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The QUEENSLAND
RADIO NEWS

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MONDAY, 1st APRIL, 1929.

The Early Days of Radio

IN these enlightened days of the multi-valve set, it is interesting —and amusing—to look back on the early days of the amateur receiver, when the crystal was the most satisfactory rectifier available, and the valve was in its early laboratory stage of development. How many of our readers can recall the care and time spent in selecting an ultra-sensitive piece of galena from dozens of specimens, and then sitting with head-phones glued to ears for half the night, breathlessly listening to far-away mutterings that spoke of Morse code transmissions between ships? Frequently one reads of a crystal-set "record"—the reception of a station perhaps three or four hundred miles away. It may come as a surprise to many people to learn that reception of Morse transmissions over distances of 1500 miles and more was not by any means uncommon in the early days.

It is true that such terms as "low-loss" had not been coined, but the amateur experimenter of 1919 paid a great deal of attention to obtaining the utmost from his equipment. It was a matter of necessity, for a crystal receiver, unlike a valve set, operates solely on the energy it receives from the aerial—it is a rectifier only.

SPEAKING of aerials brings to light the point that the aerial of that time received more attention than we are accustomed to accord it now. Because of the factor mentioned above, the larger, higher and longer the aerial, the better the response from a crystal receiver, and that this fact was appreciated is proven by the imposing dimensions of the aerials then in use. The variable tuning condenser was conspicuous by its absence in most cases, although several of the more fortunate experimenters proudly displayed home-made instruments measuring anything up to six inches in diameter, and with an eighth-inch separation between plates. Generally speaking, the loose-coupler—a type of tuner rarely seen nowadays—was first favourite for tuning purposes, while many single-, double, and even three-slide tuners rendered yeoman service. None of your "aperiodic" or untuned aerial circuits—energy was far too valuable to be thus wantonly wasted! Both aerial and closed circuits were tuned to the wavelength being received, and the coupling adjusted to the point at which the most satisfactory balance between high energy-transfer and heavy damping was arrived at.

THE method of tuning? Fifteen minutes was not too long to spend in finding the most sensitive spot (theoretically there always was **one** elusive spot that stood far above its fellows in point of sensitivity)—finding it on a piece of galena crystal perhaps no larger than the head of a match. And the result? A hair-breadth movement of the "slider"; a beatific smile spreading over the face of the operator. He speaks—loudly, for the tightly-clamped headphones shut out the sound of his own voice (a paradox, if you like!): "V-I-B giving his weather report. . . . fresh, squally easterlies over Tasman sea. . . . smooth elsewhere. . . . ." And "V-I-S, calling the 'Niagara'." From Brisbane Radio and Sydney Radio he transfers his attention to a ship off the coast of North Queensland; but they are not plentiful, these whispering dots and dashes, for the modest crystal can respond only to the more powerful transmitters over such distances. Mere "morse," all of it; yet where is the man who, having memories of those days, does not think of them with a thrill and, sitting before his five-valve Solodyne, refer to them as "the good old days"?

The 1929 Electric Solodyne

DESCRIBED BY THE TECHNICAL EDITOR

IN the accompanying article is described a broadcast receiver of more than usual interest. It is representative of the latest and best practice in electrically-operated, batteryless design, and in performance is comparable with the highest grade of set in its class. Because it is modelled around the original Solodyne circuit and uses the Solodyne coil kit, we have named it the 1929 Electric Solodyne, and we are confident that by this name the set will come to be known as one of the finest home-assembly receivers of the times.

IN saying that the day of the electrically-operated radio receiver is here, we are but repeating the conclusions already arrived at by every student of the progress of radio in this and other countries. The factory-made batteryless set has been on the market for some time, although it is only within recent months that this class of receiver has really become a serious rival to the battery-operated type. At the outset, the electric set, no matter how desirable it may have been, was denied to all except the fortunate minority on account of its high initial cost, but this drawback rapidly is being overcome.

To the man who, either from preference or from necessity, builds his own set, the electric receiver presented many difficulties. In the first place must be mentioned the dearth of suitable apparatus, and no less serious has been the lack of informative data regarding the design and operating characteristics of such a set. As more than one have found to their cost, it is one thing to build a receiver which draws its power from the electric-light mains, but a totally different proposition to obtain the expected results from it if one is not familiar with the subject.

FIG. 1.—Front elevation of the 1929 Electric Solodyne. On the front panel is mounted, from left to right, the single tuning dial with drum indicator; the power switch; the reaction control; and the volume control. The baseboard is attached to the panel by means of the five screws shown. Over the panel may be seen the tops of the three shielded coils, five valves, the power pack and the output filter.

Because of the first-mentioned reason, we have, up to the present, refrained from presenting an all-electric receiver, maintaining that the time was not ripe for the publication of an article dealing with this subject. With the appearance on the Australian market of power packs and various "socket-power" components, however, the chief obstacle was removed, and consideration had therefore to be given to the question of designing a set which would conform to our requirements.

The Circuit.

After carefully weighing the pros and cons of the matter, we came to the conclusion that the original Solodyne circuit formed an ideal basis on which to work, and this deservedly-popular circuit is used in the radio portion of the set. One consideration which influenced our choice of the Solodyne hook-up was that of selectivity; this, as many of our readers will know, being one of the features of the original Solodyne. Special valves made for A.C. operation are employed—Radiotron UX-226 for the two radio-frequency and first audio-frequency stages, Radiotron UY-227 for detector, and Radiotron UX-171A for the output stage. The UY-227, it may be mentioned, is a special indirectly-heated-cathode type, its filament being heated by raw alternating current at 2½ volts potential. The UX-226's work on 1½ volts A.C., while the UX-171A is the standard Radiotron power-amplifying valve, suitable either for A.C. or D.C. operation.

Full particulars of the Solodyne circuit will be found in the description of the "Improved Solodyne," which appeared in our issue of March, 1928, and those who are interested in the fundamental design of the circuit are referred to that article. Briefly, it consists of two stages of tuned and neutralised radio-frequency amplification, a regenerative detector, and two stages of transformer-coupled audio-frequency amplification. The three tuned grid-circuits are "ganged," resulting in single-dial tuning. The reaction control is really not a tuning control, but more a means of regulating the sensitivity of the circuit. In order to take care of excessive volume which may be developed when receiving nearby stations, a volume-control resistance is fitted in the audio end of the set as a means of regulating the input to the audio amplifying system.

WE take pride in mentioning that this receiver was wholly designed and constructed in "The Queensland Radio News" laboratory, and also in the fact that quite 95 per cent. of the material used is of Australian manufacture. After testing it over a comparatively long period, we have no hesitation in vouching for its efficiency. Unlike many A.C. receivers, it is a very good distance-getter, is reasonably selective, and is easy to tune. Its most arresting feature, however, is its glorious tone quality, which is second to none.

The Power Pack.

One of the new Emmco A.C. Power Packs, recently marketed by the well-known Sydney firm of Messrs. Electricity Meter Manufacturing Company Ltd., is built into the 1929 Electric Solodyne, this unit serving to convert the 240-volt alternating current drawn from the light socket into suitable values of A.C. and D.C. for the filament and plate circuits of the various valves. This power pack is a really excellent piece of apparatus—more than the equal of any similar device from overseas that we have yet seen. It consists of a filament transformer having three separate secondary windings, delivering 1½, 2½ and 5 volts respectively; a high-voltage plate-power transformer giving about 300 volts each side of a centre-tap; audio-frequency smoothing chokes; filter-condenser pack; voltage-dividing resistances; a rectifying valve of the Raytheon gaseous-conduction type with cushioned socket; twin wire and adapter for connection to light-socket; 6-wire cable for connecting "B" supply and earth to set; and a heavy pressed metal chassis on which all these units are rigidly assembled.

Under actual working conditions, this power pack gives perfect results. In the receiver illustrated, the measured voltages applied to the various valves are as follows: Detector, 50; radio-frequency stages, 120; first audio stage, 160; power stage, 190. These voltages are higher than the manufacturers guarantee, and probably it is to this ability to supply abundant power that the 1929 All-Electric Solodyne owes much of its success as a distance-getter and a real musical instrument.

All the valves in the set receive a negative grid bias or "C" voltage. This is simply obtained by means of a tapped Emmco resistance, the voltage-drop system being availed of here.

The Radiokes shielded coils used in our battery-operated Solodyne proved so efficient that they were again incorporated in this new 1929 electric model, and it is pleasing to note the preponderance of Australian-made components in the set. In fact, only two or three small items owe their origin to factories outside

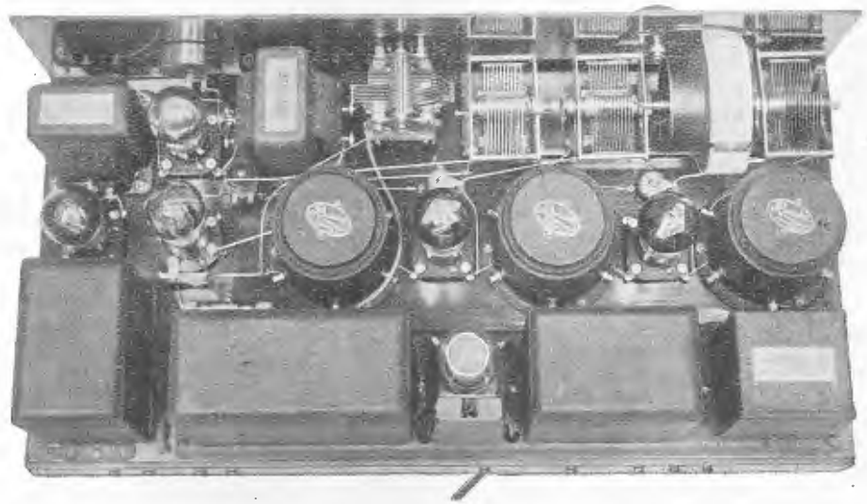


FIG. 2.—Rear elevation. The parts shown in this photograph will he identified by referring to the plan sketch, Fig. 4. The power pack is in the foreground.

of this country. Taking into consideration the fact that every part has been chosen with a due regard to its mechanical and electrical excellence, this is a striking tribute to the quality of the Australian radio apparatus now being produced.

Construction.

In Fig. 1 it will be seen that the arrangement of the controls on the front panel is not symmetrical, appearance having, to a certain extent, been sacrificed in the primary interests of efficiency and compactness. The Radion panel is screwed to a polished wooden baseboard, this baseboard being elevated approximately 1½ inches above the bottom of the panel. This will automatically follow if the panel is drilled in accordance with the diagram, Fig. 5. The bakelite terminal strip is screwed to the rear edge of the baseboard in such a way that it forms the necessary support for the back of the board. The importance of using long and heavy-gauge screws—and plenty of them—is stressed, as the completed set is a great weight, the power pack alone accounting for a good deal of it. By referring to the photograph reproduced in Fig. 2, and the plan diagram of Fig. 4, the disposition of the various parts will be made clear. The wiring diagram, Fig. 5, gives a good idea of the manner in which the terminals of the coils, sockets and transformers are located relative to one another, this being important in the interest of short wiring leads.

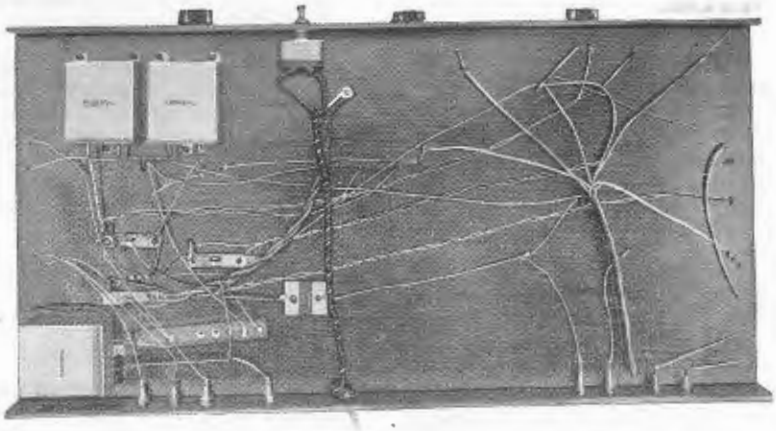


FIG. 3.—Underneath view of the baseboard, showing the resistances and condensers forming the grid bias system, the .006-mfd. series condenser and the power switch. Note the twisted leads.

On the front panel are mounted the Emmco three-gang tuning condenser, Emmco reaction condenser, Frost volume-control resistance, and Cutler-Hammer power switch. On the top face of the baseboard are the three Radiokes shielded coils (L1, L2 and L3), four Emmco UX sockets (V1, V2, V4 and V5), Emmco UY five-terminal detector socket (V3), two Radiokes neutralising condensers (C5 and C6), Radiokes radio-frequency choke (X), Wetless grid condenser (C7), De Jur 2-meg. leak (R1), two Emmco Golden Voice audio transformers (T1 and T2), Emmco output filter and Emmco power pack.

All of the radio-frequency wiring is carried out above the baseboard with 18-gauge bare tinned copper wire, but all power connections—filament, grid and plate—are taken down through holes drilled in the baseboard, and this part of the wiring done underneath. This system is highly recommended, since it provides a simple and effective means of isolating the wires carrying "A," "B" and "C" power, thus minimising the risk of unwanted induction and consequent instability and noisy operation. The wires need not be insulated where they pass through the baseboard.

For wiring the filament circuits, it is preferable to use some sort of flexible covered wire; we found flexible stranded Glazite very satisfactory. Note that the two filament leads from each socket are twisted together. This is done for a good reason; it prevents the formation of an A.C. field which would have a disturbing effect on the radio-frequency portion of the circuit, the lines of force surrounding one wire being neutralised by the lines of opposite polarity surrounding the other.

Centre-tapped Resistors.

Across each of the three secondaries of the filament transformer is connected a centre-tapped resistance. In this particular instance three De Jur 400-ohm adjustable resistors were pressed, into service, the sliding clip being disconnected from one end of the resistance winding and used as the centre-tap. Wires from each terminal of the filament secondary were soldered to the metal clips at each end of the resistance. We understand that Emmco shortly will have available centre-tapped resistance units especially intended for this purpose.

Another method of obtaining the desired effect is to use three ordinary potentiometers, which may be obtained very reasonably since there is little demand for them nowadays. They may be mounted on the underneath side of the baseboard as, once adjusted, there is seldom any necessity to touch them again. The initial adjustment of the centre-taps is critical, for on the exactness of their setting depends the silence or otherwise of the receiver. A very small deviation from the correct position of any one of the three centre-taps will result in a distinct hum being noticeable from the loudspeaker. To begin with, it is good policy to set the centre-taps in the **physical** centres of their respective resistances. After the set is in operation it is not difficult to determine the **electrical** centres, which may or may not coincide with the physical centres. Electrically speaking, the centre-taps are equivalent to the exact centres of the valve filaments, which points always are at zero voltage with respect to the filament terminals.

Grid Bias System.

The appropriate negative bias voltages for the grids of the different valves are obtained by utilising the principle of the voltage-drop which occurs across a resistance. In this receiver an Emmco 5000-ohm tapped fixed resistor is used with great success. By referring to Fig. 6, it will be seen that only four of the taps are employed, and it is most important that the resistance-bar be connected exactly as shown. However, in case the constructor wishes to use any other type of resistor, the values betwen the various taps. starting from the bottom, are as follows: 1 to 2, 450 ohms; 1 to 3, 800 ohms; 1 to 6, 2000 ohms.

The three 1-mfd. by-pass condensers used in the grid bias system are screwed to the bottom of the baseboard, as shown in Fig. 3, and also the .006-mfd. fixed series condenser C8.

In this view is also to be seen the Cutler-Hammer switch, which is connected on the 240-volt A.C. input side of the power-pack. This switch, although commonly called a "battery switch," is rated by the American Underwriters at 1 ampere, 250 volts, so that it is perfectly safe for our purpose. The twin flexible lead from the power-pack is cut, the end passed down through a hole in the baseboard, and one wire connected to one side of the switch. A 10-ft. length of twin flex. is procured, passed through a hole in the terminal strip, and one wire of it joined to the remaining terminal of the switch. The unused wires of each flex. lead are then joined together, soldered, covered with insulation tape, and secured by means of a screw and washer to the baseboard, so that they will not be likely to come in contact with anything else. It should have been mentioned that a knot is loosely tied in the long flex. input lead just inside the terminal strip, so that the connections to the switch will be relieved of any strain. This flex lead is fitted with an adapter to suit the nearest light or power-socket.

The multi-wire cable with which the power-pack is equipped is also cut, and passed through a large hole in the baseboard. The various conductors are cut to the correct length and soldered to their destinations. By referring to the piece that has been cut off and the metal tags attached to the six ends, no mistake will be made in connecting these. Here is a point that might be confusing: Although only six wires are to be seen before the cable is cut, it will be found, on cutting it, that there are, as a matter of fact, seven wires. However, this seventh wire is not to be used; just connect the six wires that have had metal tags attached to them, and ignore the seventh; seven is a standard number of conductors in these cables, which probably explains the reason for an unused wire.

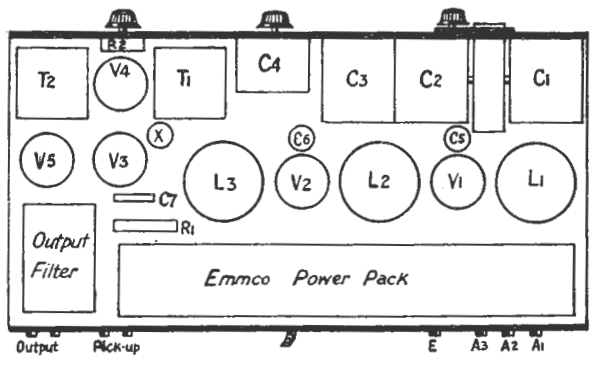


FIG. 4.—Plan diagram: The indicating symbols on the parts outlined correspond with those used on the other illustrations and throughout the text of the article.

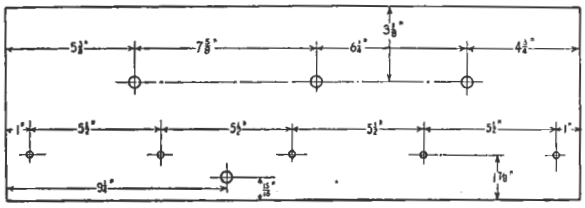


FIG. 5.—Panel drilling diagram. It is essential that these dimensions be followed accurately, so that the components will fit into their appointed places.

The leads from the three aerial terminals of the first coil (L1) also pass down through the baseboard, and are soldered to the small tip-jacks which are mounted on the terminal strip. Make sure that these aerial leads do not pass too close to any other wires or parts. They will not do this if they are taken over to the jacks in a gentle curve, as shown in Fig. 3. The leads from the "output" terminals of the output filter are connected to the two tip-jacks at one end of the terminal strip, and those for the electric gramophone pick-up to the next two jacks. These latter connections are made to the grid and cathode terminals, respectively, of the UY detector socket, and it is imperative that the lead from the grid terminal follows the shortest route possible.

Be very careful in all sub-base wiring to use adequate insulation, as some of the wires carry currents at appreciable voltages. Run no risk, therefore, of short-circuits or leaks occurring. It seems to be natural to expect good tone quality from an elecrically-operated receiver, yet this is an impossibility if the amplifier is not designed with care. Good transformers are, of course, the basis of a good amplifier, and the Emmco "Golden Voice" transformers in this set certainly justify their choice. It was found unnecessary to earth the core and case of these transformers, although an earth terminal is provided on each. The Frost variable resistance is connected across the secondary of the first audio transformer, T1. This resistance is fitted with three terminals, but only two are used—the centre terminal and either one of of the other two.

Throughout the wiring of the 1929 Electric Solodyne, be sure to avoid sharp bends. Make the connections as short and direct as possible, and form gentle curves rather than right-angle bends. This shows in the photograph of the complete set. The grid condenser is attached by means of one of its grid-leak clips directly to the grid terminal of the detector socket, thus eliminating wiring at this point.

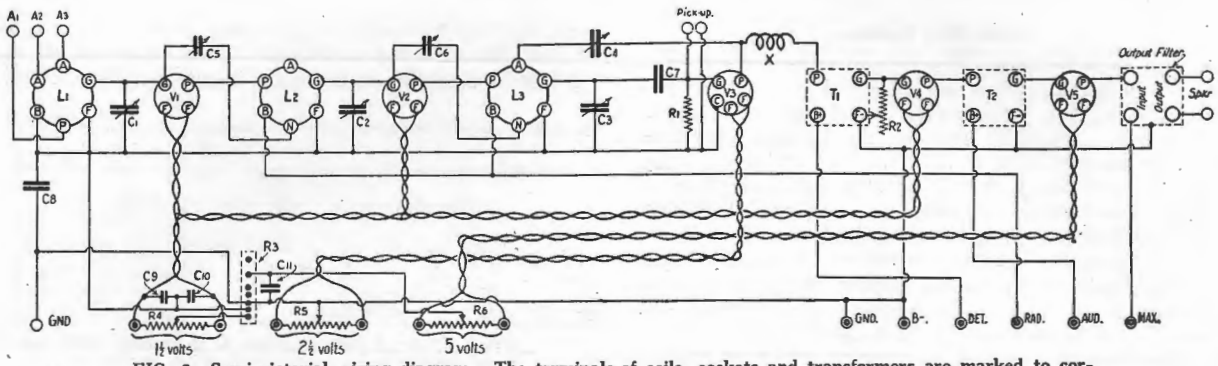


FIG. 6.—Semi-pictorial wiring diagram. The terminals of coils, sockets and transformers are marked to correspond with the markings on the actual instruments. The row of terminals along the bottom of the drawing represents the output terminals and output wires of the Emmco Power Pack. Notice that a five-terminal UY detector socket is used. The power input wires to the power pack and the power switch are not shown in this diagram, but are mentioned in the text.

Operation.

In giving this description of the 1929 Electric Solodyne, we have assumed that it is a receiver which is hardly likely to be attempted by a novice. Don't get the idea from this that it is a very complicated set; it is nothing of the kind, but the fact remains that sufficient care is needed in its construction to make it rather beyond the capabilities of the beginner. Taking it for granted that the constructor already has some slight knowledge of the subject, we have dispensed with the usual form of pictorial wiring diagram and have shown the wiring instead in a semi-pictorial fashion, which we believe will be clearer in this particular case than the former method.

When the wiring of the receiver is complete and has been checked over very carefully, insert the valves in their sockets in this order: Socket V1, UX-226; V2, UX-226; V3, UY-227; V4, UX-226; V5, UX-171A. Connect the earth lead to the pin-jack marked "E," and the aerial to one of the three aerial jacks, "A1," "A2," and "A3." The loudspeaker is plugged into the two jacks marked "Output." Now plug the adapter on the flexible cord into a light or power point, and turn on the switch. Pull the power swtich on the set into the "On" position. You will hear nothing at first, for the reason that the UY-227 detector valve takes about half-a-minute to heat up to its normal operating temperature. When this is working properly, the set will give the usual sounds indicating that it is "alive." A very slight hum will be noticed, and the reaction control, when advanced, should send the circuit into oscillation.

All that remains to be done now is to neutralise the radio-frequency stages, adjust the centre-tapped resistances (if necessary), and balance the three sections of the gang tuning condenser. In our own set, the r.f. stages are quite stable with the neutralising condensers set at minimum capacity—that is, unscrewed as far as possible, and we believe this will be the case in general, owing to the characteristics of the circuit and the relatively high negative bias on the grids of the r.f. valves.

As explained previously, the centre-tapped resistances are only to be adjusted if the A.C. hum from the loudspeaker is excessive. If the set is reasonably quiet, do not touch them. By "reasonably" quiet is meant that a faint hum is noticed from the speaker when no station is being received, but is absolutely unnoticeable when even weak signals are being received.

The task of balancing the three tuned circuits so that they will tune in synchronism is one that requires a certain amount of time and care. The procedure is to tune in a distant station—the weaker the better—as strongly as possible, and then to slacken off the two locking grub-screws in the rotor of condensers C1 and C2. Move the rotors slightly by hand until the best position is found, when the grubs are tightened up again. This operation may have to be repeated several times to obtain the best position, and is preferably carried out during the reception of one of the lower wave stations—say 2GB or 2BL. The reason for this is that the tuning on the higher wavelengths always is somewhat broader, and a slight discrepancy here makes little difference to results.

To tune the set it is merely necessary to turn the main tuning dial from station to station, using the reaction knob to control volume and sensitivity. Normally, the volume control resistance will be set at maximum position. Its real value is apparent when the set is being used in conjunction with an electric gramophone pick-up, which need not itself be fitted with a volume control. For electric gramophone operation the pick-up terminals are inserted into the two jacks marked "Pick-up" on the back of the set. No changes in the receiver are necessary.

Needless to say, a good loudspeaker must be used in order to show off the tone-quality of the set to its best advantage. We have obtained excellent results from a small exponential horn speaker fitted with a Baldwin unit.

As far as actual results are concerned, the 1929 Electric Solodyne has shown itself to be a good distance-getter. In addition to the usual list of Australian "A" and "B" class stations, all received at great strength on the loudspeaker, we have, on several occasions, tuned in JOHK Japan at fair speaker strength when 4QG was off the air, and 2YA and 1YA, New Zealand, are received usually with good volume.

(Continued on Page 49.)

Radio Aids Danish Scientists

An interesting visitor to Brisbane recently was the Danish Scientific Ship "Dana." The following is a brief description of some of the apparatus which the ship contains

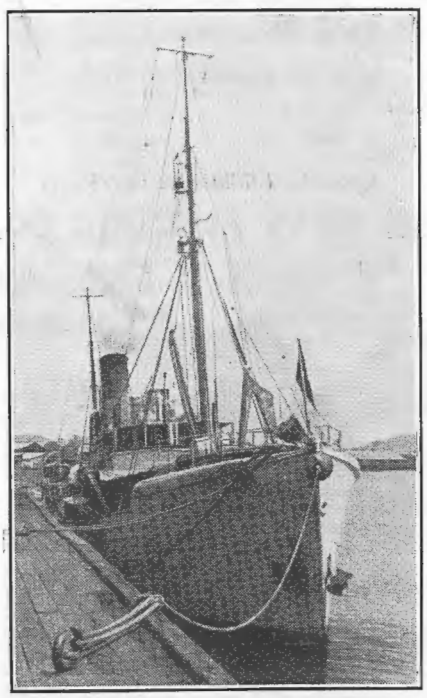
THROUGH the courtesy of Mr. Georges Mou, the ship's radio officer, we were privileged recently to inspect the Danish ship "Dana," belonging to to the Carlsbergfondets Oceanografiske Expedition, which is a scientiffc expedition on a two-years' cruise around the world, under the leadership of Professor Johannes Schmidt, of Carlsberg Laboratory, Copenhagen. This cruise is expected to occupy about two years, and has for its purpose the examination of specimens from great depths in various parts of the world, in addition to collecting data regarding the temperature and composition of the water from which the marine specimens are taken. Many prominent men of science are included in the personnel—men who are keenly interested in the wonders which are revealed to them and who have the necessary knowledge to turn the information thus accumulated to the benefit of science and mankind in general.

The "Dana" is a stout little steamer of 300 tons burden, fitted with a triple-expansion steam engine which propels her at a speed of 8 knots. Originally a British mine-sweeper, she was purchased by the Expedition and refitted to serve in her present capacity. On account of her small size, literally every square inch of space is availed of, and the "luxuries" of life are conspicuous by their absence.

While our interest primarily was centred around the fine radio installation which the ship carries, we would not like to have missed the tour of inspection on which Mr. Mou conducted us, nor the pleasure of meeting these hospitable and courteous gentlemen. Mr. Mou, although not a scientist himself, was sufficiently well versed in the subject to give a most interesting and instructive explanation of the many and varied things which are to be seen on a ship of this kind. Occasionally, he called in the assistance of one of the professors, who spared no pains to make every point as clear as possible. It should be mentioned at this stage that, although the Danish language is spoken aboard the "Dana," Mr. Mou and several of the scientists command quite an extensive knowledge of the English tongue, and we benefited accordingly.

In the museum with which the ship is fitted, we were shown marine denizens of every conceivable shape, colour, size and variety. Eels from a few months to four years old; fish carrying their own "lights"; fish of which the small-sized males are permanently attached to the female, draw their nourishment from her and die when she dies; repulsive octupi; deep-sea prawns, scarlet in colour; a deadly sea-snake from New Caledonia; a platypus from Australian waters—these and many more wonders were revealed in fascinating procession.

According to Mr. Mou, cases of specimens are sent home to Denmark from every port at which the "Dana" touches, so that the specimens exhibited in the ship's museum formed only a very small portion of the "catch." The specimens, by the way, are captured by means of special nets, which are lowered over the side and may be opened at any desired depth. The expedition, said Mr. Mou, is interested only in the smaller inhabitants of the deep seas.



The "Dana," moored at the South Brisbane Coal Wharf, in the Brisbane River. She was formerly a British mine-sweeper.

Fastened to a bulkhead in the museum is one of the most remarkable inventions of recent years—the Deep-sea Finder. This machine embodies some of the principles of radio reception, except that the energy utilised is an audio-frequency pulsation. The Deep-sea Finder is used to ascertain with accuracy the depth of water under the ship, no matter how rough the sea, and quite irrespective of the nature of the ocean-bed. Briefly, its action is this: A small generator transmits impulses of known frequency to a metal plate attached to the ship's bottom. The impulses, leaving this plate, travel through the water with the speed of sound-waves (roughly 1500 metres per second), and, impinging on the ocean-bed, are reflected back again to the ship. Here they are picked up on a second brass plate, to which is connected a powerful audio-frequency amplifier, similar to that found in a radio receiver.

The Pendulum *of* Public Preference *swings to* EVER-READY

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After being amplified, they are passed on to the headphones, which may be worn by the operator.

By means of a wonderfully-designed dial mechanism, the time interval betwen the transmission and reception of a given impulse is automatically measured and registered, and converted into its equivalent in metres, this being the exact depth of water underneath the ship at the time the sounding was made. The Deep-sea Finder, we were told, cost well over £5,000, but its value to such an expedition obviously cannot be calculated in terms of money.

In the Hydrographic Department an enormous amount of data relative to the composition and temperature of sea-water is collected, and here is a small laboratory in which Mr. Mou himself carries out the analyses. Ingenious instruments are used to bring to the surface specimens of the water from any desired depth. These cylinders are closed when lowered into the water, but may be opened at the required depth, fill with water, automatically close themselves, and are then hauled to the surface. With these instruments, there is no risk of water being taken from any depth but the pre-determined one, but in order to guard against leakage, each instrument consists of two cylinders in duplicate, each fitted with its own recording thermometer. Obviously, any marked difference between the readings of these thermometers would serve as an indication that some mishap had occurred, and the observation would be repeated.

Leaving the purely scientific part of the ship's equipment, we will touch briefly upon the radio apparatus. Mr. Mou, who in normal life is a Danish Naval officer, is in charge of a very modern and finely constructed station, and it is easy to see that he is very proud of his equipment. The "Dana" has been in practically continuous touch throughout the voyage with her home port—Copenhagen—by means of a 1-K.W. continuous-wave transmitter, operating on 37 metres. This transmitter, which may be seen at the right-hand side of our cover picture, was manufactured in Denmark, and uses Philips valves. It draws plate power from the same 500-cycle alternator which supplies the spark transmitter, both the plate and filament generators being located in the engine-room, remotely controlled.

The spark transmitter, which is used for communication with other ships and the ordinary coast stations on 600 metres, is a beautiful little 1/4-K.W. Danish-made Telefunken set, with a quenched discharger and a daylight range of 600 miles. A Danish universal-range commercial receiver is used for reception on this wavelength, and also for long-wave reception if desired.

The short-wave receiver is a three-valve set, using the Schnell circuit, and with plug-in coils. It is similar in all respects to the short-wave receivers with which we are so familiar, and exhibits a very high quality of materials and workmanship. It may be mentioned that Mr. Mou found that reception from the Copenhagen short-wave station was not satisfactory in this part of the world, partly because of the weakness of signals at this time of the year, and also on account of interference that was encountered from a station operating on practically the same wavelength.

At the suggestion of Mr. Crammond of Messrs. Melton and Co., Queen Street, Brisbane, Mr. Mou commissioned that firm to build him a screen-grid Booster unit, similar to the one described in our October issue, except that it was adapted for short wave reception. After a little experiment this Booster was connected satisfactorily to the "Dana's" short-wave receiver, and the last word received from Mr. Mou is that the Booster has made a great improvement, both as regards signal strength and the ability to eliminate the interfering station, and that he is very pleased indeed with it.

(The Radio Editor, "Q'ld Radio News.")

Dear Sir,

I received today the two copies of your very fine publication.

I want to thank you indeed for so promptly mailing these to me after you received my request regarding the Peridine radio receiver, which you had improved upon. I am now quite sure I can go through with the completion of my set, and I know I will get wonderful results when finished. Maybe I will pick your big station up sometime. I have had a Sydney station on my short-waver on code many times, but above 100 meters I don't know, maybe.....?

Just a few days ago—in fact, last Friday—between 2 p.m. and 2.30 p.m. we got London on our set perfectly. London sent it out on short wave to a station in New York, and they broadcast it to the National Broadcasting Co. of New York, and then it came across the U.S.A. by land wire to San Francisco, and then by Pacific telephone to Seattle where it was received at our Station KOWO and sent out over the air. We all got it perfectly, like local. That, I guess, is the latest dope., and is to be a regular thing, I believe, soon. **Some hook up !**

I want to thank you again. I'm a young radio fan of 63 summers and a few cold winters. I'd like to hear from you any time and will be glad to tell you later of my "Peridine."

Yours most respectfully,

M. S. Brigham

CORRECTION.

We have been advised by a reader that the short-wave transmitter of 3LO, Melbourne, is in operation every **Monday** morning between the hours of 5 and 6 a.m.—not, as stated in our last issue, on Sunday mornings.

Fifteen Years' Wireless Progress

~and the man who inspired it~

By F. W. LARKINS.

Mr. E. T. FISK.

THE first ships equipped with wireless arrived in Australasian waters about 1910, the pioneers being the P. & O., the Orient and Norddeucher Lloyd lines. Little was then known of the comparatively new science of wireless communication, and any work that had been carried out during the preceding years had been spasmodic and of an experimental nature only. So little progress had been made that there were no coastal radio station in Australia for wireless-equipped ships to communicate with, but the s.s. "Otranto" established communication and exchanged messages with H.M.S. "Powerful" which was lying in Farm Cove, Sydney, when the "Otranto" was 200 miles north-west of Fremantle—a distance of about 1800 miles.

Vastly different is the position to-day. Practically every ship in the Australasian Mercantile Marine is wireless equipped; a chain of 18 modernly-equipped coastal radio stations encircles the Australian coast-line, while ten stations are operating in New Guinea and Papua and four stations in the Fiji Islands. In the Northern Territory, radio stations serve as feeders to the landline telegraph system; broadcasting stations in each of the capital cities transmit programmes throughout Australia; while in Sydney and Melbourne the most modernly-designed short-wave transmitters are capable of transmitting any local broadcast programme to England and America, and can carry on two-way telephony conversations with Europe, America and the Dutch East Indies. The largest and most scientific wireless equipment of every type is now manufactured for use at sea, on land or in the air. To crown all, the Beam Wireless Service is daily transmitting tens of thousands of words in commercial traffic between Australia and Great Britain and between Australia and the United States and Canada, Central and South America.

Between the wireless situation in Australia in 1910 —or, as one may truthfully remark, the non-wireless situation—and the thriving and expanding radio industry of 1929, employing thousands of Australians, wonders have been worked. Not of these wonders, however, are we here so concerned as with the man who was so largely instrumental in leading the way; the man who, in the face of tremendous difficulties, slackened not his energies, but with renewed vigour sought a way to make radio communication a commonplace of our everyday life.

The record transmissions of the s.s. "Otranto" in 1910 in communicating with H.M.S. "Powerful," was carried out by the temporary wireless engineer of the s.s. "Otranto"—no other than Mr. E. T. Fisk, than no more than 24 years of age—who was sent out on this voyage by the Marconi Company, who were anxious to demonstrate the extreme range of its equipment and also to obtain first-hand information about the technical possibilities of wireless in Australia. Mr. Fisk's voyage was essentially a voyage of discovery but, unlike the discoveries of old, he found, not a new Continent, but a Continent without wireless—to him a Continent where wireless could be employed in hundreds of ways to national and international advantage.

The following years, the Marconi Company detailed Mr. Fisk to represent their interests in Australia. As Resident Engineer, he at once set about the task of placing Australia on the wireless map of the world—a big task for a young man in a new country. Yet the appointment itself was at once striking evidence of the recognition of the ability of Mr. Fisk by such a world-wide organisation as the Marconi Company of England.

Born at Sunbury-on-Thames, near London, in 1886, Mr. Fisk joined the Marconi Company in 1905 and trained and worked in all branches of wireless engineering and operating in England, America and other countries. He undertook a special mission to the Arctic icefields in 1909 and successfully demonstrated the extensive possibilities of wireless communication with the Newfoundland Sealing Fleet. In 1912 the Commonwealth Government awakened to the need of providing wireless facilities, and forthwith commenced the erection of a number of stations around the Australian coast for communication with ship stations. Once these were erected and in operation, the way was open for establishing complete ship services between such coast stations and wireless-equipped ships. Within a few short years Mr. Fisk had arranged contracts with the leading Australian ship owners and from then on the Marine Wireless Service expanded rapidly.

In 1913 a new Australian company, Amalgamated Wireless (A'sia.) Ltd., was formed to take over the rights to the patents, technical information and scientific research results of the world's leading wireless systems, and to develop them in Australia and the

Pacific Islands. Mr. Fisk became General Manager with a seat on the board, and some three years later accepted the position of Managing Director—a big position for a man not yet 30 years of age. The new company, with an enhanced capital and a staff of experienced technical engineers, set to work systematically to develop the new science in Australia.

Quite early it became apparent to Mr. Fisk that the greatest use of wireless to Australia would be its utility in trans-ocean communication between Australia and England and between Australia and each of the Dominions. Visualising this scheme as an Empire necessity, he backed it with unlimited faith and against almost overwhelming opposition strove tenaciously for years for its accomplishment. So-called "experts" there were who were ready on every occasion to say "it could not be done"—there always have been; they provide the incentive to the man who **does** things.

The efforts of the company to establish trans-ocean wireless services; the modification or removal of restrictions placed in the way of developing wireless both by successive Australian Governments and also by the British Government; the proposals placed before the Select Committee appointed by the Commonwealth Government in December, 1921, to investigate and if thought fit to approve the agreement between the Government and A.W.A. for the establishment of direct wireless services between Australia and England; and the lengthy negotiations with the British Government regarding the control and operation of a reciprocal station in England for communicating with Australia; all were matters of national importance which for several years engaged Mr. Fisk's personal and consistent attention and several times necessitated his presence in London.

Research work has always had a great attraction for Mr. Fisk. It is not surprising, therefore, in view of his scientific knowledge of wireless and of his faith in the accomplishment of trans-ocean communication between Australia and England, that most of the record long-distance experiments were, so far as regards Australia, carried out by him. The first direct wireless telegraphic messages transmitted from England to Australia were received by Mr. Fisk at his experimental station at Wahroongah (N.S.W.), on September 22nd, 1918, with Australian-designed and manufactured apparatus. The messages were transmitted from the Marconi trans-Atlantic station at Carnarvon (Wales), and were from Mr. W. M. Hughes, Prime Minister of Australia, and Sir Joseph Cook, then Minister for the Navy. The first successful transmission of low-power short-wave signals from the Marconi station at Poldhu (Cornwall) were received by Mr. Fisk's station at Vaucluse in January, 1924. Wireless telegraphic communication was established in May, 1924, between the same stations, and the first transmission of wireless telegraphic signals from Australia to England took place on November 10th, 1924. These record transmissions represented the results of a vast amount of research work on the part of Mr. Fisk and his staff—a great deal of the work being done at night and in the early morning.

Mr. Fisk's predilection for research work resulted in his being the first man to demonstrate broadcasting in Australia, the event taking place before an audience of more than 100 at a meeting of the Royal Society at Sydney in August, 1920. This was followed by his arranging a complete broadcast concert in the Queen's Hall, Federal Parliament House, Melbourne, in October of the same year. To Mr. Fisk must be credited the most consistent advocacy of a direct wireless system between Australia and England, as against the relay scheme as championed by the British Post Office, and which was totally unsuited to Australia's needs. The strenuous work of arranging and supervising the construction of the Australian Beam stations, and the organisation of a staff to operate the service from its inauguration with faultless precision, and in competition with telegraphic systems that have been in operation over a number of years, called for organising ability of no mean order.

If, as Emerson wrote, "An institution is but the lengthened shadow of a man," then the shadow of Mr. Fisk is a very virile institution with branches and agencies in the capital cities of Australia and at London, in addition to having representation at the leading seaports of the world. Its 800 employees are engaged in activities embracing all phases of modern industry—their sphere of operations covering the length and breadth of Australia, innumerable islands in the Pacific and over 100 ships at sea.

It has been said, and said with truth, that every great institution was once but an idea in the mind of someone. How many such ideas are sown but how few grow to full maturity—to great institutions !

An all-Australian wireless organisation rendering national wireless services was an idea envisaged by Mr. Fisk from the time he first became connected with Australian wireless interests. The provision of wireless facilities on ships of the Australian Mercantile Marine; the linking up of Britain's Pacific possessions, making Australia the wireless centre of the Southern Pacific; the application of wireless to outlying centres in Australia; the manufacture in Australia of every type of wireless equipment for use at sea, on land and in the air; above all, the establishment of wireless services between Australia and England and Australia and Canada, were all objectives of Mr. Fisk's and of which he has spoken many a time and oft during the past 15 years. By the majority of his listeners he was regarded as a visionary—decades and not years seemed at that time to separate the vision and its practical realisation. Never, however, was there a greater visionary with more practical ideas on the application of a great science to this island continent and its adjacent islands; never one who, against at times almost insurmountable difficulties, succeeded in convincing the powers-that-be that wireless could play a tremendous part in Australia's development, and immediately set out to build the organisation to carry out the task.

The company could not have made such great headway had not the policy been early laid down of establishing a manufacturing plant in Australia. The particular advantages accruing from this have been very definite during the last few years, for the company is now designing and manufacturing not only broadcast receivers and radio components of every

type, but such highly technical apparatus as Beam feeder transmitters, 20 k.w. short-wave transmitters for overseas broadcasting, as well as broadcast transmitters for local broadcasting stations, and marine and coastal radio equipment. In this highly technical manufacturing work, no one shows more enthusiasm than Mr. Fisk; and rightly so, for the locally designed and manufactured apparatus is the equal in modern design and performance to apparatus produced overseas.

During the past year a series of experiments by Mr. Fisk resulted in telephonic communication being effected between Sydney and New York and Sydney and Java. Several leading newspaper editors spoke in Mr. Fisk's office over the office telephone to press representatives at Schenectady, New York, and the clarity of voice-reproduction amazed those taking part.

Have you ever heard Mr. Fisk speak at a public assemblage on wireless? If not, you have missed a pleasure, for in spite of his deep insight into the subject and his highly technical knowledge of wireless in its scientific aspect, he can with relative ease deal with its progress, its problems and its future, with a lucidity and simplicity of expression that conveys to his hearers the fundamentals of the subject without in any way giving the impression that he is speaking above their heads. Few speakers have such an informal manner—fewer a more fluent style. Whether he be speaking to a meeting of trained engineers or to an assembly of laymen, his story of wireless is alike interesting, readily understandable and, somehow, a story of human interest—probably due to the fact that he has lived the story: that he has, to a large degree, moulded its scope and character.

MULLARD VALVES IN TRANS-CONTINENTAL EXPEDITION.

A Notable Performance

When General Motors of South Africa, Ltd., decided to subject a Chevrolet one-ton motor van to the severe test of travelling by road from Cape Town to London, via Cairo, they had considerable difficulty in choosing suitable radio equipment for the journey.

Mr. Wallie Wilson, a well-known amateur experimenter of Port Elizabeth, who was requested to help, installed a short-wave transmitter and receiver in the van. A 2000-volt generator driven by the engine supplied 150 watts for the transmitter, and two 15-feet poles were carried on the roof of the van. Mullard VO-150 transmitting and receiving valves were used.

After entering Rhodesia, Press messages and reports were transmitted nightly, though the rough nature of the country made the work extremely difficult. The expedition reached Cairo in five months, and London in seven months, and though the radio apparatus was subjected to much rough usage, such as being submerged during the passage of the van through rivers and over very bad roads, it functioned excellently throughout the journey. It was not found necessary to replace any of the Mullard valves, and Mr. Wilson comments very favourably on their performance.

The Quest for Quality

Some interesting details upon a subject of interest to all listeners. The most noteworthy feature of the modern broadcast receiver is its fine tone quality, but this cannot be said of many home-assembled receivers

By PERCY W. HARRIS.

APART from the programmes which it provides, there are three functions of a radio receiver in which the listener is interested —sensitivity, selectivity and quality. Perfection in all these three could only be obtained by a set which would bring in at adequate strength **any** station which happened to be working at the time anywhere, which would enable any **one** station to be heard to the exclusion of all others, and which would give a quality of reproduction indistinguishable from the original !

As the most optimistic enthusiast would demur at prophesying the attainment of such perfection in our time, it is well to consider how far we can go at present and how best we can direct our efforts towards the ideal. In designing radio receivers for home construction I have collected a good deal of data relative to this pursuit of perfection, and so it occurred to me that some notes on the subject would be helpful not only to those who build their own sets, but to all who take an intelligent interest in the performance of **any** receiver—home or factory built.

Obviously the subject is too vast for anything approaching complete treatment, but in the present notes I hope to touch on some of the more important points in the quest of quality.

The word "quality" is used as it conveys a fairly correct impression of the subject, but personally I much prefer "fidelity."

Inevitably, in the early days of any art phraseology is loose and opinions lack precision. When broadcast programmes were first made available to the "man-in-the-street," their sheer novelty had the biggest appeal, and in the marvel at any kind of radio reception many painful deficiencies were overlooked.

The first signals received were weak—a large majority of receivers being of the crystal variety—and as means of amplification were made available strength was looked upon as something aimed at, and thus such phrases as: "rattling the loudspeaker," "audible down the whole street," "signals could be heard with 'phones on the table," and suchlike, were looked upon as high praise.

In the same way, when stations began to multiply and interference made itself noticeable, "razor-sharp tuning," "knife-edged selectivity," and many such phrases, turned attention to selectivity.

Deficient Loudspeakers.

Next, as keen competition between loudspeakers arose, and it was discovered how woefully deficient were the earlier types of horn loudspeakers in regard to the low frequencies, high praise was given to any loudspeaker which would reproduce the lower tones even if (as still is the case with many!) important high tones were sacrificed. Low-note reproduction being the fashion at the present time, it is often overlooked that half of the loudspeakers sold are as deficient in the upper register as were the earlier types in the low notes, so that when we consider fidelity, one kind is often as untrue as the other !

It is now possible, in the laboratory, to test any receiver on true engineering principles with actual measurements rendered as figures to show just what any complete instrument will do in normal circumstances. Heretofore the main trouble has been that the current and voltages with which we have to deal in a wireless receiver have been so small that ordinary measuring methods are useless for the purpose.

New and complete testing methods have had to be developed. Nowadays we know just what input voltage can be applied to a given detector valve before distortion due to detector overloading is reached; what undistorted power the output valve or valves can handle; and the smallest signal voltage that will give a satisfactory output with a given receiver.

We also know that the combination of two practically distortionless audio-frequency stages (that is to say, distortionless when measured separately) does not necessarily give a distortionless two-stage amplifier and that the various interactions in a receiver are so important that the only way to obtain an adequate idea of the performance of the complete receiver is to test the whole receiver with a combination of radio and audio frequencies.

Let us now run through the requirements of a first-class receiver, assuming that we are dealing with input signals which are undistorted at the transmitting station, and free from what we may call "intervening distortion"—for the broadcasting station may send out a perfect signal and yet it may reach us in a distorted form owing to fading, heterodyning, atmospheric interference, and so forth.

Our receiver must be able to select the particular radio-frequency we desire to the exclusion of others, and this it will do by utilising circuit resonance. The damping of the receiving circuit has an important bearing on quality.

Side-band Cut-off.

The effect of reaction, either deliberately applied by the set used, or occurring naturally in the set from unwanted feed-back effects, may reduce the damping to such a point that quality is injured, and here it is

well to point out that just because the radio-frequency stages in a receiver are "stable" and the set does not burst into self-oscillation, it does not follow that this part of the receiver is well designed.

Many sets with two stages of radio-frequency allow enough feed-back to reduce the damping of the tuned circuits below the point for good quality, while yet remaining stable.

Considerable distortion may arise in the detector circuit, and the two popular forms of detection—grid leak and condenser, and plate bend—both have their good and bad points. In general, it may be said that, particularly with powerful local signals, the plate bend gives the better results, but provided the values of leak and condenser and "B" voltage are properly selected, there is not as much difference between the two methods as many of the advocates of plate-bend detection claim.

Detector distortion is a very complex subject, and deserves a complete article to itself.

In the plate circuit of the detector valve we have a current which carries both a radio-frequency and an audio-frequency component. A point often overlooked by the set designer and home constructor is that audio-frequency stages are often quite capable of amplifying radio-frequency currents, and in some circumstances radio-frequency currents leaking through the audio-frequency side give rise to all kinds of trouble. I have known many cases in which the loudspeaker leads, carrying an amplified radio-frequency current, have fed them back into the aerial so as to cause violent distortion.

Resistance amplifiers are particularly prone to this trouble. When a good radio-frequency choke is used in the plate circuit of the detector valve with what is generally called Reinartz reaction, we can often get rid of this radio-frequency component quite satisfactorily, and it should not be forgotten that the purpose of the radio-frequency choke is not only to confine the radio-frequency currents to the desired reaction circuit, but also to prevent them getting through into the audio-frequency side. Even when no detector reaction is used, an r.f. choke and a condenser by-pass is advisable.

When resistance coupling follows the detector and Reinartz reaction is used, the radio-frequency currents have an easier path through the reaction circuit, and good reaction effects can be obtained without any radio-frequency choke, but this is not good practice, and radio-frequency currents can still get through. In some sets, no radio-frequency choke is included, and I have come across many examples where radio-frequency currents have penetrated the audio-frequency side with disastrous effects to quality.

When no reaction is used in the detector circuit, we can shunt a condenser between the plate of the detector valve and the filament and get rid of this radio-frequency component, but if this condenser is too large it will also serve to by-pass the higher frequencies in the audio-frequency component.

The matter, however, becomes rather complex in the case of transformer or choke coupling. With resistance coupling .0002 to .0003 mfd. is the largest value recommended for this by-passing purpose, but with transformers and audio-frequency chokes a great deal depends upon the particular design.

Some makes of transformer have included inside the casing a fixed condenser which may have a value as high as .0005 mfd., and other transformers are designed to work with a particular condenser value. In this case the condenser working with the inductance of the transformer is part and parcel of the coupling system.

To shunt the primary of an audio-frequency transformer with a capacity different from that intended by the manufacturer may completely spoil the performance of the instrument.

Similarly the performance curve of a transformer or audio-frequency choke, or resistance-capacity unit, is different with different valves.

It is not the question of one particular make of valve being "best," it is just the choice of a suitable impedance. Some makers publish accurate curves showing the performance of their units with different types of valves, and in these the effects can be clearly seen.

While on this point it is well to mention that a great deal of nonsense has appeared in valve advertisements regarding the virtues of particular makes of valves. A claim is often made that if you use so-and-so's valves in preference to others your reception will be "clear as a bell"—"crystal clear"—"of remarkable purity"—"free from distortion"—and so forth. Most modern valves are good, and some are better than others, but poor results and distortion are obtainable in all the best makes if you use the wrong types for a given purpose.

Why Valve Effects Vary.

In changing from one make to another you may quite likely get better and louder signals, due to the higher efficiency of the valves to which you have changed, but if the new valves give you much clearer and **purer** reproduction than the make for which they have been substituted, ten chances to one you were using the wrong type in the previous make, or there is something wrong with your set.

In some cases, indeed, when the circuit design is bad through inherent reaction, the substitution of a much better valve may give you violent distortion and howling. Take, for example, a valve which, in the same class, has twice the amplification factor of the one previously used.

There may be enough feed-back in the receiver to give a low-frequency howl when a really efficient valve is used, whereas with an inefficient valve there may not be enough feed-back to cause any trouble !

The Cooley Picture Transmitter

Some interesting details of a new American Invention

THE broadcasting of wireless photographs has been in operation in America for the past twelve months. Whilst it is doubtful whether the reception of still-life pictures will ever attract a very wide circle of adherents, there are certain points about it calculated to appeal to the enthusiast.

For instance, the interest in a ringside broadcast "commentary" on a prize-fight would certainly be enhanced by the transmission at intervals of snapshots taken of the combatants in action. This is by no means an impossible performance.

The same applies to pictures, say. of exciting incidents in the Test Matches—or to any other outstanding sporting event. Or to reproductions of the leading artists, in full costume, prior to the broadcasting of an opera programme.

All this, of course, falls far short of television, where moving pictures of animated scenes will be transmitted. But as television still lies in the more or less distant future, why not utilise facilities already to hand?

From the educational point of view—not so attractive, perhaps, but still to be taken into account—picture transmission will enable broadcast talks to be illuminated graphically by explanatory diagrams or photographs, thus adding very considerably to their effectiveness and interest.

One of the most successful picture-transmission systems now being operated in the U.S.A. is the so-called Ray-Foto apparatus designed by Mr. Austen G. Cooley, a young American ininventor. The chief feature of novelty lies, perhaps, in the receiving apparatus, which utilises an ultra-violet "Corona" or brush discharge from a small Tesla transformer for marking out the received photograph directly on a strip of sensitised paper. There are, however, other features of general interest in the system, both as regards transmission and reception, which are dealt with below.

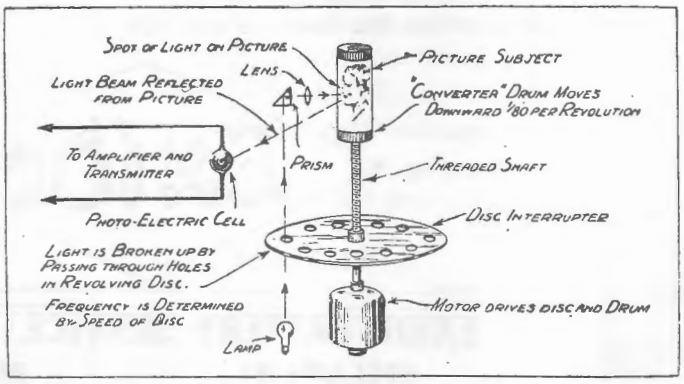
The transmitting apparatus is shown diagramatically in the drawing on this page.

How the Transmitter Works.

The picture to be broadcast is mounted on a vertical drum, which is rapidly rotated by means of a motor, and at the same time is moved gradually downwards, so that the entire surface is "scanned" along a spiral path by a ray of light from a lamp.

Before the ray from the lamp reaches the picture, it is first cut up into rapid pulses by an interrupter disc. The frequency of the pulses is 800 per second. This forms the basic wave-frequency on which the light-and-shade effects of the picture are subsequently superposed.

It will be seen that the interrupted light is focussed on to the photograph and is then reflected back on to a photo-electric cell connected in the circuit of the power amplifier feeding the transmitting aerial. Now the intensity of the reflected ray will vary with the light-and-shade value of each elementary area of the picture being scanned.



The principle of the Cooley "Ray-Foto" apparatus is illustrated here. Its operation is explained in the text.

The resistance of the photo-electric cell lessens as the intensity of the light falling upon it increases. Accordingly very light spots on the picture release heavy currents in the circuit of the cell, and vice versa. If the fluctuations so set up were radiated in this form, the recorder at the receiving station would produce a "negative" of the picture. In order to convert this

into a "positive" modulation, the current variations in the photo-electric cell are made to oppose a current of equal frequency but of constant amplitude. This reverses the original values and so gives the desired "positive" effect.

At the receiving end the recording drum, upon which the sensitised paper is wound, must, of course, rotate at exactly the same speed as the drum used in transmission, otherwise the received impulses would not be properly aligned to reproduce the original photograph.

In order to keep both drums accurately in step, a special synchronising signal of 1500 cycles is transmitted simultaneously with the actual picture signals. This operates, in the first place, to start the recording drum into rotation at the exact moment when picture transmission commences, and in the second place it serves to keep the recorder in step during the time transmission is actually in progress.

To achieve the latter purpose, the recording drum at the receiving station is normally rotated at a slightly faster rate than that at the transmitting station, but is "braked" by a magnetic clutch at the end of each revolution. The "brake" is released by the special synchronising signal sent out from the transmitter directly the drum at that station completes each revolution.

Accordingly the recording drum is started afresh, not only at the commencement of each new picture, but also at the end of each complete rotation, so that the receiver can never be more than a very small fraction of one revolution "out of step" with the transmitter.

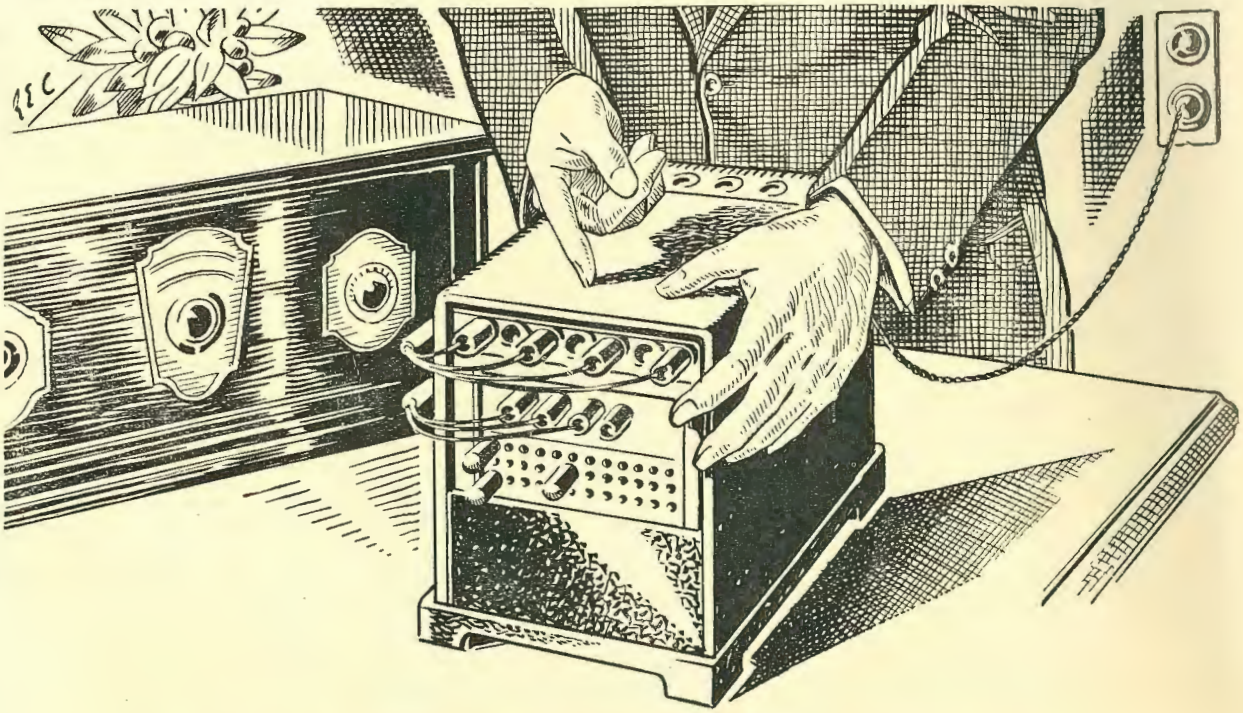
The "Corona" Effect.

The recording outfit consists of a three-valve unit adapted to be connected to the loudspeaker terminals of an ordinary three- or four-valve radio receiver. After being amplified, the high-frequency energy is fed to the primary windings of a Tesla transformer.

The secondary windings of the H.F. transformer, owing to the large step-up effect, are energised so powerfully that a brush discharge or "Corona effect" is produced. This is transmitted through a connecting wire to a recording-needle, which in turn "sprays" the discharge on to the sensitised paper strip and so produces the original photograph.

The intensity of the Corona discharge fluctuates with the strength of the received picture signals, and produces corresponding gradations of light and shade on the sensitised paper. The actual currents are, however, small, and being of high frequency they can give no shock to the operator.

One valve is intended only to handle the synchronising signals. The input circuit is tuned to 1500 cycles, so that the ordinary picture signal frequencies have little or no effect. The output circuit of the valve includes an electro-magnet which operates the synchronising brake previously referred to, and so keeps the speed of the recorder drum strictly in step with the drum shown in the diagram of the transmitter.



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The Wonderful New MARCONI screen-grid VALVES

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MARCONI Screen-Grid Valves make possible enormous amplification at radio-frequencies—even on the very short waves, with complete freedom from self-oscillation. This means that a degree of really stable amplification before detection is now possible, which makes reliable, long distance reception a reality. MARCONI Screen Grid Valve, S.625. PRICE 30/-.

Marconiphone Valve Holder for Type S625 shielded valve

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There's a Marconi Economy Valve for every purpose

Fit the new MARCONI Economy Valves in your receiver. You will be astonished at their wonderful tone quality, volume, and exceptional "B" Battery economy. Select from this list:—

	Fil. Volts	Fil. Current
Type D.E.L. 410	4.0 max.	O.1 amp. (general purpose).
Type D.E.P. 410	4.0 max.	O.1 amp. (power valve).
Type D.E.L. 610	6.0 max.	O.1 amp. (general purpose).
Type D.E.P. 610	6.0 max.	O.1 amp. (power valve).

Price 12/6 each

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Queensland's Largest Radio Store

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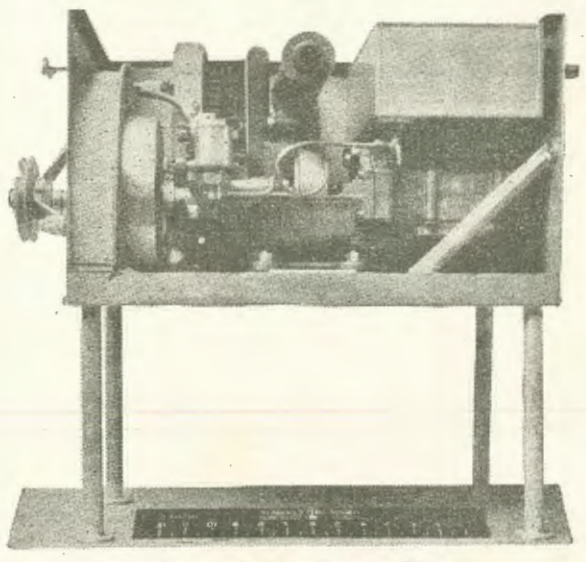
Radio in the Antarctic

During the last year or two, short-wave radio has played a notable part in connection with exploratory expeditions. The special equipment called for demands very careful design and construction

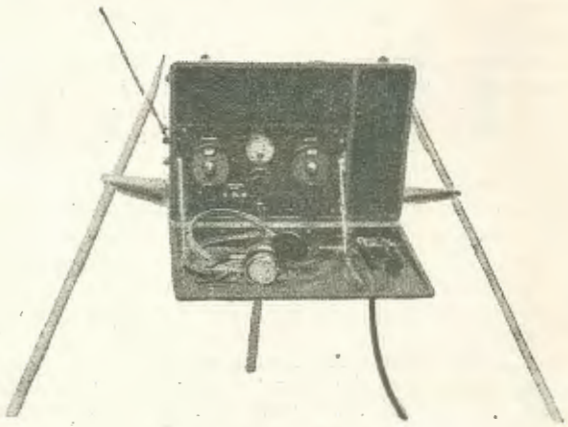
IN the grim search for scientific data and the possible establishment of several meteorological stations in the Antarctic, two of the most thoroughly outfitted expeditions ever known to history recently weighed anchor for unknown lands. Commander Richard E. Byrd, with two ships and three airplanes, and Captain George Hubert Wilkins and his planes on the steamship "Southern Cross," are on their way to the Antarctic icefields; the glacier-clad mountain range to which Shackleton and Scott gave their lives; the only remaining continent that is enshrouded in mystery.

How different from the early explorations of Marco Polo and Magellan—whose meagre navigating instruments were timed with an hour glass, and who, from the moment they lost sight of land, were out of touch with civilisation—are these present-day scientific journeys upon which every measurement is as accurate as if made in an up-to-date laboratory, and upon which regular daily communication may be had, not only with their homelands, but with all parts of the world.

Ever since Captain MacMillan took radio into the Arctic early in 1924, amateurs have eagerly looked forward to establishing communication with the various expeditions that have followed his example and equipped themselves with radio. On Wilkins' last trip to the North Pole he established communication with United States amateurs whenever he took the time to set up his apparatus. On his present trip to the Antarctic Captain Wilkins has taken two portable transmitters, one gas engine and generator power supply unit, and three receivers. He has taken no operating personnel, but he and his pilots have learned the code and enough theory and practice to carry on such communication as will be necessary.



One h.p. Gas-engine-generator Unit.



Type of Receiver used by Wilkins.

Commander Byrd has employed a staff of radio operators and technicians and has put Lieutenant Malcolm P. Hanson, of the United States Bureau of Standards, in charge. While the party is aboard ship, en route, Lieutenant Hanson acts as chief operator of the steamship "Eleanor Bolling," the supply ship, and is assisted on that ship by Carl Petersen, who has had a good bit of radio operating experience in the Antarctic whaling fleets. The radio on the "City of New York" is manned by Lloyd V. Berkner and his assistants, Howard Mason and Lloyd Grenlie. All are well-known in the short-wave transmission field through other expeditions and through their activities in the American Radio Relay League.

Both the "Eleanor Bolling," WFAT, and the "City of New York," WFBT, are equipped with 750-watt, self-rectified, 500-cycle transmitters, which may be used on any of the wavelengths assigned. The Ford plane, Floyd Bennet, signs the call WFB; the Fokker plane, WFF; and the Fairchild plane, WFC. WFA and KFK are the main base stations, while WFD and WFE are used by portable outfits at advance bases.

Probably the most interesting and unusual items in all the radio equipment are the transmitters and receivers used in the planes and at the bases. This apparatus is virtually fool-proof and crashproof. It is compact beyond all standards for portability heretofore established; and the utter simplicity with which it may be "set up" and "knocked down" make it of

great value under the conditions to be met on a polar expedition.

When Commander Byrd and his staff had determined exactly how much room and weight could be allotted the portable equipment, they turned the job over to Ralph Heintz, designer and builder of the history-making apparatus for the ill-fated Dallas Spirit and the world-renowned Southern Cross. The commander's expectations were high; he wanted a great deal of equipment packed into a very small space. He required a transmitter that would operate on short waves as well as those in the ship bands by changing not more than two controls. It must not weigh more than 50 pounds or occupy more than 1000 cu. in. of space.

This was a big order, for there is a lot of equipment necessary in a 50 watt, short and long wave transmitter; but Mr. Heintz evolved a transmitter weighing 25 pounds, occupying 700 cu. in., and operating on any wave within a band of from 20 to 75 metres and one of from 400 to 667 metres. Two single-pole, foolproof switches are used to short out the long-wave inductances when it is desired to transmit on short waves, and worm-geared condensers do all the tuning within the limits of the two bands employed.

The case is built of heavy aluminium, as are the tuning inductances, and the former is hinged on all four sides so that if it should ever be necessary to open the cabinet when aboard a plane or in other cramped quarters the operator may choose the side from which he wishes to work by removing any three of the pins and leaving the fourth. For packing, the transmitter may be put in its sack and hoisted over the shoulders.

While in the air the generator may be coupled to the plane's motor or may be attached to the fusilage and driven by the usual impeller; but when the transmitter is set up on land some other means must be used to drive it. So Mr. Heintz designed and built a 1 h.p. gas engine; built an aluminium frame around it and equipped it with detachable legs so that in extremely cold weather a stove could be put under it to thaw it out. Oil and grease solidify at low temperatures which makes starting a gas engine well nigh impossible. The complete engine and generator weigh but 65 pounds.

Due to the fact that the men who will handle Wilkins' apparatus have had practically no operating experience, an entirely different type of transmitter was designed for him. Only one wave was desired (33.5 metres) as communication will be established only when absolutely necessary. So a fixed inductance and capacitance were used in the plate circuit, the antenna length being the only adjustment necessary to obtain resonance. Not a switch nor a meter was employed; the antenna leads and jacks for the key and generator cord being all that the operator need worry about. A little "vest pocket" wavemeter is supplied for the receiver and for a final check on the transmitter. This meter has a range of from 10 to 150 metres and is being used on both expeditions.

In the small cases which hold Wilkins' receivers are two drawers in which he carries spare transmitting and receiving valves, extra coils, headphones, key and stethoscope, the latter to be used instead of phones in rainy weather. Three widely spread legs so brace the receiver that keying and copying may be accomplished without vibration.

The Byrd expedition maintains a daily schedule with Fred Roebuck at the San Francisco Examiner station, KUP, formerly 6ARD, and communicates with amateur stations all over the world. 34.05 metres is usually used for this long distance communication and amateurs are much enthused over the prospects of being chosen to relay official traffic.

♣ ♣ ♣ ♣ ♣

Frame Aerial Facts

Frame aerials are coming rather to the fore again now that screen-grid valves and better means of R.F. amplification are available. Apart from their use in portables, they are popular with the owners of fairly expensive "trans-portable" who dislike trailing an aerial lead-in from room to room.

Nevertheless, I have recently come across some really ghastly examples of frames, and I suppose they must be excused by the fact that their constructors have never before had occasion to use aerials of the "pocket handkerchief" type.

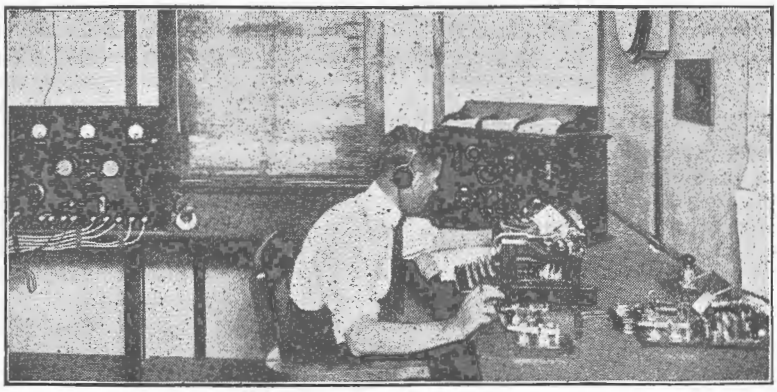
Here are some facts about frames on which to work when building a frame aerial.

The signal current produced in the winding of a frame is proportional to (amongst other things) the dimensions and the number of turns of wire. It is also inversely proportional to the wavelength.

It is really bad practice to put on the turns of wire pile-fashion, without making any attempts at accurate spacings, and the wire itself should be of fairly thick guage and well insulated. Litz wire is particularly suitable, for the multi-strand formation cuts down the high-frequency resistance.

B.E.S.S.

This photograph shows an operator on duty at the A.W.A. Receiving Centre at La Perouse, near Sydney. He is handling ship-to-shore commercial traffic, transmitted chiefly on a wavelength of 600 metres. The messages are in the Morse code —a universal language used by ships of all nationalities.



The operator does not write the messages down, but transcribes them by means of a silent typewriter as his brain decodes the Morse characters. A receiving centre such as this handles an enormous volume of radio traffic in a day, and a high standard of accuracy must be maintained.

Listening to the World

Wonderful Receiving Centre at La Perouse

By F. W. LARKINS

ON the heights of La Perouse, overlooking Botany Bay, and about 200 yards from the coast line, is located the Sydney Receiving Centre of A.W.A. This is the most important and the largest receiving station in the Southern Hemisphere. Designed in accordance with the most modern practice, the equipment incorporates the latest ideas in commercial receiving apparatus.

Radio traffic is here received from a network of stations throughout the world. Messages from ship stations in the Pacific and Indian Oceans and from the coastal radio stations on the south-eastern seaboard of Australia. Two-way radio telephony conversation is maintained between La Perouse and the trawlers operating off the N.S.W. coast; the latest news of the world is received from the English high-power station at Rugby, while reception is effected of broadcast programmes transmitted from English, American and Continental high-power broadcasting stations. The enormous range to-day attained by short-wave working is demonstrated by the reception at La Perouse of experimental communications from short-wave stations in Great Britain and Europe, the United States and Canada, Africa, Asia and the Dutch East Indies.

The La Perouse station maintains communication with all the short-wave stations in the Pacific, including Rabaul, New Guinea; Suva, Fiji; Noumea, New Caledonia; and San Francisco; while effective communication is also maintained with ship stations equipped with short-wave apparatus, crossing the Pacific and Indian Oceans.

The La Perouse station is a model of modern radio telegraph operation—efficiency, speed and accuracy are its shibboleths. The system of centralising wireless activities as conceived and developed by Mr. Fisk (Managing Director of Amalgamated Wireless (A'sia.) Ltd., has resulted in there being three large radio centres in N.S.W.—the Transmitting Centre at Pennant Hills, the Receiving Centre at La Perouse, and the Control Centre at A.W.A. Headquarters, 47 York St., Sydney. Under the old system it would have been necessary to have a separate site for each of the nine commercial services at present conducted from Sydney.

At two of the centres only are operators located—at La Perouse and at A.W.A. Headquarters; the staff at the Transmitting Centre at Pennant Hills comprises maintenance engineers only. Apart from the economy both in equipment and personnel, the operating efficiency of all the services has been greatly improved by the new arrangement.

The visitor to the picturesque village of La Perouse, set on the shores of Botany Bay, sees but a small building and a few masts on the hill overlooking the ocean. The radio operator sees in the building one of the wonders of modern science, a receiving station with gigantic electrical ears able to detect the smallest vibration or disturbance in the ether, and to instantly read its message whether it has travelled one thousand or ten thousand miles.

With headphones clamped to ears, each operator sits before a typewriter in which is a "received message" form. At the side of the typewriter is a Morse key, a simple and unpretentious instrument, but a depression of the key actuates a particular transmitter, as desired, at Pennant Hills Radio, some 25 miles away. While listening to a message from a ship the operator can simultaneously forward a message to such ship or to another ship via the Pennant Hills Marine transmitter. Another operator is in touch with Noumea, in the New Hebrides. Others

are exchanging traffic with ships, with New Guinea and with coastal radio stations. Others again are listening-in to the latest Press news from England and the Continent, or are receiving messages from experimental short-wave stations in Europe, America and the East.

Day and night messages are flashed from all parts of the world to be picked up by the ever-waiting operators at the A.W.A. Receiving Centre. A touch of a key—a depression of a switch—and the largest transmitters in Australia can be put into action, causing messages to be transmitted from La Perouse, via Pennant Hills, to England or America.

The following nine services are operated at La Perouse :—

The Beam Feeder Service from Melbourne.
The Coastal Radio Service, communicating with the coastal radio stations at Brisbane, Adelaide, Perth and Townsville.
Radio service with Suva, Fiji.
Island Radio Service, communicating with New Guinea and Papua.
Marine Wireless Services with ships at sea.
Short-wave and Long-distance Marine Services.
The Trawler Telephony Service for communicating with trawlers operating off the N.S.W. coast.
The reception of Press messages from the British high-power station at Rugby, and from stations in other parts of the world.
The reception of broadcast programmes from Great Britain, the Continent of Europe and America, re-broadcast by Australian broadcasting stations.

Messages from the company's island radio station at Rabaul, New Guinea; the A.W.A. Fiji stations and the Beam Feeder transmitting station at Braybrook, Melbourne, are received at La Perouse and automatically relayed to Wireless House, York Street, where they may be automatically recorded by mechanical means or aurally received.

The electro-magnetic principles discovered by Oersted and Faraday a century ago; the experiments of Joseph Henry, and the discoveries of Lord Kelvin, the mathematical predictions of that brilliant physicist, James Clark Maxwell, and the laboratory work of Henrich Hertz, in 1886, verifying Maxwell's deductions, were milestones in the evolution of the theory of radio telegraphy, even though many of these scientists were not at the time aware of the uses to which their theoretical discoveries were to be applied. Branly, Lodge and Popoff, noted men of science, were also instrumental in advancing experimental wireless.

It remained for Marconi, however (then a youth of twenty-one years of age), in 1895 to follow on the work of these men and by a few years' experimenting to devise a practical system of communication over a distance, without the use of wires. A stroke of genius, and the result—a new science which was destined to have a greater effect on man's activities than any invention, excepting probably printing, of the preceding nineteen centuries.

For the last eighteen years, Mr. E. T. Fisk, Managing Director of A.W.A., has consistently worked in developing every phase of wireless in Australia, and his world-famous experiments in initiating radio communication between Australia and England and his application of radio to Australia's needs have placed Australia in the forefront of radio progress. During the past year the receiving station at La Perouse has become known throughout the world for the many noteworthy interceptions carried out by the station. Of particular interest to Australians was the reception of the "Southern Cross" messages. From the time Squadron-Leader Kingsford-Smith left San Francisco until he reached Australia, operators at La Perouse were in touch with the 'plane, and in this achieved a record in 'plane-to-earth communication.

The apparatus in use at La Perouse has successfully received messages from Australian ships transmitted from the docks at Tilbury (London), and also messages from ships in harbour at Vancouver and San Francisco, as well as maintaining communication for the whole period of the voyage to and from Sydney.

The recent telephony tests between Sydney and Schenectady, New York, and Sydney and Java, carried out by Mr. Fisk, were effected through the La Perouse station so far as concerned the reception of the voices at the Sydney end, while the transmissions were accomplished through the new 20 k.w. transmitters at A.W.A. Radio Centre, Pennant Hills. The whole of the modern wireless equipment at both La Perouse and Pennant Hills, was designed and manufactured by Amalgamated Wireless (A.'sia.) Ltd.

The Transmitting License

By Q.R.N.

Article No. VI.—Dealing with the most popular types of transmitting circuit.

IN the preceding articles of this series, designed to instruct the more technically inclined among the readers of the "Queensland Radio News" in the requirements of the Amateur Operator's Proficiency Certificate, discussion has been made of the various pieces of apparatus that go to make up a well-equipped amateur transmitting station. From this article until the end of the series the space available will be devoted to consideration of sundry popular transmitting circuits, utilising both morse and telephone methods of signalling.

There are three or four transmitting circuits which stand out in point of popularity. These are the circuits known universally as the Hartley, the Meissner, the Colpitts and the Armstrong—the latter especially in its adapted form known as the tuned-plate, tuned-grid circuit. Of these four circuits probably the Hartley and the T.P.T.G. are more popular than the Meissner or the Colpitts, though all four are in use throughout the Commonwealth.

From the point of view of flexibility, probably the Hartley is preferable, for adjustments are few to enable large changes of wavelength. Similar flexibility may be obtained for the T.P.T.G. by the use of interchangeable coils, not unlike the use of receiver coils.

These two circuits have been, and still are, very popular in Queensland amateur circles, and the balance is fairly even between them. For purposes of discussion, however, it will be convenient to deal firstly with the Hartley and the Colpitts, and later with the Meissner and T.P.T.G.

Refer now to Fig. 1. This shows the "business end" of both the Hartley and Colpitts types, and shows the striking similarity between the two types.

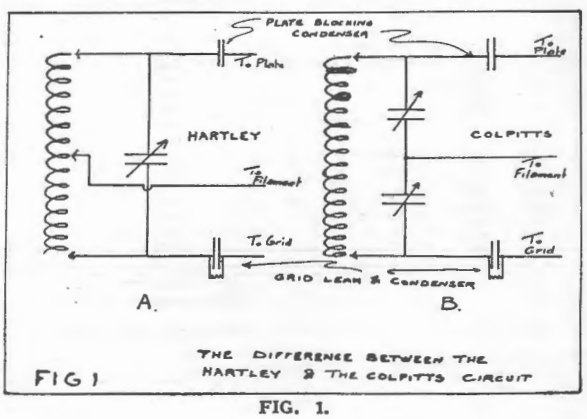


FIG. 1.

It is noticeable that the only essential difference between the two lies in the fact that the Hartley uses a tapped coil and an "untapped" condenser—if such a

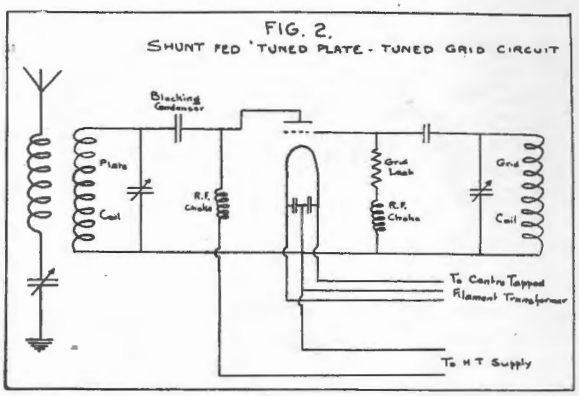


FIG. 2.

definition is permissible—while in the Colpitts one has an untapped coil and a "tapped"—or split—condenser. For either of these circuits in its simplest form the rest of the installation, including power supply, may be the same, so that a general discussion will suffice.

In the Hartley the grid-plate coil may be regarded as two coils connected in series. Upon the correct balance established between these coils will, to a large extent, depend the efficiency of the transmitter. The coupling between these grid-plate circuits would, if two coils were utilised, be governed, firstly, by the physical measurements of the coils and, secondly, by the proximity of one to the other. A very similar arrangement exists in the usual two or three coil regenerative receiver circuit, wherein the plate coil (or reaction or tickler coil) is hinged, and may be moved relatively to the grid coil. Indeed, when one considers fundamentals, there is virtually no difference between receiving and transmitting circuits, except that the latter (yes, the latter) are usually simpler.

Though the main part of a Hartley circuit usually does not consist of two coils, but of one only as shown in Fig. 1, variations in coupling between the plate and grid circuits are very easily obtained. The leads—three in number—from the plate, grid and filament circuits, terminate in spring clips, which may be moved backward or forward so as to include less or more turns of the coil within any one circuit. Thus, at once, the flexibility of the Hartley transmitter becomes apparent, for a change of wavelength from the so-called 40-metre band to the 80-metre band be-

comes primarily only a question of moving a couple of clips to a pre-determined position and a retuning of the circuit by means of the condenser.

Now for the rest of the circuit:

The chief details are shown in Fig. 2. When the power supply, derived from a step-up transformer, is applied to the terminals as shown, it is obvious that sundry alterations must be made to our circuit of Fig. 1.

First of all, a "good" condenser must be placed in the lead to the plate. The reason for this is obvious because were it not there the coil would simply be short-circuiting the whole power supply which would,

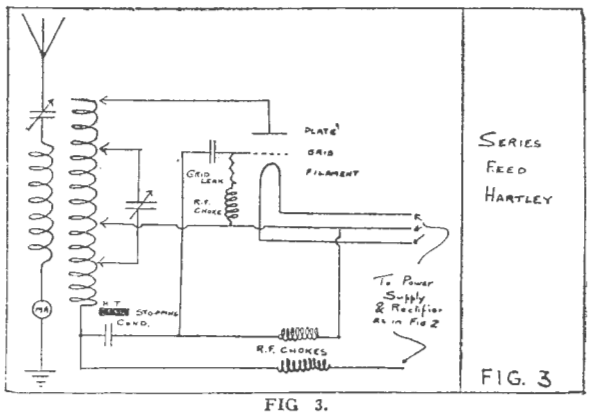


FIG 3.

to say the least, cause fireworks. The "plate-stopping" or "plate-blocking" condenser should be of a good, reliable transmitting make to carry anything over comparatively low power. It is realised that the latter statement is impossible of definition. The average Australian amateur uses a 7½ watt valve for transmitting; this does not, however, mean that he transmits with a power of 7½ watts. Oh dear, no!

The poor little 7½-watter is loaded and loaded with power until the plate is blushing (literally, not metaphorically!) under the burden of fifty, seventy, or ninety watts. Indeed, many amateurs regard, seemingly, their transmission as a failure unless the plate of their valve is glowing nearly as brilliantly as the filament. So it is obvious that the capacity and insulation value of the plate blocking condenser is not safe if limited by the rated value of the transmitter. However, a good receiving type condenser will stand up to all requirements when reasonably low power is used.

Just as the plate-blocking condenser is placed in the plate-coil lead to prevent the power from breaking into the coil circuit, so must a radio-frequency choke be placed in the plate-power lead to confine the radio-frequency current to its destined path. It will be remembered from earlier articles that condensers block direct or low-frequency alternating currents while by-passing high-frequencies, while chokes act in the opposite way.

This is all that needs description in the circuit shown in Fig. 2. All of the other parts have been well labelled, and a description of their uses given in earlier articles. It should, however, be carefully noted that the power supply in Fig. 2 is "shunt-fed"; that is, the power is connected in parallel with the valve. An alternative method of feed is in use, known as "series-feed," when the power is in series with the plate circuit as shown in Fig. 3.

From a consideration of Figs. 2 and 3 it is obvious that the plate stopping condenser used in the shunt-fed circuit is not required in the series-fed type. A condenser is, however, required in the latter (series-fed) type in the plate coil feed, as shown across the power supply, to prevent short-circuiting the high voltage supply and to provide a low resistance leakage path for the high-frequency currents in the primary coil. Choke coils are used, as shown, to keep the radio-frequency oscillations out of the power supply.

All in all, shunt-feed is preferable to series-feed, inasmuch as the former gives a greater measure of safety to the operator—no small matter when high voltages are being used. In series feed the helix and tuning condenser are both "alive" at the potential of the applied power, and adjustment to either component may become dangerous.

As for the aerial circuit, all that needs to be said is that it usually contains a separate helix, coupled to the main coil of the transmitter, and tuned with a condenser. If an indicating ammeter of the thermo-couple or hot wire type be used, it may be placed in the aerial or in the earth lead. From a point of view of protection to the meter the latter position is preferable. Coupling between aerial and plate-grid coil should be variable, and the condenser should be of a type to stand the applied radio frequency current without leakage.

Relative to the Colpitts circuit in its simple form, all that needs to be known can be gathered from the preceding remarks. It only remains to be emphasised with the exception of the difference shown in Fig. 1, that, fundamentally, the circuits are precisely similar and the remarks made as to the operation of the one apply with equal strength to the operation of the other.

Continuing the discussion on the various transmitting circuits in general amateur use, one reaches now the Meissner and the "Tuned-grid Tuned-plate" transmitters. It has been shown how the Hartley and Colpitts circuits closely resemble one another. In

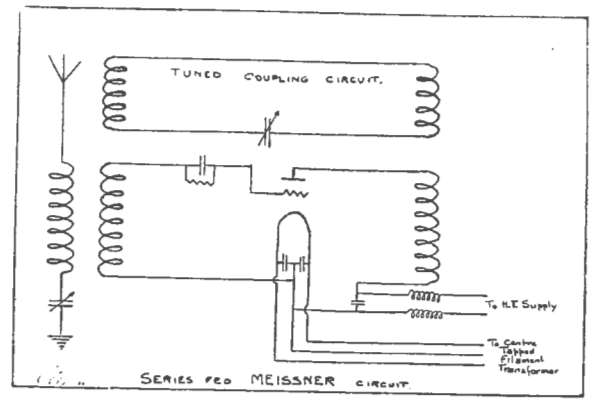


FIG. 4.

and no sliding of coils to give the best coupling. Possomewhat similar manner does the Meissner compare with the tuned-grid tuned-plate type. The chief point of similarity lies in the fact that ordinarily the grid-coil in either of these layouts is at a distance from the plate-coil. Herein, too, is the chief point of difference to the Hartley and Colpitts type. In the tuned-grid tuned-plate transmitter the distance apart of these coils is usually about 18 inches, and is often considerably more—depending solely upon the vagary of the construction.

In the Meissner type the same usually is the case. However, there is a type, or rather an adaptation, of the original Meissner type known as the "three-coil"

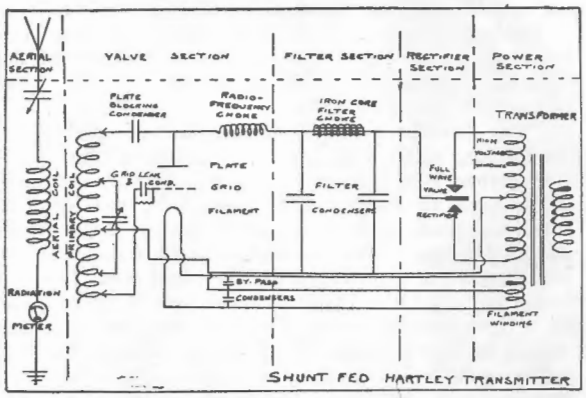


FIG. 5.

Meissner, wherein the grid and plate coils are relatively close together. This, however, being, as noted, an adaptation of the fundamental idea, is not really admissible in a consideration of the general circuit.

So much for the preliminary discussion; a closer survey of the two types—the Meissner and the tuned-grid tuned-plate circuits—is in order.

The Meissner circuit is, like most transmitting circuits, simply a grown-up receiving layout. Refer to the diagram of Fig. 4, wherein is shown the standard circuit diagram of a four-coil Meissner circuit with series power supply—that is, as explained already, the transmitter is "series-fed," or in other words, the high voltage feed is in series with the valve. The diagram shows five coils, but the circuit is named from the four main coils—viz., the two forming the coupling circuit and the two to which this circuit is inductively coupled. The aerial pick-up coil, being standard to all circuits, is usually disregarded in discussion.

The development of the Meissner circuit from the ordinary broadcast receiver is simple. One has only to imagine the receiver reaction (or tickler, or plate) coil swung right away from the grid coil to convert the passive receiving set into the prototype of a very active transmitter.

Ordinarily, when using a one-valve receiver of the P1 type, the broadcast listener swings the reaction coil into close proximity to the grid coil. The habit is reprehensible, but one for which there is no feasible remedy. The "oscillation" consequent upon such action is to a large extent unwanted in a receiving set, but is, on the other hand, the **sine qua non** of a transmitter. A transmitter depends upon the oscillations developed in its various circuits, and steps are taken to make such oscillations strong and steady.

In a receiver, however, the powers used in the various circuits and, in consequence, the strength of the oscillations, are comparatively minute, so that a tight coupling between grid and plate coils does no serious damage except to the feelings of neighbouring listeners. But the same tricks tried with a transmitter with closely coupled coils and an applied voltage of eighteen hundred or two thousand would cause quite a different result. From many points of view it is desirable that the coupling between grid and plate coils should be more delicately controlled than is possible in the example just considered.

To gain this advantage the P1 receiving circuit is subjected to mechanical alterations. The reaction coil is swung away from the grid coil—in fact, is placed right at the other end of the baseboard, and turned at an angle to give greater certainty to the intention that no stray coupling exists between the two coils. Of course, if this be done with the basic receiver the state of oscillation so noticeable when the two coils were in close proximity would be non-existent when the coils were far apart. So, too, in the present state of the transmitting circuit—there is no "oscillation" in the set, and the transmitter is inoperative. Some means then must be found which will, in itself, incorporate the desirable features of close and remote coil positions. The two coils must be coupled electrically to permit the circuit to work, and this is done by means of the two coils which, in Fig. 4, form the coupling circuit. As can readily be seen this addition has the effect of facilitating the passage of energy, by a system of inductance coupling, from the plate circuit into the grid circuit. The circuit as shown is standard, and the three-coil Meissner transmitting circuit differs only in the fact that both coils of the coupling unit are merged into one.

It is usual to tune the coupling circuit as shown, though the same result might ordinarily be obtained by leaving this circuit untuned and tuning either (or both) the grid or plate circuits. However, the system shown, which has the advantage of lessening the number of controls, is also to be preferred, because of the more effective control it gives in tuning the transmitter. As will be seen, the rest of the circuit does not require very much consideration. It is similar in every fundamental respect to the circuits already shown, except for the actual layout. Radio frequency chokes and by-pass condensers are used as before in the power leads, and the use of centre-tapped transformers and efficient rectifiers and filters is as desirable in this as in the earlier circuits.

The outstanding advantage of the Meissner and tuned-grid tuned-plate transmitters has, however, not yet been emphasised. It lies, of course, in the fact that the coils in the plate and the grid circuits—not being coupled to each other—can ordinarily be wound to a specified size and fixed into position. There are no clips to be juggled into various relative positions,

sibly the Meissner is not as flexible as the conventional Hartley to cover quick changes of wavelength, but such is not necessarily a drawback in these days, when a transmitter works for weeks at a stretch on one band without the urge to change to another to seek additional contacts. For this reason the Meissner and the tuned-grid tuned-plate transmitters have much to recommend them to the amateur who has not the inclination to do unnecessary manipulation of coils and clips and prefers a straightforward condenser-controlled transmitter.

From this aspect an even greater measure of popularity has been accorded the tuned-grid tuned-plate circuit. It has increased in numbers in the last year until it shares with the Hartley about 80 per cent. of the Australian amateur transmitters. Handled by an efficient operator, it is no better and no worse than the Hartley, and will give the same consistent results. The advantage of the Hartley is the ease with which big changes of wavelength can be compassed. The tuned-plate tuned-grid circuit on the other hand has an easier and a smoother control. It has the further advantage that the coils used may be wound directly on bakelite tubing of suitable diameter, and may be so proportioned as to keep the inductance capacity ratio of the circuit within the most desirable limits. A set of plug-in coils to cover various transmitting bands takes the place of the spaced copper helices of the Hartley type, and, together with their compactness, they permit of the assembly of a very neat looking transmitter. A further advantage of the tuned-plate tuned-grid circuit lies in the ease with which the purely condenser-coupled transmitter may be definitely calibrated for any given waveband, with the added fact that the calibration once made is permanent.

In practice the circuit is as shown in Fig. 5. A glance will show its similarity to the circuit of Fig. 4. Here, too, the grid and plate coils are far apart, but in the case of the tuned-plate tuned-grid transmitter the coupling between the two circuits is capacitative in place of inductive. The grid and plate coils are each tuned, and the symmetry of the circuit is evidenced by the fact that the inductance of the coils and the capacity range of the tuning condensers are the same for either circuit.

As shown in Fig. 5, the grid-coil is placed on the opposite end of the baseboard to the plate-coil, and the aerial-coil is variably coupled to the latter. The whole transmitter is tuned by three variable condensers which, for powers up to about 50 watts, may be good type receiving condensers. The greatest care should be exercised in the choice of the various fixed condensers used for coupling or blocking purposes, though a good type of mica-dielectric fixed condenser as used in receiving sets, will, in all ordinary circumstances, prove suitable.

Reliable meters to measure plate current, aerial current, and filament voltage are greatly to be desired in handling the tuned-plate tuned-grid transmitter, as unfortunately the valve is (at certain settings of the tuning condenser) prone to stop oscillating, and when this occurs the loading up of current upon the plate causes it to heat up very quickly, which tends to shorten the effective life of such valve. Of course, any such heating is readily visible to the eye, but the use of calibrated meters is a surer indication that all of the circuits are functioning correctly.

In next issue, in the concluding article of this series, various methods of keying will be discussed, together with the use of relays and other protective devices, and a survey made of the manner in which speech and music are broadcast.

Extract from the "Wireless Trader,"

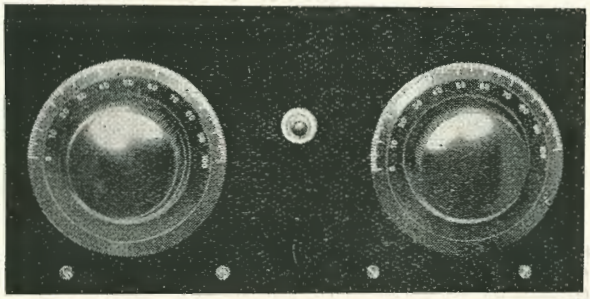
OCTOBER 13th, 1928.

Impressions from the New York Radio Show

Messrs. Ferranti Ltd., of Hollinwood, England, have permission from the "Wireless Trader" to reprint the following paragraph which appeared in their issue of the 13th October, 1928:

"The outstanding feature was that of quality reproduction, which now appears to be receiving attention rather long overdue. A great deal of emphasis is laid upon the improved design of L.F. transformers. Little or nothing is heard of resistance-capacity or choke-coupling. We are inclined to believe that the introduction of a famous English transformer has had something to do with the increased standard of quality. Our correspondent stressed the fact that the American manufacturer is at last convinced that not only is quality the thing, but that it has to be paid for. We are told that the transformer selling for thirty pence is no longer regarded as good enough."

The Selectimax Crystal Set



The crystal receiver described in this article is the idea of a Sydney reader of "The Queensland Radio News." It embodies several features which commend it to the attention of the crystal fan.

By the TECHNICAL EDITOR.

SEVERAL times within the last few months we have received requests for details of a selective crystal receiver. At the moment, such a thing seems rather superfluous as far as Brisbane listeners are concerned, in view of the fact that only one broadcast station is in operation in the capital city. However, it is the earnest hope of everyone interested in the progress of radio in Queensland that such a state of affairs shall not exist for long; the advantages that would follow the inauguration of a good "B" class service are self-evident, and it appears safe to assume that such a service will be in operation before the end of the present year.

It must be said that the crystal set owner residing in the metropolitan and suburban areas of Brisbane is quite well served by 4QG although, since he is restricted to the reception of one station only, lack of variety must inevitably be his lot. In every capital city—that is, where the "A" class stations are located—the number of such listeners is extremely large, and crystal sets of different makes and types are in use. Now, excellent though a well-made crystal receiver undoubtedly is, it suffers always from one great failing—broad tuning, or lack of selectivity. Hence, with the advent of another station, it will be found that the majority of these sets will be unable to discriminate sufficiently between the "A" and the "B" class stations, with the unpleasant result that the latter always will be received with a more or less strong background of the former.

In Sydney, where there are two powerful "A" class, and several "B" class, stations on the air, the problem of gaining sufficient selectivity with a crystal receiver already has become acute. Realising the need, Mr. Theo Kugler, of Maroubra, N.S.W., set about designing a simple and inexpensive crystal receiver that would be capable of eliminating one powerful station in favour of a weaker or more distant transmission. He spent a great deal of time in experimenting with various circuit arrangements before he was satisfied that he had the right idea, and the Selectimax Crystal Receiver is the result.

Being an enthusiastic reader of the "Q.R.N.," Mr. Kugler very kindly sent us sketches and full particulars of his crystal receiver, but, because of the fact that all "Radio News" receivers must, as a matter of policy, be built in our laboratory and thoroughly tested before publication, we were unable to make use of the information straight away. The Selectimax has been described in a Sydney contemporary since that time under another name, but that is no reason why it should not be presented to our readers, for it is worth talking about!

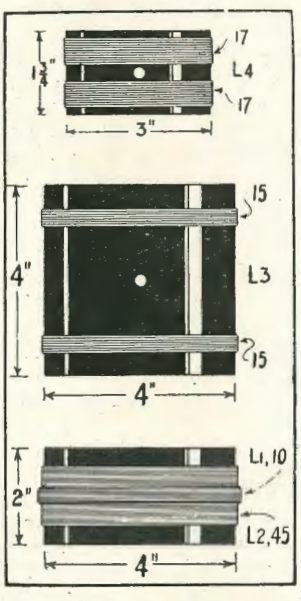


Fig. 1.— Constructional details of the coils. Full particulars are given in the text.

The two photos show the front and rear views, respectively, of the finished receiver. The small amount of material that is necessary is listed at the end of this article, and it will be noticed that all of the parts are quite inexpensive. In our own model, a Celeron panel was used, but a piece of varnished three-ply wood will serve just as well. The centre-holes for the variable condenser and variometer spindle are located 2½ inches from the ends of the panel, and are on a line approximately 3 inches from the bottom edge. In the case of the variometer spindle, the distance from the bottom edge of the panel will be governed by the thickness of the baseboard, as will be seen later. In this set, we have used a "Liontron" detector—a detector of the tellurium-zincite, semi-fixed type, which is extremely rugged and seldom requires adjustment. If, however, the constructor demands the utmost sensitivity from his set—that is, the loudest possible signals from the greatest possible distance—and is prepared to spend some time and care in adjusting the detector frequently, he is advised to

substitute a detector of the catwhisker variety, with one of the many excellent synthetic minerals on the market. "Hertzite," "Mighty Atom" and "Neutron" are some of the trade names under which these crystals are sold. Such a detector may be mounted quite easily on the front panel, where it will be readily adjustable.

Construction of Coils.

Really the only parts of the Selectimax that require any detailed description are the coils. They are the heart of the set, and so must be constructed with a due regard to accuracy. Let us consider them in the order in which they are numbered in the diagrams Figs. 1, 2 and 3.

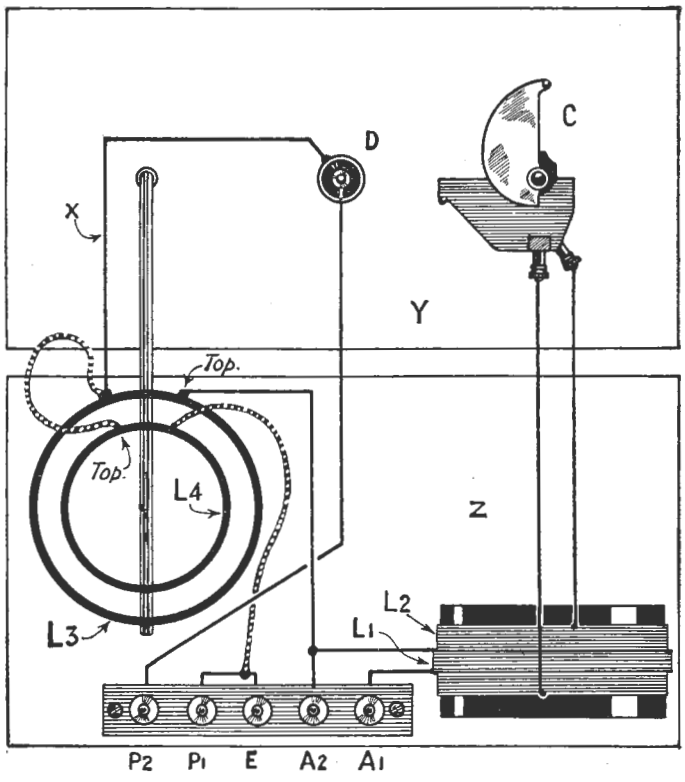


Fig. 2.— This pictorial diagram shows the positions of the various parts and the wiring—what there is of it!

L1 and L2 form, with the variable condenser C, a trap circuit, which may be used or not, as circumstances demand. Take a 2-inch length of the 4-inch diameter cardboard tube, and wind on it 45 turns of the 24-gauge double silk-covered wire. This winding will occupy a space of approximately 1¼-inches. Leave 6-inches or so of wire at each end for external connections. Now wrap a piece of heavy paper or tape about ¾-inch wide round this winding, in the middle of it. Over this tape, wind a new coil of 10 turns, securing each end with a dab of sealing-wax, and leaving 6-inches for connections, as before. Note that this last coil is quite separate and distinct from L2; it is wound **over** it, with the paper acting as insulation between the two windings. L1 is the pick-up coil of the trap, while L2 is the tuned rejector coil.

L3 and L4 form the stator and rotor, respectively, of a simple variometer, with which all tuning is done. For L3, take a 4-inch length of the 4-inch diameter tube and, starting ½-an-inch from one end, wind on 15 turns. Leave a gap of 2¼-inches, then continue the winding for another 15 turns. Finish the winding, and leave some of the wire over for connections. Pierce two holes diametrically opposite in the centre of the tube for the ¼-inch spindle, and attach two small brackets to the bottom of the tube so that it may be screwed down to the baseboard.

The rotor coil L4 is made by winding 34 turns of the same wire on a 1¾-inch length of 3in. diameter cardboard tube. Start close to the edge, wind on 17 turns, leave a gap of ⅜in., wind another 17 turns, and finish off. A long piece of thin flex is attached to each end of this coil and holes are pierced for the spindle. It should be superfluous to mention that **all coils should be wound in the same direction.**

In our set, a 6-inch length of ¼-inch brass rod was used for the spindle, and the rotor coil secured to it by means of a piece of heavy wire, which was soldered to the spindle inside the rotor coil and bent tightly round the edges of the cardboard tube on which the rotor coil is wound.

Five terminals are mounted on a small bakelite strip, which is screwed down to the baseboard, and the coils are mounted in the positions shown in the pictorial diagram, Fig. 5. The actual wiring is simplicity itself. One end of the pick-up coil L1 goes to terminal A1, and the other end to terminal A2, to which the **top** end of the stator coil L3 also is connected. The two ends of the tuned trap coil L2 are connected to the terminals of the variable condenser C. Terminals E and P1 are connected together, and one of the flexible leads (it doesn't matter which) from the rotor coil L4 connected to them. The other flexible rotor conection is joined to the bottom end of the stator coil L3, and this point is also connected to one terminal of the crystal detector, D. The remaining terminal of the detector is connected to the terminal P2.

For operation at a time when interference is not being experienced, the aerial is connected to terminal A2, thus cutting the trap out of circuit. When high selectivity is desired, connect the aerial to terminal A1, when the trap is in circuit. The earth wire is joined to terminal E, and the headphones or loudspeaker to P1 and P2. The required station is tuned in by means of the variometer dial, while the interfering station is eliminated by rotating the condenser dial, at the same time re-tuning slightly with the variometer with the aerial on terminal A2, the condenser dial has, of course, no effect whatever.

For best results, the aerial used should be as long and as high as possible, and the efficiency of the earth connection plays a very important part in securing loud signals and distant reception. In his letter, Mr. Kugler mentions that on one of these sets which he made for a friend living at Windsor, 34 miles from Sydney, 2FC, 2UE, 2BL and 4QG are heard nightly, and sometimes 3LO, while he himself, located only ¾ of a mile from 2BL, has no trouble in receiving 2FC without interference when both are on the air. This is a splendid performance for a crystal set, and our own tests go to prove that Mr. Kugler has not over-stated its capabilities in any way.

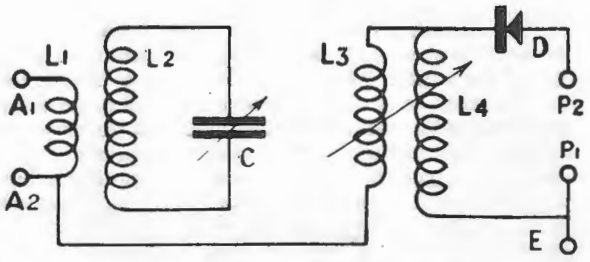


Fig. 3.—The circuit diagram. This, it will be noted, is rather unusual in its arrangement.

In short, the Selectimax possesses so many worthwhile features that it is sure to find favour with a large number of enthusiasts in this and other States. Without the trap portion of the circuit, it is at least equal to any crystal set in existence, and in that form is heartily recommended to readers living outside the interference area. Where the factor of selectivity is of no importance, louder signals will be obtained by transferring the wire marked "X" in Fig. 5 to the **top** end of the stator coil, L3.

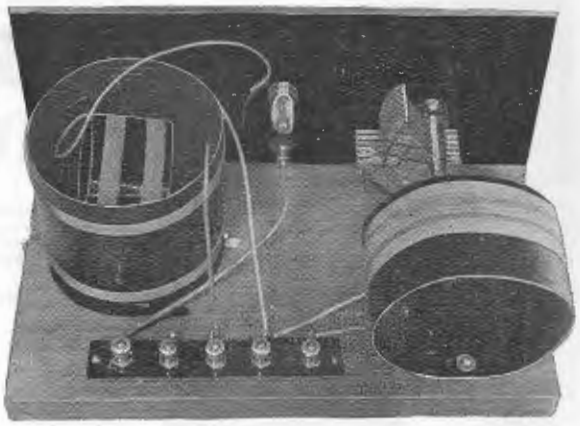


Fig. 4.— Rear view, showing the simple layout. The trap circuit is on the right, while the tuning variometer may be seen on the left, with terminals in the foreground.

PARTS FOR THE "SELECTIMAX."

1 Celeron or 3-ply panel, 12 x 6 x ⅛-inch, Y.

1 Pine baseboard, 12 x 6½ x 1-inch Z.

1 Formo .0005-mfd. variable condenser, C.

1 Liontron crystal detector, D.

1 Cardboard tube, 2-inches long x 4-inches diameter, L1 and L2.

1 Cardboard tube, 4-inches long x 4-inches diameter, L3.

1 Cardboard tube, 1¾ inches long x 3-inches diameter, L4.

1 ¼-lb reel 24-gauge blue D.S.C. wire.

1 Brass spindle, 6 inches long, ¼-inch diameter.

2 4-inch bakelite dials.

5 Terminals.

1 Celeron terminal strip, 6 x 1 x ⅛-inch.

2 Lengths silk-covered flex.
18-gauge tinned copper wire and spaghetti.

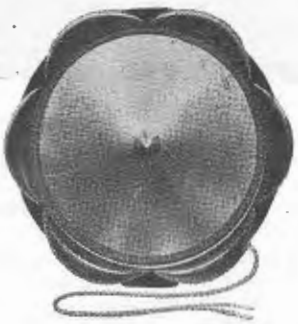
Stewart-Warner Radio Now Handled by Martin Wilson Bros. Ltd.

It is with pleasure that we announce the taking up of the well-known Stewart-Warner Radio apparatus agency by Messrs. Martin Wilson Bros. Ltd., of Adelaide Stret, Brisbane.

The great American firm of Stewart-Warner is perhaps best known in this country in connection with its Spedometers, Vacuum tanks, carburettors and other automatic accessories. In addition to this department, however, Stewart-Warner also produces a complete line of very fine radio receivers—both battery and all-electric types—and high-grade valves and loud-speakers. Messrs. Martin-Wilson are to be congratulated on securing this agency, for we believe that it is the better type of receiver that is going to keep radio in Queensland in a live and flourishing condition.

TESTED AND RECOMMENDED

A Department of Investigation, conducted for the benefit of our readers. Every piece of material featured on these pages is subjected to a rigorous and searching test before publication. No remuneration is received for the publication of these paragraphs.



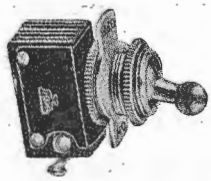
The Mullard Pure Music Speaker.

The latest addition to the line produced by the famous Mullard Wireless Service Co. Ltd. of England, is their new "Pure Music" Speaker, type "C". This is an instrument of the cone type, measuring 13 by 12 inches overall. The translation of electrical impulses into sound is effected by a balanced moving armature, symmetrically arranged relative to the magnetic field, while a conical diaphragm translates the impulses into audible speech or music. This diaphragm—which is unaffected by damp—is ingeniously designed to obviate all resonance peaks on the performance curve, and responds uniformly to the most delicate vibrations of the armature over the whole range of audio-frequency.

A novel feature is the incorporation of a special filter, and by means of a switch at the back of the filter it is possible to secure either high or low-pitch reproduction, according to the taste of the listener and also to the characteristics of the receiving set. This filter is a valuable feature, inasmuch as it materially assists in reducing the unpleasant effects introduced by a poor audio amplifying system.

Tested with a receiver having a well-designed amplifier, the Mullard P.M. Speaker gave very good results. The clarity of the speech reproduction was particularly noticeable, while in dealing with music a very evenly-balanced output was obtained. The bass portion of the scale is reproduced with good volume and definition, even the drums being present—and sounding **like** drums. With the filter switch in the high-pitch position, the rendering of the treble of the pianoforte is exceptionally brilliant.

The Mullard P.M. Speaker is available in three distinct finishes, and is so designed that it may be placed on a table, hung flat on the wall, or inclined to it. An extra-long cord of heavy material is provided, equipped with the regulation tips. An examination of the construction of the speaker suggests that it would be especially well adapted to mounting behind a baffle-board in order to obtain even better response from the bass. This is being done with many cone speakers nowadays, and certainly results in a great improvement in reproduction. With many speakers difficulty is experienced in carrying the idea into practice, but this trouble will not intrude in the case of the Mullard P.M. Speaker. Our sample came from the Queensland distributors, Messrs. Edgar V. Hudson, 51 Charlotte Street, Brisbane.



The Monarch Toggle Battery Switch.

"Diminutive in size, high in efficiency, and attractive in appearance" is the way one would sum up the characteristics of the new Monarch Toggle Battery Switch, recently placed on the market by the manufacturers, Messrs. Radio Corporation of Australia, Ltd., Melbourne, from whom our sample was received. As its name indicates, the movement is a high-grade toggle action, positive and rugged. Phosphor-bronze contacts are employed and bakelite insulation, and the switch is rated for use on 125-volt circuits carrying a current of 3 amperes. A moulded bakelite case totally encloses the movement, two lugs protruding for the external connections. The switch may be mounted on panels up to ¼inch in thickness by drilling one 7/16-in. hole; the clamping nut serving also to hold a stamped "On-Off" indicating plate. The exposed metal parts are nicely finished in oxidised copper, and the Monarch Toggle Battery Switch measures but 1½ x ⅝ x ⅝ inches overall.

"Q.R.N." Question Competition

This is the fourth question in a novel competition for our readers, for which good prizes are being donated by Messrs Trackson Bros., Ltd. Each month a question relating to some usual trouble experienced with a radio set will be given, the prize being awarded to the sender of the correct or most nearly correct answer:—

As we wish this competition to become popular with our readers, the questions will be kept as simple as possible, so that those with only an elementary knowledge of radio may compete.

The following are the conditions governing the competition:—

(1) The closing date of the competition will be the 20th of the month in which the question appears.

(2) Answers must be forwarded to the "Queensland Radio News," box 1095N, G.P.O., Brisbane, the envelope being marked "Question Competition."

(3) Competitors may send in as many answers as they wish, but each answer must be accompanied by the coupon printed below.

(4) The prize will consist of an order on Messrs. Trackson Bros., Ltd., for the radio apparatus mentioned each month as the prize.

(5) The decision of the Technical Editor of the "Queensland Radio News," who will act as judge, will be final.

COMPETITION COUPON.

This coupon must accompany each answer sent in for the APRIL competition.

NAME .....

ADDRESS .....

.....

LAST MONTH'S COMPETITION.

In connection with the March "Q.R.N." Question Competition, the prize-winning entry was received from

E. J H. CORNELIUS,
Margaret Street,
Milton.

Mr. Cornelius correctly diagnosed the trouble as being caused by the three sections of the gang condenser not being compensated to tune each inductance properly, or to the locking devices between the three sections being ineffective, thus allowing a "slip and catch again" effect in one or more of the three sections. The remedy suggested by Mr. Cornelius is as follows: Tune in an interstate station and then loosen the coupling devices between each section of the condenser. Adjust main tuning dial to loudest point and then shift first and second rotor sections to loudest point. Then, when rotor plates are adjusted to receive the station at maximum strength, proceed to lock down securely the coupling devices between each condenser in the three-gang assembly.

The prize of one Formo Three-gang Variable Condenser, donated by Messrs Trackson Bros. Ltd., will be awarded to Mr. Cornelius.

THIS MONTH'S QUESTION.

In a four-valve Browning-Drake receiver, signals became louder as the reaction control was advanced, until there was a loud "click" and a strong whistle replaced the music. This whistle did not cease when the reaction control was retarded, the only difference being that it changed slightly in pitch. It was found that the receiver could be restored to its original condition by retarding the reaction control and touching the aerial terminal with a moistened finger. As soon as the reaction was advanced, however, the trouble reappeared. What was the cause, and what is the remedy?

PRIZE: One Valve, type to be selected by winner, value not to exceed 15/-.

"SHORT-WAVE ACTIVITIES."

We regret that, owing to unforseen pressure on our space, we have been compelled this month to delete Mr. F. W. Nolan's usual monthly budget of short-wave notes. We adopted this course very much against our will, and offer sincere apologies to the large number of readers who find the notes of interest. They will, however, occupy their usual position in next month's issue.

Interesting notes on the short waves will be found in the April 8th issue of "The Broadcast Bulletin," our weekly companion paper.

TOOMBUL RADIO CLUB.

Matters have been fairly quiet lately with 4TC, the weather being rather too cold for any more raiding parties to Leitch's Crossing.

However, this is but the lull before the storm (I think I heard someone say that before, hi) and now that the new officers are getting their bearings run in, so to speak, there will be something doing. Several very favourable reports from all Suburbs have been received on 4TC transmission, and are very much appreciated. We would like more.

During the month a very enthusiastic and useful new member was enrolled and welcomed very heartily. Among the month's activities was included a treasure hunt, conducted per medium of the usual trusty qrn-makers (sorry, I mean motorbikes). This was won by Mr. A. E. Walz and his Aerial. Another interesting item was a demonstration of Electrical Gramophone Reproducers, Amplifiers and Loudspeakers, which nearly became a debate, and almost a free fight.

Listeners on the 250 metre band are informed that something special in the way of a stunt transmission is being prepared for Wednesday night, April 10th, so watch out on that night for 4TC, Toombul Radio Club, and send your reports to the Clubrooms, Cnr. Eton Street, and Sandgate Road, Nundah.

* * * *

BABINDA RADIO SOCIETY.

[It is pleasing to learn that the radio enthusiasts of the Babinda district have banded themselves into a Radio Society. We wish them every success, and look forward to the appearance of the society's report on this page for many years to come.—Ed.]

On January 4th last, a meeting was convened by G. Groth to consider the advisability of forming a radio society in Babinda. The response of the radio "fans" was very encouraging, with the result that the Society was duly formed, and the following officers were appointed: T. McFarlane, chairman; G. Groth. secretary; M. Brown, treasurer; also a committee consisting of the abovementioned officers and F. Hanish.

Since the foundation meeting, classes of instruction in electricity and Morse have been commenced, all the members being keen on the Morse practice. As several good operators are available, it should not be long ere the members get into the swing of the "dots and dashes.".

The Society has secured a lease of an area of ground, for which they are very thankful to the General Manager of Railways. It is the intention at an early date to erect a short-wave transmitting and receiving station, in which will also be held the classes of instruction, etc.

The membership fees have been fixed at £2/2/- per annum, and to date a financial membership of 18 constitutes the society. It is expected that a number of new members will join up in the near future. Dances, etc., are being held, and it should not be long before sufficient funds are in hand to go ahead with the erection of the building. Considerable assistance in material has been offered by members and others, to whom the society is indebted, including Messrs L. Slape, J. Donaldson, E. Gunders, F. McFarlane, and G. Griffiths.

All communications from other clubs, and diagrams of tested short-wave transmitters and remarks concerning them, would be of great assistance to this new society. Letters should be addressed to the Society, C/- of G. Groth, Babinda, North Queensland.

* * * *

WOOLOOWIN RADIO CLUB.

Now that the excitement of the Radio warfare stunt has cooled off a little, 4WN members are settling down to business. Certain experiments regarding our transmitter have been completed to everyone's satisfaction, and by the time these notes are in print, our P.D.C. sigs should be rattling the phones of W's, G's, etc., as well as entertaining those venturesome BCL's who sleep all day, and spend their nights coaxing their Browning-Drakes and P1's down below the 250-metre band.

By the way, Gang, I was taking a stroll the other day round Kedron Brook way, and while feasting my eyes on the wonderful curves and bends of the brook, was surprised to see a lot of young fellows gathered around a large pole, at the top of which was perched a small boy whose only desire, apparently, was to get as far as possible from terra firma. The other lads appeared to be throwing pieces of iron at him, somewhat in the same manner as small boys used to throw at birds' nests in the days before radio was discovered. Seing the awful plight the poor fellow was in, I decided to report the matter to either the Prevention of Cruelty authorities or the nearest police station, but on getting a little closer I discovered that the fellow on top was none other than 4JL, (otherwise Nim Love), arrayed in his school shorts, with MM, LJ, our Hon. Sec. and two other burly chaps whom I did not know, throwing bolts, spanners, blocks, etc., at him. I could see that there was work afoot, and not feeling very energetic I just made for the nearest tram stop and dissappeared.

On making inquiries later I discovered that Nim had called for volunteers to assist him in the dismantling of his 50 footers, painting and fitting same with new halyards, and generally helping him adjust his aerial system. Say, Vern! You'll have to keep an eye on this baby; he sure looks like a real first class op.

FK was down in VIB recently, and at time of writing is stationed at Roma, but hopes to be back here at Easter. That's FB, Vern. being shifted around like that; it sure must feel good to be such an important person in the department. Hi!

Our Hon. Sec. has been dabbling in battery charging. He certainly gets FB results—a 7-amp. charge through a 2 amp. Tungar. And he calls that a slow charge!!

Vic. Bouchard has been QRL rendering first aid to BCL's receivers lately, likewise Clyde George, but he spends most of his spare evenings eliminating "B" batteries.

Gordon Shearer has not yet returned home to Gayndah, and at present amuses himself with a key in the negative lead of his receiver. He says that he calls up all the local hams that way, but I couldn't say whether they hear him or not; what about getting some gear together Gordon? We often see articles in radio journals telling us about a transmitter for £5, so just "go to it, bo," and let us see what sort of a fist you have.

Sydney has a wonderful attraction for some people! Charles of RG has been there **again.** There must be some attraction there, gang. He almost had to carry his mobike part of the way, and anyone who does a thing like that must have a reason. I wouldn't do that for anyone unless, of course, it was a YL. That's different!

We very seldom see LJ these days, but I suppose he is still busy with ARTL work. How about it, Leo? Couldn't you spare, say, one night a month?

We would be pleased to receive any reports on our transmission from listeners, and all reports will be acknowledged if addressed to the Hon. Sec., Wooloowin Radio Club, c/o F. W. Thomas, Willmington St., Wooloowin.

STOP PRESS !

Have just heard Vic. Bouchard's Austin was run over by a big Trojan; no serious damage, only a lump on Vic's head as big as a 201A.

GOOD NEWS FOR PROSPECTIVE HAMS

A.R.T.L. to run Instruction Classes Soon.

We have been requested to give prominence to the following notice, which speaks for itself:—

The Australian Radio Transmitters' League shortly will be starting a class of instruction for those aspiring to the ranks of the Licensed Transmitting Experimenter. Fees will be fixed when the response to the demand is known, but intending applicants can rest assured that the cost will be as low as possible. We will teach you the theory by lecture, and the rudiments of Morse will be given by a skilled operator in class. Later on, 80 and 250-metre classes will be put on from a station especially equipped therefor. The class will be short, yet thorough, and it is hoped that the response will be large and that a high percentage of passes will be obtained, thus keeping up the high standard set by the Fourth District Licencees in the A.R.T.L.

Write to vk 4MM, M. O'Brien, Fewings Street, Toowong, Brisbane, for full particulars.

(sgd.) M. M. O'Brien, vk4MM,
Hon. Sec., Instruction Committee

Tested and Recommended

Continued from Page Forty two

LEWCOS LITZ WIRE.

The value of Litzendraht wire for winding coils having a minimum radio-frequency resistance has long been appreciated. Before the advent of the short-wave "low-loss" craze, it generally was admitted that a well-made litzendraht coil was the most efficient type of inductor that could be produced. For short-wave work, however, there is reason to believe that a coil composed of wire with a solid cross-section gives slightly better results, and so we find this type of inductor in undisputed possession of the short-wave field.

For operation on the broadcast wave-band, it is a fact that a "Litz" coil, **properly made,** will give results superior to the ordinary type of coil. Notice that we lay particular stress on "properly made." Litzendraht wire, as many of our readers will know, consists of a large number of very fine insulated wires, twisted into a cable. Each and every strand is itself insulated, which means that, wherever the wire is to be joined to a terminal or to another wire, every strand must be bared and the whole lot twisted together and soldered. As each wire comprising the cable is very fine, it is an easy matter to break one or more without noticing that this has been done. Immediately one strand is broken, or for any other reason fails to make a good contact, the effective resistance of the coil goes up, and the use of litzendraht becomes a hindrance rather than a help. It is apparent, therefore, that this very efficient conductor must be used with extreme care, otherwise it is better to leave it strictly alone.

We have received from Messrs. J. B. Chandler & Co., 45 Adelaide Street, Brisbane, a sample reel of the Lewcos Litz wire. This is a 27/42 cable—that is, 27 strands of 42-gauge wire—with silk insulation. The wire is very uniform in diameter, has a relatively high tensile strength, and the insulating covering appears to be of very good and even quality. The reputation of the manufacturers—the London Electric Wire Company and Smiths Ltd., of England—is a sufficient guarantee of the product, and readers may use the Lewcos Litz wire with full confidence.

P.S.

P.S.—Here's some of the things the Advertising Manager writes about Clyde Batteries. They're all true, of course, but we couldn't think of them.

DEPENDABILITY
PERMANENT POWER
LONG LIFE
DURABILITY
RUGGED POWER
NATURAL FORCE
MORE POWER TO YOU
Etc., Etc.

Dear Radioites,

The Advertising Manager has gone away for a week. The boss says we've got to do this week's advertisement. We don't know a thing about advertising, so all we can tell you is what we know about the battery we're selling. It's a great thing to have confidence in what you're selling. We have confidence in Clyde because we know from long experience it's a darned good battery—and we know how it's made at the factory.

We know the months of patient research and testing that went on before the plates in the Clyde Battery were brought up to their present-day standard. That means that if you give a little care to your Clyde, those extra solid plates will never buckle. A little distilled water and a recharge occasionally is all that's needed. The carrying handle makes transportation simple. The exhaustive processes that the wooden separators go through to make them sturdy and acid-resisting mean exceptionally long life in the Clyde. That hard rubber case is absolutely non-leakable. You can put a Clyde anywhere in the house and have no fear of the acid spilling and ruining something.

There's lots more we could say, but this is all we've got time for. We're far too busy writing up orders.

Yours for a good battery,

THE CLYDE BATTERY SALES STAFF

CLYDE

RADIO BATTERIES

THE CLYDE ENGINEERING CO., LTD.
Brisbane Branch: 115 Albert Street, BRISBANE. Telephone 1425.

(Continued from Page 10.)

Results are excellent on an indoor aerial, and 2FC, 3LO and 2BL are still audible on the speaker when using a 3-foot length of wire as an "aerial." This, we think, is quite good for an electric set, as this type of receiver commonly is credited with being less sensitive than the battery-operated type.

Tone quality is, of course, the "high spot" of the 1929 Electric Solodyne. Absolutely no distortion is noticeable (unless the reaction is forced too far), and the volume of clear, natural music is remarkable. It is only after listening to a set of this type that one really sympathises with the manager of a broadcast station with regard to the complaints he receives from listeners. During the last three weeks we have listened a great deal to the various stations—both distant and local—and we say without hesitation that the transmission from 4QG over that period has, with few exceptions, been almost perfect. Undoubtedly it is quite as good as the transmission from any Southern station, in spite of the criticism that one hears so frequently. In making this statement, we are referring to the **technical** aspect of the question; we are not here concerned with the programmes.

Tuning is simplicity itself, and the circuit is absolutely stable. Reaction is smooth and very effective. With regard to selectivity, the 1929 Electric Solodyne is not quite as good in this direction as the battery-operated model, as was only to be expected. At a distance of 2½ miles, using a long outdoor aerial, 2FC is clear of any interference from 4QG, 2BL is received with a slight background, while on 3LO it is about "fifty-fifty." The addition of a simple wavetrap effectively overcomes this difficulty; it is connected between the aerial and whichever one of the aerial jacks proves to give the best results.

If you have enough radio knowledge to follow a circuit diagram, then you should be able to build the 1929 Electric Solodyne with the assurance that no difficulty will be experienced in obtaining satisfactory results. It is such a good receiver that we hesitate to say any more regarding its capabilities on the grounds that we probably will not be believed. However, we have not the slightest doubt that the 1929 Electric Solodyne will be the most popular receiver of the year with those who are prepared to go to the trouble and expense of building it. Should the foregoing particulars prove to be deficient in any detail, drop a line to the Technical Editor and every assistance will gladly be given.

Material for the 1929 Electric Solodyne.

1 Radion or Celeron panel, 24 x 8 x 3/16-inches.
1 Stained pine baseboard, 24 x 12 x ¾-inches.
1 Emmco 3-gang .0005-mfd. condenser, C1, C2, C3.
1 Emmco .00025-mfd. S.L.F. condenser, C4.
1 Radion or Celeron terminal strip, 24 x 2½ x 3/16-inches.
2 Radiokes neutralising condensers, C5, C6.
1 Wetless .00025-mfd. grid condenser with clips, C7.
1 Wetless .006-mfd. fixed condenser, C8.
3 Powerplus 1-mfd. fixed by-pass condensers, C9, C10, C11.
1 Radiokes shielded Solodyne coil kit, L1, L2, L3.
1 Electrad 2-meg. grid leak, R1.
1 Frost 300,000-ohm variable resistance, R2.
1 Emmco 5000-ohm tapped fixed resistor, R3.
3 De Jur 400-ohm adjustable resistors, R4, R5, R6.
1 Emmco Golden Voice No. 1 transformer, T1.
1 Emmco Golden Voice No. 2 transformer, T2.
4 Emmco balanced UX sockets, V1, V2, V4, V5.
1 Emmco balanced UY socket, V3.
1 Radiokes radio-frequency choke, X.
1 Emmco Power Pack, long model.
1 Emmco Golden Voice speaker filter, type OC22.
1 Grid leak mounting.
9 De Jur tip-jacks.
1 Cutler-Hammer push-pull switch.
3 Yards twin lighting flex, with adapter.
1 Emmco arrow knob.
Flexible Glazite; 18-gauge bare tinned copper wire.
Screws; solder.

ACCESSORIES:

3 Radiotron UX-226 valves.
1 Radiotron UY-227 valve.
1 Radiotron UX-171A valve.
1 Loudspeaker.

Edgar V. Hudson undertakes Queensland Distribution for Stromberg-Carlson

The preliminary announcement that one of Queensland's leading radio wholesalers has added another first-rank factory representation in that of Stromberg-Carlson to the already extensive list of many of the world's best known and appreciated radio agencies—Mullard, Ferranti, Radiokes, Emmco, Cyldon, Advance, Sonochorde, De Jur, Deal, among others—will be of interest to the radio trade and public.

The house of Edgar V. Hudson previously has been indentified principally with the components trade, and always has maintained stocks well in advance of requirements. That they are now embarking on a comprehensive policy of set distribution may be taker as a very significant indication of the trend of the trade towards factory built sets, and the demand that has come in from both dealers and public for a standard-constructed set for which service and spares always will be available. The policy of distribution will be by authorised dealers throughout the state, backed by technical service with extensive and informative advertising.

The name of Stromberg-Carlson is most favorably known all over Australia through their long connection with, first, all equipiment for telegraphy and telephony; and since the inception of wireless, with radio equipment of every description. The organisation of Stromberg-Carlson (Australia) Ltd. is such as to inspire full confidence in the receiving sets, speakers and components produced by the factory. The combination of American and Australian capital and interests, of the magnificently-equipped Stromberg-Carlson Laboratories and Factory in U.S.A. and the long years of experience of the Australian branch staff in radio in Australia, with a completely modern factory in Sydney must result in the production of high class sets, ideally suited to Australian conditions, being made available at really attractive prices.

A full range of sets, including three-valve, five-valve and six-valve sets for battery or eliminator operation, as well as three-valve and six-valve A.C. all electric sets, will be produced. These all are assembled on steel chassis, in very handsome and solid metal cabinets with "moire" lacquer finish in tones of old gold with handsome silver escutcheon plate.

The established name and reputation of Stromberg-Carlson with the continuance of service backed by the responsible house of Edgar V. Hudson will certainly result in a very large number of these sets being installed this season. Samples, literature, prices and particulars will be available through the month and actual release and deliveries of orders will commence 1st May. Reviews and tests of these latest model sets will appear in an early issue.

This department is conducted for the benefit of our readers. We cannot answer queries by mail.

Questions Answered

By the TECHNICAL EDITOR

Questions received before the 20th of the month will be answered in the following issue.

"A Q.R.N. Reader," Brisbane—"Will you check over the enclosed diagram of a 'C' battery eliminator, and let me know if it is correct?"

Answer.—The diagram itself is correct, but the value of the resistance is too low. With the value you show—2000 ohms— a no-load current of 45 milliamps would flow through the valve, which is excessive. A suitable value for this resistance is 100,000 ohms. You should check the voltages delivered at different settings of the adjustable tappings with a high-resistance voltmeter. An instrument having a resistance of 1000 ohms per volt should be used for the purpose.

* * * *

R. R. W., Darra.—"Can you tell me how to calculate the value in henries of a radio-frequency choke coil?"

Answer.—The formula is rather too involved to print on this page, but, as a rough guide, it is usual to assume that one complete turn of wire on a 2-inch diameter form has an inductance of one microhenry. On a 1-inch form, a coil of 100 turns of fine wire (say 36 gauge), insulated, has an inductance of approximately 90 microhenries, which will give you some basis to work on. Note that the term "microhenry" is used. The henry is the unit of inductance, being defined as the inductance required to produce a back e.m.f. (electromotive force, or voltage) of one volt when the current is changing at the rate of one ampere per second. For radio purposes, where small coils are used, subdivisions of this unit are convenient, and it is customary to employ the milli-henry (one-thousandth of a henry) and the micro-henry (one millionth of a henry). A smaller unit termed the centimetre also is used, but this need not be considered here. I would advise you to procure a book covering measurements and formulae used in electrical and radio work.

* * * *

D. S., Melbourne.—The issue you request has been mailed to you. The trade names are those which are specified in the list of parts which the article includes.

* * * *

G. L., Windsor.—"For some time past I have been troubled with a grinding noise which is present all the time the Southern stations are being received. It is not loud enough to drown them out entirely, but is bad enough to make the reception unpleasant to listen to—so much so, in fact, that some nights we close down the set in disgust. On 4QG, the trouble is not noticeable. The set is a four-valve Browning-Drake, using 4-volt valves, and taking its H.T. supply from a Philips "B" eliminator. As far as I can remember, the trouble was not nearly so bad when the set was operated from batteries, yet the fault is not in the eliminator, as I have had it tested, on several friends' sets with perfect results. Can you give me any idea of where to look for the cause, and how to rectify it ?"

Answer.—The noise about which you complain is almost certainly coming from the electric light mains, and is being fed into the set via the "B" battery eliminator. In many localities—including the writers' —disturbances picked up from the mains have a disastrous effect on distant reception, and there seems to be no practical remedy. Generally it is found that disconnecting the earth wire and substituting a small counterpoise makes an appreciable improvement, but I doubt if this would be so when a "B" eliminator is used. In case you would like to try it, however, it should be as short as will give satisfactory volume; a wire attached to the skirting-board inside the room is generally sufficient.

* * * *

S. S. C., via Caboolture.—"With a two-valve amplifier added to a crystal set, would there be any advantage in increasing the "B" battery voltage to 120 volts instead of the 60 volts I use at present? I get fair speaker volume, and the tone is good."

Answer.—By increasing the plate voltage you would probably notice a gain in volume, and the tone quality certainly would be improved. This would only be the case if the grid bias or "C" battery voltage is increased to a suitable value, as recommended by the manufacturers of the valves you use. A high plate voltage is always advisable, and, although the life of the "B" batteries will be slightly reduced, it is worth while when one takes into consideration the greatly improved results.

T. B. P., Greenslopes.—Cannot do better than refer you to the article describing the 1929 Electric Solodyne which appears in this issue. The set operates satisfactorily from any 240-volt alternating-current power supply, consuming no more current than an electric light of average size. Once you hear and operate a good electric set, you will never be satisfied with the battery-operated type.

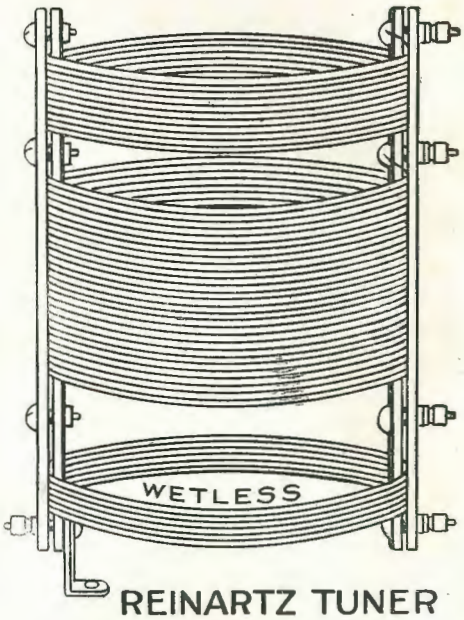
HIGH GRADE Products Selling at a LOWER PRICE

GUARANTEED **"WETLESS"** **RADIO PRODUCTS**

The Technical Editor Recommends the **"Wetless" Reinartz Tuner**

It is Guaranteed

Price **10/6**



REINARTZ TUNER

The "Victory Two" incorporates a Wavetrap thus ensuring reception of Southern Stations

List of Parts Required for the "Victory Two"

1 Wetless Reinartz Tuner	10/6
1 Wetless .00025 Variable Condenser	6/6
1 Knob (with pointer) for same	1/-
2 .0005 Cariable Condensers (9/- each)	18/-
2 Vernier Dials for same (4/- each)	8/-
1 Wetless Type B Grid Condenser with clips	2/6
1 5-meg. Grid Leak	2/-
1 Amperite	5/9
1 Audio Transformer	9/-
2 Non-microphonic Sockets (2/6 each)	5/-
1 Battery Cable (7 wires)	2/9
1 Battery Switch	2/3
1 Bakelite Panel, 21 x 7 x 3/16ths	12/6
2 Bakelite Terminal Strips	6d
5 Terminals	1/3
1 Bakelite Tube, 3 x 2	1/-
4 Ounces No. 20 Gauge DCC Wire	1/-
Hook-up Wire	9d

Total £4/12/3

Accessories

2 Valves (A-415 and B-406)	27/-
3 1½-Volt "A" Batteries (3/- each)	9/-
2 60-Volt "B" Batteries (18/- each)	36/-
3 4½-Volt "C" Batteries (1/3 each)	3/9
1 Dinkie Speaker	15/-
Aerial Equipment and Earth Wire	5/-

Total £4/15/9

"Wetless" Products obtainable from all Radio Dealers or from the Distributors:

TRACKSON BROS. LTD.

The Radio and Electrical People **157-159 Elizabeth St., BRISBANE**

Manufactured by J. WETLESS, 28 King St., SYDNEY, N.S.W.

The Stromberg-Carlson franchise will be the most valuable agency for Queensland Radio Dealers, since the advent of broadcasting. Applications for district rights should be forwarded to the distributors without delay. Territory will be keenly sought for.

The preliminary announcement of arrangements by which the most modern line of Receiving Sets produced by the American and Australian factories of Stromberg Carlson (Aust.) Ltd. will be distributed in Queensland by the leading wholesale radio house of EDGAR V. HUDSON.

The

STARS

of the

RADIO FIRMAMENT

MULLARD
VALVES.
CONE SPEAKERS.

FERRANTI
TRANSFORMERS.
RADIO METERS.

RADIOKES
COIL KITS.

ADVANCE
MANUFACTURES.

CYLDON
CONDENSERS.
TEMPRYTES.

EMMCO
COMPONENTS.
POWER EQUIPMENTS.

SONOCHORDE
CONE SPEAKERS.

AMPERITE
FILAMENT CONTROLS.

DEAL
BATTERIES.

DE JUR
ACCESSORIES.

AND NOW—

STROMBERG-CARLSON
RECEIVING SETS

3-Valve Electric Operated
3 Valve Battery Operated
5 Valve Battery Operated
6 Valve Electric Operated
6 Valve Battery Operated

Distributed by:

EDGAR V. HUDSON

The Leaders in Radio Merchandising.

The American laboratories of Stromberg-Carlson backing the Australian factory, have produced this full range of high-class sets at most moderate prices. Home or dealer built sets will not be able to compete in price or value. Distribution commences 1st May. Full announcements, prices and samples 21st April. Send for particulars.

Stromberg-Carlson complete range of sets from three to six valves, both for battery operation and full plug-in-the-socket operation, attractively designed and highly finished, absolutely guaranteed and extensively advertised, will command the largest sales of all this season beyond question.

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