Wireless Weekly* of November 19, 1924, it might interest you to know that I have built one of these receivers to the particulars laid down, and I cannot speak too highly of this wonderful instrument, being so simple to build for the average experimenter.

At present I am using the detector valve only, and coupling it to my amplifier and loud-speaker. I have received the American station KDKA on his short wave nearly every night at 11.30 at full loud-speaker strength, except when atmospherics make reception rather unpleasant.

I think that this particular set is one which can be handled by any enthusiast who is capable of twisting the condenser dial, and, in conclusion, believe that amateurs who have tried this will bear me out.

Wishing your paper every success for 1925,—Yours faithfully,

G. A. VANDERVELL.

London, W.11.

2KF HEARD IN SAIGON

SIR,—The following information may be of interest :—

A report from Saigon, Indo-China, states that signals from G2KF were received at good strength on two valves at 7 p.m. G.M.T., December 6, 1924, by a French experimenter there. The English station was in communication with Australian 3BQ at the time, and the reception was carried out through heavy atmospherics.—Yours faithfully,

J. A. PARTRIDGE, G2KF.

Colliers Wood.

PANEL TRANSFERS

SIR,—Concerning your "panel transfers," in connection with which some correspondence appeared recently in *Wireless Weekly*, I find the following the most convenient method of fixing them to the ebonite :—

Strip the transfer from the backing paper, moisten the *surface* slightly (until it is just "tacky") and press into position. (The sticky surface holds it in place.)

Then wet the back thoroughly until the lettering can be seen through quite distinctly and *slide* the paper carefully from the panel, leaving the lettering in position.

The lettering should not be touched afterwards until perfectly dry, or smudging will occur.

Wishing you continued success with all your publications,—Yours faithfully,

F. N. KING.

Keighley.

ST150 CIRCUIT ON THE OMNI RECEIVER

In the wiring key for this circuit in the January 7 issue, the connection 15—17 should read 18—17, and the connection 32—40 should be added.

Louden Valves

Filament Volts - 4.8—5
Filament Amps. 0.4
Anode Volts - 40—80

"Like the sweet sound that breathes upon a bank of violets"—*Twelfth Night.*

By many the 'cello is regarded as possessing the most beautiful tones of all instruments. From the sonorous bass notes of the C string to the soaring melodies of the D and A, we cover a range of notes which, both in compass and in quality, resemble most closely those of the human voice.

Some of the most beautiful of our programmes have been those in which the 'cello has figured either as a solo instrument or in concerted works.

To enjoy the 'cello by wireless, however, and to appreciate to the full the subtle inflexions of the artists playing, we need a good receiving set, a good loud speaker, and FIRST-CLASS VALVES.

The Valves which your set requires are those which will give you a first-class concert from your own Broadcasting Station rather than those whose chief claim is that they will receive concerts over stupendous distances.

That is why we recommend you to equip your set with Louden Valves—their supremacy in the matter of Silver Clear reception is literally unchallenged, and within a few months of their introduction they are being asked for at the rate of many thousands per week!

The beautiful pure notes of the Louden Valve are due to special features found in no other valve; be sure, therefore, to ask for Silver Clear Louden Valves by name.

The Plain Louden for detecting and Low Frequency Amplifying. The Blue Louden for H.F. Amplification. All Loudens are Silver Clear and free from mush. Their current consumption is very low and their life long.

PRICE 10/-

Louden VALVES

Louden Valves - Silver Clear

ADVT. OF THE FELLOWS MAGNETO CO., LTD., PARK ROYAL, LONDON, N.W.10

E.P.S. 9

Apparatus we have tested

Conducted by A. D. COWPER, M.Sc., Staff Editor.

Ediswan "Dulcivox" Loud Speaker

A small loud-speaker, designed for use in an ordinary living room, has been submitted for test by Messrs. Edison Swan Electric Co. This Type W.L. 321 "Dulcivox" loud-speaker is of 2,000 ohms resistance, stands about 19 inches high, and has a proportionately small curved horn. The sample submitted was finished in an elegant dull bronze, shading to black, giving a very pleasing effect.

The diaphragm is fairly large for a small instrument, and the adjustment of the magnets is effected by an extremely ingenious and mechanically sound device, which in practice was found to be very sensitive and stable. The top, carrying the diaphragm, is supported on a tripod, of which the length of one leg is variable by the usual screw and adjusting knob (here projecting through the top of the base, in a most accessible place). Powerful spiral springs steady this tripod and eliminate all shake or back lash. A slight tilting of the tripod then adjusts with great accuracy the distance of the diaphragm from the poles of the magnets in the lower part of the base.

The permanent magnets are circular, with consequent poles; the pole-pieces are finely laminated.

Points which give evidence of careful thought in the design of the instrument are the ingenious way in which the trumpet—always an embarrassing part of a loud-speaker for transportation—takes down in two sections, so that the whole instrument could be packed in a large handbag; the provision of a green baize covering for the bottom of the base avoids the possibility of scratching polished tables.

On trial, in comparison with other instruments of from one-half to three times its price, this instrument showed up quite well, though there was the slight tinniness and absence of rounded tone which is often observed when a trumpet of small dimensions is used on a loud-speaker of any design. It was powerful enough even with the small trumpet supplied with the instrument, and was able to handle considerable energy without rattling.

As the results were so favourable in comparison, it seemed to be of interest to test what performance this excellently designed little in-

strument could give when fitted with a trumpet of adequate size to do justice to the lower tones. Our standard gramophone-horn type of large, flaring trumpet with non-resonant taper tone arm was accordingly fitted to the "Dulcivox" base. The effect was quite remarkable, and the instrument now compared favourably with any of the others, even the most pretentious, and with our previous standard. In fidelity of tone, absence of both hardness and hollowness, as well as in power, when on a near-by high-powered transmission, loaded to the limit given by two stages of audio-frequency amplification, the last a power stage, the performance was excellent. The power was as great as that of any other type of domestic loud-speaker we have experimented with. It was impossible to stand directly in front of the trumpet when at full power, and more than fifty yards away down the road the Savoy band was still audible when the loud-speaker was to the far side in a ground-floor room with the window open, and still without distortion. We think the makers are a little modest when they state that this instrument is of the "Baby" type for use in an average living-room. Fitted with a trumpet of sufficient size to give really faithful reproduction, it is powerful enough for much more ambitious purposes. We can strongly recommend it, accordingly, for those who want both powerful and faithful rendering of broadcasting, with the provision that it be used with a large trumpet of the correct design.

New Pattern Watmel Variable Grid-Leak

Messrs. Watmel Wireless Co. have sent us samples of a new improved pattern of the well-known Watmel variable grid-leak. In these, the possibility of any irregularity of action due to wear (in continued use), which might result in some slackness in the fit of the controlling spindle, has been obviated by the provision of a small D-shaped spring, working in a slot milled in the bush, and bearing on the spindle. This provides a positive electrical connection at all times. On trial it was noticeable how smooth and silent the device operated, giving a convenient range of resistance-values for close control of a detector-valve.

Variable Grid Condenser

We have received from A. J. Baty a sample of a smaller pattern of the well-known two-plate variable condenser (which has been mentioned before in these columns), designed more particularly for use as a variable grid condenser for fine adjustment of the rectifying action in addition to or to replace the variable grid-leak so often used on a rectifying valve.

On test, this mica and air condenser showed a maximum capacity, when screwed up so that practically only mica intervened between the plates, of around .00023 μF, which is not on the large side for a variable grid condenser, where a value of e.g. .0003 μF might be desired at times for experiment; the minimum, as with the larger condenser of the same make, was exceedingly low.

The insulation resistance was but 4-10 of a megohm, as supplied and after reposing for a time in a damp laboratory; on careful drying for some time this value increased to 1.8 megohms, when screwed up tight. When the one plate and the mica of the other plate were no longer in contact this figure increased very considerably. In actual reception it was found, in some cases, unnecessary to use a grid leak, and satisfactory reception ensued. As a tuning condenser proper the reaction demands for bare oscillation considerably exceeded those of a reliable variable air-condenser.

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B T-H

Information Department

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A. C. R. (GUILDFORD) is somewhat puzzled by the behaviour of a two-valve low-frequency amplifier employing resistance-capacity coupling, particularly in regard to grid bias. He finds that when he uses a small power valve in the last stage, no grid bias appears to be necessary, other than that which is provided by connecting the lower end of the grid-leak to the negative end of the low-tension battery, the filament resistance being in the negative lead.

This characteristic of low-frequency amplifiers is certainly a little puzzling at first, but it is due to the fact that with the usual value of grid-leak a considerable negative charge is built up on the grid of the valve, which may in many cases be quite sufficient for purposes of grid biasing. In consequence, it is often quite possible to dispense with the grid bias battery altogether, at a pinch, and to connect the grid-leak directly to L.T. The exact degree of negative bias which will be obtained in this way will naturally depend upon the value of the grid leak, and if it is of low value it is quite likely that the bias will be inadequate. This, of course, is the explanation of the sweeping statements sometimes made that grid bias *must* be used in any low-frequency amplifier, regardless of the system of intervalve coupling employed. It is perfectly true that a correct bias upon the grid of the valve is essential, but in some types of amplifiers this may be obtained without the use of any grid battery whatever. It is hoped that the answer to this question will clear up the confusion undoubtedly present in the minds of some experimenters on this point, but we do not wish to imply that it is a desirable practice to dispense with the grid battery altogether, and depend upon the more or less haphazard adjustment of grid bias by means of the value of the grid-leak.

I. L. T. (BIRMINGHAM) is building a super-heterodyne receiver and asks various questions about the suitability of a certain frame aerial for use therewith.

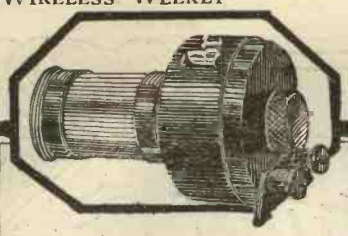
Since this receiver is not intended for portable purposes, we would strongly urge our correspondent to

use a larger frame than the 18-in. square design which he has in mind. It should be remembered that the receiving powers of a frame aerial increase enormously according to the size of the frame within certain limits. Nothing less than 2-ft. square should be used unless a really super-sensitive receiving set is employed, or for some reason of space, and a 3-ft. frame is better still. Probably a square with 3-ft. sides represents a good compromise between receiving efficiency and compactness, and if twelve turns are put on this frame, say ½ in. apart, a tuning condenser of reasonable size should serve to cover the broadcast band. Great care should, of course, be taken to insulate the winding of the frame, and a reasonably thick gauge of wire, such as No. 18, should be employed.

With regard to the directional properties of this frame, we would warn our correspondent that if he intends to use it in an ordinary living room, he will probably find that the direction for maximum signal strength is widely different from the direction in which the frame would be set upon if a compass were used for the purpose. We therefore do not think that it is worth while to incorporate the rather elaborate suggested arrangement of a compass upon the base, and a divided scale as an aid to picking up of distant stations. It is almost always necessary to actually swing the frame through a considerable angle before deciding upon the maximum signal strength, and this in the case of an ordinary building has little relation to the true direction of the station.

T. H. I. (ANDOVER) writes regarding his attempt to design a two-valve receiver using a form of Reinartz circuit with the addition of a single low-frequency valve, his aim being to produce a set which will be capable of useful work upon the broadcast band and which will also serve by the use of an interchangeable system of coils for short wavelengths. His main difficulty relates to the size of the variable condenser, since he objects to the use of verniers in parallel, but is aware that a condenser of a suitable size to cover the broadcast band will be too large for convenient working upon the shorter wavelengths.

A device commonly adopted in cases of this sort is to use a variable condenser, say of .0003 μF. maximum, in parallel with which small fixed condensers of suitable capacity can be switched or otherwise connected. For example, if the tuning condenser is actually of the value suggested, a series of fixed condensers of the same value will serve to extend the capacity range when working on longer wavelengths. This is naturally a somewhat crude device, and may prove decidedly inconvenient in use. Probably a better method is to use, where space permits, a double condenser of the type now so familiar for the simultaneous tuning of two intervalve circuits, bringing the connections from the two sets of fixed plates and the moving spindle out to sockets upon the panel, so that by means of plugs each section can be connected into circuit in any desired manner. For example, upon the longer wavelengths, the two fixed sections can be connected in parallel, the other connection going to the moving spindle, so that the whole arrangement becomes a variable condenser of twice maximum capacity of either of the sections. For intermediate wavelengths one section can be used alone, and for extremely short wavelengths the sections can be connected in series. In this latter case, one connecting wire will go to one fixed section and the other to the second fixed section, no connection being made to the moving spindle.



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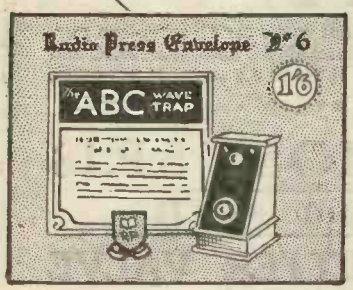

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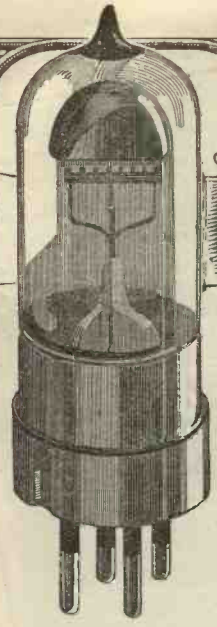

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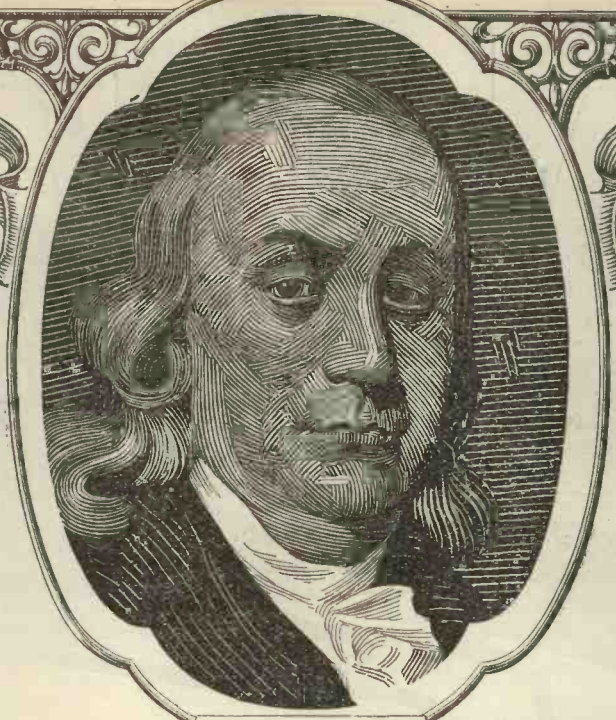
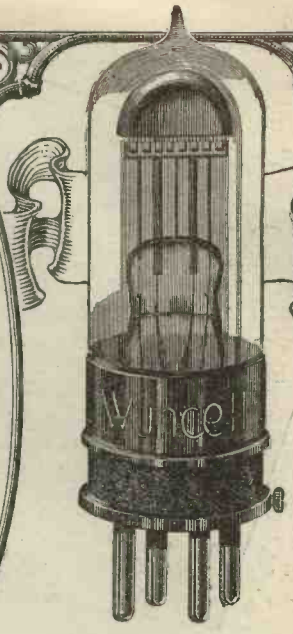


Benjamin Franklin



Wuncell
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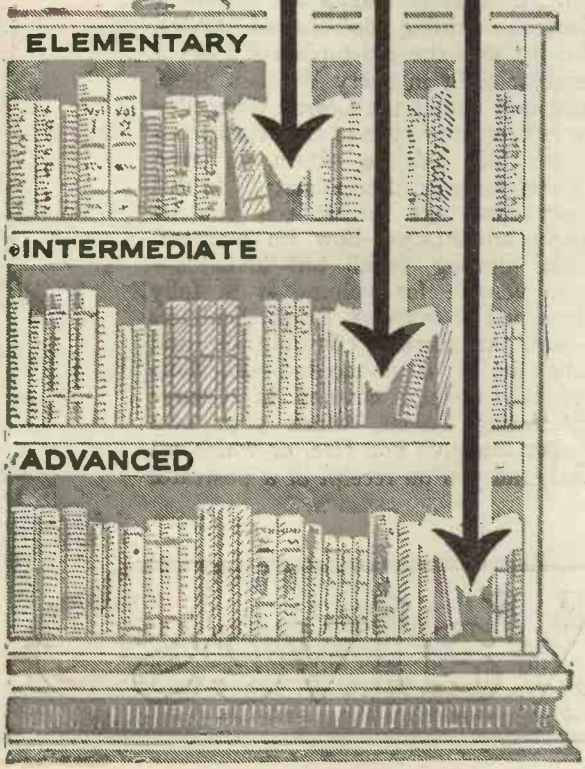

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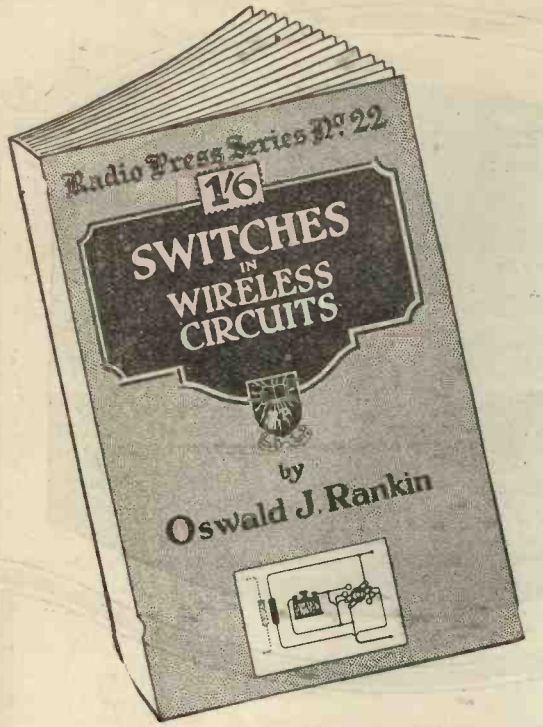

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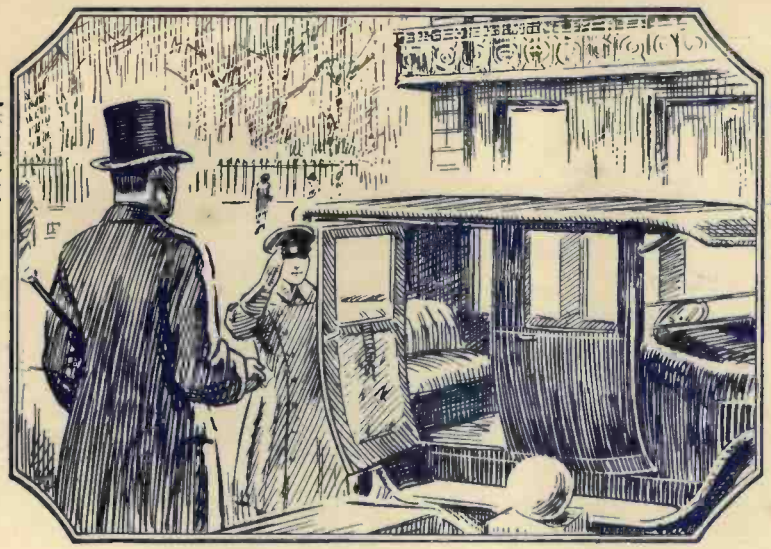

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