ISSUED EVERY — — SECOND WEDNESDAY

SIXPENCE

RADIO

IN AUSTRALIA & NEW ZEALAND

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RADIO
IN AUSTRALIA & NEW ZEALAND
Incorporating "Sea, Land and Air".

CONTENTS

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"Buy Australian-Made!"

SOME little time ago, Sydney, and for all that is known, other capitals of the Commonwealth, were profusely placarded, postered and paragraphed with a forceful appeal to buy goods which owed their origin and manufacture to the Great Southern Continent. If memory serves aright, countless importunings appeared bidding one buy "ships and shoes and sealing-wax, cabbages and, no doubt, if another had been required and they were purchasable by a people who already render loyal homage to one, "kings."

THE merits of Australian cheese, chalk, china, cloth, cutlery, and cigarettes were borne upon every citizen at every corner and in every tram and train. But was there made mention of this country's, comparatively speaking, most infant industry—although there can be no doubt there will come a day, and that not a very far distant one, when it will take its place as one of Australia's greatest—that of the local manufacture of all wireless apparatus and accessories?

IN any case, even if mention was made of this industry, there is not the slightest reason in the world why it should not be alluded to in these columns afresh.

GIVEN an equal opportunity, an Australian or his handiwork is equal to the best of any other country in the world. It would be mock-modesty to deny this, for it has been proved time and time again that in whatever field of endeavour, be it strife, or in that time which comes after the beating of the sword into a plough-share, the Australian and/or the work of his head and hand have survived competition with the world's best.

SO far as merit is concerned, so is it with the Radio industry, both retail and wholesale, in Australia and New Zealand. To meet foreign interests on an equal basis it is necessary that the price of local products come down further. And there is only one way in which that reduction can be secured—by the public making sure that every square inch of bakelite, every foot of "spaghettie," and, so to speak, every microfarad capacity of their condenser hails from our factories. It is in the Wireless public's interest to take these precautions as it is the Radio public which will directly benefit.

A VISIT to the premises of those companies who have showrooms in Sydney, say, for example, Messrs. Amalgamated Wireless (Australasia), Limited, Messrs. United Distributors Limited, Messrs. Burgin Electric Company Limited, Messrs. Wiles Wonderful Wireless, Messrs. Western Electric Company (Australia), Limited, Messrs. David Jones, and other leading dealers will unmistakably show the indubitably high standard which Australian Radio goods enjoy.

IT is not as though they were only the result evolved out of attention to local conditions and requirements, they are also the outcome of research and investigation carried out not only by the best brains of their own concerns but by those of foreign Wireless research staffs who are meritedly world-famous. It is obvious, then, that such products are equal to, if not better than, anything else of their kind in the world.

THIS ISSUE'S SPECIAL CONSTRUCTIONAL ARTICLE—"A MULTI-VALVE RADIO FREQUENCY AMPLIFIER"—WILL BE FOUND ON PAGE 708.

"GRANTED then," says your scoffer, "that local products compare so favourably with the imported article. But think of those accessories which *have* to be imported because there are not in existence to-day proper facilities for their manufacture here."

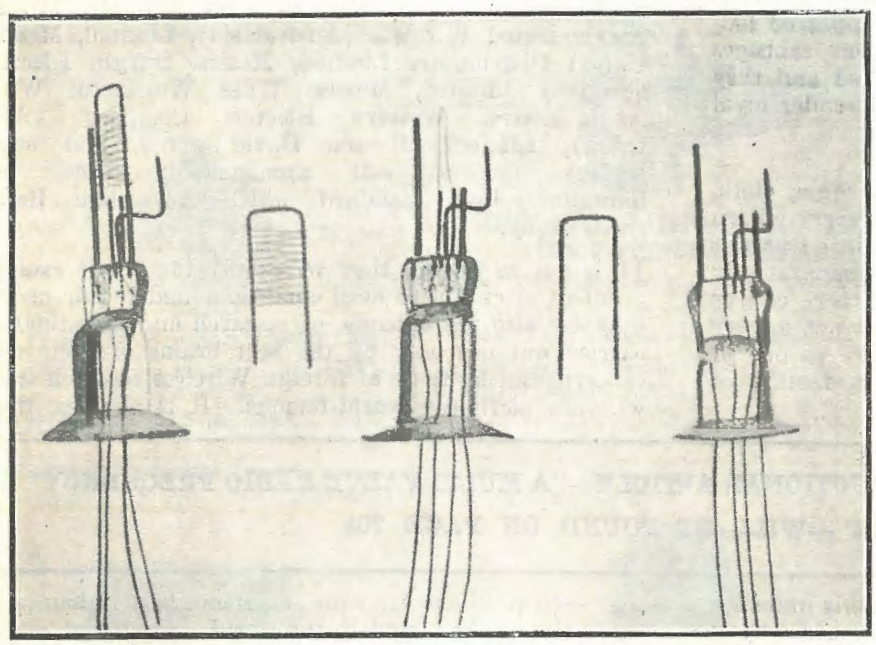
TO which one replies, and thereby insures his remaining to pray: "If Australia can make Wireless valves—the very heart and soul of a receiving or transmitting set—it can embark with assured success upon the construction of anything from a fixed condenser to the filament of a "peanut" audion. All these will be produced immediately the public's faith in them is demonstrated by a suitable demand.

THE Australian Wireless enthusiast who does not support Australian productions on every possible occasion is not worthy of the name of "Australian."

Marconi Valves

How They Are Made at the Osram Lamp Works

WERE the amateur wireless enthusiast permitted to view the process of manufacture necessary to produce a complete valve for his set, he would be somewhat astonished at the number of operations (many being of a complex nature) through which such an apparently simple piece of apparatus has to pass. Even a careful examination of a valve purchased from a retailer will tell him little or nothing about its construction, yet there are in reality over forty different operations involved in the production of one complete valve. Herewith is described, then, how valves are made at the Marconi Osram Valve Company's works at Hammersmith, London. Before doing so, however, a few words on the history of the development of the valve may not be amiss. The rapid development of wireless has been, to say the least, remarkable. This development is largely due to the invention of the Thermionic valve by Dr. Fleming, in the year 1904, but undoubtedly the war did much to stimulate its application. The General Electric Company Ltd., devoted a portion of their Osram Lamp factory at Hammersmith to investigating the complex problems involved in wireless valve manufacture, and from these works large quantities of valves were despatched to the various battle fronts. The cessation of war left the Company with a strong organisation in this particular branch, together with the knowledge acquired by reason of wartime research. Then followed the great wireless boom, and today the demand for Marconi-Osram valves is such that a complete reorganisation of some of the departments at the factory has been necessary, and automatic machinery of the most modern design has been installed in the place of older types.

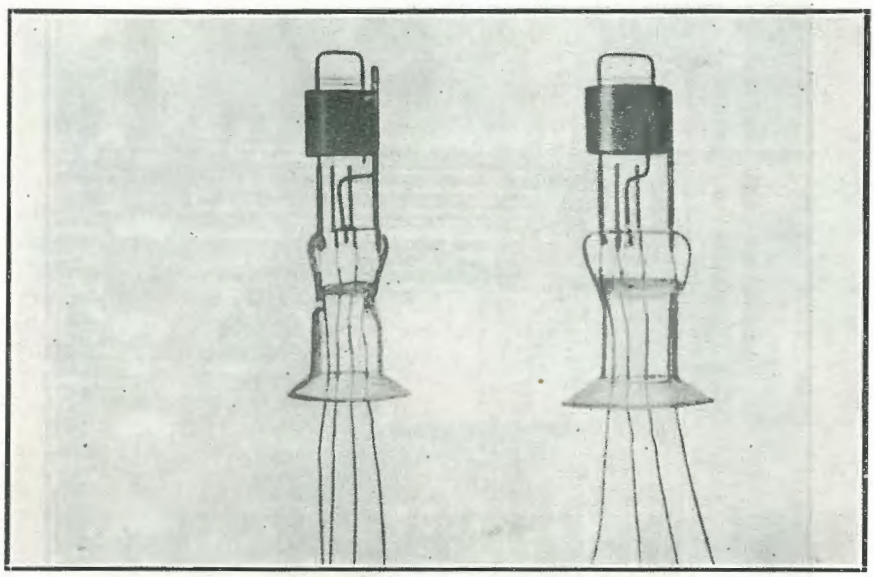


Seal with Filament and Grid Mounted. | Completed Grid. | Seal with Filament Mounted. | Damping Wire for Grid. | Seal.

THE CONSTRUCTION OF A VALVE.

Before describing the various processes involved in their manufacture, a few words on the construction of the Marconi-Osram Thermionic valve will, no doubt, be of interest to our readers. The valve consists of a glass tube from which the air has been exhausted, in which is a filament of Tungsten wire similar to that used in the manufacture of ordinary electric lamps; surrounding this filament, but electrically insulated from it, is the grid, an open spiral wound coil of wire, and surrounding this again forming an outer wall, as it were, is the anode, an open-ended tube of solid metal. The connections to the two ends of the filament, also to the grid and anode, are brought through the bulb to four pins mounted in the cap. Different types of terminals are used, according to the type of valve. By passing a current of electricity through the filament, large quantities of minute charges of negative electricity, called electrons, are dispersed from the filament. If the anode be made electrically positive, the electrons will travel through the gap between the filament and the anode by virtue of mutual attraction, and will be manifest by an electric current. The control of this current, known as plate current, is determined by the potential applied to the grid. As an example of the valve, the varying potential of the aerial may be applied to the grid, with the result that the plate current will be modified in strict accordance with the current variations in the aerial, but will be considerably more powerful. It is after this manner that a valve is employed as a high frequency amplifier in a wireless receiving set. It will be seen from the observations already made that not a few of the problems met with in valve construction are also to be found in the manufacture of ordinary electric lamps, though, perhaps, the latter, by virtue of construction in a more simple and on a larger scale, are more easily overcome.

Nevertheless, the raw material, such as glass and Tungsten wire, are the same in both cases, and many of the operations employed in their manufacture can be said to be identical. The system adopted at the Hammersmith Works in order to cope with an output of 25,000 to 30,000 valves per week, called for a very careful study of shop lay-out, and while one hesitates to use the words "mass production" when applied to England, it is on these lines that the "M.O." Valve Co., Ltd., have organised their factory. It is possible to completely trace the history of valve manufacture from the raw material stores, following it up until it emerges as a complete wireless unit. Each type of valve manufactured at the Marconi-Osram factory is carried out in its own section, though there are some operations, such as the high frequency apparatus employed for the eddy-current heating of plates of certain types of valves during evacuation, where, for convenience, the grouping of plant has been adopted.



Complete Assembly.

Seal with Filament, Grid and Anode Mounted.

THROUGH THE FACTORY.

Let us proceed to describe the operations involved in the manufacture of the popular DE3 valve, used by thousands of wireless enthusiasts on their broadcasting reception sets. This valve is a dull-emitter general-purpose valve, the filament being rated to consume .06 amps. at 2.8 volts. The extremely small clearances between the filament grid and anode, together with the fine gauge filament wire, affords not only an interesting example of skill of the operators, but also of the design of the machines employed in the manufacture of this type of valve. As with the ordinary lamp, so, too, with the valve, the first operation is known as the "Pinch," or seal. A short length of glass tube cut to the correct length on a carborundum wheel, one end of which has been bell-mouthed by means of heating the glass in a Bunsen flame, and placing a forming tool in the glass opening while under heat treatment, is clamped into a machine similar to that shown in Fig. 1. Through this tube is threaded four copper leading-in wires; to one end of each is spot-welded a short piece of special wire and then another piece of thicker gauge wire, the latter eventually acting as a support for the filament, grid and anode. When the wires have been correctly placed in the glass tube, the tube revolves while the flames of the Bunsen burner, drawn to a very fine point, are allowed to impinge on the unflanged end of the tube. When the glass has been heated to the correct temperature, at which it is reduced to a soft putty-like state, two arms rise up, and by a squeezing action flatten the tube; at the same time, this flattening action tightly grips the leading-in wires, thus forming an air-tight seal. The four supporting wires are then bent to the correct shape, according to the type of valve being made. In some cases, for example, in the DE3 valve having a vertical filament, grid and anode, an extension of the supporting rod is added at this stage consisting of top supports for grid, anode and filament, these supports forming a rigid unit, at the same time being thoroughly insulated frome one another by being sealed into a glass bead. This upper unit is attached to the lower portion by spot-welding the bottom of the upper filament support to one of the short filament supports. The grids, anodes and filaments are prepared ready for assembling, the grids being principally made on a universal grid machine (Fig. 2). This machine is of ingenious design, the necessary number of turns of wire being correctly spaced on a mandrel and spot-welded at every turn to the supporting wire. These machines can be adapted for any type of grid. One of the most interesting machines to be seen in operation, is entirely automatic, and, once set up, winds a continuous spiral coil and cuts off the coil, by means of travelling cutters, to the correct length, and welds it to the supporting wire. The anodes, be they flattened or cylin-

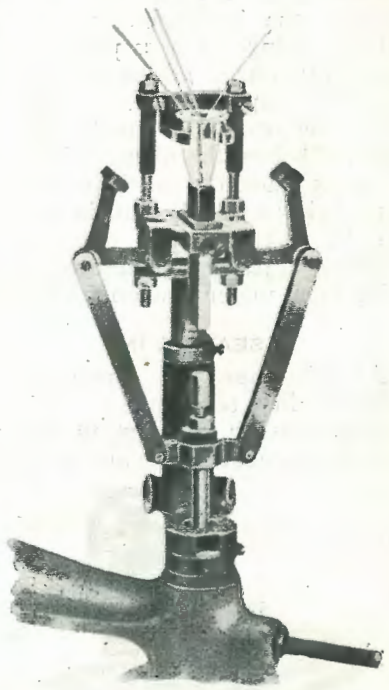


Fig. 1.—Head of Pinch-making Machine.

drical in shape, are bent to shape on formers, the joints being spot-welded. A longitudinal rib is also spot-welded, and a short piece of magnesium wire, about which we shall have something to say later. Having

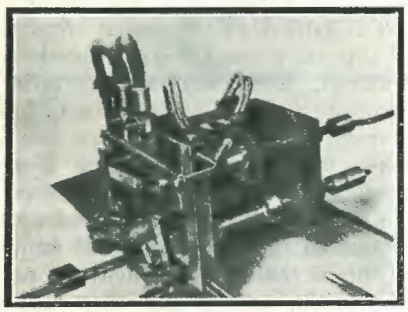


Fig. 2.—Grid-making Machine.

described what may be said to be the most delicate part of the apparatus, it will be readily observed by our readers, if they examine the internal construction of the Marconi-Osram valve, that the assembly of these component parts upon their respective supports requires, first, great accuracy in manufacture, consequently, we find jigs are extensively used through the factory; secondly, the delicate nature of these parts is such that only women labour can be successfully employed. As a case in point, the grid and anode are assembled before the filament is inserted in its place, the gap between these parts being so small that, in order to see that every part is correctly assembled, a tester is employed examining them under a magnifying glass.

SEALING IN.

At this stage the operation of "sealing in" takes place. This operation consists of inserting the seal, with its filament, anode and grid, into

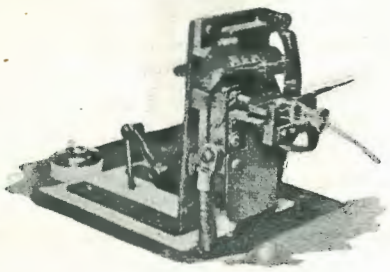
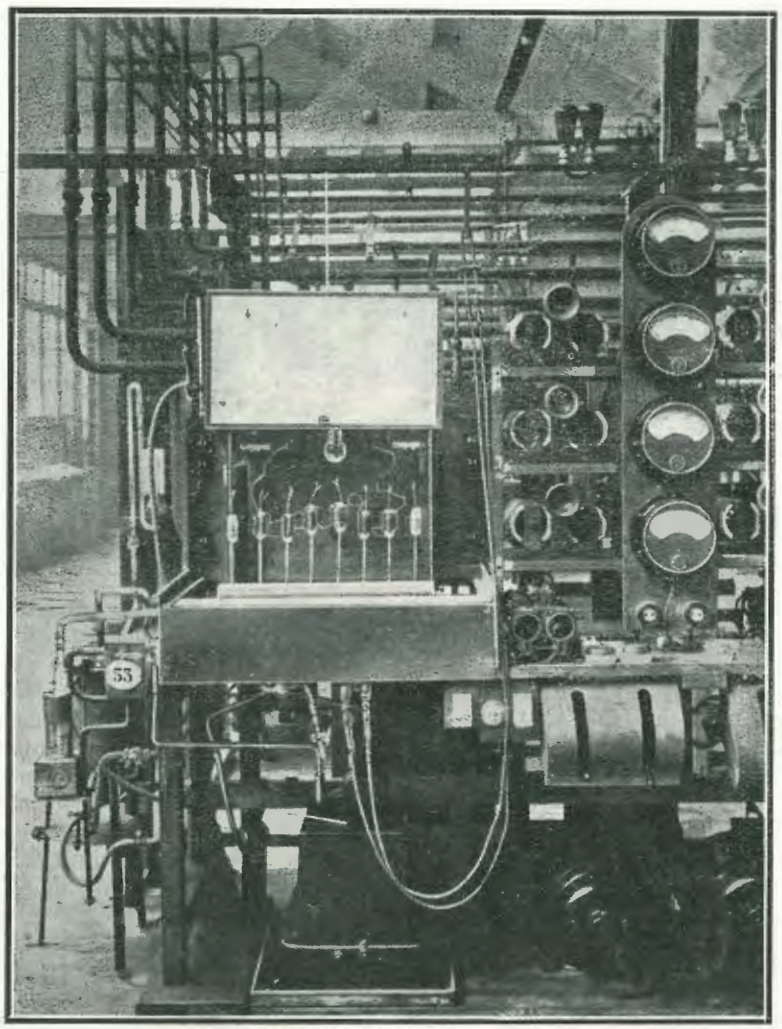


Fig. 3.—Spot Welding.

the glass bulb. Prior to the sealing in, however, these bulbs are heated at the bottom where the pip is in a finished lamp, while the other end, which is open, is placed under a cylinder of compressed air. The glass at the bottom of the bulb is heated almost to a melting point, while the pressure of compressed air blows a small hole through the heated end. The bulb is then placed in an inverted position in a machine, and heat applied round the small hole, while a fine, hollow tube of glass is melted to it, care being taken to ensure a free air passage. The object of this tube will be stated later. The globe is now ready for sealing in. The seal and bulb are placed on a jig on a revolving table, round the periphery of which are equally spaced Bunsen burners. Heat is applied at the point of junction between the seal and the bulb until the two pieces of glass are fused together, while the excess portion of the bulb is cut off by the action of the flame.

EXHAUSTING.

The valve is now ready for exhausting. For this purpose it is passed through an oven which has twenty-four positions, heat is again applied to the bulb which travelled slowly over the twenty-four positions, while oil vacuum pumps are employed to exhaust the air by drawing it out of the bulb through the glass stem, already mentioned. When the bulb has passed through this oven the stem is cut off automatically and sealed, leaving the well-known pip seen in nearly every electric lamp at the bottom. The valve has been partially exhausted of air, but owing to the comparatively large quantities of gas that can be "occluded" or held by the metal parts of the valve and the inner surface of the glass bulb, it is necessary to raise these parts to a



Pump Tables with Eddy Current Heating Equipment for Fine Filament Valves.

high temperature, thus driving off as much gas as possible, and it is at this point the magnesium previously mentioned plays a part. The valve is then placed in another revolving machine and current is passed through the lamp in exactly the same manner as it does in the receiving set; this raises the temperature of the filament and metal parts, sufficiently high to fuse the magnesium, some of which combines with the small amount of gas left in the bulb prior to this operation, and "cleans up" the vacuum; the remainder forms a fine, silver-like coating upon the inner surface of the bulb, this coating absorbing any further gas which may be liberated from the metal parts during the life of the valve.

Several methods are adopted to heat the plate and for flashing the magnesium. That used for DE3 valves is known as "eddy-current heating." A coil of copper wire, through which a high-tension current of high frequency can be made to flow, is slipped over the bulb of the valve, the closing of the pump cage doors automatically switches on the high frequency current, and in a few moments the eddy currents induced in the plate have raised the metal to a temperature sufficiently high to flash the magnesium. The exhausting being completed, the lamps are sealed off, and are ready for the final processes. Dull emitter valves have filaments of Tungsten wire in which there is a certain amount of thoria, a substance which possesses the property of giving a very large electron emission at a comparatively low temperature. In order to bring a large quantity of the thoria to the surface of the filament, the valve is burned for a certain period at a definite temperature considerably in excess of the normal. The filament is next "aged" by burning at its rated temperature for a certain time, after which it is ready for the very exhaustive final test. The valves are put on circuit and tested for filament consumption for emission at set conditions, also for impedance. Finally, a microammeter gives a reading of the maximum reverse grid current, or "backlash." The valve is then ready for capping, marking and packing. In addition to the various types of small valves, it is interesting to note that large rectifiers are manufactured, capable of dealing with small currents at 150,000 volts, such as are necessary in cable testing, in the electrical precipitation of dust and other processes. Large water-cooled transmitting valves, electrodes of which are shown in Fig. 4, are also manufactured for the Marconi Wireless Telegraph Co. Ltd., in sizes taking an input from 10 to 20 kw.

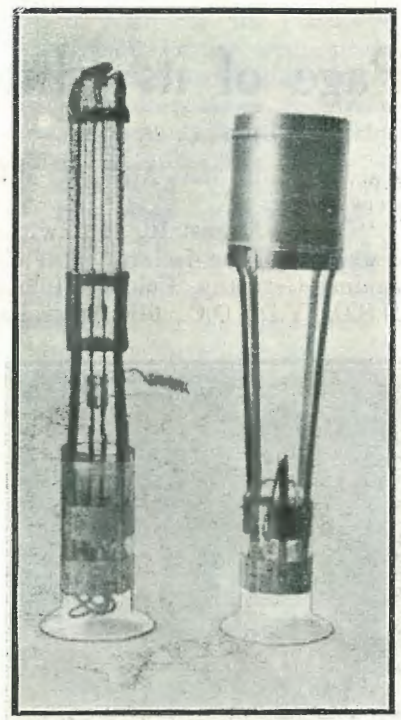


Fig. 4.—Electrodes for Transmitter Valves.

West American "Hams" Work a Chilean Amateur

AMATEUR radio telegraph signals, starting from the Pacific coast, have nearly succeeded in reaching the tip of the South American continent, according to an announcement of the American Radio Relay League. A message from Maurice E. McCreery, manager of the League's Pacific Division, states that four western amateurs have communicated in both directions with an amateur radio station in Chile.

Many western operators, who helped to maintain communication with the MacMillan Arctic expedition in the Far North, are now equally enthusiastic in their desire to get in touch with amateurs in some of the South American countries. This awakening of interest in the possibilities of frequent contact with brother operators in the Latin American field is credited to the unusual success of the recent Pan-American radio tests.

The first amateur to work the Chilean station, according to McCreery, was Glen A. Litten, of Orange, Cal., while the others were McCreery himself, whose station is in Los Angeles; William L. Williams, of Pomona, Cal., and Robert W. Kennedy, of Riverside, Cal. These men are credited with having made the best South American records since the work with Argentina.

The desire of amateurs in Chile to establish contact with operators in the United States has been of long duration, and one of the more prominent experimenters of that country recently announced that he would give a genuine Chilean hat to the North American who turned the trick. It is expected this hat will be given to Litten in the near future.

DE LUXE AERIAL.

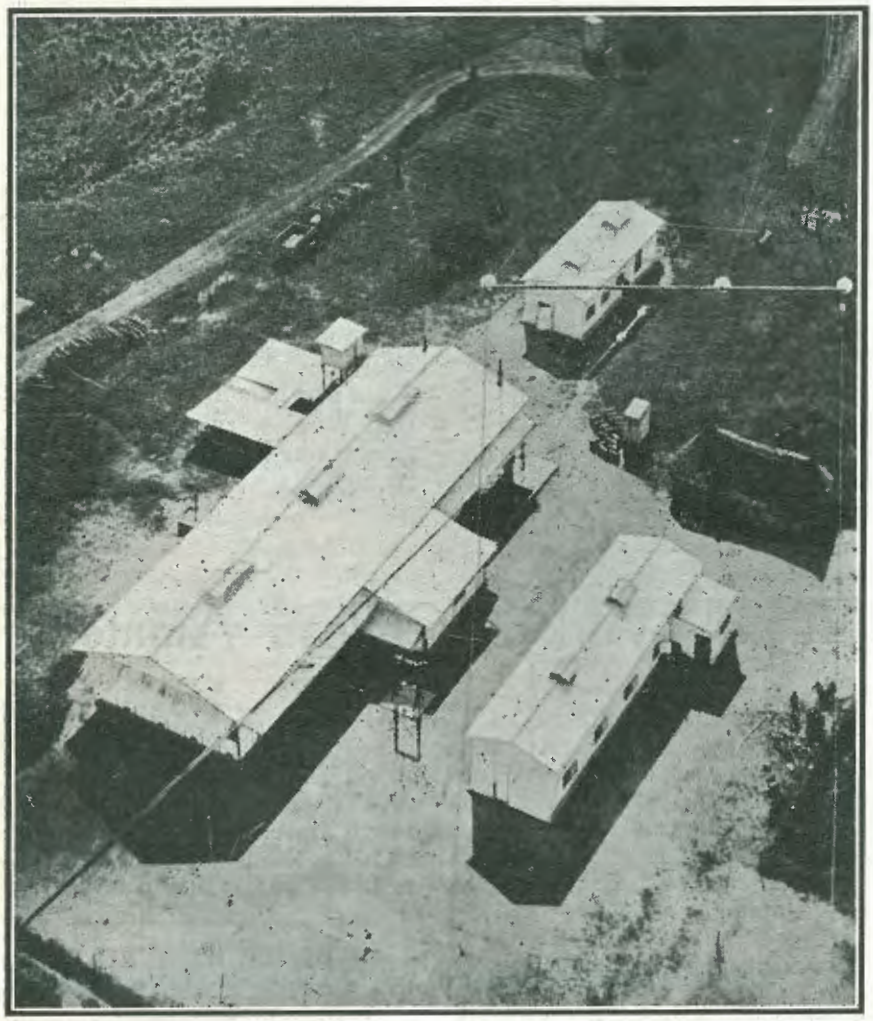
DR. G. J. ADAMS, of The Avenue, Wanganui, has installed a three-valve set and has erected an aerial that for height and appearance is the envy of many amateurs in that locality. It has been noticed that a lucky neighbour was fortunate enough to be able to hang one end of his aerial on to the doctor's rear mast. Excellent reception has been reported on this installation.

VJZ

A Page of its History

By J. C. D.

MANY readers, perhaps, have not heard of the capture from the Germans on September 11, 1914, of the Bita Paka Wireless Station, then the last remaining link of the German chain of Radio stations in the Pacific.



A view from the top of one of the aerial masts of Bita Paka (Rabaul) Radio Station.

Extracts from the first *Government Gazette* published in Rabaul immediately after the Australians occupied German New Guinea, give an interesting account of the A.N. & M.E. Forces' work:—

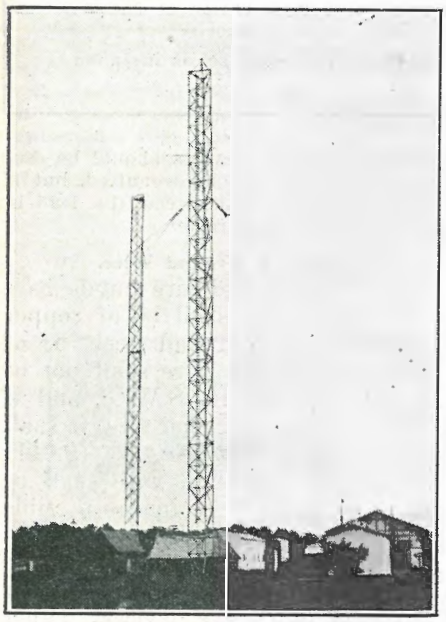
"On the August 10, 1914, within a week from the declaration of war against Germany, Colonel Holmes, D.S.O., V.D., O.C., 6th Australian Infantry Brigade, accepted the command of Australia's first overseas force, and on the following day the first batch of recruits was received, sworn in and steps taken to select regimental, staff and other officers. The work of organising, clothing, equipping and training was proceeded with vigorously, and within one week the force was embarked on the transport *Berrima* at Sydney as a complete, self-contained unit ready to proceed to sea on active service. At the same time, the Naval portion of the force was completed and placed in charge of Commander Beresford, R.A.N. The *Berrima* commenced her voyage from Farm Cove, Sydney, on the 19th of August, and some weeks later, sheltering under the escort of ships of the Royal Australian Navy, arrived off New Britain on September 11, when a Naval detachment of twenty-five men put ashore at Kabakaul with instructions to locate the wireless station about six miles inland. Owing to serious opposition from the enemy, reinforcements were quickly requisitioned, whereupon two companies of Naval Reserves and two of infantry were landed with instructions to locate and co-operate with the first party of twenty-five in the attack on the wireless station. The absence of reports from the original party, led to instructions being given, that at daylight on the following morning, the guns of the fleet should shell with shrapnel the ridge between Kabakaul and Herbertshohe (on which Bita Paka is situated), which appeared to be strongly held, and on completion of shelling, the forces at Kabakaul and Herbertshohe should attack simultaneously. Early on the morning of September 12, however, information was received that the enemy's troops defending the wireless station had surrendered and the station occupied by a party under Lieut. Bond and Capt. Travers; but not without the following casualties on our side:—

Killed: Capt. B. C. A. Pockley, A.M.C.; Lieut.-Com. C. B. Elwell, R.A.N.; G. V. Williams, A.B.; J.

Courtney, A.B.; R. Moffatt, A.B.; —. Street, A.B.

Also four wounded.

The forces, having completed the capture of the station, then removed to Rabaul, landing there at 6 p.m. the same day, and it was there that the garrison was established



Aerial Masts.

and the British flag hoisted. Terms of capitulation were then arranged and the German Governor allowed to return to Germany."

As told above, the capture of the station at Bita Paka put out of action the last of the four forming the German Pacific chain. Yap was destroyed by the H.M.S. *Hampshire,* Nauru was captured by a landing party from H.M.A.S. *Melbourne,* Samoa occupied by the N.Z. Expeditionary Forces. The Bita Paka station was, at the outbreak of the war, in the early stages of construction and working on low power. There appears to be little doubt that military considerations were the primary object of these stations, but without sufficient military protection, proved a failure.

The capture of Bita Paka resulted in the first bloodshed of Australian manhood in the Great War, and the scene of the fight is some 30 odd miles from Rabaul, on the eastern-most peninsular of New Britain. After capture, part of the apparatus was shifted to Rabaul township, but the necessity of the original high power station was soon discovered, and Engineers D. McDonald and C. W. Hardinge, with a party from the Australian Coastal Service, arrived in November, 1914, to complete its construction. The original German plans provided for five steel lattice masts, but these were considered above requirements to obtain communication with Australia and two towers only were erected. The erection of the larger tower of 315 feet—first assembled on the ground and with the aid of jury mast and winches, lifted holus bolus into position—together with the general arrangement of the apparatus and buildings, displayed the ability of the construction engineers. The station eventually opened for working early in 1916 with L. Luscombe as O.I.C., and rapid progress was soon made in obtaining the best results from the modified arrangements of aerial system and gear; the most important of these results being the change from night to day working, made possible only by the use of longer waves and installation of valve receivers. The more recent achievements on still shorter waves would have eased the strain on telegraphists of the tropics in these days, but these achievements have resulted from utilising valves for transmission, whereas valves had at that time only partly met with approval for reception purposes; further, it would not have been possible to tune spark sets to such short waves. Several smaller stations of ship-type transmitters (locally termed "jampots") were erected at the outpost stations in the German territory, and traffic from these, together with Nauru, Ocean Island and Tulagi (Solomon Islands) relayed to Australia through Bita Paka, Woodlark Island (now abolished) and Townsville.

In 1922, when Amalgamated Wireless (A/sia.) Ltd., assumed control of the Australian coastal stations, by agreement with the Commonwealth Government, the stations in New Guinea also came under the control of the company, the Island Radio Service, and Mr. W. G. Clarke, Officer-in-Charge of Perth Radio, was appointed Radio Inspector, Rabaul, and required to transfer the service from local administration to company control.

The installation of amplifiers and valve transmitters at both Rabaul and Townsville, which was soon effected after A.W.A. control brought about a further modification of power at Bita Paka and also at Townsville. The 90 h.p. Diesels at Bita Paka have since been replaced by a 14½ h.p. Rus-

Another view of VJZ.

ton engine, which fully meets all present day requirements, and the service in all directions is much more efficient on 1,000 watts valve transmitter than the old 40,000 watt Telefunken spark transmitter. Telephony has also been arranged on the valve transmitter and this is used daily in the maintenance of a service with

(*Continued on page* 712.)

Radio Installation Rules

Authorised by Fire Underwriters' Association of N.S.W.

THE information contained in the following article has been issued by the Fire Underwriters' Association of N.S.W. for the guidance of those who propose installing radio receiving sets.

Holders of Fire Insurance Policies should notify the company concerned immediately a receiving set is installed on the premises.

IN setting up Radio Equipment, all wiring pertaining thereto must conform to the Association's "General Rules for Wiring for the Utilization of Electrical Energy," and the following additional Rules:—

FOR RECEIVING STATIONS ONLY.

Antenna.

(*a*) Antennas outside of buildings shall not cross over or under electric light or power wires, nor shall they be so located that a failure of either antenna or of the above-mentioned electric light or power wires can result in a contact between the antenna and such electric light or power wires.

Antennas shall be constructed and installed in a strong and durable manner, and shall be so located as to prevent accidental contact with light and power wires by sagging or swinging.

Splices and joints in the antenna span, unless made with approved clamps or splicing devices, shall be soldered.

Antennas installed inside of buildings are not covered by the above rules.

NOTE.—Outdoor antennas should be of rugged construction, held securely in place and kept well away from electric light and power wires. It is advisable for the amateur not to make any connections to poles carrying light or power wires. Those unfamiliar with electric wiring will do well to have antennas and other apparatus installed by competent electricians.

The size of the antenna will depend on the span; for the ordinary receiving antenna about 100ft. long, No. 16 gauge soft drawn copper wire may be used, or other wire of equivalent strength. Where the span is long, or where the antenna crosses other wires, it should be larger.

Lead-in Wires.

(*b*) Lead-in wires shall be of copper, approved copper-clad steel or other metal, which will not corrode excessively, and in no case shall they be smaller than No. 16 S.W.G., except that approved copper-clad steel not less than No. 18 (0.044) S.W.G. may be used.

Lead-in wires on the outside of buildings shall not come nearer than twelve (12) inches to electric light and power wires unless separated therefrom by a continuous and firmly fixed non-conductor that will maintain permanent separation. The non-conductor shall be in addition to any insulation on the wire.

Lead-in wires shall enter building through a non-combustible, non-absorptive insulating bushing.

NOTE.—Although desirable from a signalling viewpoint to prevent partial grounding in wet weather, these rules do not require the insulating of lead-in wires, except where they pass through the building wall, where a bushing is specified. This is to protect against possible contact with wires, pipes, or other grounded metal, which may be concealed in walls.

Protective Device.

(*c*) Each lead-in wire shall be provided with an approved protective device properly connected and located (inside or outside the building) as near as practicable to the point where the wire enters the building. The protector shall not be paced in the immediate vicinity of easily ignitable stuff, or where exposed to inflammable gases or dust or flying of combustible materials.

The protective device shall be an approved lightning arrester which will operate at a potential of five hundred (500) volts or less.

The use of an antenna grounding switch is desirable, but does not obviate the necessity for the approved protective device required in this section. The antenna grounding switch if installed shall, in its closed position, form a shunt around the protective device.

NOTE.—The protective device should be approved lightning arrester; the use of cheap home-made devices should be discouraged. Fuses are not required, but if installed should be between the lead-in and the lightning arrester.

Protective Ground Wire.

(*d*) The ground wire may be bare or insulated, and shall be of copper or approved copper-clad steel. If of copper the ground wire shall not be smaller than No. 16, S.W.G., and if of approved copper-clad steel it shall not be smaller than No. 18 (0.044) S.W.G. The ground wire shall be run in as straight a line as possible to a good permanent ground. Preference shall be given to water piping. Gas piping shall not be used for grounding protective devices. Other permissible grounds are artificial grounds such as driven pipes, plates, cones, etc.

The ground wire shall be protected against mechanical injury. An approved ground clamp shall be used wherever the ground wire is connected to pipes or piping.

NOTE.—The proper connection of the antenna to the ground minimises the lightning hazard. A satisfactory ground and properly-run ground wire are of primary importance.

Wires Inside Buildings.

(*e*) Wires inside buildings shall be securely fastened in a workmanlike manner, and shall not come nearer than two (2) inches to any electric light or power wire unless separated therefrom by some continuous and firmly fixed non-conductor making a permanent separation. This non-conductor shall be in addition to any regular insulation on the wire. Porcelain tubing or approved flexible tubing may be used for encasing wires to comply with this rule.

Receiving Equipment Ground Wire.

(*f*) The ground conductor may be bare or insulated, and shall be of copper, approved copper-clad steel,

or other approved metal which will not corrode excessively under existing conditions, and in no case shall the ground wire be less than No. 16 S.W.G., except that approved copper-clad steel not less than No. 18 (0.044) S.W.G., may be used.

FOR TRANSMITTING STATIONS.

NOTE.—Transmitting stations are regarded as involving more hazard than stations used only for receiving, and require additional safeguards. In addition to these requirements, all wiring and apparatus supplying power for sending should be installed in accordance with the General Rules for Wiring.

Antenna.

(*g*) Antennas outside of buildings shall not cross over or under electric light or power wires, nor shall it be so located that a failure of either the antenna or of the above-mentioned electric light or power wires can result in a contact between the antenna and such electric light or power wires.

Antennas shall be constructed and installed in a strong and durable manner, and shall be so located as to prevent accidental contact with light and power wires by sagging or swinging.

Splices and joints in the antenna span, shall, unless made with approved clamps or splicing devices, be soldered.

Lead-in Wires.

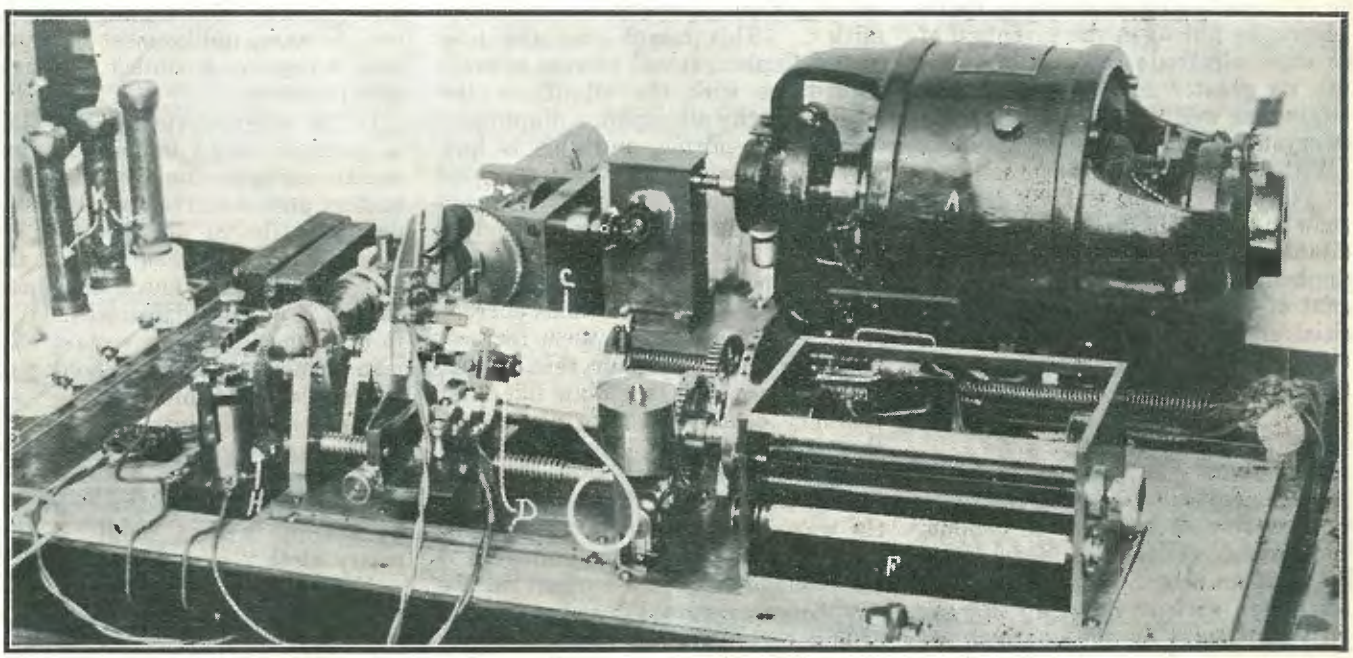
(*h*) Lead-in wires shall be of copper, approved copper-clad steel, or other metal which will not corrode excessively, and in no case shall they be smaller than No. 16 S.W.G.

Antenna and counterpoise conductors and wires leading therefrom to ground switch, where attached to buildings, must be firmly mounted five (5) inches clear of the surface of the building, on non-absorptive insulating support such as treated wood pins or brackets equipped with insulators, having not less than five (5) inch creepage and air-gap distance to inflammable or conducting material. Where desired approved suspension insulators may be used.

(*i*) In passing the antenna or counterpoise lead-in into the building a tube or bushing of non-absorptive insulating material shall be used, and shall be installed so as to have a creepage and air-gap distance of at least five (5) inches to any extraneous body. If porcelain or other fragile material is used, it shall be installed so as to be protected from mechanical injury. A drilled window pane may be used in place of bushing provided five (5) inch creepage and air-gap distance is maintained.

NOTE.—Entrance tubes or bushings may be glazed porcelain or composition.

In making these installations, the peculiar characteristics of radio-frequency current should be kept in mind, and all wires should have adequate clearance in order to make sure that the current will stay upon the wires until it has reached its intended destination.



This is the apparatus housed at the New York headquarters of the Radio Corporation of America, upon which was recently received for the first time in history a series of photographs transmitted by wireless from the Corporation's London office. The machine was designed by Captain R. H. Ranger, Radio Engineer. Details of the apparatus are as follow:—The motor, A, operates the gearing, B, which rotates the cylinder bearing the recording paper, C. A specially-constructed fountain-pen, D, is fed with ink from a reservoir, E, and is agitated by the received signal pulses to make a direct record on the paper of the transmitted picture. To the right in a camera box shown open at F, a photographic record is simultaneously made with a small electric light on a sensitive photographic film. A large tuning fork kept continuously buzzing by electricity holds the motor, A, to a rigorously constant speed.

Protective Grounding Switch.

(*j*) A double-throw knife switch having a break distance of four (4) inches and a blade not less than one-eighth ($\frac{1}{8}$) inch by one-half ($\frac{1}{2}$) inch shall be used to join the antenna and counterpoise lead-ins to the ground conductor. The switch may be located inside or outside the building. The

(*Continued on page* 714.)

Talks from 3LO

Crystal Detectors

FROM time to time, commencing with this issue. there will appear in "Radio" reports of addresses made by wireless experts from 3LO. the Melbourne Station of the Broadcasting Company of Australia.

IT is with the intention of putting on permanent record the remarks made by the leading Australian Radio authorities concerning the many and various types of receiving sets and their management, and the different branches of wireless that these addresses will be published in these columns. They should also prove of considerable interest and assistance to those other Australasian listeners-in and experimenters who, through different circumstances, are unable to hear the items transmitted from 3LO.

TO-NIGHT I want to tell you something about crystal detectors. The crystal as a detector of electro-magnetic waves was associated with the very earliest experiments in Radio Telegraphy but upon the invention of the three electrode thermionic valve, with its greater sensitivity and amplifying, as well as rectifying powers, the crystal faded into the background.

With the advent of broadcasting a few years ago, the crystal was granted a new lease of life, as it is admirably suitable for the reception of radio telephony over short distances, on account of its extreme simplicity, small initial cost and upkeep. No doubt many of you are listening to me on crystal sets to-night and will be interested to know just how that little piece of crystal functions.

Many years ago scientists found that some crystals possessed the peculiar property of being more conductive in one direction than in the other, that is if an alternating electro-magnetic force, such as is set up in your receiver circuits on the arrival of ether waves from the broadcast station be applied to such a crystal it will be transformed into direct current "kicks" or pulses, and these are just what we need to actuate our telephone receiver. Now those pulses on a wave-length of 600 metres occur at the rate of 500,000 per second and form practically a continuous current. This current will be steady, provided the amplitude of the transmitted waves is steady and as our ears cannot respond to frequencies nearly so high as 500,000 per second nothing will be heard, but if the amplitude of the transmitted wave or carrier wave, as it is called in radio telephony, is varied by superimposing on it sound waves then our 500,000 cycle per second pulses through the telephones will vary in strength, too, and what is more important still, they will vary in exact accordance with the sound waves impressed on the transmitter. This means that the telephone diaphragm will vibrate in exact accordance with the vibrations impinged on the microphone diaphragm at the transmitter, and this is how you are hearing my voice in your telephones to-night.

There are several varieties of crystal which possess this rectifying property, some of which require the passage of a small, continuous current from a battery through them for best results. The reason for this is that they do not obey Ohm's law like most ordinary conductors of electricity, that is, the current through these crystals does not increase proportionally to the voltage. Therefore, when the wave comes along to our receiver and sets up an E.M.F. or voltage and this voltage rises, the current in the telephones only increases slightly, but after a certain voltage is reached, the current then increases rapidly, so that if we supply this first voltage from a couple of dry cells we have our crystal operating at that point where any further increase will give rise to a large current increase. Thus by supplying this initial voltage we obtain more current and therefore louder signals in our telephones.

Carborundum is a crystal of this nature and in order to find the correct voltage necessary, which will vary with every piece of crystal, a potentiometer is used with the three-volt battery to adjust the voltage very gradually from zero to maximum. Although not very popular, on account of requiring a battery and potentiometer, carborundum has many advantages, the chief being its stability once a good point is found and the potentiometer set at the best position, when it will remain adjusted for months and will even withstand knocks, jolts, etc., because, unlike most other crystals, it requires a contact of considerable pressure.

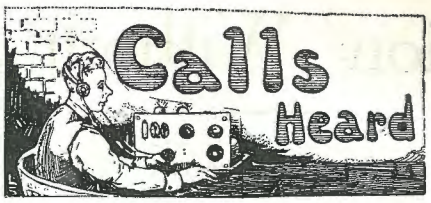
Of the other crystals in use, Galena is perhaps easily the most popular, unlike carborundum, it requires no battery and is extremely sensitive. Its drawback lies in the fact that it requires a very light contact and, therefore, the slightest knock or vibration throws it out of adjustment. A way to overcome this, to a certain extent, is to mount the crystal holder on a piece of spongy rubber.

A few useful hints should be helpful for keeping your crystal in good working order.

Keep your catwhisker point clean by rubbing with a small piece of emery cloth occasionally.

If your crystal is exposed a film of dust and moisture forms on the surface in time, and its sensitivity decreases. This can generally be overcome by breaking the crystal carefully until a new surface is exposed, or, better still, use one of the many crystal cups on the market in which the crystal is enclosed in a glass cylinder. Do not handle your crystal, as this puts a minute film of grease in its surface and decreases its sensitivity.

Do not scrape the surface of your crystal with a knife in an endeavour to obtain a new surface, but carefully break it, keeping your fingers off the new surface. Some of these precautions may sound trivial but, if heeded, will help you to get results which are just a little better than the average and you all know the feeling of satisfaction that this gives.



"I AM having a holiday at Norfolk Island," writes Mr. H. Hammond, "and being a confirmed wireless 'bug,' have my 'box of rubbish' with me." Mr. Hammond began operations by constructing the famous P1 with one valve and erecting a 100ft. T aerial, 40ft. high. The result of searching the ether on the first night was 2BL's carrier wave which was some encouragement, so the next day this experimenter went "over" his set, shortened all wiring and soldered every joint. "The next night 2BL came in as well as the average crystal set receives them in Sydney. Immediately it was known that I heard Sydney my wireless room was over-run by inquisitive tourists and interested islanders. During the next week I was busy logging amateurs. This is my list: 2HM, 2RJ, 2JM, 1FJ (N.Z.), 6XI, KGO, 2FC, VIS, VHY, GBE. The amateurs were logged on the one night, and, with the exception of 1FJ, on 'phone. I also heard Mr. Crawford, the Radio Inspector, speaking to 2JM." Mr. Hammond intends to add a stage of radio and an AP double filament valve as an audio amplifier when "these ought to bring in something pretty good."

IN "Calls Heard" of last issue, mention was made of a Mr. Atkins, of Dubbo, N.S.W., who can hear 2FC on a crystal set with two pairs of ear-'phones any night on anything like favourable conditions. Additional details have now come to hand and it appears that the tuner is a single coil, single circuit, using galena, silicon or any other sensitive crystal. The aerial is 28ft. high, one end being fastened to a green tree. The antenna consists of five wires on about five one foot hoops. Crystal reception of this station is not confined only to Mr. Atkins, but several other amateurs in the town who have learnt to handle their sets properly have been equally successful. As the reception conditions at Dubbo and right on through to Bourke are so much better than they have been found on the Blue Mountains they have given rise to the theory that the "Heaveyside Layer" is acting as a reflector across the range.

MR. LAWRENCE E. DEANE, of Lindfield, Sydney, sends details of his station. The receiver is a single valve, low loss, the circuit being a modification of the Reinartz. The aerial is a 3/20 single copper wire 130ft. long and 35ft. high. The earth is a water-pipe. Mr. Deane's latest list of calls heard is a very fine one and we take this happy opportunity of publicly congratulating him. Stations logged are as follow:—N.S.W.: 2CR, 2GQ, 2HM, 2RJ, 2SO, 2YA, 2WS, 2JS. Vic.: 3AP, 3BD, 3BH, 3BK, 3BL, 3BM, 3BP, 3BQ, 3BU, 3CB, 3DB, 3EF, 3EM, 3EN, 3GB, 3HL, 3JH, 3JP, 3JU, 3LM, 3LS, 3OT, 3RY, 3TM, 3XF, 3XO, 3XX. Qld.: 4AN, 4AP, 4AZ, 4CM. S.A.: 5AD, 5BF, 5BG, 5CD, 5DA, 5DO, 5LO, 5WJ. Tas.: 7AA, 7AB, 7BK. N.Z.: 1AA, 1AK, 1AO, 1FF, 2AB, 2AC, 2AF, 2AO, 2AP, 2AQ, 2AR, 2AW, 2BA, 2BC, 2BL, 2BM, 2XA, 3AA, 3AD, 3AF, 3AL, 3CG, 4AA, 4AD, 4AG, 4AK, 4AP, 2BU. U.S.A.: 1BUX, 1JS, 1KC, 1OW, 1PL, 1XB, 1XZ, 1XAM, 1XAV, 2BFB, 2BGI, 2CQZ, 2RK, 2XQ, 3AB, 3ADB, 3HG, 3AU, 3AUV, 3WB, 4KL, 4KU, 4OA, 4SB, 4UK, 4XE, 4YE, 5IN, 5QY, 5ZAI, 6AHP, 6AK, 6AKW, 6ALO, 6AO, 6APW, 6ARB, 6AWT, 6BUW, 6CGO, 6CN, 6CNL, 6CTO, 6EB, 6ETC, 6EW, 6UC, 6VC, 8BA, 8CBP, 8PL, 9BCJ, 9CJC, 9EFZ, 9EKY, 9XI, 9ZT, WGH, KGO, 6XI, 6ASE, 6BDT, 9ZY, 1ABF, 6BIP, 6CCT, 6CRX, 2BRB, 5ZAV, 9AQD, 9BDW. Mexico: BX. England: 2OD, 2NM. The following stations have been logged, using no aerial at all:—Aus.: 2GQ, 2HM, 3BQ, 3BD, 3JH, 3EM, 3TM, 3LM, 3JU, 3JP. N.Z.: 1AA, 2AC, 2AP, 4AA, 4AG, 4AK, 2XA, 1AO. U.S.A.: 6AWT.

WHEN you have several valves in parallel and all lit, do not take one of them out, as this causes a rise in filament current.

Amplification Without Distortion

"I CAN hear 2FC on my set 50, 100, 500 feet from the loud-speaker."

How often you hear this remark. and how often the informant swells with pride when he tells you about it! You are invited along to hear it. On arriving you find that he has not exaggerated, in fact, you hear it along the street long before you reach the house, *but* what is the quality like when you get inside? In all probability, the music or speech is almost unintelligible. Just one huge blast. There is a something within the hearts of all wireless enthusiasts which causes us to delight in getting signals just a little louder than the other, but now that the first novelty of broadcasting is over we should conquer this desire for *quantity* and strive for *quality*. Otherwise, the years of research on the part of the radio engineers responsible for the quality of the broadcast transmissions are rendered fruitless. The aim of Broadcast Radio Engineers is ever quality, and faithfulness of reproduction, so with this same aim in mind let us turn to our receiver, and more especially to the audio frequency amplification portion of it.

There are three methods of obtaining audio frequency amplification in common use to-day. They are:—Transformer coupled; Resistance coupled and choke coupled. Now the transformer coupled method gives the greatest amplification per stage, and for one stage of audio frequency, amplification works quite satisfactorily; beyond this, however, distortion creeps in.

The second method, resistance coupled, gives less amplification per stage than the other two, but has a straight amplification curve, that is, it gives distortionless amplification. This method, however, is not popular, because, on account of its low amplification it is not economical.

Now the choke coupled method comes between these two, and is, we think, the happy medium. It has an amplification curve which is practically straight; gives greater amplification per stage than the resistance coupled method. No very special apparatus is required to build it up, and it can be added to any ordinary valve circuit quite simply.

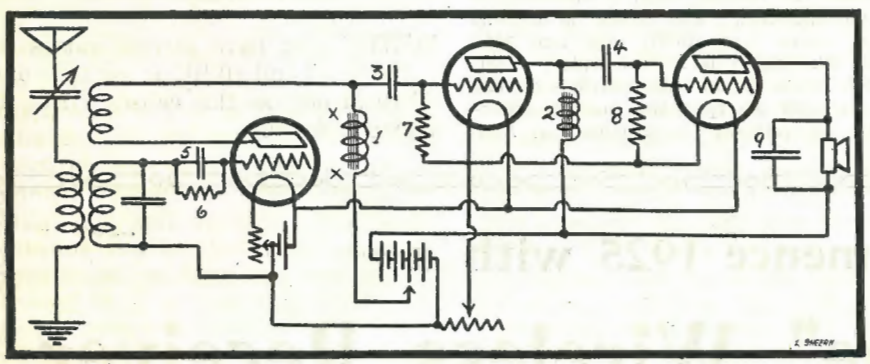


Fig. 1.

Referring to Fig. 1, the left-hand portion of which is an ordinary three-coil regenerative circuit, and in the case of a single valve receiver, the points x x would be the telephone terminals. Across these terminals, instead of the telephones, is connected the first choke. This can be the secondary of any ordinary iron core intervalve transformer. 2 is a similar choke, 3 and 4 are fixed condensers, having a capacity of .01 microfarads, this value, however, is not critical. These condensers can easily be made up of 14 sheets of tinfoil 3½in. x 1in. separated by sheets of thin, waxed paper. The grid condenser 5 has a capacity of .0003 mf. and the grid leak 6 a resistance of two megohms. Grid leaks 7 and 8 have a resistance of one megohms each. It is advisable to have these variable, if possible, or select leaks to suit the particular valves in use. The condenser 9 across the loud-speaker helps to clean up reception and should have a capacity of .001 microfarads.

It will be seen on studying the diagram, together with the above description, that if you are using a transformer coupled set it will be quite an easy matter to make the necessary alterations for conversion to choke coupling and the trial will be well worth while. A slight reduction in signal strength will be noticed, but the difference in quality will be an agreeable surprise.

THE ISLAND SERVICE.

IN a previous issue of *Radio* mention was made of the advantages of linking up the various islands of the Pacific, the news of the striking and beaching of the steamer *Roma* being given as a cast in point. The Government steamer *Tutanekai,* which took up the running of the *Roma,* has returned to Auckland, and reports the excellent results which are being obtained from the recently installed plants at Raratonga and Niue. Typewritten copies of the news of the world are daily posted outside the several offices, and the doings of the "All Blacks" and Australian cricketers are followed with the utmost interest. The Islanders, however, are more interested in the prices of their produce than in anything else, and as they now know the day and hour of the steamer's arrival, they are more than satisfied with the blessings bestowed upon them by wireless.

HONEYCOMB coils absorb moisture, so dry them out if they do not perform as in the past.

Audio Frequency Transformers

A GREAT deal has been written about audio frequency transformers and most of it with the idea of getting volume from the loud speaker. Volume is all right if the sound is good to listen to but where quality must be sacrificed just to get a lot of noise, the writer, as well as the average fan does not want volume.

You may have tried three stages of audio at one time or another and it was not a success. You naturally concluded that three stages of transformer coupled audio frequency was not practicable. In most cases it is not, but this is due to using improper ratio transformers. A properly-designed amplifying transformer for use in radiophone receiving sets should have no marked resonance over a band of from 50 to 5000 cycles. With standard valves, a ratio of about four should be used for obtaining the above. When using transformers of high ratios, it is necessary to use leaks (high resistances) or fixed condensers across the secondary windings or to use a high and low ratio transformer in the first and second step. Such arrangements cause losses and a weaker signal.

Where transformers of various ratios are used it is done with the idea of not overloading the valves and to reduce distortion. A 9 to 1 ratio may have a resonance point about 1200 cycles; one of 6 to 1 may be around 800 and one of 3 to 1 about 600 cycles. This broadens the resonance curve and cannot be compared to the use of low ratio transformers throughout.

Most amplifiers are noisy even when good materials are used and in many cases may be due to: low voltage A or B battery; connection from transformer to grid being too long or parallel to other wires; loose connections, all connections should be soldered; improper wiring or arrangement of parts; high resistance B battery; cheap transformers and open transformer windings.

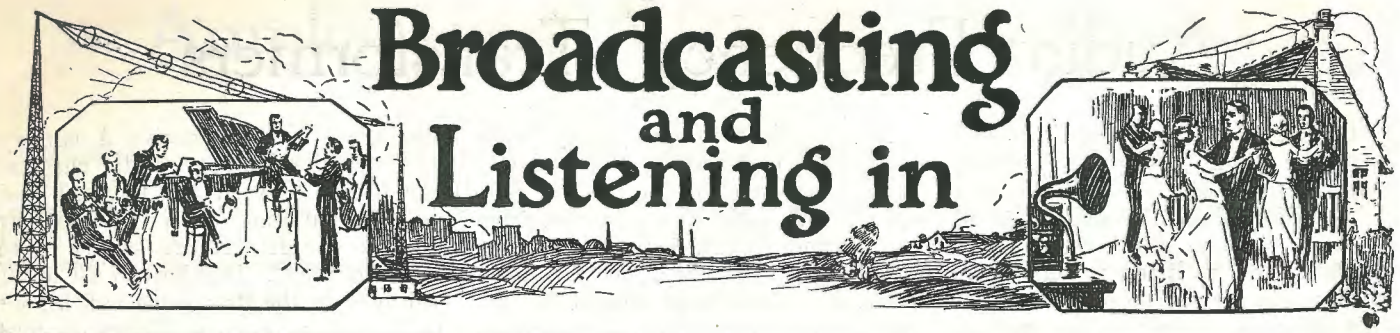
The remedy for the above is to keep both A and B batteries fully charged. If you use dry B batteries, when they get low, you must replace them with new ones if you expect good results. The connection from the grid of the valve to the transformer should be as short and direct as possible. It is sometimes necessary to place the transformer sideways or at an angle but the main idea is to get the lead short and away from other leads. Loose connections mean both weak signals and noise. In a great many cases, "static" is nothing more than poor connections. When you disconnect the aerial and ground and still hear "static," it is a loose or corroded connection. A good place to look is the positive A battery. Jacks very often do not make a perfect contact, but a fine file or piece of sandpaper drawn between the contacts will clean them quickly. Every connection on your set should be soldered if at all possible. No matter how tight you make them at first, somehow or other they work loose. Wires should be run as direct as possible and not all over the cabinet. The grid return from the transformer should go to the negative A battery and not the filament. The rheostat should be between the filament and grid return lead. If a "C" battery is used, the grid return should go to the negative C. It is best to use lower voltages on the first valve and higher on the others, such as 67½ on the first stage; 90 on the second, and 110 or 135 on the last, with corresponding "C" battery voltage from 1½ to 12.

AMATEUR STATION IS INSTALLED AT SHOW.

ONE of the prominent attractions at the Chicago Radio Show, held at the Chicago Coliseum, was the exhibit given by E. T. Flewelling, of amateur station 9XBG, who set up his station for broadcasting and handling messages for visitors.

The most unique feature of the experimental station was the fact that the entire equipment, from the current supply to the antenna and counterpoise, was located entirely in the building. The transmitter was a 100 watt set, broadcasting on 80 metres, and operated entirely from power supplied from storage batteries.

Special permission was secured from E. A. Beane, Supervisor of Radio for the Ninth District, to permit broadcast on the short waves. Musical programmes were given by two entertainers. Mr. Flewelling was assisted in the operation of the set by members of the Radio Traffic Association, affiliated with the A.R.R.L.



Broadcasting and Listening in

2FC

BROADCASTING TIMES.

Sydney Mean Time.
CALL SIGN 2FC, SYDNEY.
Wave Length: 1100 metres.
Power: 5 kilowatts.

Midday Session:

12.55 The Chimes of 2FC.
12.58 Time Signals from Farmer's Master Clock.
1.0 Coastal Farmers' Market reports, Stock Exchange information, Weather information, "Sydney Morning Herald" news service, Reuter's and Australian Press Association cables, "Evening News" midday news service.
1.30 Close down.

Educational Session:

3.0 The special Education Session, which has been arranged by the N.S.W. Department of Education, will be held on Mondays, Tuesdays, Wednesdays, and Thursdays of each week. Friday, Musical Programme from 3 p.m. to 3.45 p.m.
3.3 The Chimes of 2FC.
3.50 Musical Programme.
Afternoon Stock Exchange information, late Weather information, "Evening News" afternoon news service.
4.0 Close down.

Early Evening Session:

6.30 The Chimes of 2FC.
6.33 Children's Hour.
7.10 Dalgety's Market reports (wool, wheat, stock), fruit and vegetable markets, late Stock Exchange information, Weather News, Shippings News, late "Evening News" news service, Reuter's and Australian Press Association cables.
7.20 Close down.

NIGHT SESSION:

7.55 The Chimes of 2FC.
8.0 Musical Programme.
The evening entertainment broadcast from Station 2FC is varied and includes Theatrical transmissions from the Theatre Royal, Her Majesty's Theatre, The Criterion Theatre, The Palace Theatre, The Tivoli Theatre, Haymarket Theatre and the Prince Edward Theatre.
Jazz music provided by the Wentworth Orchestra is also broadcast direct, and high-class musical entertainments provided at the Studios of 2FC, in which Sydney's leading artists participate, are also features of the programme.
SATURDAY: Midday, early evening and evening sessions as on week days, afternoon session as follows:—
3.15 The Chimes of 2FC.
3.18 to 3.45: Late Sporting information.
3.45 Close down.
SUNDAY: No midday, afternoon or early evening session. Church Services from one of several Churches, commencing at hour appointed for Divine Service, according to the Church, and varied by some Sacred Concert from the Studio of 2FC.
10.0 Close down.

6WF

BROADCASTING TIMES.

Perth Mean Time.
Wave Length: 1250 metres.

Midday Session:

12.30 Tune in to gramophone.
12.35 Market Reports of The Westralian Farmers, Limited.
12.38 News Service.
12.42 Weather Reports.
12.44 Gramophone Items.
1.0 Time Signal.
1.1 to 1.30 Gramophone and Pianola.
1.31 Close down.

Afternoon Session:

3.30 Tune in to Pianola.
3.35 to 4.0 Special programme, comprising Talks, Gramophone, Pianola, Westralian Farmers' Studio Orchestra.
4.1 Close down.

Early Evening Session:

7.5 Tune in to Gramophone.
7.10 Bedtime Stories.
7.45 Market Report.
7.57 Weather Report.
8.0 Time Signal.
8.1 News Cables.

EVENING SESSION:

8.10 to — Entertainment. See list hereunder.

Monday: 8.10, Lecture; 8.45, Wesfarmers' Orchestra.
Tuesday: 8.10, Professional Concert.
Wednesday: 8.10, Theatre or Hall Broadcasting.
Thursday: 8.10, Professional Concert.
Friday: 8.10, Concert Evening and Lecture.
Sunday: 7.29, Church Service.
Saturday: 8.15, Wesfarmers' Studio Orchestra.

SATURDAY:

Midday Session:

12.0 Tune in to Gramophone.
12.5 Market Reports of The Westralian Farmers' Ltd.
12.10 News Service.
12.15 Weather Report.
12.16 Gramophone and Pianola.
1.0 Time Signal.
1.1 Close down.

Early Evening Session:

7.5 Tune in to Gramophone.
7.10 Bedtime Stories.
7.45 Market Reports.
7.57 Weather Report.

Evening Session:

8.0 Time Signal.
8.2 News Cables.
8.15 Wesfarmers' Studio Orchestra.

3LO

BROADCASTING TIMES.

Melbourne Mean Time.
Wave Length: 1720 metres.

MONDAY TO FRIDAY:

Midday Session:

12.55 Time Signals. "Argus" and "Herald" News Service, Reuter's and the Australian Press Association Cables.

Afternoon Session:

3.30 Musical programme.
4.45 "Argus" and "Herald" News Service.

Early Evening Session:

6.30 Children's Hour; "Billy Bunny" Stories.
7.0 "Argus" and "Herald" News Service, Reuter's and the Australian Press Association Cables.

Evening Session:

8.0 Theatrical Items, Lectures, Vocal and instrumental items.

TUESDAY NIGHT.

Carlyon's (St. Kilda) Dance Orchestra.

SATURDAY:

Midday Session:

12.55 Time Signals. "Argus" and "Herald" News Service, Reuter's and the Australian Press Association Cables.

Afternoon Session:

3.15 Musical programme.
4.0 "Herald" News Service. Results of Races and other sporting events broadcasted immediately details received.

Early Evening Session:

6.30 Children's Hour; "Billy Bunny" Stories.
7.0 "Argus" and "Herald" News Service, Final Sporting Results.
8.0 Vocal and Instrumental Concerts.

SUNDAY:

Afternoon Session:

3.0 Pleasant Sunday Afternoon Services from Wesley Church.

Early Evening Session:

6.30 Children's Hour; "Billy Bunny" Stories.
7.0 Church Service.

Evening Session:

8.30 Concerts from the Studio.

WHILE intercepting recent test transmissions from Australia to England, the Rabaul commercial wireless station picked up NOZ (Nauen) on 75 metres CW and telephony. The former was of perfect tone and excellent strength, but the latter was rather difficult to receive, owing to severe atmospherics. The transmissions, as stated by POZ, were for three mornings only and lasted from 3 a.m. to 6.15 a.m., Sydney mean time. The distance from Nauen to Rabaul is approximately 9,000 miles.

2 B L

BROADCASTING TIMES.

Sydney Mean Time.

Wave Length: 350 metres.

Midday Session.

12 to 2 p.m. } Musical Programme, with News Reports supplied by "The Guardian."

Afternoon Session.

3 to 5 } Musical Programme, with News Reports supplied by "The Guardian."

Early Evening Session.

7 Nursery Rhymes and Bedtime Stories.
7.45. Pitt, Son & Badgery Stock Exchange Reports.

Night Session.

8 Nightly Concert.

EVENING ENTERTAINMENT.

Monday:	"Jazz" night, with vocal items from the Studio.
Tuesday:	Classical Studio Concert.
Wednesday:	Dance Night.
Thursday:	Broadcasters' Popular Concert.
Friday:	"Jazz" night, with popular items from the Studio.
Saturday:	Popular Concert.
Sunday:	Classical and Operatic Concert.

ACCORDING to the San Francisco correspondent of a Queensland daily "radio incompatability" has made its debut as a ground for divorce in the States. The story is that the parties concerned, who are of the respective ages of 19 and 25, were married about a year ago and lived happily until a radio receiving set entered the home when, as is more often the case on the appearance of Poverty, love flew out of the window. It appears that the lady in the case was a confirmed "movie-goer," while the husband viewed such a pastime with cold contempt. On the night after the first discordant scene it was decided that the pair go to the moving pictures. When Mrs. —— was dressed and ready to set forth, she found her husband still in his shirt sleeves and listening-in. As a means of hurrying him up she promptly disconnected the set, with the result that her worse half immediately declined to escort her to the pre-arranged place of entertainment. Whereupon, as is Woman's way, she determined to have the last word—even between herself and the loud-speaker—for her answer was to snap a wire, thus concluding the wireless concert. It is reported that the husband won the first legal engagement in the New York courts but we have no doubt that more will be heard of the matter.

IN order to demonstrate the value of amateur radio for forwarding news despatches in times of emergency, when communication by wire is cut off, sixty-eight messages addressed to as many newspapers were started recently from New York City over the routes of the American Radio Relay League.

These messages were addressed to the member papers of the North American Newspaper Alliance, whose subscribers are distributed all over the United States and Canada.

One of the messages received by T. E. Graves, of Cambridge, Mass., and delivered to *The Boston Post* read: "Thanksgiving greetings from the North American Newspaper Alliance via American Radio Relay League. Here is an example how amateur radio can serve you when communication lines fail."

3 A R

BROADCASTING TIMES.

Melbourne Mean Time.

Wave-length: 480 metres.

MONDAY TO SATURDAY.

Morning Session:

11.0 Musical Items.
11.45 Weather Report, Stock Exchange Information.
12.0 Time Signal, Close Down.

Afternoon Session:

3.0 Musical Items.
3.30 Weather Report, Afternoon Stock Exchange News.
4.0 Time Signal, Close Down.

EVENING PROGRAMME.

7.0 Children's Corner, by "Uncle Rad."
7.35 Closing Stock Exchange News.
7.45 Weather and latest Market Reports. News Bulletin.
8.0 Vocal and Instrumental Concerts.
10.0 Close down.

SUNDAY.

Afternoon Session:

3 to 4 Musical Items.

EVENING PROGRAMME.

7.0 Children's Corner, by "Uncle Rad."
7.30 Vocal and Instrumental Items (Church Services announced).
9.30 Close down.

FOILED BY WIRELESS.

WIRELESS played the chief part in bringing to justice three Samoan desperadoes who were wanted from Apia (Samoa) on a charge of stealing the fifteen-ton ketch, Fetu Ao, otherwise designated *Morning Star*. The boat was taken in the dead of night, and had already been provisioned for an extended Island cruise. Besides being amply supplied with all manner of eatables, there was the sum of £100 locked in the safe of the ketch. The party got well away but Samoa was soon up in arms and right through the Pacific the alarm by wireless "rang" an accurate description of the ketch being given. A month sped by but no word came to hand concerning the missing vessel. But one day a wireless communication was received from Tonga to the effect that the three half-castes and their boat had arrived, and that the natives were having a lively time on the £100 in their possession. The natives were tried at Samoa and each of them received a sentence of five years' imprisonment.

BROADCASTING LECTURETTES.

THE broadcasting of lecturettes was instituted at 1YA recently, when Mr. W. Foster, M.A., of the Auckland College and Grammar School staff, spoke for fifteen minutes on correct French pronunciation. The subject can hardly be called a popular one, and it would have perhaps been more to the point had the speaker given a fifteen minutes discourse on the "All Blacks" match, whether he gave it in French or in English. Probably the former language does not contain sufficiently strong adjectives to adequately describe a tightly-packed "scrum"!

SHIP'S ORCHESTRA BROADCAST.

A "SHIP'S orchestra repeater," designed to enable music played in the saloon to be heard in other parts of the ship, has been developed by the Marconi Company. The installation comprises the Marconiphone, which has achieved popular fame in connection with most of the stations of the British Broadcasting Company, and the Marconi loud-speaker, which has been widely used recently in connection with large gatherings throughout England, including the closing ceremony of the British Empire Exhibition when the Prince of Wales' speech was made audible to the vast audience in the Stadium.

The quality of reproduction is such that it is possible to give an exact imitation of an orchestra both in regard to the volume of sound and musical quality. Orchestral music can be repeated in any part of the ship—in the dining saloons, on deck, or in the crew's accommodation, and it will be especially popular as a means of providing dancing on various decks.

It will not only be available for the reproduction of music, but can also be used for lectures, concerts, or any other purpose for which simultaneous hearing might be useful on board ship.

The first ship to be fitted with this installation is the C.P.R. liner *Montclare*, running between Liverpool and Canada.

NEW ZEALAND WIRELESS INSTITUTE.

THE New Year promises to see the New Zealand Wireless Institute established in Christchurch on a sound basis, and good promises of support are coming in from all sides. The body in question follows much on the lines of similar organisations in America and other places, and will do much to secure the recognition of wireless claims throughout the Dominion. The Government is most sympathetic towards the movement and has promised to assist it in every possible way.

4AA ACTIVE.

MR. F. D. BELL, 4AA (Waihemo), recently received a message from the United States Airship *Shenandoah*, the first foreign aircraft to be heard in New Zealand. The messages referred in appreciative terms to the excellent services rendered by 4AA during the ship's flight across the Continent, and the hope was expressed that the same help would be forthcoming on the return trip.

A TESTIMONIAL.

ONE American radio receiver will fill a German home with music as a direct result of the epoch-making flight of the ZR3. Hans R. Ludwig, wireless operator of the gigantic dirigible, whose work contributed greatly to the success of the flight, is the proud owner of the set. He has sailed with it on the steamer *Muenchen* for Bremen. During his brief stay in America, Mr. Ludwig broke away from the strenuous schedule of entertainment as frequently as possible, so that he could visit radio stores, and get demonstrations of receivers. Everywhere he went his unique uniform cap, with its badge of a silver airship streaming through a letter Z, gave him away, and made his task easier.

His final choice was a five-tube Neutrodyne, which he purchased complete with all accessories. Just before sailing Mr. Ludwig sent the following letter to the New York store where he made his purchase:—

ZR3, New York City.
October 27, 1924.

Gentlemen:

Since my arrival from Germany on the airship ZR-3, I have spent much time studying the progress of Radio in the United States. I have been greatly impressed with American-made receiving sets, and especially with their advancement in the last few years.

The chief purpose of this letter is to tell you that, after careful study of the market, I have bought from your Radio Department a Stromberg Carlson Neutrodyne Receiver and Loud-speaker, to take back to Germany with me. It is the finest equipment that I have ever seen.

Very truly yours,
(Signed) HANS R. LUDWIG,
Radio Operator of the ZR-3.

As the German broadcast stations operate on wave-lengths above a thousand meters, Mr. Ludwig is convinced that he will be able to get most of the American concerts in Germany on his American receiver.

A Multi-Valve Radio Frequency Amplifier

BELOW we give a description of a multi-valve receiver in which is combined the principles of Transformer, Capacity, and Resistance methods of coupling valves in cascade for amplification purposes. The limitations of amplifiers employing the Tuned Anode or Tuned Transformer methods of coupling, particularly in respect of the number of stages which may efficiently be utilised, are well-known and the object of this article is to describe a system in which seven or more valves may be employed in cascade without affecting the stability of operation of the system.

By G. Apperley.

IN a previous article we pointed out the advantage of imposing only one function on a receiving valve. By this means, especially when several valves are employed in cascade, stability of operation is possible. Also the valves for various purposes should be carefully selected. For instance, there are several well-known makes designed specially as amplifiers, whilst others are designed to possess characteristics particularly suitable for rectification purposes.

In common with crystal and other rectifiers, the thermionic valve is disproportionately insensitive to very weak signals and to illustrate this point the reader is referred to Fig. 1.

The characteristic of an average rectifying valve being plate current plotted against grid volts, is shown by the curve a. If an alternating electromotive force A of small amplitude is applied to the grid, the effective current in the plate circuit (which is the difference between the currents due to the two half cycles as denoted by a1 and a2) is practically zero. In fact, if the applied E.M.F. is very weak, the signals are practically not rectified at all. If, however, a strong alternating E.M.F. B, is impressed on the grid, the effective current b1 b2 in the plate circuit, is considerable. For the sake of simplicity we have taken the difference of the peak values of the plate current as representing the magnitude of the rectified current but this is not strictly correct since it is proportional to the mean increase of the plate current. No further explanation is necessary to show that efficient rectification is obtainable only when the applied signals are reasonably strong, and this is an important fact not lost sight of by the inventor of the circuit arrangement described.

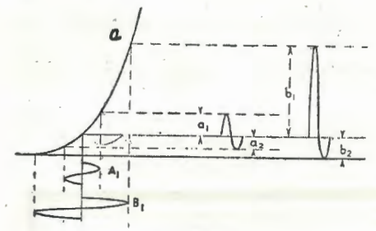


Fig. 1.

Another most important point is the way in which advantage is taken of the characteristic curve of a valve for amplification purposes. To illustrate this, a curve similar to that shown in Fig. 1 is reproduced in Fig. 2. If an alternating E.M.F. of given amplitude is applied at a certain grid potential X, the change of current in the plate circuit represented by a1 a2 is comparatively small, and, owing to the unsymmetrical form of the curve at this point, a certain amount of rectification occurs.

If, however, the same E.M.F. is applied at a grid potential Y, the change of plate current as represented by b1, b2 is considerable and in virtue of the symmetrical form of the curve about this point, the variation of plate current is an exact reproduction of the variation of the applied E.M.F. and, moreover, no rectification occurs.

To take full advantage of these two effects, the reception of weak signals is best made by amplification before rectification, that is to say, by the use of a high frequency amplifier.

In practice there are certain limitations to the degree to which the magnification of high frequency oscilations can be usefully carried by tuned plate methods, the principal of which is the tendency of the valves to generate persistent oscillations; also beyond two or three stages, considerable difficulty is experienced in making accurate adjustments and maintaining the system stable. Another limitation is the time and trouble involved in changing the adjustment from one wave-length to another.

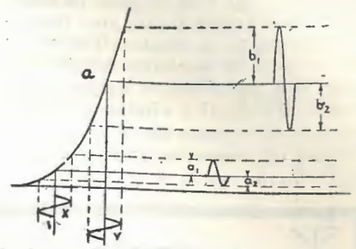
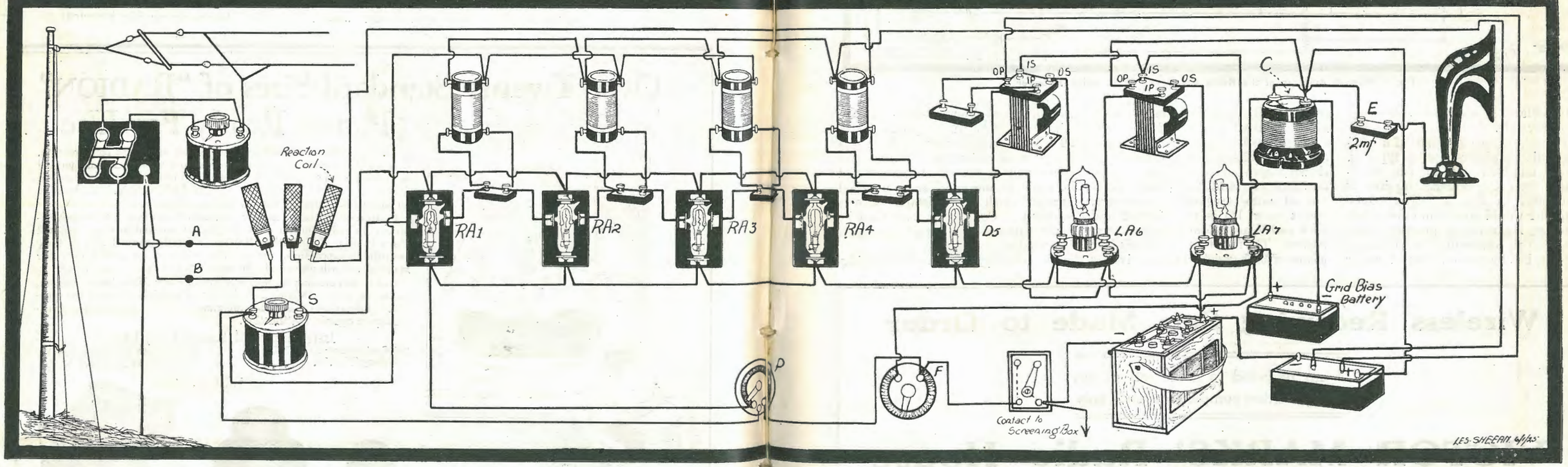


Fig. 2.

These disadvantages have been practically removed in a multi-valve amplifier due to H. J. Round, of England, Australian Patent No. 15162/20.



Pictorial diagram of the Radio Frequency Multi-valve Receiver and Amplifier herewith described. Details of component parts are as follow:—Aerial Circuit: Series Parallel Switch-Aerial Tuning Condenser (Variable .001 m.f.d.)—Aerial Coil. Secondary Circuit: Secondary Condenser (Variable .0002—.0005 m.f.d.)—Secondary Inductance Coil. Amplifier: Four Resistance Inductive Transformers; Four Coupling Condensers for ditto; Ra 1, 2, 3, and 4, V24 Valves; D5, QX Valve; LA6 and 7, Amplifying Valves; P, 250 ohms Potentiometer; F, Filament Resistance; C, Choke Coil (5 henries); E, Fixed Condenser (2 mfds.); Two Audio Frequency Transformers; One By-pass .001 m.f.d. Fixed Condenser; One Single-pole One-way Switch; One Six-volt Accumulator; One 100-volt High Tension Battery; One 1½volt Grid Bias Battery; One Loud-speaker.

By combining the resonance effect of a tuned plate amplifier with the characteristic of a resistance-capacity amplifier a very wide range of sustained amplification is obtained without any adjustments excepting to the receiving tuner. By this method, as many as ten to fourteen valves may be usefully employed in cascade. The valves are coupled by specially constructed intervalve transformers having high resistance inductive windings and by carefully designing these to give an element of resonance at any desired wave-length, good amplification is obtainable over a considerable range on either side.

The relative performance of a semi-aperiodic amplifier of this type, a tuned amplifier set to one wavelength, and a resistance amplifier is illustrated in Fig. 3. The tuned amplifier would appear to have an advantage, inasmuch as greater amplification can apparently be obtained with it, but by the addition of one or more valves the curve of the semi-aperiodic amplifier can be made equal in amplitude. The great advantage

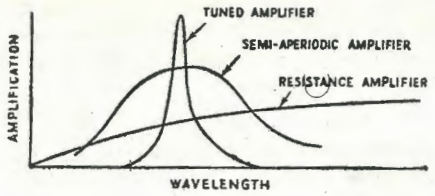


Fig 3.

of the latter, however, lies in the fact that a remarkably wide range of good amplification can be covered without any difficult tuning adjustments such as are required by a tuned amplifier.

A seven-valve amplifier constructed on the semi-aperiodic principle is shown diagramatically in Fig. 4. The first four valves RA1-2-3- and 4 function as radio frequency amplifiers, whilst valve D5 is the rectifier and LA6 and 7 are audio frequency amplifiers. The first four are coupled by means of high resistance inductive air core transformers and to give good amplification over a band of wavelength of from about 300 to 1700 metres they should be wound to have an element of resonance at about 700 or 800 metres.

The transformers can be readily constructed by winding on an ebonite or other insulating former 1⅝in. in diameter by about 2½in. long, two layers of 48 gauge double silk-covered Eureka wire, each layer having about 500 turns. Each winding should be separated by a layer of paraffin paper about four or five mils thick. The resistance of each winding will be in the proximity of 20,000 ohms. Resistance wire of this gauge is, of course, very fragile and connections to the transformer should be made by means of brass terminal lugs to which the resistance wire is soldered. Connection may then be made without the fear of damaging the winding.

The coupling condensers for bridg-

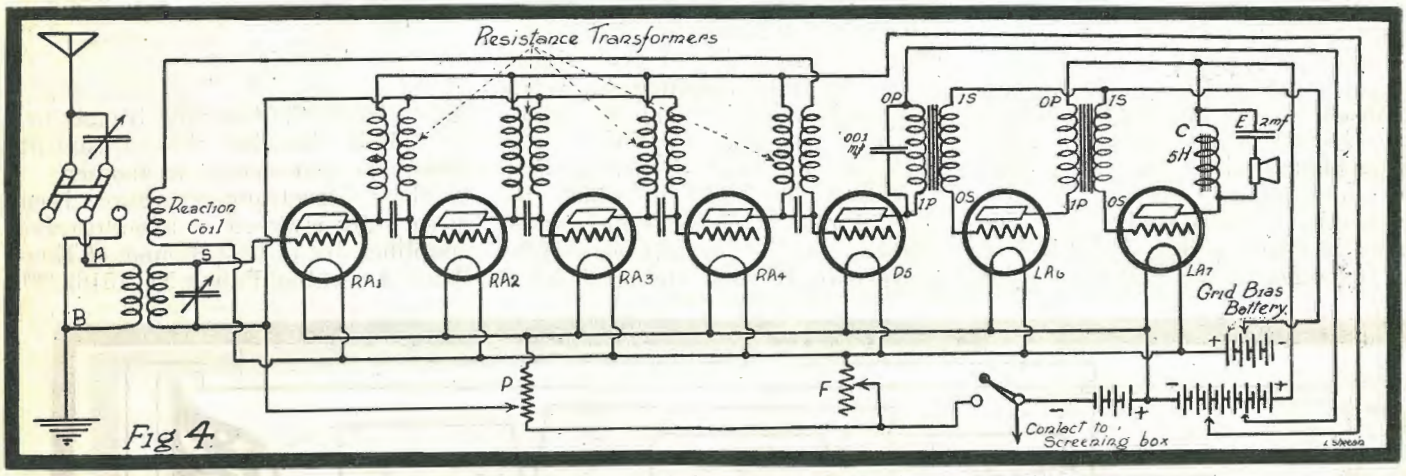


Fig. 4.—Circuit diagram of the Radio Frequency Multi-valve Receiver.

ing the plate-grid terminals of the transformers should consist of ten sheets of copper or tinfoil about 1½ mils thick, ⅝in. x 1½in. interwoven with mica sheets 2 mils thick ⅝in. x 1¼in. area, each condenser being clamped between two ebonite or other insulated blocks. It is preferable to use copper foil sheets in the construction of the condensers because of the relative ease with which soldered connections can be made to the two sets of plates. The iron core transformers coupling the audio frequency valves to the detecting valve may be of any approved type. The filament resistance "F" is common to all valves, but should valves having different filament consumption rating be used separate lighting batteries and rheostats should be employed. The potentiometer P is for adjusting the grid potential of the radio frequency amplifying valves to the best position on their characteristic curve, whilst for the same purpose a bias battery is included in the grid circuit of the low frequency amplifiers.

In order to prevent the constant direct current of the plate circuit of the last valve from passing through the loud-speaker windings a combination of a choke coil C and condenser E is used. The choke coil should have an inductance value of about five henries and the condenser about two microfarads.

Tappings on the high tension battery should be provided for applying the best potentials to the respective sets of valves.

The tuning element may be constructed in any approved manner and for the purpose of taking advantage of regeneration or auto-heterodyne for continuous wave reception a reaction coil may be included in the grid circuit of the rectifying valve and coupled to the secondary winding of the tuner. The tuning arrangement shown may be constructed with standard honeycomb coils, and if it is desired to use a single circuit, the grid and filament of the first valve can be connected to the points A and B and the reaction coil coupled to the aerial inductance.

The range of wave-lengths obtainable with standard honeycomb coils and condensers has previously been published in *Radio*. If it is desired to use less than seven valves one or more of the high frequency amplifiers can be cut out of circuit by connecting the lead S direct to the grid of any valve of the series, whilst one or both of the audio frequency amplifiers can be removed from the circuit by connecting the loud-speaker into the plate circuit of the detector or the first low frequency amplifying valve.

To render the system more stable in operation and to eliminate the effects of body capacity of the operator the whole instrument should be enclosed in a metallic screening case, the front of which is hinged so as to provide access to the valves and provided with slots, so that the filament and potentiometer resistance handles can be adjusted when the lid is closed. The screening box itself should be metallicly connected to the negative terminal of the low tension battery.

It is preferable to use in the high frequency amplifier section valves having the lowest possible internal capacity. A valve very suitable for this purpose is the type V24. The rectifying valve D5 should, of course, possess a characteristic suitable for the purpose, whilst the low frequency am-

(*Continued on page* 716.)

VJZ

(*Continued from page* 696.)

Roviana, Solomon Islands, described in a previous issue of *Radio,* while telephony tests resulted in "speeching" both ways between Bita Paka and Townsville, over a distance of 1,000 miles.

Bita Paka carries a staff of ten white men and thirty natives, and traffic with Rabaul is carried by Morse line. Malaria more or less infects the whole staff, but not in a very severe form, as all precautions against mosquitoes are taken with good results. Operators on the outpost stations are not so fortunate in this respect. The staff find much pleasure indulging in tennis, cricket, and horse-racing. Tropical life is more congenial than most people imagine!

Australian and New Zealand experimenters have, during recent months, heard 2ME testing on short waves to VJZ (Bita Paka), and many experimenters were heard between tests including:—Aust.: 2CM, 2BK, 3BQ, 3BD; N.Z.: 2AC, 2AP, 4AA, 4AG, 4AK, and many others unlogged.

QUERIES ANSWERED. COUPON.

"RADIO in Australia & New Zealand."

January 21, 1925.

Tuned or Un-tuned Primary

IN an effort to make receiving sets simple, enthusiasts have turned to the un-tuned primary as a means of getting away from another control. They got this idea from the dyed in the wool amateur who is always experimenting, and while the aperiodic primary is all right for the amateurs, it is not so good for the broadcast listener.

For short wave-lengths the un-tuned primary has been found to be good, but when it comes to the longer wave-lengths, as used by broadcasting stations, experience has shown it is not so good. Not that it will not bring in stations, but the tuned primary will bring them in better.

Figure 1 shows the usual method of using the untuned primary, while figure 2 shows how this same circuit is changed to a tuned primary by the addition of coil of wire and a variable condenser. The coil may be one of 60 turns tapped every 15 turns, and the variable condenser one of .0005 microfarad capacity.

Stations may be tuned in, in the regular manner as though the extra coil were not used, and then after the signal has been brought in, the primary should be adjusted for maximum signal strength. You may then require a finer adjustment on the secondary circuit, whether you are using a variometer or a variable condenser, and probably regeneration can be increased by moving the tickler coil or plate variometer, whichever method is used.

Speaking about regeneration. There are several ways this may be obtained, such as the ultra-audion; tickler and plate variometer. Either one will obtain it. With the ultra-audion method regeneration is controlled by the filament rheostat. The tickler controls it by coupling to the secondary circuit and the plate variometer by tuning that circuit to the incoming frequency. The variometer gives the best control of regeneration but it

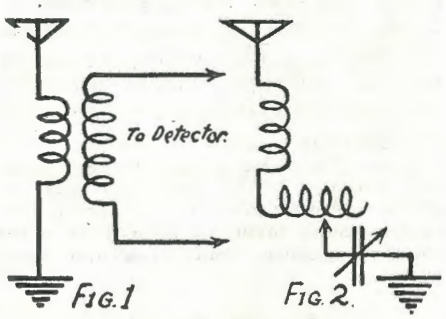


FIG. 1 FIG. 2

makes your set bulky. The ultra-audion method is the simplest.

Some beginners think that if they combine two or all three of the methods, they ought to obtain better signal strength and greater distance but a valve will oscillate if any one of the three methods is used and adding any of them only makes more controls and a bulky set without adding to its efficiency. If your set will not oscillate using any one of these methods, there is something wrong with your set and you might as well tear it down and start the job over again. Trying to improve a defective set by the addition of other apparatus is poor policy.

Getting back to the tuned primary. When the loading coil is put in, be sure and keep it away from the other coils and if near them have them at right angles to one another. This may be very easily done by inserting the coil and condenser in the ground lead of your present set.

POOR insulation is sometimes the cause of poor signal strength.

A VARIOMETER and a variable condenser make a simple receiving set.

3LO

GENERAL satisfaction is being expressed by broadcast listeners at the recent improvements to Braybrook's transmissions, the quality of both the modulation and nature of programmes having improved considerably. The broadcasting of the full performance of "The Merry Widow" from His Majesty's Theatre was regarded as being the nearest thing to perfect broadcasting ever heard in Victoria.

Another improvement in the dissemination of news is announced by the proprietors of 3LO, who state that in future progress results of sporting events will be broadcast every half hour, a feature that will be greatly appreciated by listeners-in generally, particularly those in country districts.

Radio Installation Rules

(*Continued from page* 699.)

base of the switch shall be of non-absorptive insulating material. Slate base switches are not recommended. This switch must be so mounted that its current-carrying parts will be at least five (5) inches clear of the building wall or other conductors and located preferably in the most direct line between the lead-in conductors and the point where ground connection is made. The conductor from grounding switch to ground connection must be securely supported.

NOTE.—Ground switches are required because the ordinary transmitting antenna, of larger size than the receiving antenna, involves a greater lightning hazard, and because of the high voltages used in transmitting. To comply with this rule, a standard 100 ampere single-pole double-throw switch, or a special antenna switch of proper design, may be used.

Protective Ground Wire.

(*k*) Antenna and counterpoise conductors must be effectively and permanently grounded at all times when station is not in actual operation (unattended) by a conductor at least as large as the lead-in conductor, and in no case shall it be smaller than No. 16 S.W.G. copper or approved copper-clad steel. This ground wire need not be insulated or mounted on insulated supports. The ground wire shall be run in as straight a line as possible to a good permanent ground. Preference shall be given to water piping. Gas piping shall not be used for the ground connection. Other permissible grounds are artificial grounding devices, such as driven pipes, plates, cones, etc. The ground wire shall be protected against mechanical injury. An approved ground clamp shall be used wherever the ground wire is connected to pipes or piping.

Operating Ground Wire.

(*l*) The radio operating ground conductor shall be of copper strip not less than three-eighths ($\frac{3}{8}$) inch wide by one-sixty-fourth (1/64) inch thick, or of copper or approved copper-clad steel having a periphery, or girth (around the outside) of at least three-quarters ($\frac{3}{4}$) inch (for example, a No. 2 S.W.G. wire), and shall be firmly secured in place throughout its length. The radio operating ground conductor shall be protected and supported similarly to the lead-in conductors.

NOTE.—The rules should be very carefully followed in the installation and use of the operating ground wire, special precaution being taken to keep it at a respectful distance from pipes and other wires.

Operating Ground.

(*m*) The operating ground conductor shall be connected to a good permanent ground. Preference shall be given to water piping. Gas piping shall not be used for ground connections. Other permissible grounds are artificial grounding devices such as driven pipes, plates, cones, etc.

Power from Street Mains.

(*n*) When the current supply is obtained directly from street mains the circuit shall be installed in approved metal conduit.

Protection from Surges, etc.

(*o*) In order to protect the supply system from high-potential surges and kick-backs, there must be installed in the supply line as near as possible to each radio-transformer, rotary spark gap, motor in generator sets, and other auxiliary apparatus, one of the folowing:—

1. Two condensers [each of not less than one-half ($\frac{1}{2}$) microfarad capacity and capable of withstanding a six hundred (600) volt test] in series across the line and mid-point between condensers grounded; across (in parallel with) each of these condensers shall be connected a shunting fixed spark-gap capable of no more than one-thirty-second (1/32) inch separation.

2. Two vacuum tube type protectors in series across the line with the mid-point grounded.

3. Non-inductivity wound resisters connected across the line with mid-point grounded.

4. Electrolytic lightning arresters such as the aluminium cell type.

In no case shall the ground wire of surge and kick-back protective devices be run in parallel with the operating ground wire when within a distance of thirty (30) feet. The ground wire of the surge and kick-back protective devices shall not be connected to the operating ground or ground wire.

NOTE.—Many of the amateur installations have been placed without giving much thought as to what the effect of the radio power devices will have upon the balance of the system and supply authorities may require these stations to take current from a separate transformer, and in addition to place all of the wiring in conduit, also to have it protected at each radio-transformer, rotary spark-gap motor in generator sets and other auxiliary apparatus. This precaution tends to preserve the quality of the light and power service in the neighbourhood and obviates fire hazards.

The Lighter Side of Radio

(By Our Hobart Correspondent.)

HAVE you ever had the misfortune to be asked that riddle about Adam and Eve and Radio? It's something to do with a loud-speaker being in vogue when Adam choked on a piece of apple—the loud-speaker, of course, being Eve.

That is only one of the many stories concerning wireless which one hears nowadays; and it is an indication of the growing popularity of listening-in that humour should find its way into the radio cabin.

Fishing, of course, is famous for its associations, but the proverbial "fish" story is having a hard tussle to retain its position amongst the tall stories told by some wireless "cranks."

Perhaps, more than in any other sphere, there is immense scope for so-called "practical" joking in radio.

We have all heard of the faked broadcast from America "received" by an Australian amateur on one valve.

Not so far divorced from true humour is the "gag" often practised by wireless enthusiasts to foozle an innocent listener-in. A thin wire is attached to the victim's aerial lead-in and the "earth" is composed of a connection with a poor conductor, such as a tree. The "messages" transmitted from the fake station are sent by a high-tone buzzer, which gives the effect of a big Telefunken apparatus.

I heard of a ship's officer who once practised this dodge on the wireless operator with the result that the poor "Sparks" dashed up to the bridge with a long roll of script in his hand announcing an enormous earthquake in Sydney, a revolution in New Zealand, and a tidal wave in Tasmania. The "Old Man" happened to see a "catch" in it somewhere, and the officer in question nearly lost his job over it.

The humorous side of radio is often revealed to the inspector searching for stations working without a Government licence.

One inspector of my acquaintance noticed what he took to be an imposing aerial one day whilst on his rounds, and called on the offending premises to make enquiries. A small boy opened the door, and on being asked if a wireless plant were installed in the house, he bashfully admitted that there was.

He consented to lead the inspector to the offending "apparatus," which turned out to be a jumble of jam tins and pieces of watch mechanism. The "aerial" was composed of pieces of thick string!

A Multi-Valve Radio Frequency Amplifier

(*Continued from page 711.*)

plifiers LA6 and 7 may be of any good type.

Some idea of the sensitiveness of this circuit can be gathered from the fact that it is possible to hear ordinary commercial ship stations at a distance of 150 to 200 miles during daylight when using a loop about 18in. square.

When properly constructed the circuit will give excellent service, the only adjustments necessary for different wave-lengths being confined to the tuning section.

Wireless and Lightships

THE use of wireless telephony installations for communication between lightships, lighthouses and their headquarters ashore is rapidly increasing. In this particular service, Great Britain again leads the way.

The sets which have been installed during the past few years at various points around the coast have clearly demonstrated their value, and now this demonstration period is past, the coastal protection services are busy extending the use of wireless as rapidly as their funds permit.

In the Harwich Group of lightships Trinity House authorities have already equipped the vessel *Alert*, and the work of installation in other lightships in this group is proceeding.

The Goodwin group of lightships has been equipped for some considerable time, and many expressions of appreciation of the efficiency of the working have been made.

It is noteworthy that only a very small amount of technical attention is required in connection with the working of these wireless telephone sets.

The Dundee Harbor Trust officers have now completed installation of their equipment on their lightship *Abertay*.

Similar wireless telephone sets have been installed on the Butt of Lewis, the Flannen Islands, Barrow Head and Castle Bay, for the Northern Light House Board, and we learn that these installations are all working satisfactorily.

The Marconi Company has received a further order from the Mersey Docks and Harbor Board to equip their lightship *Crosby* with a wireless telephone set and wireless bell. The Mersey dock offices at Liverpool and the Board's other two lightships were equipped some time ago, and this extension of the system by the authorities is the natural outcome of their satisfaction with the services rendered.

This linking up of wireless lighthouses and lightships with their headquarters is rapidly extending, and no doubt we shall hear of further installations in the near future.

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As a result of the phenomenal number of readers who availed themselves of the special Xmas subscription offer published in "RADIO" No. 46, we find the short time allowed did not give our interstate and other distant readers a chance to avail themselves of this splendid offer.
We therefore have pleasure in repeating this offer for the benefit of Country, Interstate and New Zealand readers only.

The conditions are that such subscription must be received before February 28, and that the offer is limited to the first one hundred subscribers in each section.

1. **Bound Volume, SEA, LAND & AIR, Vols. 2 or 3.**
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FILL IN THIS FORM.

To "RADIO,"
97 Clarence Street,
SYDNEY, N.S.W.

Dear Sir,—

I enclose herewith 10/- (ten shillings) for twelve months' subscription (twenty-six issues) to RADIO, commencing from the next number; also please send me book No. — (Number of book required.)

Please forward each issue of RADIO to—

Full name .....

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My First Trip to Sea

THE Editor of "Radio" will be pleased to consider articles concerning their war-time and other experiences from all present and past members of the Marine and Coastal Wireless Services.

IT is considered that such type of matter should prove quite a feature of the magazine's contents, dealing, as it would, with the experiences, both humorous and otherwise, of those public servants who must be considered as the most efficient of their kind in the world.

ALL accepted matter will be paid for at the usual rates.

BY H. TUSON.

AS in the case of most present and past "ops," I was stung by the wireless bug very early, and longed to go down Sydney Harbour aboard one of the big liners dressed in a uniform with bright brass buttons, my domicile a room with "Wireless Operator" over the door.

It was in 1913, during a visit to Sydney, that I decided to purchase the parts for a loose-coupler crystal set, and take it to my home in the country. On my return, I immediately tackled the question of erecting an aerial—not a very difficult job where poles can be obtained without any trouble. Two masts 30ft. high were erected, and a 3-wire aerial about 60ft. long.

It was soon evident, however, if I was going to do any long distance reception I would have to remove the receiver from the house, owing to interference from the rest of the family, which was done by erecting a small hut right under the aerial.

One of the first stations picked up, apart from passing ships which we could see quite plainly—in the wireless cabin of one which I was longing to be operating—was VIS, which enabled me to get the correct adjustment for the commercial wavelength. Needless to say, there was great excitement in the small township when it was ascertained I had picked up VLA—the familiar land station on the north of New Zealand—mine being the first wireless set in the place.

It was not long, however, before I wanted to realise my ambitions, and a few months later I went to Sydney, and to cut a long story short, was fortunate in being appointed to a well-known coastal passenger steamer, and later passed down Sydney Harbour just as I had pictured it in the past, walking the deck as if I was the most important "man" (18 years old) on the ship.

I was soon "brought to earth," however, when a passenger approached me and asked if I was the operator, as he wanted to send a message. Then I realised I was not on board to parade round the deck!

Sending my first message was an ordeal I will never forget. My hands and legs shook; in fact, I shook all over—but nothing to the way the Morse left the aerial. I imagined hundreds of operators listening to me, but the one most concerned was the one at Sydney Radio who had to take the message, which he eventually did after some repetitions. From then on I gained confidence, and everything was plain sailing.

In the meantime, unfortunately, the sea decided to take a hand and remind me I was not on "mother earth." Within a few hours we were in the centre—if not I was glad we were not—of a "cyclonic disturbance." The captain was anxious to get the weather report, which fortunately I managed to get, but afterwards I found I had a more important engagement at the ship's rails.

However, I managed to keep my watch, with occasional further "engagements," realising the responsible position I held, and after that trip was not further troubled with "mal-de-mer."

I did not remain on board that ship long enough for the trip to get monotonous, being transferred to various other vessels, and served for a number of years during the war on a troopship visiting many parts of the world, including Africa, Egypt and England, experiences on which I may relate in some later issue.

THE GOSFORD DISTRICT RADIO CLUB.

THE above club was formed on July 3, 1924, with about seven members, and meetings were held in the residence of one of them. Buzzer practice, lectures and demonstrations were arranged and every assistance was given to members constructing sets. The club has received much publicity through the local paper "The Gosford Times," and there is little doubt that this has greatly assisted in the steady growth the club has enjoyed. A wireless column is written by members and radio hints are offered, local activities chronicled, the articles giving the local touch that helps to make them readable matter for all. Through these columns the club is always mentioned.

Visits to local places of interest have been arranged. It was recognised about three months ago that a larger meeting room was necessary. The local Masonic Lodge kindly came to the club's aid and placed a large and well lighted room at their disposal where they have since held their meetings. There is every facility available in the way of an aerial, buzzer sets, blackboard, etc., for conducting wireless meetings. The club's set is in course of construction and will be a two-valve reflex portable.

The "Light Horse Troops" approached the club recently with an affiliation scheme, their work running along similar lines to that of the wireless body. The scheme was accepted and both concerns

are now working together to their mutual benefit.

The club would like to hear from any other "go-ahead" clubs with a view to exchanging lecturers, etc. Address: "The Secretary, Gosford District Radio Club, c/o. P. Hoare, Mann Street, Gosford."

TRADE ANNOUNCEMENT.

WE have been advised by Mr. Maynard Crookes that he is at present in Australia representing Messrs. New London Electron Works Limited, makers of Electron aerial wire, and Messrs. Autoveyors, who make a number of radio specialities.

Readers will probably be acquainted with Electron advertisements, which are so prominent in the English wireless papers. The sales throughout Britain for the month of September totalled 80,000 aerials, or 1,600 miles of wire. It is this huge production which enables the manufacturers to sell so cheaply.

Messrs. Autoveyors, it will be remembered, were responsible for fitting the King's sets at Buckingham Palace, and carried through much of the election speech broadcasting which was such a feature of the recent English elections.

Mr. Crookes expects to arrive in Sydney this month. Any communications addressed, Poste Restante, Sydney, will have his immediate attention.

WIRELESS ON COASTAL STEAMERS.

AS a result of agitation following the wreck of the *Ripple* that all small steamers should be fitted with wireless—the Northern Steampship Company, Auckland, will equip the *Manaia, Rorawa, Matangi, Ngopuhi,* and *Clansman* with apparatus. A start has already been made with the *Manaia.* The material for fitting the vessels mentioned has not yet come to hand, but the work will be carried out shortly. In the meantime, a number of the officers are being trained in "sparking" and wave-lengths, etc., at the company's office, where a plant has been installed for that purpose. The travelling public will welcome this improvement, for, although most of the trips are very short, they are sometimes fraught with much danger.

American Radio Relay League

WE have received the following from Mr. F. H. Snell, Traffic Manager of the American Radio Relay League, Inc., Hartford, Connecticut:—

SHORT WAVE SCHEDULES.
Until Further Notice, Unless Otherwise Specified.

NKF—Address reports to U.S. Naval Research Laboratory, Bellevue, Anacostia, D.C. (P.S.—Dr. Taylor, of the Naval Research Laboratory wants many more short wave observers—please refer amateurs who are interested in short wave work to the Laboratory.)

NKF will transmit on 54 metres on Mondays, Wednesdays, and Fridays: 8.0 to 8.10 p.m., 9.0 to 9.10 p.m. 10.0 to 10.10 p.m., and 11.0 to 11.10 p.m., E.S.T.

. . . . . .

FL—Address reports to Chief of Radiotelegraph Centre, Eiffel Tower, Paris, France.

FL will transmit daily on about 106 metres: 9.20 to 9.50 a.m., 6.15 to 7.0 p.m., and 11.0 to midnight, E.S.T.

. . . . . .

F8BF—Address reports to Pierre Louis, 8 Rue de la Mouillere, Orleans, France.

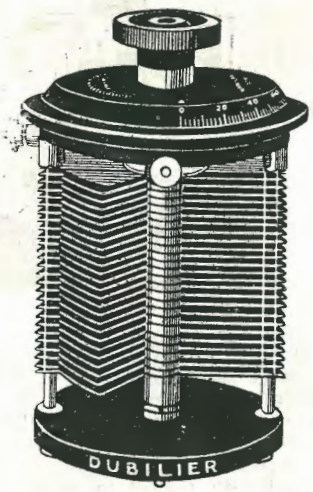
. . . . . .

Another station, operated by a German scientist, call, XOX, will do some short wave transmission, but the wave-length and hours of operation are not known at this time. Dr. Esau, the operator of XOX, became enthused over two-way work when we asked what the possibilities of working POZ on short waves would be if arrangements could be made. Dr. Esau probably designed and supervised the installation of the short wave set at POZ. POZ will be back on the air again on short waves very soon. We have nothing definite, however.

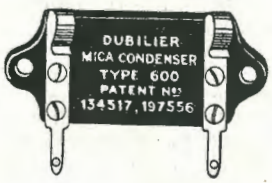
Has anybody any definite information about the 40-metre waves or lower? Transmission and reception information is requested on the low bands, particularly from 25 metres down to five metres. Who has it?

WIRELESS TRAFFIC IN NEW ZEALAND FOR THE FINANCIAL YEAR 1923-1924.

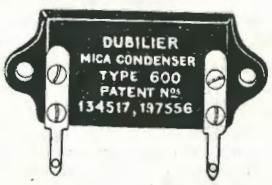
THE number of forwarded and received radio messages shows an increase of 16.47 per cent., and 14.51 per cent. respectively. The amounts earned by New Zealand show an increase under both headings of 15.77 per cent. and 16.06 per cent. respectively. The number of words of forwarded radio press telegrams decreased from 107,293 to 98,607.



Dubilier
Variable Condenser.
Price, .001 capacity, 35/-.



Dubilier Mica
Condenser, with grid
leak clips.
Price, .00025 capacity, 3/6.



Dubilier Mica
Condenser.
Price, .001 capacity, 4/-.

The name "Dubilier" stands for leadership in Condensers.

Supplied in all capacities.

DUBILIER CONDENSERS

The Radio enthusiast, in these days of highly efficient valve apparatus, is most exacting in his requirements. No condenser will be tolerated unless its internal and leakage losses are an absolute minimum; no condenser finds a place in his receiver unless he is assured that it will remain constant under all conditions.

Amateur experimenters in all parts of the world employ Dubilier British-made condensers in their transmitting and receiving sets. "Dubilier" is specified by the experts because they know that years of research and manufacturing experience stand behind every condenser. You will realise—just as they do—what this means in efficiency.

"Specify Dubilier."

Amalgamated Wireless (Australasia) Ltd.

97 Clarence Street, Sydney
Collins Street, Melbourne

Queries Answered

F. H. (Castlemaine). Q.: Recommend a three-valve set and particulars for making same. A.: Either that comprising the P1 circuit with two stages of A.F. amplification (*Radio*, No. 40) or that comprising one stage radio, detector and one stage of audio amplification (*Radio*, No. 44). Copies of these issues are obtainable from this office.

C. J. (Arncliffe). Q.: Using a crystal set with "pancake" coils, will the addition of a variable condenser increase efficiency? What capacity should this be? A.: Use an aerial tuning condenser of .001 m.f. variable for finer tuning. If it is desired to receive over a large range of wavelengths, a series-parallel switch will be an advantage. If troubled with interference, a condenser for tuning the secondary coil will eliminate this by still finer tuning. Q.: Will the crystal-valve circuits (*Radio*, No. 39) work a loud-speaker? A.: Possibly, but depends upon your distance from the transmitting station —which also applies to the P1 circuit.

H. A. J. (Petersham). Q.: What is meaning of abbreviations QRN, QSA, QST, and QSL? A.: See page 659, *Radio*. No. 47.

"P1" (Punchbowl). Q.: Although excellent results were obtained from both 2FC and 2BL with a temporary aerial, when twin aerial 10ft. higher was erected and thoroughly insulated 2FC was very weak, please explain. A.: You omit to state length of aerial. Suggest you use aerial tuning condenser in series when receiving 2FC. and using the coils mentioned failed to bring you up to the required wavelength. A series-parallel switch will be an advantage.

J. K. (South Singleton). Q.: Can downleads be carried any distance? A.: It is always advisable to bring these in as direct line as possible. Q.: Is tuned radio and detector better than the ordinary regenerative detector for all-round work? A.: Yes, especially for DX reception. Q.: Would aerial pointing N.N.E. with downleads inclined to Sydney and Adelaide be satisfactory for long distance and Australian stations? A.: Yes, you omitted to state whether this is inverted L or T; the former is more directive than the latter. Q.: Using two valves, should there be a "mush" sound when the current is turned on, and a "cracking" sound when switched off? A.: You do not state whether this refers to the filament or plate current; if the latter, you are evidently using very high voltage. Light the filaments at normal brilliancy before switching on plate battery, making sure correct voltages in both cases is used as specified by the makers, then gradually increase filament voltage until signals are maximum. Q.: Which is the best, valve-crystal-valve or two valves or crystal, with a combination of radio and audio, such as reflex circuit with secondary of audio transformer connected to return grid lead of first valve? A.: The reflex method, if loud-speaker work is required over short distances. Q.: Would a variometer be satisfactory (instead of condenser) in grid circuit for long, as well as short, wave reception? A.: Depends upon the circuit used, but is not recommended for long wave work.

READERS, PLEASE NOTE!

QUERY letters which are accompanied by our coupon and comply with the following directions will receive first preference.

MAKE your letter as brief as possible and write your questions one underneath the other. All letters must be signed in full, together with the address of the sender. For publication, the writer's initials will be used or a nom-de-plume, if desired, but on no account will any consideration be given to anonymous communications.

IF requested, answers will be forwarded by post, providing the letter of enquiry contains a stamped, addressed envelope and the coupon to be found elsewhere in this issue.

IT SHOULD BE NOTED THAT IT IS IMPOSSIBLE FOR US TO ANSWER QUESTIONS REGARDING THE APPROXIMATE RANGE OF EXPERIMENTERS' SETS.

K. D. G. (Yeppoon). Q.: Give information. such as gauge of wire, spacing and number of turns necessary, for a frame aerial for receiving on 350 metres. A.: See "Experimental Loop Aerials" (*Radio*, No. 10). Q.: How far, approximately, would a single valve set which receives Sydney broadcasting 800 miles away at fair strength on an outdoor aerial. receive the same station on the aerial referred to? A.: Will depend upon the position of the frame aerial with regard to surrounding objects such as trees, houses, etc.; you should, however, be able to receive approximately 150 miles.

D. G. T. (Kilmoney). Q.: Can you suggest any improvements to three-valve receiver (circuit submitted)? A.: Earth the negatives of both A and B batteries instead of positive of A as shown. You did not mention ratio of transformer, type of valves and capacities of condensers, which are a big factor in the results obtained in any valve receiver.

J. B. (Bondi). Q.: Using one valve crystal reflex receiver, should a radio transformer be used (circuit submitted)? A.: No. Q.: What should be the ratio of the audio transformer? A.: 5-1. Q.: Where should leads marked 1, 2, 3 and 4 be connected? A.: OP, IP, IS and OS respectively. Q.: Should valve be a detector or amplifier? A.: Any standard make, use preferably a "general purpose" valve.

S. L. G. (East Brunswick). Q.: Can you explain why better results were obtained with a Phillips E valve than a Phillips D1, although the latter is recognised as a better rectifier? A.: Possibly you used too high a plate voltage with the D1, or it is possible there was a slight defect in this and not the E.

W. B. (Brisbane). Q.: Using five-valve receiver (circuit submitted) with three 201A's and two UV199 valves can you recommend type of valve to replace the latter so that all may be worked from a six volt accumulator? A.: Use either a UV200 as detector with UV201A's as amplifiers or two Marconi "R's" in place of the UV199's. Q.: What voltage should be used with UV1714 transformers? A.: Depends upon the type of valves used; the tuning range is from 200 to 5000 metres. Q.: Would a .0005 or .0003 m.f. grid condenser be better than a .00025? A.: Either a .0003 or .00025 will be satisfactory. Q.: Can you suggest any improvement to the circuit? A.: Circuit quite O.K. You will probably find an improvement using valves

(*Continued on page 726.*)

DECEMBER.

MR. R. W. BARNES signed off s.s. *Oonah* at Melbourne, 12th, and signed on s.s. *Kaiapoi* at Melbourne, same date.

Mr. L. C. Farnsworth signed off s.s. *Kaiapoi* at Melbourne, same date.

Mr. G. Hugman signed on s.s. *Zealandia* at Sydney, 16th.

Mr. H. A. Macgoun signed off s.s. *Yankalilla* at Sydney, 16th.

Mr. H. Taylor signed off s.s. *Macedon* at Newcastle, 16th.

Messrs. M. L. Robertson and R. W. S. Bailey signed on s.s. *Changsha* as senior and third operators respectively at Sydney, 18th.

Mr. J. H. Pullen signed off s.s. *Ashridge* at Melbourne, 16th.

Mr. E. W. Coldwell signed off s.s. *Kooringa* at Melbourne, 11th, and signed on s.s. *Echuca* at Melbourne, 12th.

Mr. J. Carew signed off s.s. *Echuca* at Melbourne, 12th, and signed on s.s. *Loongana* at Melbourne, 17th.

Mr. S. L. Filer signed off s.s. *Camira* at Sydney, 18th.

Mr. C. Drew signed off s.s. *Junee* at Sydney, 20th.

Mr. H. F. Hartley signed off s.s. *Wyreema* at Sydney, 19th.

Mr. D. N. Quinn signed off s.s. *Riverina* at Sydney, 18th.

Mr. E. C. Bouel signed off s.s. *Lowana* at Melbourne, 19th, and signed on s.s. *Burwah* at Melbourne, 20th.

Mr. T. M. Alexander signed off s.s. *Burwah* at Melbourne, 20th.

Mr. C. Drew relieved Mr. E. C. Bouel on s.s. *Burwah* at Sydney, 22nd.

Mr. W. C. Lucas signed off s.s. *Moira* at Sydney, 26th.

Mr. F. M. Basden signed off s.s. *Yarra* at Sydney, 29th.

Mr. E. J. Glaisher signed off s.s. *Chronos* at Newcastle, 29th.

Mr. S. L. Filer signed on s.s. *Carspey* at Newcastle, 23rd.

Mr. F. J. Forrest signed off s.s. *Werribee* at Melbourne, 22nd.

Mr. E. I. Hyde signed off s.s. *Moorabool* at Geelong, 22nd.

Mr. T. J. O'Leary signed off s.s. *Ellaroo* at Melbourne, 22nd.

Mr. A. W. Hodge signed off s.s. *Period* at Melbourne, 20th.

Mr. L. F. O'Donnell signed off s.s. *Era* at Geelong, 20th.

Mr. J. McManus signed off s.s. *Kooyong* at Melbourne, 23rd.

Mr. A. Stuart signed off s.s. *Dimboola* at Sydney, 31st.

Messrs. C. Carthew and S. C. Austin signed on s.s. *Kangaroo* as senior and third operators respectively at Fremantle, 22nd.

recommended in place of the present dry cell type. A .0005 m.f. variable condenser across the secondary coil will give finer tuning. Noted with interest the excellent results obtained by your friend with the P1 and 2 stages of audio. We have no record of 2LE and 3LE.

A. D. H. (Rockdale). Q.: Can you advise cause of distortion using the P1 with two stages of audio amplification (*Radio*, No. 40)? A.: This source of trouble can usually be traced to transformers. It is usual to have a lower ratio in the second stage. use, therefore, the United in the first stage and the Jefferson in the second, also reversing the primary connections often overcomes this trouble. Make sure the correct voltage for the valves is used in each case as specified by the makers.

W. S. (Ringwood). Q.: Which is correct method of adding a stage of audio amplification to present valve set? A.: Connect the primary of the transformer to your present 'phone terminals. See "One-valve Amplifier" (*Radio*, No. 37). Q.: Does a biassing battery make any difference to the "A" battery? A.: No; this is distinct from the "A" battery. See article published in *Radio*, No. 41. Q.: Advise how to eliminate interference from 3LO when receiving from 2FC, using a three or four valve set. A.: Without a circuit of the receiver you are using we are unable to assist you except to suggest a coupled aerial circuit and condensers across both primary and secondary coils. which will give finer tuning.

R. S. (Hawthorn). Q.: Can the "60 to 600 Metre Tuner" (*Radio*, No. 45) be used as a single valve set by connecting the 'phones in place of primary of first audio frequency transformer? A.: Yes, but it is not recommended for this purpose, the radio frequency choke may be dispensed with. Q.: Could a loading coil be used for receiving 3LO and 2FC? A.: No, the receiver is designed specially to receive on the wave-lengths specified.

J. M. (Adamstown). Q.: Can a .0005 and a .0003 variable condenser be used in the primary and secondary circuits respectively? A.: Yes, it is usual. however, to use a .001 aerial tuning condenser which gives a greater tuning range. Q.: What is cause of difficulty in receiving 2BL, although good results are obtained from 2FC? A.: You are evidently using your aerial tuning condenser in parallel and your aerial being large, would not enable you to get down to the required wave-length. Using a series-parallel switch with 35 and 50 turn coils, you should have no difficulty in tuning in this station. For 2FC use 150 and 200 turn coils.

J. C. M. (Clifton Hill). Q.: Supply information for constructing a choke coil to be used in a tone filter (sketch submitted). A.: We do not understand why you require a tone filter; in any case, the condensers you propose to use are too small. These should be of large value to offer low impedance to audio frequency currents and should be of about 2 m.f., one only is required. For a choke coil the secondary of an intervalve transformer will serve the purpose.

C. J. W. (Yass). Q.: Advise any improvements to crystal receiver (circuit submitted). A.: The connections of the series-parallel switch are not correct. For proper connections see *Radio*, No. 41. Placing a condenser across the secondary will give finer tuning. You should not require the tapped loading coil in the earth lead when using a condenser in the aerial circuit.

H. B. H. B. (Box Hill). Q.: Advise how to eliminate interference from 3LO when receiving 2FC using three-valve receiver (circuit submitted). A.: Use coupled aerial circuit such as any standard three coil method. where the connection to the grid of the first valve is taken from the secondary coil and not direct from the aerial as at present. You may find a slight decrease in the signal strength but this will be compensated by increase in selectivity. We note you have coil L2 connected to the grid of the first valve instead of the plate, no doubt this is merely an error in the circuit and not the wiring.

J. H. (East Brunswick). Q.:. Recommend a crystal receiver to enable reception through "static." A.: See the "Carborundum Crystal Detector" (*Radio*, No. 42). This type of crystal will not eliminate static but will enable reception through this soruce of interference when it would be practically impossible to keep a sensitive point with other types.

T. E. E. (Melbourne). Q.: Using the "60 to 600 Metre Tuner" (*Radio*, No. 45), can you supply information regarding the radio frequency choke? A.: This may be a plug-in coil such as a honeycomb, according to the wave-lengths over which it is desired to receive. The correct size will have to be found by experiment.

R. S. P. (West Maitland). Q.: Supply information such as number of turns and size of a frame aerial for receiving 2FC and 2BL on a five-valve receiver, comprising two stages of radio, detector and two stages of audio amplification. A.: Space precludes see "Experimental Loop Aerials" by C. D. Maclurcan (*Radio*, No. 10). Q.: Would it be necessary to change present coils? What is method of connecting this type of aerial to receiver? A.: Depends upon whether you wire the frame aerial to tune to the desired wave-length. Using your present receiver it will be necessary for you to use a coil in series and a secondary coil for coupling to detector valve. Q.: Should this be capable of receiving Sydney broadcasting stations on loud-speaker at 75 miles? A.: Yes. you will have to find the best angle by experiment.

H. J. H. (North Preston). Q.: Please give opinion of three-valve receiver (circuit submitted. A.: Your circuit is O.K., except you show two grid condensers; the one shunted across the leak is not necessary. Q.: Using a twin-wire aerial 60ft. long and a lead-in of 30ft., what size honeycomb coils should be used for 3AR, 3LO, 2FC, 2BL, 6WF and KGO? A.: This information has been published many times in previous issues of *Radio*. To cover the desired wave-length. the best method is to obtain a number of coils from 25 to 250 turns and select those suitable for each station. With your aerial you will probably find it an advantage replacing the .0005 primary condenser with a .001, also a series-parallel switch. Q.: Would the same size coils be used in conjunction with a frame aerial? A.: No; use a tapped frame such as the "Experimental Loop Aerial" (*Radio*, No. 10). Q.: Using dull emitter valves, what ratio audio transformer should be used? A.: The same as for "bright" valves, 5 or 4 to 1.

J. G. (Naremburn). Q.: Please give opinion of one-valve receiver (circuit submitted). A.: You do not mention the wave-lengths on which you desire to receive; if for 2BL and 2FC, who transmit on 350 and 1,100 metres, use the P1 circuit (*Radio*, No. 38). This is identical to the circuit you submit except that honeycomb coils are employed. Q.: Will a .001 variable condenser be satisfactory for tuning the primary circuit? A.: Yes. Q.: Could a .0005 variable condenser be used to advantage? A.: Yes. across the secondary coil to give you finer tuning. It is usual to employ a fixed condenser in the grid circuit of about .0003 m.f. Q.: Should a 35 or 6 ohm rheostat be used with an Ediswan AR06 valve? A.: Use the 35 ohm. Q.: What type of socket is required for this type of valve? A.: "Ediswan." Q.: What should be the voltage of the A and B batteries? A.: Three and 20 to 50 respectively; the higher voltage when used as amplifiers. Q.: Would a condenser with a large number of plates give better tuning? A.: Increasing the number of plates increases the capacity of the condenser; large capacity condensers enable a greater range of wave-length tuning. To obtain fine tuning and selectivity. a small capacity condenser should be used, such as .0005 or .0003. Q.: What are jacks for? A.: Jacks are used for plugging in on 1, 2, 3 or more valves, see circuit of five-valve receiver (*Radio*, No. 47).

H. W. S. (Cooroy). Q.: Can you explain cause of trouble with four-valve receiver comprising one stage radio, detector and two stages of audio amplification? A.: See "Receiver Noises" (*Radio*. No. 45). We note you are using two 5 to 1 transformers. It is usual to employ a lower ratio in the second stage, about 4 or 3½ to 1. Apparently you are not using a series-parallel switch; you will find this an advantage. You should not use the same size coils for both primary and secondary, For 2BL these should be 35 and 50 with condenser in series. and for 2FC, 150 and 200, with condenser in parallel. A grid bias battery may also be used to advantage as shown in an article published in *Radio*, No. 41.

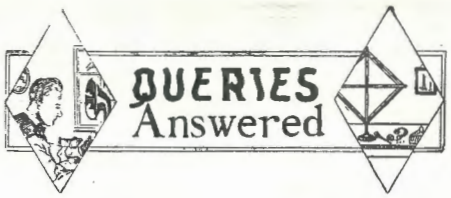
T. W. (Lindfield) submits two samples of wire and asks if they are suitable for

(*Continued on page* 728.)

wiring an amateur transmitting station, and if they comply with the Fire Underwriters' regulations? A.: Both samples are No. 16 gauge wire. No. 1 would be suitable; No. 2 should not be used owing to inferior insulation. Details of the regulations appear in this issue, and should be complied with when installing a transmitting station.

E. M. (Caulfield East). Q.: Using a crystal receiver (circuit submitted), how can signals be increased? A.: Use the one-valve amplifier (*Radio*. No. 37). As you will probably be troubled with interference. use two honeycomb coils instead of one. as at present, with a condenser for tuning the secondary coil.

H. F. B. (Brunswick). Q.: Supply circuit for one-valve receiver using Phillips D1 type valve capable of receiving N.S.W. stations. A.: Use the P1 circuit (*Radio*, No. 38). Whether you are able to pick up the stations you desire will depend upon many factors, such as your locality. You may possibly need to add a stage or two of audio.



N. S. (Drouin). Q.: Supply circuit of a seven-valve reflex set, using honeycomb coils capable of picking up British broadcasting stations. A.: Unless you have had previous experience with multi-valve receivers, we do not recommend you to use more than three or four valves, employing the "Reflex" method and suggest, therefore, the seven-valve receiver published in this issue, which should be capable of picking up English amateur stations in view of the fact they have been received on only two valves.

J. C. M. (Gretna). Q.: Do you know of any amateur using the Weagant X Circuit for short wave-lengths and whether it is satisfactory? A.: :No. Unfortunately this, and many other static eliminating devices, reduce the strength of signals. Q.: Recommend a good book on transmitting circuits, such as the Meisner, Hartley, etc. Q.: *Wireless Valve Transmitters* by James.

J. F. S. H. (Wentworthville). Q.: Using the long distance receiver (*Radio*, No. 45) could an Acme low loss, .0005 condenser be used instead of one of those specified? A.: Yes; use in place of condenser H shown in Fig. 2. Q.: Are the honeycomb coils mounted in a three-coil holder or a two-coil holder and is the third coil separate? A.: Coils C and D are mounted in a two-coil holder; coil G is mounted a distance of about six inches from the former. Q.: Is aerial 100 feet long and 30 feet high satisfactory? A.: Yes, providing it is well insulated and clear of any obstructions such as trees, iron roofs, etc. Q. Can a De Forest five-volt valve be worked from a six-volt accumulator in conjunction with a 201A? A.: Yes, providing separate rheostats are used for both valves. Q.: Is this receiver suitable for receiving broadcasting and amateur stations? A.: Yes, but for short distance reception, audio frequency should be used instead of radio.

International Radio Congress

THE first congress of the International Juristic Committee of Radio, and the first congress of the International Union of Radio Amateurs will be held at Paris during Easter of 1925.

The Congress Committee has issued a prospectus of the Congress in the "International Help Language" Esperanto. This assures all radio enthusiasts of every country knowing of the Congress and its aims.

The topics to be discussed are:—

Of the Juristic Committee of Radio:

I. Juristic regulations of wave-lengths.

II. International Regulations for transmission.

III. Intellectual characteristics and radio telephonic transmission. Rights of Authors; Interests of Artists; property of gazette information; Advertising.

Of the International Union of Radio Amateurs:

I. Organisation of an Intellectual Union of Radio Amateurs.

II. Methodical Organisation of the Technical Tests of Amateurs.

III. Wave-lengths of Radio Telephony and Amateur Transmissions.

IV. Educational use of Radio Telephony.

V. International Help Language.

The address of the Secretariat is:—T.S.F. 2 rue de l, Echaude, St. Germain, Paris. (6.E).

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The Sterling "Dinkie" Loud Speaker is supplied in a Brown tinted finish, complete with flexible cord.

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Diameter of Base, 4 in.

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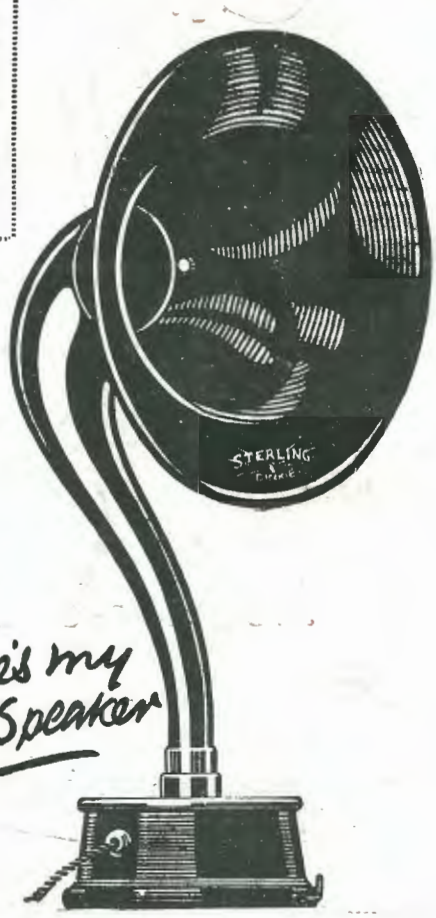
Lists and full particulars on application.

Here's my Loud Speaker



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