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VOL. II

MAY 14, 1924

No. 30



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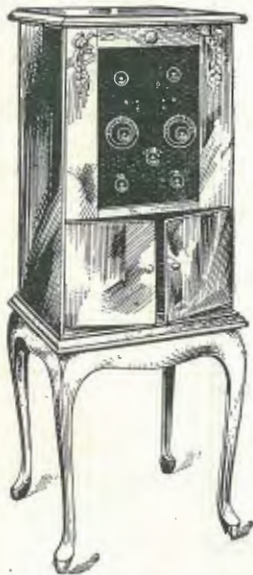
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Radiotorial

2000 A.D.

IT has always been a regret of the writer's—one of those bitter-sweet, gentle sorrows that help to make Life what it is, or rather, what we think it is—that the possibility of his being on this earth in the Year of Grace 2000 A.D. is extremely remote.

THIS scribe's regret at his unlikely existence some seventy-six years from now is based on several things; eight, perhaps, in themselves, but all depending for their importance on the particular point of view. If you cannot agree with him, put it down to the dis-similarity of the respective viewpoints, then there will be left no chance for mutual or unspoken reproaches.

FOR an instance, who could deny the charm of knowing that he would be able to eat and sleep and talk and laugh and breathe on a day 730,000 odd ones after The First? To think that since the beginning of the Christian Era that over 17,920,000 hours had come and gone; that ten hundred and seventy-six million and a great many additional minutes had helped to make those millions of hours; that—but there *would* be a thrill in that thought, wouldn't there?

BUT let us put a rein on these Imaginings. The mind of Man can only assimilate and grasp so much and perhaps it is as well that we in our day can only "sit and fancy things." It is not meet that we should try to peer too far into the Future and all that it holds. Not well, that is, at all that the coming years hold, but there can be no harm in reviewing in an idle moment some of the wonders that Wireless will give us with such a lavish hand. Let us then suppose insofar as Radio is concerned that to-day is May 14, 2000.

AT seven-thirty a.m. we tumble out of bed in answer to the alarm-clock's urgent summons set-off by wireless waves. Grabbing a towel, we turn a switch which ignites the radiator from an invisible underground power-main and nip into the bathroom. There, besides turning on the shower (which is just as cold in 2000 A.D. as it was

in 1924!) we twiddle with a couple of black knobs and hey presto! it would seem as if there were another person in the room, for in well-modulated tones a voice tells us that So-and-so has won the aero race to Mars and back; that war was declared last night between Spain and Portugal but that as soon as Certain Rays were brought into operation it was decided to settle the matter by arbitration, and that this year's wool clip will be of astounding proportions. Having assimilated this *souçon* of news we dress and proceed to breakfast. If it is highly-concentrated food we nibble a couple of tablets, if not, the wireless toaster, water-boiler or griller does the rest.

TWENTY minutes to nine. Living in Australia as we do, and thus comparatively but a stone's-throw from London, where our business is situated, we take our time, and having mounted an aerial cab, we make a leisurely journey of the twelve thousand miles or so in a little over three-quarters of an hour.

ARRIVED at the scene of our labours, the first thing to be done is to dictate our mail on to the Dicto-type which typewrites our letters straight on to the letter-heads. This being done, the Tele-seer is brought into play and, after some slight adjustment of delicate apparatus, we sign cheques for out-standing accounts at Vladivostock, Tunis, Broome, Biarritz and Berlin houses, the creditors having our blank cheque-forms which we sign by wireless proxy.

BY mid-day, thanks to one-hundred-per-cent.-efficient calculating machines; world-wide, instant communication; minimum transit costs of time and money; the obliteration of Human Error—all secured by the suitable application of radio—we wash our hands of business for the week and by one o'clock are enjoying a strenuous "sett" at the Deauville courts.

WHEN one really comes to consider the matter there IS a good deal to be said for life on this planet in the Year of Grace 2000!

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Highlights of Radio Broadcasting

Applying the Golden Rule in Radio

By ALFRED N. GOLDSMITH, B.S., Phd., Fellow I.R.E.,
Chief Broadcast Engineer, Radio Corporation of America
(Special to "Radio.")

NO satisfactory substitute for the Golden Rule has yet been discovered as a guide to human conduct and as a pathway to human happiness. Consideration for the rights of others and "a decent respect for the opinions of mankind" are the only known lubricants which keep the wheels of life spinning smoothly. It is also a fact that in few fields is it more necessary to obey the Golden

days of radio, when messages were few and far between, and receiving sets located at long intervals, the problems of mutual interference were not serious. But to-day the ether carries the hurrying traffic of two hemispheres through the trans-oceanic long wave stations, it carries the urgent messages of the continents to thousands of ships on the high seas through the shorter wave marine sta-

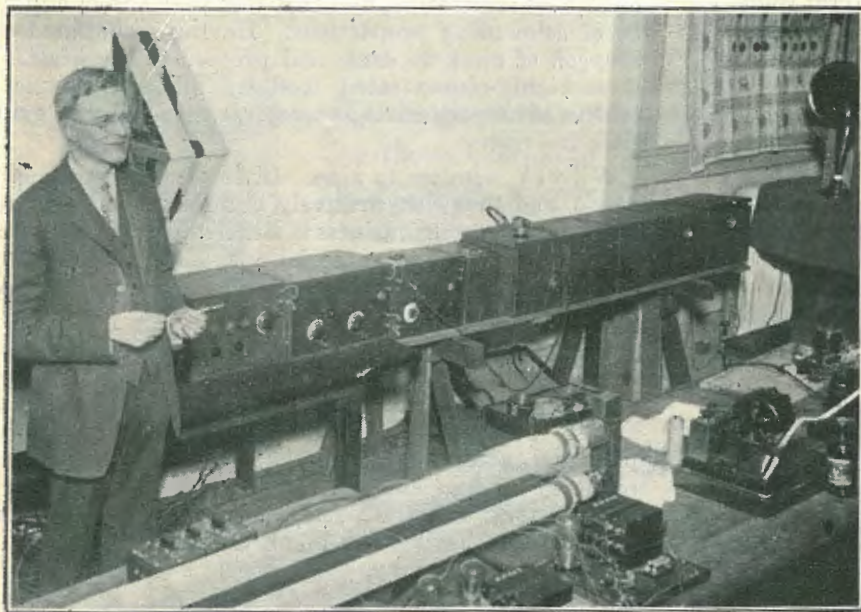
to each other. A trip through city or country will show rows of dwellings on the roof of each of which will be one or more aerial wire systems or antennas for trapping the energy of the radio waves. It is inevitable that some interference should result under such conditions, particularly if the field of transmission were unorganised and the locating and handling of receivers unsystematically done and without due regard for others. Radio shares with all other entertainment devices the necessity for thoughtfulness. It is neither wise nor decent to permit a phonograph to shout through open windows with full intensity under some conditions. The reason is that the air belongs to all, and the sound from phonographs occupies not only the user's air but his neighbour's air as well. Similarly, the ether is occupied by all transmitting stations, and its successful use by all receiving stations is possible only under certain conditions.

The application of the Golden Rule to transmission has already been carried out in large part by the Department of Commerce acting on the recommendations of the First and Second National Radio Conferences held at Washington. Basically, the organization of transmitting stations is as follows:—

1. All transmitting stations are classified as to the type of service they expect to render the public.

2. Every transmitting station of a given class is granted a specific frequency or wave-length on which to operate, as nearly exclusively as possible, for certain hours.

3. Every transmitting station must divide time on its frequency or wave-length with other equally qualified transmitting stations in its vicinity, on a basis largely determined by mutual accommodation, with the advice and approval of the local Supervisor of Radio of the Department of Commerce.



This is a Powerful Receiving Set used for the Measuring of the Speed of Radio Waves. It is the first Long-wave Receiver ever built without Outside Connections and is of Fourteen Tubes with Super-selective High-power Receiver for Relay Control, the Batteries being contained in the Set. It was recently used in Measuring the Speed of a Message sent from the Radio Corporation, New York, to Warsaw and back again. The time taken to cover the 8,500 Miles was 0.054 Seconds.

Rule than in radio. The reason is not far to seek. As long as people live isolated lives and do not come into contact, they do not have to worry particularly about the rights of others. But when they live in congested areas in large cities and are bound to jostle each other on every corner, forbearance and consideration are urgently required. In the early

tions, it carries the multitude of personal and experimental messages of the short wave amateur stations, and last but not least it must carry the hundreds of entertainment programmes nightly broadcast from the elaborate stations which serve the millions of broadcast listeners. The receiving stations are correspondingly increased in number and in nearness

4. The frequencies or wave-lengths assigned are such as to minimize to the utmost all interference between broadcast stations and to make it possible for all receivers to get the greatest feasible number of simultaneous programmes by tuning.

5. Amateur stations, which are in general located in residential districts near the broadcast listeners, are required to refrain from transmission during those hours of the evening when the best broadcast programmes are being sent to the largest number of listeners, an obvious application of the principle of "the greatest good to the greatest number."

These measures have been a great step forward, the full value of which is now beginning to be appreciated by the broadcast listeners when they contrast the orderly conditions now existing in the main with the confusion which confronted the Government before the new regulations were promulgated. The receiving field is clearly in line for organization, and in this field the co-operation and understanding of the broadcast listeners is very urgently needed.

A series of suggested rules and their reasons are given here which, it is believed, would go far toward increasing the pleasure of broadcast listeners.

1. Keep your antenna or aerial wires as far as possible from your neighbours. If you must cross his antenna with your own, do so preferably at right angles. Avoid long runs of your antenna parallel to his own and near his antenna. Do not use a longer antenna than necessary. Do not use the same ground connection that he does.

By observing this rule you will not rob him of part of his signal strength at times, nor will he do the same to you. Furthermore, he will not throw your set out of tune when he happens to tune in to the same station to which you are listening. Your reception and his will become more independent and reliable as a result of separated antennas.

2. If you use a single-circuit or two-circuit regenerative receiver, avoid excessive "feedback coupling" (otherwise known as "tickler coupling" or "intensity control"). Endeavour to pick up stations without having the set oscillating; that is,

without swinging the tickler handle around so far that you hear the tweeting "birdie" sound every time you pass through a station setting. If you do find that you have made the set oscillate to pick up a station, instantly throw the tickler handle back when you locate the station and bring it up again very cautiously until you get a satisfactory signal. Be satisfied with a little less signal at times rather than producing a howl or squeak by bringing the tickler up too far.

The reason for this method is that, every time you produce a squealing note in your set by excessive tickler coupling while tuning, your receiver has actually become a feeble trans-

mitter and is producing the same sort of disturbance in your neighbour's set. He may be all tuned in, enjoying the concert, and your thoughtless interference will be a real annoyance to him. A minute later he would be justified in treating you to the same sort of careless handling of his receiver. Differently stated, whatever you are doing in the way of producing such unpleasant sounds in your own receiver, you are doing in some measure to your neighbour as well. It is better by far to avoid this yourself, and to explain to your neighbour in a friendly way why he should do the same, showing him how if he is unacquainted with the handling of radio receivers. Skilled amateurs can

do a great deal for radio if they will carry this message to the broadcast listeners in their vicinity and show them how to handle receiving sets in considerate fashion.

3. If you have a two-circuit regenerative receiver, work with the coupling between antenna circuit and secondary circuit as loose as possible so that, if the set does by accident get into oscillating condition through excessive tickler coupling, you will radiate as little interference as possible.

4. Keep a little table of settings for stations which you have heard and enjoyed. That is, have a chart of the various scales of your receiver and mark carefully on it the positions of



This is "Blind George" Wittenberg, a sightless News-boy at his Stand at the Intersection of 42nd Street and 6th Avenue, New York City. While George Listens-in on his Radio Receiving Set many a passer-by stops to look and in the long run profits thereby accrue to the Blind News-boy.

the various stations so that you can readily pick them up by setting everything as indicated on the chart.

This avoids the necessity of "fishing" for the stations, with the set in danger of oscillating and disturbing others, and also simplifies picking up stations speedily.

It is also desirable for all those who can read the Continental telegraph code to keep a record of all interfering telegraph messages which bother them during the broadcasting hours particularly noticing the call letter of the sending station and the station to which the message is addressed, and the general nature of the message (commercial, personal, official, etc.).

(Continued on page 96.)

Trans-Pacific Wireless Tests

C. D. Maclurcan's Report

Success Crowns Australian Experimenters' Efforts

IT is with the greatest pleasure that we place before the readers of "Radio" the following specially written report by Mr. Charles D. Maclurcan. It is entirely exclusive to this magazine, and, in fact, "Radio" is the first publication in the world to contain the full facts and details of the trans-Pacific wireless tests held recently to ascertain the short wave, low power radio possibilities of communication between Australia and the United States of America.

BY the inclusion in the contents of this number of "Radio" of the story of Mr. Maclurcan's and Jack Davis' activities while en voyage to and from San Francisco we give our readers the opportunity of first preference in reading an announcement which is awaited with impatience by the wireless authorities and the Press of the world.

BY CHARLES D. MACLURCAN.

(Special and Exclusive to Radio.)

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I PROPOSE in the following pages to give a brief but comprehensive account of our experiments, and some of the results obtained during our interesting journey to San Francisco and back, on the R.M.S. *Tahiti*. I only intend to deal with that por-

tion of the work concerning, and of interest to, experimenters generally.

My able accomplice in this "criminal" undertaking was our young friend Jack Davis, whose real name (though few know it) is Ross Raleigh Davis. Undoubtedly Jack was, in common parlance, the "gnat's eyebrows" and was a great comfort to me—especially when I was not feeling "too well."

As is generally known one of the objects of the trip was to obtain some reliable data as to the possibilities of the two low-power transmitters at my experimental radio station 2CM at Strathfield, Sydney. Amalgamated Wireless, Ltd., 97 Clarence Street, Sydney, were approached in the matter, and it is entirely due to their generous assistance that the expedition was made possible. This Company made arrangements for the fitting up of a complete low-power radio installation on the R.M.S. *Tahiti*. The radio cabin was situated on a small boat deck near the vessel's stern, and the aerial was suspended from the main mast to the stern.

The Sydney end of the work was in charge of Mr. F. Basil Cooke, who was very ably assisted by Mr. Bon Gow. The work done by these two gentlemen is worthy of the greatest

praise. Theirs was the most uninteresting portion of the business, which for several weeks meant staying out of a warm bed, and transmitting for long periods, without the relaxation of having something to listen to.



Mr. Charles D. Maclurcan.



Mr. F. Basil Cooke, F.R.A.S.

APPARATUS USED AT 2CM, STRATHFIELD, SYDNEY.

Aerial.—A six-wire cage on 4ft. hoops. Modified T, with 100ft. top supported by 80ft. mast. A tuned counterpoise is used but no earth connection. Natural W/L: 190 metres. Resistance at 200 metres: 7.8 ohms. Capacity: .00083 M/F.

100-Watt Transmitter.—This set employs two 50-watt Radiotron Valves No. 203 in a direct coupled Hartley Circuit. Kenotron rectified A.C. plate supply, of 1,000 volts, 180 M/A. Power input: 180 watts. Radiation: 4 amps. at 185 metres and 5 amps. at 230 metres (to which wave-length this set was afterwards altered).

10-Watt Set.—Uses three five-watt Radiotron Valves, No. 202, all as oscillators, in an inductively

Maximum radiation with counterpoise: 1.8 amps.; without C/P, 1.5 amps. at 220 metres.

Receiver.—Four-valve set, with three coil tuner. One step tuned plate R.F., and two steps of Audio.

Receiving Valves Used.—Radio Frequency, Marconi QX (which I think stands alone for this purpose). For Detector and Audios, all Radiotron 201A's.

After the installation work was completed on the ship, preliminary tests were carried out with 2CM the night before sailing. Everything was working well, and there only remained the erection of the counterpoise after we got out to sea.

AT SEA.

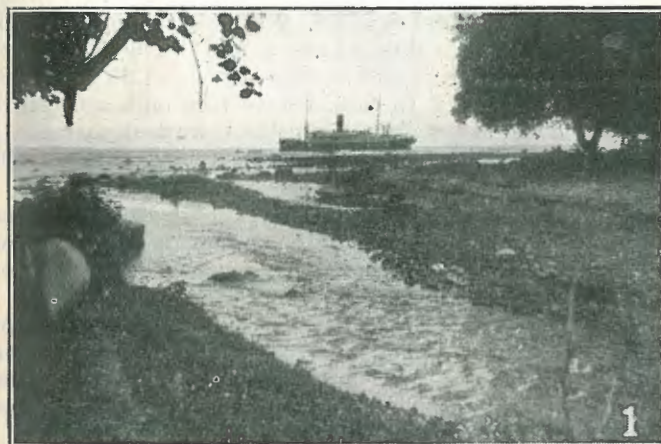
We had a splendid send-off from members of the Wireless Institute,

we had been to a birthday party the previous evening, or were suffering from ague!

Still, the conditions were far from ideal for long distance reception. Try getting a fine adjustment with your honeycomb coils flapping like a donkey's ears and the microphonic noises in your receiver trying to play, "She Sat in the Sink and Sunk." When you add to this the fact that the ship's regular wireless traffic had, of course, to go on no matter whether we were working or not, you have some idea how slender we thought our chances of success.

We rigged up the counterpoise after lunch and soon were in communication with 2CM.

The sea was not rough then, but there was quite enough movement to suit us. Later in the evening it did



VIEWS ON THE VOYAGE.

1. The R.M.S. "Tahiti" at anchor off Raratonga.

2. The "Tahiti's" three Wireless Operators. Left to right: E. J. Gough (3rd), E. M. Bain (1st) and H. F. Tye (2nd).

coupled feed back circuit. Kenotron rectified A.C. Plate supply. Normal power used throughout the tests: 7.8 watts input. This set was also used for music, speech and I.C.W. Direct Grid modulation. Radiation: 1.8 amps. at 235 metres.

Receiver.—Regenerative Detector and One Step Audio Amplifier.

APPARATUS USED ON R.M.S. "TAHITI" (2CDM).

Aerial.—A six-wire cage opening at the top to 16ft. Spreader. Inverted L about 80ft. total length. A tuned counterpoise was used when possible.

Transmitter.—A replica of 2CM's 10-watt set, but plate power supplied by D.C. Generator. Maximum power input: about 30 watts.

Mr. S. E. Tatham, Managing Editor, and Mr. N. H. Thompson, Associate Editor, of *Radio*, Miss Wallace, of the Royal Arcade, Mr. Malcolm Perry, and a host of experimenters and other friends, and steamed away at 11 a.m., Feb. 28. In an hour we were well at sea and very down-hearted to find that the vibration in our cabin was very much worse than we had expected. The small boat deck had an oscillation period of its own, which, added to the usual vibration at the after-end of the ship, made us feel as though we had St. Vitus' Dance. We quite despaired of doing any good reception work under these adverse conditions, but strangely enough, we got quite used to this state of things, and could almost write in the cabin later on. Of course, when we did go to the quieter portions of the ship people thought

liven up a little, and so remembering that "discretion was the better part of valour," I thought it advisable to turn in. Jack bravely remained on duty, however—which soon caused him to seek solace over the port rail.

Many messages were received, mostly advice as to how to cure sea-sickness. Callous 3BY said, "Start feeding the fishes after you log me."

PROOF OF RECEPTION.

The method adopted to prove reception was as follow:—

Test messages were sent daily from 2CM, each one consisting of three 10-letter code-words. These were forwarded daily to Mr. Cooke by the Amalgamated Wireless Company. Immediately these messages were received by us, we took copies along to Mr. Bain, First Wireless Operator, who



Mr. Bon Gow, who was of inestimable assistance to Mr. F. Basil Cooke, who was in charge of 2CM.

filed them away and later forwarded them direct to the company.

The code messages were received from the eight-watt set to within two days' journey from 'Frisco, a distance of 5,380 nautical miles. They were still nicely readable, but were missed the following night because at the schedule time we were working with 6AKW. Music was received from this set up to 4,300 miles and was quite clear on the loud speaker with four valves.

From the 100-watt set the code was last received one day's journey short of 'Frisco, a distance of 5,900 miles. Signals were then QSA, but reception of the code was rendered impossible in 'Frisco harbour owing to very bad QRM from power mains. The familiar call could be heard from both sets above the QRM, but no code words could be deciphered.

We had not expected such good results as these. In fact, I had instructed Mr. Cooke not to use the small set after we were due in Rarotonga (3,000 miles). The signals were still so strong, however, that we sent a wireless through the ship's set instructing him to continue working the ten-watt.

The furthest two-way work was done with 2CM, at 1,800 miles. This

was rather disappointing, but 2CM had quite a lot of difficulty reading our signals, they being unstable and swinging badly. This was, no doubt, due to the motion of the ship and the position of our aerial in relation to derrick stays, etc.

OUR TROUBLES BEGIN.

Two days out from Sydney our first five-watt burnt out. This left us with two spares. The night before our arrival in Wellington our generator gave a "fourth of July" celebration and ceased to take any further interest in the proceedings. This happened at 1 a.m. while in the middle of a sentence by 'phone to 2CM. 2CM thought we'd been suddenly torpedoed in the engine room! Our first visit to Wellington was therefore taken up with hunting for another generator.

By the kind assistance of Mr. Harrison, 2AI, and Mr. Shrimpton, 2XA, a generator was procured for us from the Wellington University. A wooden pulley was quickly made by 2AP, Mr. Percy Collier, which was attached to the original 100-volt motor. A sewing machine belt and a couple of holding down bolts, and away we went again—Yes! and away went three more five-watters, too, but more of this anon.

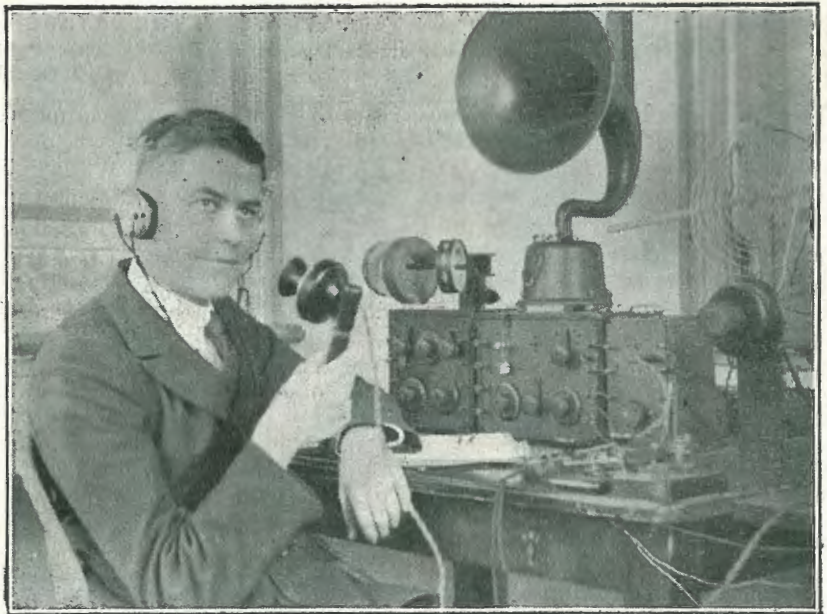
We were looking forward to our arrival in Wellington, for Frank Bell, old 4AA, had promised to leave the

jumbucks and toddle along to meet us. He was there all right. We picked him out quite easily on the wharf. Knew him by his morse code!

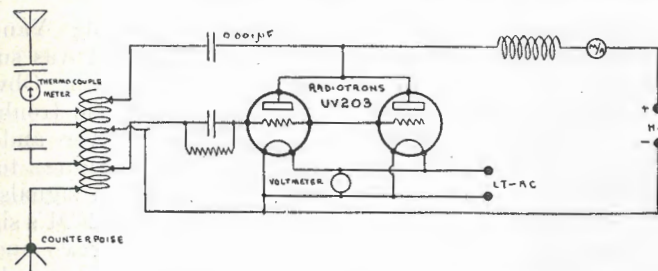
We spent a most enjoyable day with him, though he did nearly lead us astray. On the return trip we had the pleasure of meeting his sister, who was passing through Wellington at the time. Miss Bell is just as keen on radio as Frank, and she came and sat in our little wooden hut and listened most sympathetically, to our "tale of woe." Many N.S.W. and Victorian experimenters know Miss Bell by key. She always relieves Frank about 2 a.m. while he gets sufficient nourishment to carry on till 4 a.m. and so keep us out of bed *without nourishment*.

When we returned to Wellington on our homeward voyage, we visited the amateur stations of Jeff Shrimpton, 2XA, Walter Harrison, 2AI, and Percy Collier, 2AP. They are all real experimenters' sets and do good work. In fact, I have to compliment all the N.Z. "hams" we worked with on the efficient way they handle their traffic. No time is wasted.

We had left Wellington about half an hour when our next trouble occurred. The little generator was bolted down and started up: Three of our precious valves started up also—right out of their sockets. We had now only two left and one of these proved a "dud." Then was there



Jack Davis (2DS) in his Radio Room at his Home at Vacluse, Sydney.



Circuit of 100-Watt Transmitter at 2CM.

"weeping and wailing and gnashing of teeth," for we did not expect to cause much disturbance in the ether with one five-watter. We had to put up with it, however, and do our best and anyway we worked 2AP for three days up to 1,200 miles with it and later 6AKW (U.S.A.) at 1,000 miles, so it might have been worse. Our power input was then six watts.

On March 5, the day after our departure from Wellington, we picked up broadcasting from KGO, Oakland, California. This was in Lat. 38° 50' S Long. 179° 33' E. The distance be-

On several occasions the code message was easily received from the eight-watt set on 235 metres, but impossible to pick up from the 100-watter on 185 metres. This wave-length seems to be the most popular one for American "Hams."

While on the subject of QRM, we were astonished at the number of Yanks who do nothing else but call CQ for long periods. On several occasions we made a point of listening to some of the strongest to see if anyone answered them, or whether they worked any traffic. No, sir! They

raise the wave-length of the 100-watter to 230 metres. After this we had no difficulty in getting him.

But no wonder the signals of the Yank Hams were QSA. We were astonished to learn of the amount of power they put into their tubes. They do not rate their power as we do, by the actual plate input, but according to what power the manufacturer of the tube rates it.

For instance, we visited the station of 6AWT in San Francisco. He employs a single 250-watt valve. His power is therefore described at 250 watts. But his plate voltage was 6,000 and current 900 milli-amps., 5.4 kilowatts plate input power! We were told that 6KA's power was ten kilowatts. If so, no wonder we hear him in Australia!

The weather across the Pacific was, on the whole, excellent. We had a couple of rough days before arriving in 'Frisco, but by that time we were hardened sailors, and no longer spoke



1. A typical native hut at Raratonga.



2. Mr. Maclurcan and Jack Davis exploring Papeete.

IN THE SOUTH SEAS.

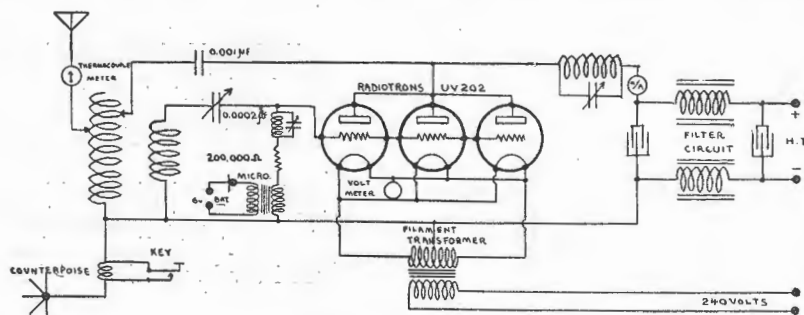
ing about 5,600 miles. Although it wanted half an hour to sun-set he was heard all over the after-deck on the loud speaker. KGO's modulation was excellent at all times, and his transmissions uniformly good throughout the voyage across the Pacific.

After leaving Raratonga we experienced some trouble reading the 100-watt set through QRM from American amateurs. Many of these could be read by their generator or A.C. hum only, and hundreds were very QSA.

were simply QSL-card-hunters and who knows, perhaps, had no receiving sets. As a result of this QRM, we radioed instructions to Mr. Cooke to

of "leaning over the palings at the blunt end."

Our calls at Raratonga and Papeete were most enjoyable. Raratonga is a



Circuit of 10-Watt Transmitter at 2CM.

perfect "Garden of Eden"—plenty of "Eves" there, too, mark you, and V.N.T. (For those who don't know the code abbreviations, V.N.T. means "very nice, too.") It was at Rarantonga, on the return trip, that we nearly lost Jack. One buxom young Eve took a decided fancy to him, and in attempting to introduce him to her family we had a fleeting glimpse of the reluctant Jack being dragged into a native hut. But that is a long story, suffice it to say that we rescued him without any broken bones—or hearts.

IN SAN FRANCISCO.

We arrived in 'Frisco at 8 p.m., Friday, March 21. Although we only

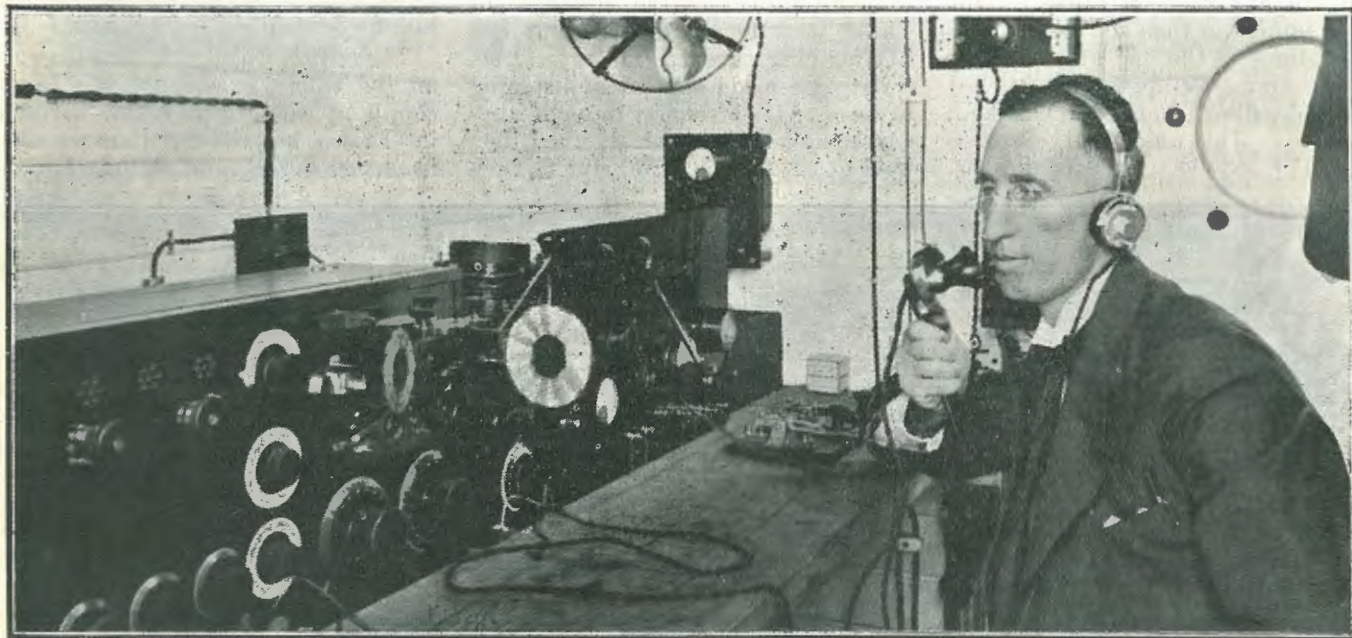
pleasure of meeting Mr. Dillon, the Radio Inspector, and Mr. McGowan, his jovial assistant.

We were also lunched by Mr. R. F. Whitehurst of the Electrical Appliance Co., to whom we had a letter of introduction. This gentleman assisted us greatly in obtaining such apparatus as we required for the return trip.

The "Ham" who stands out most in my mind, however, is Mr. Ralph Heinz. He is an experimenter after my own heart, and is keen on *low power* work. A most enjoyable afternoon and evening was spent with him, when, accompanied by Mr. McGowan and Mr. Halloran, we visited his, and Mr. McGowan's radio stations. Later

of us were logging Yanks whose power in the aerial was supposed to be no more than ours. Obviously the best way to find the trouble, was to send over a receiver and operator, used to Yank logging, to try and pick up Australian signals. As you have already read, 2CM's signals were heard by us in 'Frisco under unfavourable circumstances, and, although we notified many U.S.A. "Hams" of the times of transmission, and had also written ahead to "QST," giving the schedule, no U.S.A. amateur succeeded in hearing 2CM, so far as we are aware.

Now, the amateur over there has a great deal with which to put up. The QRM at amateur wave-length is, at



Mr. Charles D. Maclurcan at 2CDM, the experimental wireless station which was specially erected on the after deck aboard the R.M.S. "Tahiti."

had six days there our stay was made most enjoyable for us. We had been referred by Mr. Warner of the American Radio Relay League to Mr. A. H. Babcock, a director of the A.R.R.L. I had taken the liberty of cabling to Mr. Babcock from Wellington, asking him to procure for me another generator, to replace the one burnt out. This was ready for us on arrival, and our thanks are due to this courteous gentleman, who made our short stay so enjoyable. He entertained us at luncheon in the Engineers' Club, at which we had pleasure in meeting some thirty of San Francisco's leading experimenters. We also had the

in the evening we were joined by several other experimenters who visited the ship and ended the evening with a "worfels (spelt waffles) and honey" supper.

TWO-WAY TRAFFIC.

I want now to say a few words about the possibility of amateur two-way traffic between Australia and U.S.A.

One of the principal things we wished to find out during this trip was why no Australian station had been definitely logged in U.S.A. Some of our transmitting stations were known to be very efficient and many

all times, indescribable. At the same time, they are not as used to receiving weak signals as we are in Australia. As a matter of fact, there has been in the past, little need for them to be. They have all the power they require to cover America with loud signals, and until quite recently, there was little incentive to reach out. We, on the other hand, were for many years allowed only to receive, and all there was to receive, was the rest of the world, for there was little doing in Australia. Hence, we are able to successfully handle tuned Radio Frequency Amplification which the Yanks consider of very little more use than

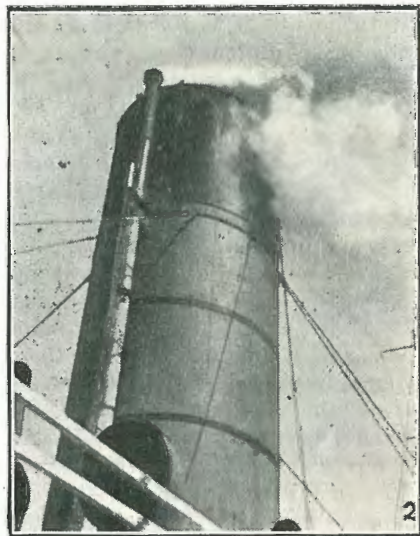
the ordinary regenerative detector. We know how wrong they are there, however.

I am quite convinced that there is little hope of working with U.S.A., as things are at present. It will be necessary for us to adopt transmitting circuits that are adaptable to quick wave-length changes, work on wave-lengths away from QRM, and increase our signal strength considerably. As we are not allowed much power by the authorities, we must depend on increased efficiency for the louder signals. This will probably be done with specially constructed sets to operate on wave-lengths about 100 metres, with large aerials and series condensers. By the time these alterations are effected we will hope that our friends across the pond are more intimately acquainted with Radio Frequency Amplification. Then the rest is easy.

While on the subject of Radio Frequency Amplification, I procured in 'Frisco a Grebe "13" receiver, which employs one stage tuned R.F. This instrument had been recommended to me by Major Mott (6XAD) and many others, as being the "last word" in DX receivers. Well, we gave it a good try-out on the return trip. It is quite



At Sea.



The Mid-day Whistle.

easy to handle and very selective, but, with the same number of valves, (1R.F. and Detector) my own old set gives about double the signal strength on long distance C.W.

Before leaving 'Frisco I cabled to Mr. Cooke as follows:—

"Signals received 'Frisco. Now send only eleven to twelve both sets until notified. Listen from twelfth. Notify all States call half hour before."

Unfortunately, when the cable was delivered, the word "before" was omitted. This will account for the few Australian stations logged on the return trip.

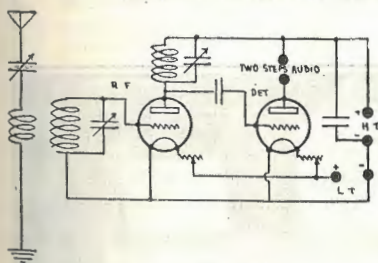
BOUND FOR HOME.

The homeward voyage was very pleasant throughout and 2CM's signals came through nightly to cheer us up. Particular attention was given

to taking audibility readings of the signals. This had been somewhat neglected on the way over, as we were more concerned with receiving the test code messages.

On our return to Wellington we had a fine reception, and were given a most enjoyable supper by the New Zealand Radio League of which Mr. P. Evans is the President

We arrived back in Sydney on Saturday, April 19, well and happy. The whole trip had proved most successful, interesting and entirely worth while. It is probably the first time in history that an experimenter has been in the unique position of hearing and measuring the signals from his own radio station, for a period of over six weeks, and it is hoped that many improvements in the station will result therefrom.



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We can supply you with a "BURGINPHONE" SEALED RECEIVER NOW.

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Alterations to 2CM 100-watt set are already well under way, and it is hoped in about a month's time to shoot over a hefty signal on 120 metres or thereabouts (Yank "Hams" please note, schedules booked strictly in rotation, no extra charge for staying up all night).

Before concluding this rather disjointed effusion, I wish to express my thanks to the three wireless operators of the *Tahiti*, Mr. Bain, Mr. Tye and Mr. Gough. Had it not been for their help and very tolerant attitude toward us, the whole expedition could easily have been rendered useless. As it is, our recollections of the R.M.S. *Tahiti* can only be of the most pleasant for we met with the best of treatment from the whole of the ship's company from start to finish.

CALLS LOGGED (2CM NOT SHOWN).

The figures in brackets indicate the Audibility.

Feb. 28:

Aust., 2JM (fone and I.C.W., 200), 2RA (speech), 2DK (speech), 2UW (speech and I.C.W.).

Feb. 29, Daylight, 330 miles:

Aust., 2BB (CW 34).

Feb. 29, Night, 430 miles:

Aust., 2BB (speech), 2JM (7), 3BY (9), 3ER (10), 2ZN (11), 3BM (11), 3JH (11).

N.Z., 1YA (60), 2AP (4) 1AA (6).

March 1, 850 miles:

Aust., 2JM (6), 3AF, 3JH, 3JU (voice 16), 3JF, 2IJ, 3AR, 2AM, 2RA, 2JN, 2YI, 5BQ.

N.Z., 2AB, 1YM (voice).

Mar. 2, 1200 miles:

Aust., 3BM (9), 2DS (8), 2IY (4-5), 2JM (7), 3BD (3), 2IJ (7), 3JU (8), 2KC (8), 2FA (8), 3BG (6).

N.Z., 2AP (worked), 3AD, 1AA, 1AO, 1AE.
U.S.A., 8ZE (6000 miles).

Mar. 5, 1600 miles:

Aust., 3BD (20).

N.Z., 2AP (worked), 4KF, 3AF, 2AQ, 2AF.
U.S.A., Dist. to 'Frisco: 5,600 miles. KGO.

Mar. 5 (No. 2.):

Aust., 1830 miles, 3BH, 3BY, 3BD.

N.Z. (Dist. 1200 miles), 4AA (wkd.), 2AP (wkd.), 4AB, 4AR, 4CK, 2YG.

U.S.A., 'Frisco, 5300 miles, 7ABZ, 6ZBG, 7NPW, 6NB, 6KA, 6BLW, 9CCS, 6ALK, 5NW, KGO.

Mar. 6:

Aust., 2200 miles, 3JH.

N.Z., 1600 miles, 4AA (16), 2AP (wkd. 1200), 2AG (16), 1AC (9), 2AB, 3AF.

U.S.A., 'Frisco, 5000, 6BK, 9EJZ, 5ANA, 6PY, 4BZ, 6ADK, 9DR, 4JE, KGO.

Mar. 7:

U.S.A., 9DWN, 6EW, 6ABY, 4ZAV, KGO.

Mar. 8:

N.Z., 2800 miles, 1AI (6), 4AA (8).

U.S.A., 'Frisco, 4800 miles, 8LL, 6ABD, 6CNG, 7SH, 8ZZ, 1BOM, 7CK, 5AL, 6RF, 5PK, 9BQ, 6RFX.

Mar. 10:

N.Z., 3400 miles, 4AA.

U.S.A., 4100 miles, 7FQ, 6AHP (CQ), 9EKY (CQ), 7AQ, 6AH (CQ), 9BZ (CQ), KFKX (QSA).

Mar. 11:

N.Z., 3800 miles, 2AQ (7), 4AA (7), 3AF (5).

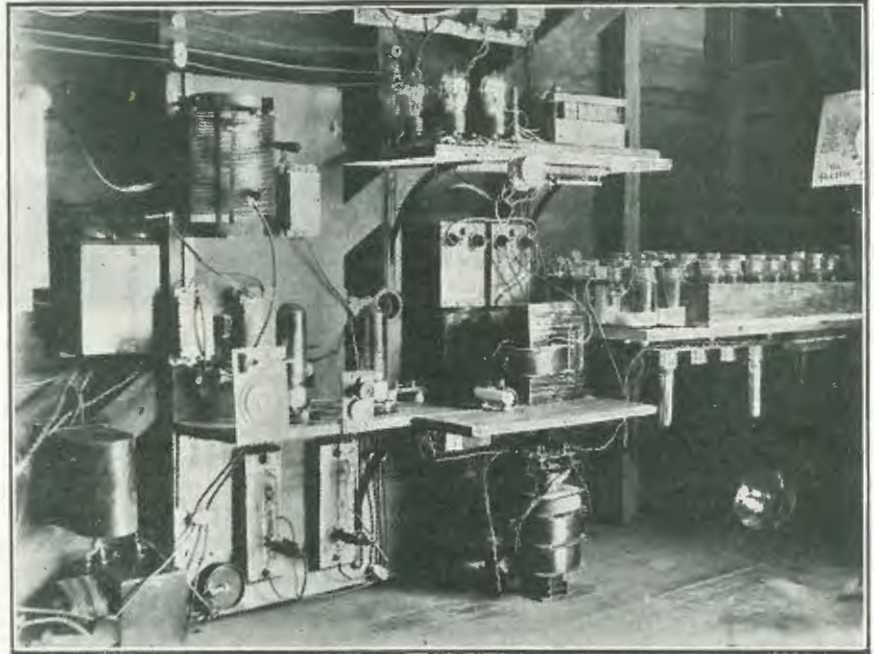
U.S.A., 'Frisco, 3300, 6QL (CQ), 9BLY (CQ), 6ARF, C6XC (CQ).

Mar. 12:

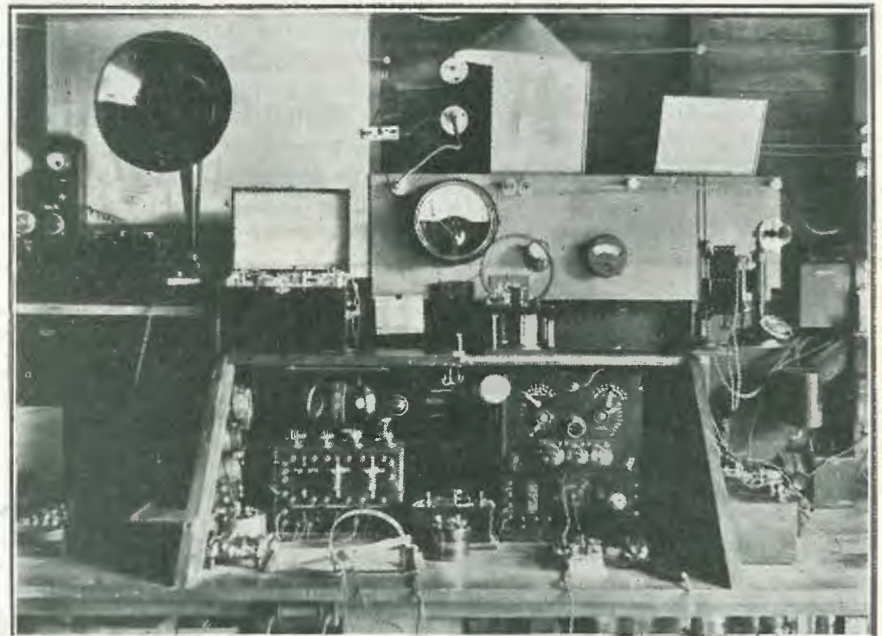
U.S.A., 'Frisco, 2900 miles, 7CRQ, 6CDC, 9AND, 9BQ, 9CJU, 6AFM, 6DO, KGO.

Mar. 15:

N.Z., 3400 miles, 2AQ (6).



The 100-Watt Transmitter at 2CM was used in the Tests for Wireless Telegraphy only. On a Wave of 210 Metres this Set radiates five Amps.



The Low-Power Sending and Receiving Apparatus at 2CM. On the Right is the 10-Watt Transmitter. This Set Radiates 1½ Amps on a Wave-length of 250 Metres. A Duplicate used for both Telegraphy and Telephony was Specially Made and Installed on the R.M.S. "Tahiti."

U.S.A., 'Frisko, 2500 miles, 6ANY, 6ADC?, 6BK, 6ACB, KHJ.

Mar. 16:
U.S.A., 'Frisko, 2200, WGY, WGAF, KGO, KHJ.

Mar. 17:
U.S.A., 'Frisko, 1700 miles, KFI, 5FT, 6AVR, 8AIG, 6BWD, 8CIK.

Mar. 18:
U.S.A., 'Frisko, 1350 miles, 6AHP, 6BNT, 5GT, 5ALM, 3HH.

Mar. 19:
U.S.A., 'Frisko, 1000 miles, 6AKW (wkd), 9CXX, 5UM, 6AVY, 6FP, 6ALK, 6CDV,

6ANB, 6RA, 6VE, 6CHU, 6ADS, 9ACY, 6XAD.

Mar. 20:
U.S.A., WGHC, WGKG, KPO.

Mar. 29:
U.S.A., 'Frisko, 1000 miles, 6KN (wkd.).

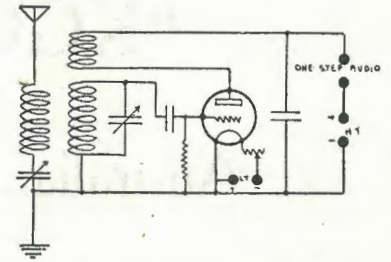
April 1:
U.S.A., 6BIC, 6CCY, 9TC, 6CPO, 7CO.

April 3:
U.S.A., 'Frisko, 3000 miles, 1CPI, 1CJM, 6AGI, 6CCY, 6ZBT, 6AHP, 6BEZ, 6AJA, 6AFA, 6BRI, 6CHL, 6AO, 6CB, 6WP, 6BLA; 6LA, 7EM, 8CZZ, 8UR, 8KJA, 9CKW, 9DAY, 9CJY.

April 4:
U.S.A., 'Frisko, 3300 miles, 1BIE, 5ADB, 5CUV, 5APP, 5AJJ, 5ADB, 6BLW, 6BNT, 6AKM, 6BWP, 6CEJ, 6GO, 6BNO, 6CMU, 6PU, 6CGO, 6PN, 7UZZ, 7DR, 7JN, 7FR, 7IW, 7FO, 7ADG, 8DI, 8XKM, 8DBM, 9DAY, 9EJ, 9AYJ, 9MY, 9IE, 9CLQ, KEO, KFST.

N.Z., 2700 miles, 2AR.
Aust., 4100, 3BD.

April 5:
N.Z., 2200 miles, 2AD.



Circuit of receiver used at 2CM.

U.S.A., 'Frisko, 4300, 1AL, 6DUR, 6AHG, 6BLK, 6BLW, 7LM, 8TXC, 9CR, 9CDL.

April 6:
U.S.A., 'Frisko, 4700 miles, 6QJ, 6AGK.

April 7:
U.S.A., 'Frisko, 5000 miles, 9CLY.

April 8:
U.S.A., 'Frisko, 5300 miles, 6BWP, 5QLS, 6ACK.

April 9:
N.Z., 1200 miles, 3AF.
U.S.A., 'Frisko, 5700 miles, 9CP, 1MO.

(Continued on page 96.)

**SPECIAL VALUES
IN RADIO EQUIPMENT**

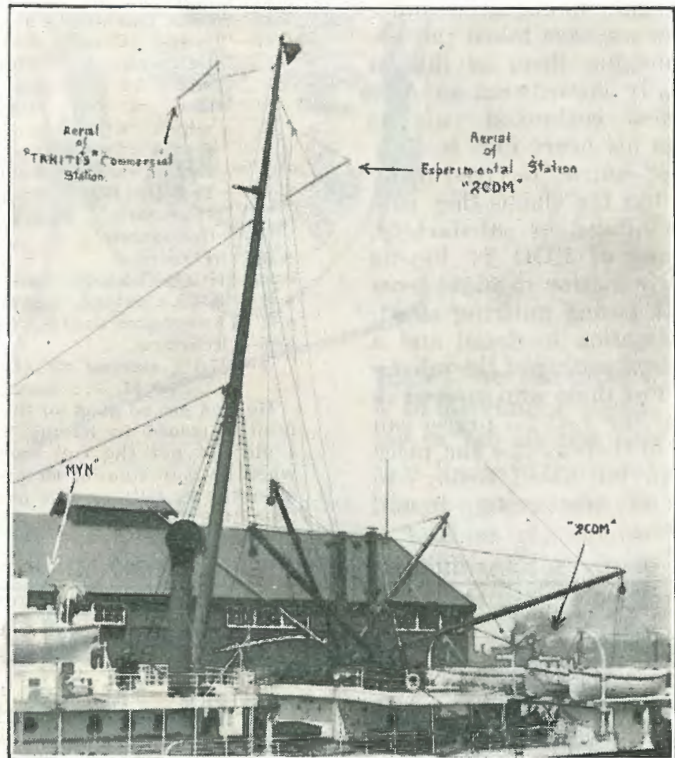
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This shows the After Portion of the "Tahiti." Here may be seen the Experimental Wireless Cabin (2CDM) and its Aerial, together with that portion of the Commercial Station (MYN).

"Radio" is the only paper dealing effectively with Australian Broadcasting activities. It is bright and up to date.

An annual subscription at 10/- will bring it regularly to your home each fortnight. Send that Sub. to-day.

"KGO, Oakland, California"

Australian Experimenters Second to None

Several More "Log" American Station

SINCE the last issue of *Radio*, when we published letters from Mr. A. E. Wright and Mr. J. G. Onus, stating reception of the General Electric Company's broadcasting station KGO, at Oakland, California, U.S.A., we have received several further reports—two from Mr. Wright and one each from Messrs. E. M. B. Pell and C. P. Morgan and Mr. N. O. Glasson. In order to encourage other experimenters we have taken the liberty of publishing them so that it may be actually shown what an Australian wireless enthusiast can do when he puts his heart into it.

We have, of course, received many other letters but the claims they contain are not altogether satisfactory, for the logging of KGO is by no means the easy matter it might seem on paper. It means untiring effort, meticulous attention to detail and a thorough understanding of the science of wireless. For those who succeed in accomplishing the feat no praise can be too high; to them is due the place radio holds in the world to-day; to them will be due the prestige it will enjoy to-morrow.

The reports received are as follow:

LETTERS TO THE EDITOR.

Dear Sir:

I again picked up KGO this evening and herewith append a detailed report:—

P.M.

5.35—Orchestra.

5.39—"KGO, Oakland, California."

6.10—Orchestra.

6.14—"KGO, Oakland, California."

6.17—"Pacific Coast Station KGO, Oakland, California. There will be another intermission of ten minutes, after which KGO, Oakland, California will continue broadcasting of music from the St. Francis Hotel Orchestra, San Francisco. Henri Holburge, Conductor."

6.32—Orchestra.

6.36—"KGO, Oakland, California."

6.41—"KGO, Oakland, California."

6.47—(Announced another interval.)

6.55—Orchestra.

7. 3—"KGO, signing off at 1 ——— ½
..... A.M. ... Good morning!"

He was not so good on this date. The fault I traced to be my B. Battery. I did not get the full announcement when he was signing off owing to the noise the B. Battery was making. His time was 1.1½ or 1.2½, I am not sure which.

On Sunday night last the atmospherics were bad, which perhaps you know, nevertheless I managed to get the following. (You may think that I am guessing at this report, as they are all nearly alike, but I can honestly say that every word stated was heard by a J.P. and myself in spite of bad receiving conditions.)

P.M.

5. 5—Heard the carrier.

5.25—Orchestra.

5.34—"KGO, Oakland, California" (as clear as a bell).

5.40—"Pacific Coast—KG—Oakland—There will be an intermission—KGO, Oakland, California, will continue broadcasting of music—San Francisco. Henri Holburge, Conductor."

5.55—Orchestra.

5.58—"KGO, Oakland, California."

6. 6—(Came in extra strong).

6. 7—"KGO, Oakland, California."

6.11—"Pacific Coast Station KGO—after KGO—California will continue broadcasting of music."

6.27—Orchestra.

6.35—"KGO, Oakland, California."

6.38—(A break in the music of about ten seconds.)

6.41—"Pacific Coast Station KGO, Oakland, California. There will be about 10 minutes intermission, after which KGO, Oakland, California, will continue



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broadcasting of music from the St. Francis Hotel Orchestra, San Francisco. Henri Holburge, Conductor."

6.52—Orchestra (going full blast when I "lit up").

6.55—"KGO, Oakland, California."

6.58—(A break.)

7. 1—"Pacific Coast Station KGO, Oakland, California. This concludes broadcasting of music—San Francisco. Henri Holburge, Conducting, KGO, Oakland, California—off at 1 a.m. Pacific Coast time. Good morning!"

When announcing his time he made a pause between the 1 and a.m., as though he were looking to see if there were any odd minutes.

3AR, telephone 475, broadcasting from Melbourne came over splendidly to-night. I have heard this station often lately, but not nearly as well as he was doing this evening.

Yours faithfully,
(Sgd.) A. E. WRIGHT.

Scarborough, South Coast, N.S.W.
April 16, 1924.

Dear Sir:

When listening-in last night on our six-valve set, Mr. C. Morgan and myself were again successful in picking up KGO, Oakland, California.

We first heard this station on January 6 last, but have not been successful in picking them up since on account of bad static. Last night on three valves at about 6.43 and at 6.46 we distinctly heard the words, "KGO, Oakland, California," and then an orchestral item, followed by a pause of some minutes. Then "KGO, Oakland, California transmitting, General Electric Company, KGO, Oakland, California." Static was bad for a minute or two and when it stopped the carrier wave had stopped also. On four valves (1 H.F. 2 L.F.) the music was loud enough at one time to operate a loud speaker. It was heard perfectly by Mr. Morgan, Mr. J. L. Walker, a local experimenter, and myself, each using a separate pair of 'phones at the one time (in series).

To give you an idea of the efficiency of our set, which was designed and manufactured by ourselves, I enclose a copy of our log for the last four nights.

Yours faithfully,
(Sgd.) E. M. B. PELL.

P.S.—I have been reading *Radio and Sea, Land and Air* since the latter commenced publication, and must

congratulate you on the excellence of standard you have maintained.

Bega, N.S.W.
April 17, 1924.

STATIONS LOGGED BY C. P. MORGAN AND E. M. B. PELL, BEGA, N.S.W.

Saturday, April 12: Commenced listening at about 10.30. Logged:—2HM, 2UW, 2VI, 2AC, (N.Z.); 2CM, 2BK, 2YA, 2YI, 2CDM, 2YG, 3JU, 3BD, 2AL.

Sunday, April 13: Logged:—2JM, 2GR, 2FA, 2JM, 2UW, 5BQ. The latter (5BQ) was almost as loud on speech and music as some of our local experimenters.

Monday, April 14: Logged:—Wellington Broadcasters (N.Z.), 3XO, 2ZZ, 3BM, 2AC, 2YI, 3SE, 3QW, 2GR, 2IJ, 3BU, 2BC, 2AQ (N.Z.) on speech and music—came through with loud speaker strength.

Tuesday, April 15: Commenced listening at about 10.30. Logged:—3DP, 5BQ, 2YI, 2JM, 3BU. Early in the evening we heard 1YA (Auckland, N.Z.), on speech and music. Strength very good.

Wednesday, April 16: Logged:—KGO, Oakland, California (6.46—7.5), Wellington Broadcasters Ltd. (N.Z.); 2YI, 4YA, 1YA.

All the above were fairly loud on three pairs of 'phones. Static was very



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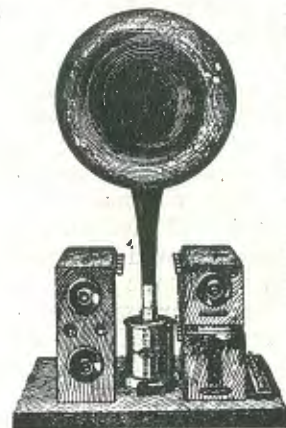
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troublesome at times on all the above nights, and several carrier waves were heard on the 130-450 metre band which could not be read on account of bad interference.

Dear Sir:

Re your reference in the current issue of *Radio* to the really excellent receiving work of Mr. Wright, of Scarborough, in "logging" KGO and urging other experimenters to join him. Herewith I submit the first results obtained by me on this station.

Shortly after 6 p.m. on last Sunday evening, 20th instant, I picked up faint telephony on what I took for a wave-length of 300 metres approximately. At first I thought this might be a New Zealand station but, as nothing else was audible on a near wave-length, I decided, like Mr. Micawber, to see what would turn up.

At 6.30 p.m. I caught the words "Oakland, California" very distinctly and re-doubled my efforts to tune just a little finer. The subsequent loggings are set out hereunder:—

P.M.

6.30-6.35—Orchestral Selection.

6.35—Announcement, "KGO, Oakland, land, California."

6.35-6.40—Orchestra.

6.40—Announcement, ". . . Station sending KGO, Oakland, California. There will be about 10 minutes' intermission."

This was followed by the station-call and a reference to the Orchestra by name, but it was so badly chopped about by "static" as to be unintelligible.

During the intermission it came on to rain fairly heavily here and "static" which had been troublesome all through became very heavy. The orchestra was audible again at 6.53. At 6.55 there was an announcement and the orchestra was audible again until 7 p.m., with the exception of a short period at 6.57 when it disappeared, either due to a pause or a fade-out. The concluding announcement was unintelligible owing to incessant 2RN and concluded at three-quarters of a minute past 7 p.m. The times given are fairly accurate, being at the worst not more than half a minute out with Melbourne Standard Time and I would like you, if possible, to verify the above results by those from other experimenters.

The receiver used was a five-valve home-made Neutrodyne, using both stages of audio to get audible strength but which, of course, made the "static" very troublesome. The

aerial used is, however, somewhat unique, being a private 'phone line which runs to our out stations here. The total length of wire is from four and a half to five miles, No. 10 gauge galvanised iron wire, supported on posts about 14ft. high by the ordinary Swan Neck insulators.

The "lead in" is taken off about one and a half to two miles from one end, thus making a sort of un-balanced "T" of irregular shape. My former aerial arrangement was blown away by a storm, and as static conditions have been very bad all through the last summer and autumn I did not rush ahead with the work of erecting masts, etc. However, I hope to have this done very shortly and should get "KGO" regularly. Actual tests have convinced me that at least on amateur wave-lengths the telephone line is not as efficient as a single half cable 25ft. high by 100ft. long. No special lead-in arrangement is made, the line and earth wires coming in side by side in the usual manner. Connection from the 'phone to receiver is made by two No. 14 copper wires attached to the terminals on top of the former instrument, a standard Ericsson wall type. Other fair results obtained with the same set and aerial are:—2CDM on C.W. on four valves at 12.5 a.m. on 12th instant, and 2YK, Wellington, N.Z., 15-watt telephony.

Yours faithfully,

(Sgd.) N. O. GLASSON.

"Shiel," Woodstock, N.S.W.

April 23, 1924.

Dear Sir:

KGO came in again last night. He made slightly different announcements on this occasion. The following were made at:—

P.M.

5.15—"Pacific Coast Station KGO, Oakland, California."

5.45, 6.11 and 6.41—"There will be a short intermission, after which KGO, Oakland, California, will continue broadcasting of music by Henri Holburge at the St. Francis Hotel, San Francisco." (Four intervals.)

The following announcements were made at the times stated: "Pacific Coast Station KGO, Oakland, California. We are broadcasting music by Henri Holburge at the Granume (?) St. Francis Hotel Orchestra, San Francisco."

This announcement was made at p.m.: 5.11, 5.25, 5.35, 5.41, 5.58, 6.9, 6.20, 6.38 and 6.55. At 7.0, "Pacific

Coast Station KGO, Oakland, California. This concludes broadcasting of music by Henri Holburge at the Granume (?) Orchestra St. Francis Hotel, San Francisco. KGO, Oakland, California, signing off at 1.2. Good morning!"

Yours faithfully,

(Sgd.) A. E. WRIGHT.

Scarborough, South Coast, N.S.W.

April 24, 1924.

Dear Sir:

Referring to my letter of the 14th instant I have to state that Mr. Morgan and myself have again been successful in picking up KGO, Oakland, California.

Sunday, April 20: 5.42 to 5.50 p.m., Orchestra. Announced, "KGO, Oakland, California." 6.35 to 7.0 p.m., Several orchestral dance items. Announced, "KGO, Oakland, California." Announced, "Pacific Coast time now is—" rest drowned by static) and closed down at 7 p.m. local time.

Static was very bad and it was raining while the above was received.

Wednesday, April 23: Received both before and after tea, orchestral items and announcement, "KGO" several times. Static was not bad, but reception was spoiled by local interference, and also by harmonics of 600-metre stations. Closed down after usual announcement of time, which was not received owing to interference, at exactly 7 p.m. local time.

On this night "KGO" was heard by two other local experimenters.

I consider that under present conditions "KGO" can be heard on three valves without any trouble, as the strength was quite audible on a loud speaker on four valves at times.

Their wave-length is just under VIS harmonic of half wave-length producing a very shrill heterodyne note when VIS is transmitting. Would you please let me know what is the exact wave-length VIS is working on at present?

Yours faithfully,

(Sgd.) E. M. B. PELL

Bega, N.S.W.

April 24, 1924.

VIS radio station's commercial wave-length is 600 metres, while for high-power transmission 2,000 metres is used.—Ed. R.

Mr. S. McCarthy, of Kempsey, North Coast, N.S.W., also writes that he has succeeded in picking up KGO. On the night of April 27, between 6.15 and 7 he heard "KGO" announced four times, together with music and speech. His set, which was a home-made one, is of four-valve 1 High Frequency, 1 Tuned Anode Detector, and 2 Stages Low Frequency Amplification.

Wireless Progress

Besides the service an industry renders to the community, industrial progress can best be measured by the number of people engaged directly as employees in an industry, and by the number of people indirectly occupied in the allied industries supplying the raw material for manufacture, or the finished apparatus for re-sale.

In 1914 the number of employees in the wireless industry was under one hundred, and the wages paid £12,000 per annum. At the present time Amalgamated Wireless (A/sia) Limited employs no less than eight hundred Australians, who receive in salaries and wages the sum of £150,000 per annum.

In addition, the Company disburses in respect of raw material, goods and general expenses the sum of £200,000 per annum.

In 1914 the Company conducted wireless telegraph services on some seventy ship stations; to-day over two hundred and seventy ship stations of the Australasian Mercantile Marine are controlled by the Company.

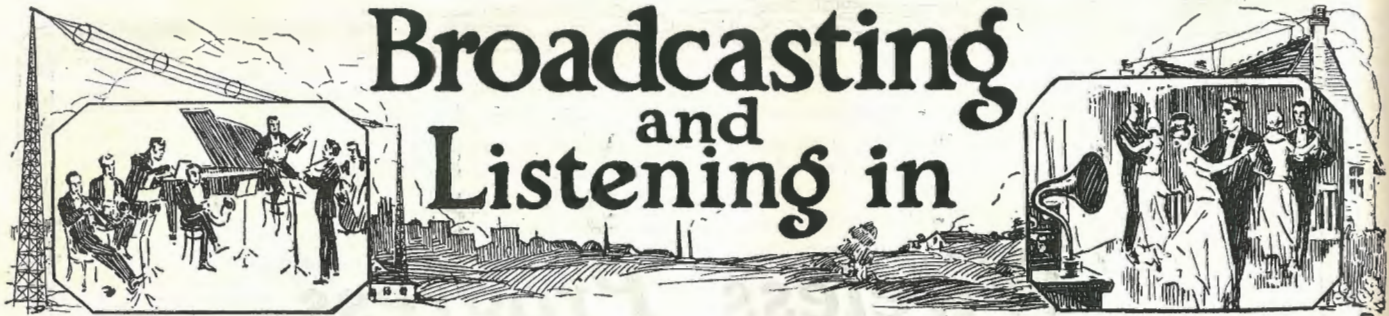
The whole of the Coastal Radio Stations in Australia, New Guinea and Papua—twenty-six in number—are operated by the Company.

In 1914 there were six men engaged in manufacturing operations—to-day wireless production gives employment to 200 operatives.

Amalgamated  **Wireless**
(Australasia) Ltd.

Pioneers of the Wireless Industry in Australia





Broadcasting and Listening in

WIRELESS enthusiasts in Berlin and throughout Germany are learning the English language by radio. A concern called "The Ullstein Service" is broadcasting a lesson in English twice a week. Special leaflets are being issued to enable pupils to perfect their knowledge. "A thousand English words you must know" is the slogan.

FOR the first time in history a seaplane has been used as an Admiral's Flagship. This happened during the recent manoeuvres of American warships. From a seaplane, flying his flag, Admiral Samuel E. Robinson directed the movements of the seacraft under his command. The experiment was a complete success, and the idea is to be extensively used on the other side of the Atlantic. Admiral Robinson's commands were broadcasted from the seaplane to the ships below, by means of wireless telephony and he had a perfect bird's-eye view of the movements of each individual unit under his command. Shortly the U.S. Admiralty intends to carry out more full and complete tests.

IN last issue of *Radio* it was stated that a test for the purpose of judging wireless broadcasting as an educational factor was to be held at Bourke (N.S.W.) on May 9 and 10. In response to requests of firms interested in the experiment the tests will now not be held till June 6 and 7.

ONE who is connected with a broadcasting station meets some very bright moments in the course of his work. The other day a young woman broadcasted a monologue from a Sydney studio. At the conclusion of the item, noticing the depressed expression of the manager she said, "I know I wasn't a success, Mr. Blank, but you see I couldn't

move my arms about and without that I couldn't recite properly." "Well, why didn't you move your arms about," asked the manager. "But the audience wouldn't have seen them," she explained with wide-opened eyes.

QUITE on a par with this are the two other ladies who poured out their vocal sorrows and joys into the

THE management of 2FC (Farmer and Co., Ltd.'s broadcasting studio) have received a large number of enquiries concerning the recent broadcasting by the company of items played by the Leichhardt (Sydney) Municipal Band, which, by the way was among the place takers at the competitions held at Toowoomba, Letters from Cairns (Q.), S.A., Suva, Thames (N.Z.) and many other places have been coming in, all asking how it was done. Unfortunately, like a good many other interesting things, that is more or less of a secret. However, it may be said that the whole band, drums and all, was squeezed into a "damped" (electrically, that is) room some seventeen feet by twenty-five. Then some mysterious adjustments of the apparatus and replacing of the musicians were made and hey presto! Wagnerian selections came in over the ether to listeners-in-far and near as though they had been doing it since the day they were written.

DO you know the musical (?) instrument that gives the broadcasting stations the most trouble to transmit over the ether? It is that which is often termed the "Soul of Jazz"—the Saxophone. Mr. Saxe is considered the vagabond of all instruments but already the broadcasting companies—particularly 2FC—are giving him a lot of attention, and it should not be long before he is as well behaved as any other self-respecting instrument.

MR. E. S. RALLS.

Through a typographical error it was recently stated in *Radio* that Mr. E. S. Ralls had taken over the management of the firm of Messrs. Turnbull & Jones, Auckland, N.Z. This should have read "the radio department of Messrs. Turnbull & Wells" and we take this early opportunity of correcting the mistake.

2FC

BROADCASTING TIMES.

Sydney Mean Time.

P.M.

12.55: Tune in to the Music of the Chimes.

1: "Sydney Morning Herald" News and Cable Service.

1.25: Coastal Farmers' Market Reports.

1.30: Stock Exchange Intelligence.

1.52: Weather Report.

1.55: Midday "Evening News" News and Cable Service.

1.45: Close down.

3: Chimes.

3.5 to 3.45: Musical Programme.

3.47: Afternoon Weather News.

3.50: "Evening News" News and Cable Service.

4: Close down.

6.30: Chimes.

6.33: Children's Time — Lamplighter Stories.

7: Dalgety's Market Reports.

7.5: Fruit and Vegetable Market Reports.

7.7: Closing Stock Exchange Intelligence.

7.10: Late "Evening News" News and Cable Service.

7.15: Close down.

7.55: Tune in to the Music of the Chimes.

8.00

Entertainment.

to

See List hereunder.

10.00

EVENING ENTERTAINMENT.

Mondays: Popular Concert.

Tuesday: Theatrical items.

Wednesday: Dance Programme by Farmer's

Novelty Jazz Orchestra.

Thursday: Music Lovers' Night.

Friday: Popular Concert and Amateur

Theatricals.

Saturday: Choral and Popular numbers.

microphone. One asked when the record would be released and the other asked whether she should come and hear her own voice over the ether during the following week! (We hasten to add the foregoing are cold, hard facts.—Ed. R.)

Wireless Institute of Australia

NEW SOUTH WALES DIVISION.

THE twelve months which have just elapsed have been epoch-making ones in the history of the Institute. Much effort has been expended and much has been accomplished. The council has worked untiringly in the interests of the experimental movement, and many hours of patient labour are expected to bear fruit at an early date. Of the papers and lectures which have been presented before this division, only one thing can be said; they have been excellent throughout. Radio enthusiasts will remember with pleasure Mr. Alec Hector's lecture on "Colour Music," and the fact that he has promised to give another lecture at an early date under the auspices of the Institute, augurs well for the future. Two things stand out prominently in the year's proceedings, the Wireless and Electrical Exhibition in the Sydney Town Hall, and the affiliation of the various radio clubs of N.S.W. with this division. The exhibition was a complete success in every way and of-

ficials are still busy answering enquiries concerning the organisation, which have come from all parts of the world. With regard to the Affiliation Scheme little need be said, as it is recognised on all sides that this is one of the great turning points in the experimental movement in N.S.W. The retiring council is to be congratulated upon the progress which the Institute has made during the past twelve months and the best wishes of all are extended to the new members.

The new offices of the division are situated on the second floor, 82 Pitt Street, Sydney, and all enquiries concerning the Institute's activities will be welcomed. Address all communications to Box 3120, G.P.O., Sydney.

The following officers have been elected for the next twelve months:—

Pres., C. D. Maclurcan, Vice-Pres., F. Basil Cooke, H. A. Stowe; Hon. Treas., O. F. Mingay; Hon. Sec., Phil Renshaw; Council, S. V. Colville, W. H. Newman, R. C. Marsden, E. B. Crocker; Publicity Officer, A. H. Perrett. A meeting of the delegates' council of the clubs affiliated with the Wireless Institute will be held at the offices on May 27, at 7.30 p.m. sharp. All clubs that have completed their bonds of affiliation are entitled to take part through their delegate.

Amateur Transmitting Licenses Issued During March, 1924

NEW SOUTH WALES.

- 2GF Chilton, G. F., Radio Station Enclosure.
- 2LR Lismore and District Radio Club (R. H. Atkinson), 12 Park Street, Ashfield.

VICTORIA.

- 3AG Gurr, H. F., 224 McKillop Street, Geelong East.
- 3CP Philpott, C. H., 16 Glenleith Avenue, Geelong.

QUEENSLAND.

- 4BO Odgers, N. F., Anne Street, Charters Towers.

SOUTH AUSTRALIA.

- 5DA Buckerfield, J. R., 4 Regent Street, Parkside.
- 5GB Vailer, J., Commercial Street, Mt. Gambier.

TASMANIA.

- 7BN Wills & Co., Pty. Ltd. (A. Smith), 65 George Street, Launceston.

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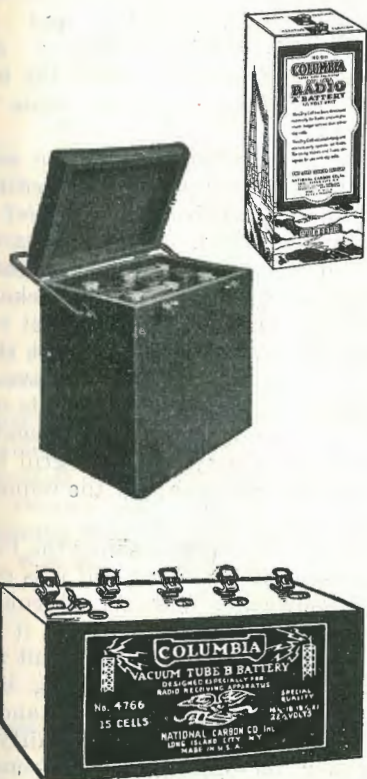
COLUMBIA Storage "A" Batteries for vacuum tubes of one-half ampere or over have many characteristics which make them ideal for such use. They are shipped dry and charged as sold, thus always assuring a new, fresh and powerful battery.

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Valve Constants

BY P. B. C. HOLDSWORTH.

FOR some time now it has been the practice of certain American vacuum tube manufacturers to publish tables of constants for their hard vacuum valves. These tables are now possible due to the high degree of standardisation which has been attained in their production, and since they give a very fair representation of the results to be obtained with similar conditions, and a valve of the particular type to which they refer, they may be used as a basis of comparison between makes and types. The three manufacturers of valves in the United States are large firms with big reputations and their figures can be safely taken as authentic.

The appended table may at first sight appear to some beginners to be somewhat formidable, but this is not the case and the detailed explanation given should make the figures, and their relationship to one another perfectly clear. Looking at the table it will be seen that the first column contains the Code Number used by the manufacturer. This should require very little explanation, though some may not be aware that both Cunningham, and Radio Corporation Valves are identical, being manufactured by G.E.C., and stamped with the code "UV" followed by a number if for the Radio Corporation, and with "C" and a number if to be sold by E. T. Cunningham. It will also be found that for similar tubes the Cunningham numbers are exactly one hundred greater than those of the Radio Corporation.

The next column contains the filament voltage, and is the actual voltage across the filament, so that 25 per cent. should be added to this to

allow for flexibility of control. From this column may be determined whether a large or small battery will be required to light filament. For example it would be sheer waste of good money to buy a six-volt accumulator for lighting a "W.D."12 or W.E.203B.

Column 3 gives the filament amperage and this aids in the determination of the type of battery to be used for this purpose. For tubes consuming up to .25 amperes, dry cells lighting is satisfactory. If two, or three cells are connected in parallel, the most satisfactory tube from a filament consumption standpoint is, however, the "UV"199, which requires only .06 amps. For those taking more than .25 amps, the only satisfactory way of battery lighting is by means of an accumulator.

The product of these two columns gives the energy used up in the filament, in watts, and forms a comparison of the extravagance or economy of energy used in the filament circuit by the various valves. It will be seen that the "C"301A is far more economical than the "C"301 since it uses only 1.25 watts against 5 watts for the latter.

Column 4 gives the plate voltage used when computing the tables and is that which the makers consider to be the average best voltage to use. Here again, the choice of the "B" battery is helped by the figures, for it is obviously unnecessary to procure a 45-volt dry cell battery for use with a "C"300.

The plate current is given next, and this is one of the most important factors, since it practically decides the type of tube that will carry out the functions required of it most satis-

factorily. The two groups into which it divides the tubes are "Detector" and "Amplifier," more particular audio frequency amplifier. A good example is the choice of a valve for the second stage of audio frequency when a loud speaker is used. In this case, it is easily understood that a "C"301A with a plate current of 1.5 to 8 milliamps is better than the "W.D."11 which gives only .5 milliamp. These figures should be taken in conjunction with the filament consumption when comparison is made. It is interesting to compare the two thoriated filament valves "W.D."11 and "UV"199. The former gives but .5 milliamp for filament circuit consumption of .3 watts, and the latter the milliamp for a consumption of only .18 watts, the high tension voltage being the same for both valves.

The next column shows the negative voltage required on the grid, if any, when the valve is used under the conditions shown. It is always calculated with respect to the negative end of the filament which is reckoned as nought. This is the reason that very often in amplifiers, the filament rheostat is connected in the negative leg of the filament, the drop in volts over the resistance between the negative end of the filament and the grid lead being sufficient to supply the requisite bias.

The seventh column shows the Plate Impedance of the valve and it is common knowledge that an instrument works best in a circuit when it has the same resistance as the circuit into which it is connected. This, however, is not altogether true and it is often found necessary to modify it. However, these figures are extremely useful in the calculation of the Mu-

tual Conductance of the valve as will be shown later.

Column 8 shows the amplification factor of the valve, which is the ratio between the variation of the grid and plate voltages which would produce the same variation in the plate current. Thus it follows that a valve with a high amplifying factor neces-

dividing the Impedance into the Amplifying Factor, the result giving the Mutual Conductor in microhms. Thus, since it takes into consideration both the Impedance and Amplifying Factor, it is a better basis for comparison than either of these factors taken separately. It also shows that the valve having the highest ampli-

TABLE OF CONTENTS FOR AMERICAN VALVES.

Code and Maker.	Fil. Volts.	Fil. Amps.	Plate Volts.	Plate Millamps.	Negat. Bias.	Plate Imped. Factor.	Amplif. Factor.	ductance.
UV201, C301, G.E.C. ..	5	1	40	1	..	20000	6	300
UV200, C300, G.E.C. ..	5	1	18-25	.25-1	..	10000	..	..
UV201a, C301a ..	5	.25	40	1.2	..	16000	6.8	425
G.E.C. ..	..	..	120	8	-9	8000	8	1000
UV202, C302, G.E.C. ..	7.5	2.3	350	45	-22	4000	7.5	1875
UV203, C303, G.E.C. ..	10	6.5	1000	150	-35	3300	10	3030
UV204, C304, G.E.C. ..	11	14.5	2000	250	-55	3000	25	8333
UV199, C299, G.E.C. ..	3	0.6	40	1	..	13400	6	455
WD11, Westinghouse ..	1.2	.25	40	.5	-1	20000	6	300
203B, VT1, West. Elect ..	2.5	1.1	20	5.2	..	20000	6.5	325
205B, VT2, West. Elect ..	7	1.3	350	40	-20	4000	7	1750

sarily has a steep characteristic curve. Hence, to say that the valve has an amplification factor of six means that a variation of one volt on the grid will cause the same fall or rise in plate current as six volts difference in plate voltage would.

The next column is the Mutual Conductance, and may be obtained by

fication factor does not necessarily have the highest conductance.

The above should make clear the use of the tables and be of some help in the selection of valves. It is regretted that tables of constants for the English and European valves were not available.

Broadcasting in W.A.

THE Westralian Farmers' Limited anticipate that they will shortly be able to begin broadcasting a wireless service over the southern half of the State. An order has been placed for a five kilowatt set, and this will enable pastoralists at Wyndham—1,400 miles from Perth—to listen to general news, entertainments and all other things that a first-class broadcasting service can supply.

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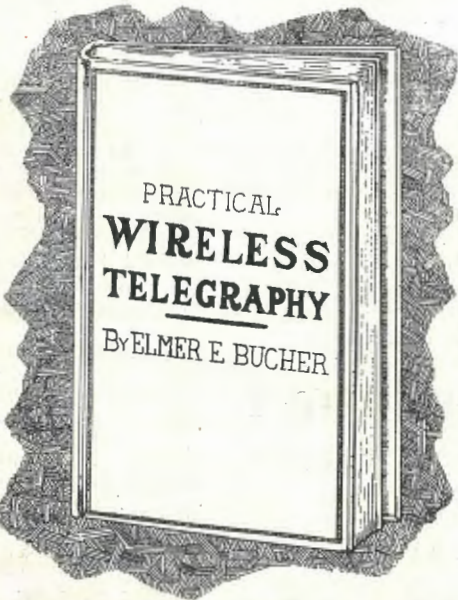
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Queries Answered



Crystal (Nailsworth, S.A.), submits particulars and diagram of his receiver, and asks why he cannot receive music, although Morse can be heard quite clearly.

A.: The radiophone range of such a simple crystal set is limited to about ten miles from a normal broadcast station, which probably accounts for your poor results, especially as there are no high-power radiophones in your State.

P. F. J. (Edmonton, N.Q.). Q.: What are the regulations, and licences, necessary to receive broadcasting, and from whom procurable?

A.: Apply Chief Manager Telegraphs, P.M.G. Dept., Melbourne, Victoria.

Q.: Are reflex circuits permissible with reaction directly in aerial circuit, or modified?

A.: Yes, if you are situated in certain specified areas as outlined in the W/T regulations.

Q.: Are dull emitter valves capable of long distance reception?

A.: Yes, dull emitter valves are particularly suitable for long distance reception owing to their quiet operation. They are naturally more fragile than the ordinary type because of the finer filament.

Q.: What height and form of aerial would be required to receive up to, say, 2000 miles?

A.: No estimate of range can be given owing to the many factors involved, such as intervening conditions.

L. F. S. (Largs Bay, S.A.), submits circuit of rectifier, and asks if it is suitable for supplying power to the anode and filament of a 10-watt transmitter.

A.: Your rectifier circuit is O.K., but in the oscillator diagram a blocking condenser must be employed between the plates and the anode tap on the aerial tuning induct-

ance, otherwise the high tension will be short-circuited.

C. E. D. (Broken Hill). Q.: Would either of the two circuits submitted receive Adelaide and Sydney Broadcasting? Which would be most suitable?

A.: Circuit No. 2 will be the most sensitive owing to the use of radio amplification and re-action, and be most likely to pick up Sydney and Adelaide. Estimates of range, however, cannot be given. See answer to *P. F. J.* above.

O. A. M. (Parkes). Q.: When will 2FC be broadcasting on high power?

A.: No information is available at present.

Q.: Does a five valve broadcast receiving set cost more for up-keep of batteries than a two valve set? If so, how much?

A.: Using similar valves the current consumption will be $2\frac{1}{2}$ times greater.

Reflex (Dunedin). Q.: Would three UV202 valves be better for receiving on a De Forest Reflex circuit than a similar number of UV201 valves?

A.: The increase in strength would be apparent only in the amplifier valves. Considering the excessive current consumption with these valves it would be better to use 201A valves, which require 0.25 amps, in comparison to 2.3 for the 202 type.

W. A. W. (Ballarat), submits particulars of his 10-watt transmitter, and asks why same will not oscillate without the use of a series condenser.

A.: If your series condenser is a good one with air for a dielectric it will cause no appreciable loss. Your present aerial capacity is too high and the valve be-

ing unable to charge it to sufficient voltage with the power being used, finds difficulty in oscillating. The reduction in capacity with the series condenser brings this value to a more suitable figure. As the wave length is reduced the radiation resistance increases, which accounts for your lower aerial current.

W. W. (Gaumain) submits particulars and diagram of a three valve receiving set, and asks if it is capable of receiving concerts broadcasted from Sydney, distance about 300 miles.

A.: Your circuit is O.K. and employs the first valve as a radio frequency amplifier, which is the best for long distance work. As already pointed out in these columns, no estimate of range can be given.

Q.: What would be the most suitable valves?

A.: If battery charging facilities are not available use dry cell valves, such as D.E.R., U.V.201A or W.D.12.

Q.: Could any improvement be made in the wiring, etc?

A.: Your aerial is abnormally long, reduce it to 150 ft.

Q.: Are wires intended to be connected where shown crossed on sketch?

A.: The wires where shown crossed should not be connected.

G. M. (East Camberwell). Q.: How can 8 volts A.C. be rectified for filament lighting without resultant hum?

A.: An article appeared in the "Technical Section," *Radio*, issue No. 5, describing fully how to apply low voltage alternating current for lighting of valve filaments. There will always be a slight residual hum depending in intensity on the valve characteristics and general insulation of the apparatus.

The Homcharger

A NEW model of the well-known Homcharger rectifier, the "Gold Seal," table-type, is now being placed on the market in Australia. It constitutes a valuable addition to the Homcharger range. The new model contains many exclusive features, is simple in construction and most efficient in operation. The rectifier is of the vibrator type, consequently there is nothing to break or spill as is the

case with the bulb and liquid types of rectifiers.

The Contacts, which are the only wearing parts, have a guaranteed life of 5,000 hours.

One great advantage of this Homcharger is that it has a highly efficient Ammeter indicating the charging current. Thus, when connecting up, the state of the battery is obvious at a

glance. The charger gives a tapered charge and when joined up, if the battery is more or less charged, a smaller current would flow, consequently the Ammeter will give a smaller reading. This in itself is a very great advantage, but it is only one of the many excellent features of this instrument. It should prove a boon to all who desire to charge their batteries in the home.

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APRIL.

Mr. F. Barclay signed on s.s. *Woolgar*,
 at Melbourne, 7th.

Mr. A. V. Zoppi signed off s.s. *Eurella*,
 at Sydney, 12th, and signed on s.s. *Aidinga*,
 at Sydney, 14th.

Messrs. E. C. Bouel and R. B. Lowry
 signed off s.s. *Changsha*, as 2nd and 3rd
 operators respectively, at Sydney, 14th.

Mr. E. C. Bouel relieved Mr. J. Elmore
 on s.s. *Largs Bay*, as 2nd operator, at
 Sydney, 15th.

Mr. T. Chalmers signed off s.s. *Echunga*,
 at Sydney, 15th, and relieved Mr. V. E.
 Stanley on s.s. *Melbourne*, at Sydney, same
 date.

Mr. J. R. Gilligan signed off s.s. *Aroona*,
 at Sydney, 15th.

Messrs. R. B. Lowry and S. H. Gover
 signed on s.s. *Hauraki*, as 3rd operators, at
 Sydney, 15th.

Mr. T. A. Jones signed off s.s. *Katoomba*,
 at Sydney, 16th, and signed on s.s.
Wyandra, at Sydney, 17th.

Mr. J. R. Gilligan relieved Mr. J. A.
 Cooper on s.s. *Kanna*, at Sydney, 22nd, and
 proceeded on Home Port Leave.

Messrs. J. P. Mulhall and R. E. Mann
 signed off s.s. *Victoria*, as 2nd and 3rd
 operators respectively, at Sydney, 22nd.

Mr. J. P. Mulhall signed on s.s. *Echunga*,
 at Sydney, 22nd.

Mr. A. Stuart was relieved by Mr. R. N.
 Stewart on s.s. *Bulla*, as senior operator,
 at Sydney, 24th.

Mr. G. R. Hore signed on s.s. *Eugowra*,
 at Melbourne, 10th.

Mr. F. Kettlewell relieved Mr. G. R. Hore
 on s.s. *Wonganella*, at Melbourne, 10th.

Messrs. V. B. Rippingdale and A. Tru-
 scott signed off s.s. *Arafura* as 2nd and 3rd
 operators respectively at Sydney, 26th.

Mr. R. C. V. Humphrey signed off s.s.
Cantara at Sydney, 28th.

Messrs. J. McTavish and H. B. Tyler
 signed off s.s. *Carina*, at Sydney, 28th.

Mr. V. P. Nevins signed off s.s. *Carina*
 as senior operator, at Sydney, 29th.

Messrs. R. C. V. Humphrey and H. B.
 Tyler signed on s.s. *Changsha* as 2nd and
 3rd operators, at Sydney, 28th.

Mr. J. McTavish relieved Mr. K. W.
 Downey as 3rd operator on s.s. *Largs Bay*,
 at Sydney, 28th.

Mr. T. Bannister relieved Mr. T. A. Jones
 on s.s. *Wyandra*, at Sydney, 28th.

Mr. G. Tracey signed off s.s. *Barwon*, at
 Sydney, 30th, and proceeded on Home Port
 leave.

Mr. G. R. Hore signed off s.s. *Wonganella*,
 at Melbourne, 15th, and signed on s.s.
Eugowra, at Melbourne, 17th.

Mr. F. Kettlewell signed off s.s. *Eugowra*,
 at Melbourne, 17th, and signed on s.s. *Won-
 ganella* same date.

Mr. C. E. Robinson signed off s.s. *Bom-
 bala*, at Melbourne, 17th, returned to Syd-
 ney and proceeded on Home Port leave.

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Highlights of Radio Broadcasting

(Continued from page 77.)

This information, together with a description of your receiver and radio experience, should be sent to the Supervisor of Radio for your District, whose address can be readily obtained through the radio editor of your newspaper or from the operator's or station license of any nearby amateur. The Supervisor will gladly investigate the matter and your information will be of real help to him in the drawing up of further regulations of the Department of Commerce for the improvement of radio reception. At the same time, you should not fail to contribute your quota to your neighbour's enjoyment of radio concerts by careful observance of the few simple suggestions given above.

Trans-Pacific Wireless Tests

(Continued from page 85.)

April 10:

Aust., 1900 miles, 3BM (2000 miles, 4), 3BD (10).

N.Z., 900 miles, 2AP (wkd.).

U.S.A., 'Frisco, 5200 miles, KGO, KDKA (6400 miles, 95 metres, daylight), 5BE, 8RY, 1VL.

April 12:

Aust., 1700 miles, 3BD.

N.Z., 600 miles, 2AC, 2AQ, 2AA, 2AR, 2AP (wkd.), 4AA (wkd.), 2XA (wkd.).

U.S.A., 'Frisco, 5600 miles, 9AFY, 9CUN, 9DWN, 6ADD, 3AJ, 9CIU, 9EAK, 6AGK, 7SH, 8SV, 6ZBF, 6AAQ, 6ZBA, KDKA (6600 miles).

April 13:

Aust., 1500 miles, 2HF (clear music), 3BD, 3JU.

N.Z., 2XA (wkd.), 3AF (wkd.), 2AP (wkd.), 1AX (wkd.), 1AA (wkd.).
U.S.A., 'Frisco, 5800 miles, 7EM, 7SF, 6NB, 7SH, 7AQ, 6AGK, 6AOL, KDKA (95 metres, 6800 miles).

April 15:

Aust., 1200 miles, 2YI (4), 2BC (5), 2IJ, 3BH (29), 2YG (6), 2BF.

U.S.A., 'Frisco, 6000, 4CK, 6UK, 6AFI, 6RN.

April 16:

Aust., 900 miles, 3QW (3), 2JM (speech O.K., C.W., 6), 2IJ (7), 2LO (7), 2ZZ (3).

N.Z., 2AB, 3AF, 1AX (wkd.), 4AQ (wkd.), 4CK.

April 17:

Aust., 520 miles, 2SO (C.W.11), 2YG (C.W. 23 Buzzer 4.5), 2IJ (wkd.), 2ZZ (2), 7AA (6).

N.Z., 2AD, 2AB.

I will be very pleased to have the logs of any experimenters who heard 2CDM working, together with any particulars of interest.

Logs have already been received from Mr. L. S. Spackman, Auckland,

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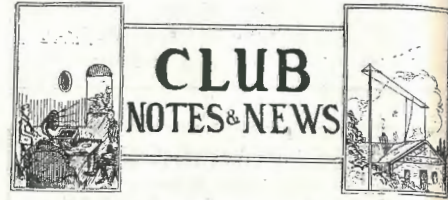
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Phone: U 3441.

Mr. E. A. Cox (3BD), Mr. H. C. C. McCabe, N.Z., and Mr. Smethurst, Kalgoorlie, W.A.



WIRELESS INSTITUTE OF AUSTRALIA.

QUEENSLAND DIVISION.

THE announcement that the whole of the debt owing when the existing committee of the Wireless Institute of Australia (Queensland Division) took over control had been wiped off was greeted with cheers at the annual meeting of the Institute held in Brisbane a few days ago. All current expenses had been met, and the incoming committee was left with a clean sheet with which to start the year. The work of Mr. A. N. Stephens, Secretary, during the year, came in for considerable praise from the members, particularly in the direction of assisting to wipe out the deficit with which the Institute had been faced. The syllabus for the coming year contains some attractive features, and present indications point to a highly successful season. The election of officers resulted as follow:—Patron, Professor Hawken, B.Sc., M.E., M.I.E., Aust.; Vice-patron, Professor Parnell, M.S.C., and Dr. Boyd, D.Sc.; Honorary Members, Messrs. J. M'Conochie, F. Walker, A.M.I.E.E., S. V. Colville, J. Sutton, M.I.E.E., C. W. Isles; President, Mr. A. G. Jackson, A.M.I.E.E., A.M.I.E., Aust.; Vice-presidents, Messrs. S. H. Smith, W. I. Monkhouse, A.M.I.E.E., A.M.I.E., Aust., A. Langford-Ely, W. Ranger, B.Sc., and A. K. Lawton; Council, Messrs. Casperson, Ingram, Dutton, Searle, J. Hindman, and A. A. Jackson, A.M.I.E., Aust.; Honorary Secretary, A. N. Stephens; Honorary Treasurer, J. Williams; Honorary Auditor, H. Maddicks. The appointment of delegates to the Federal Council was held over till after the meeting of metropolitan clubs.

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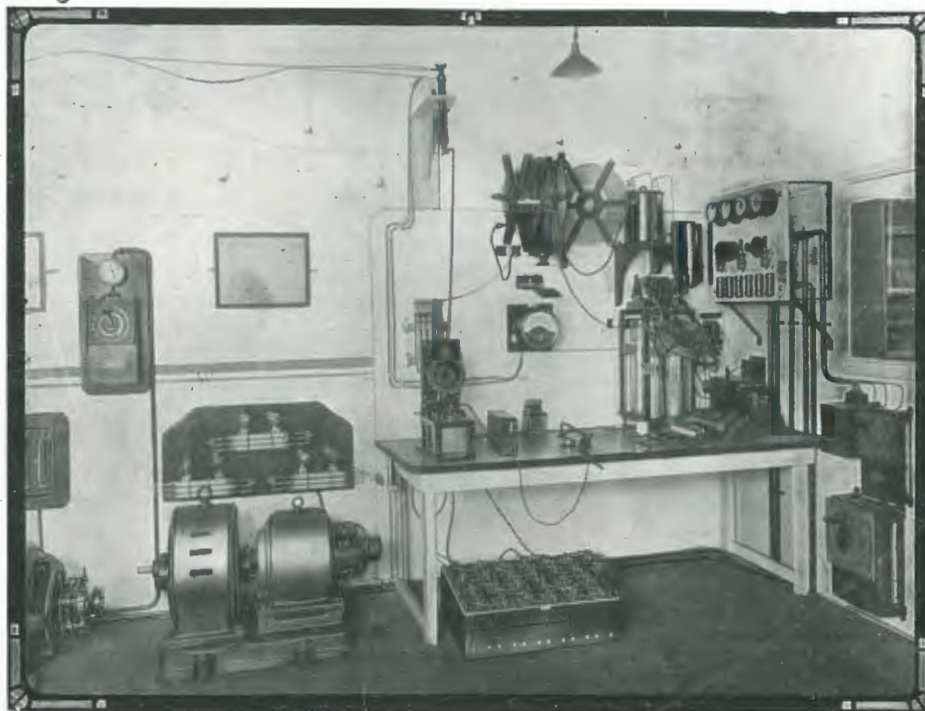
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