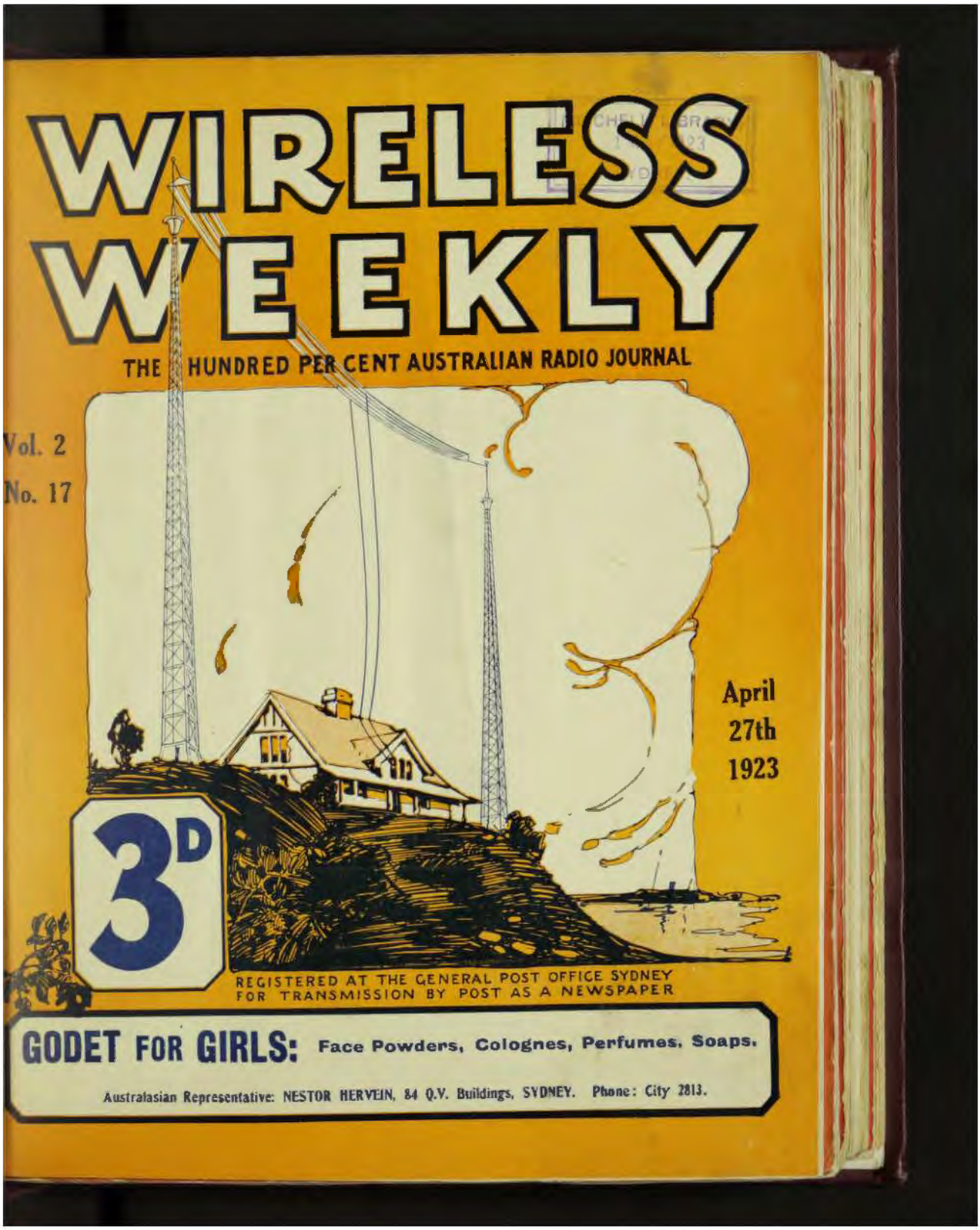
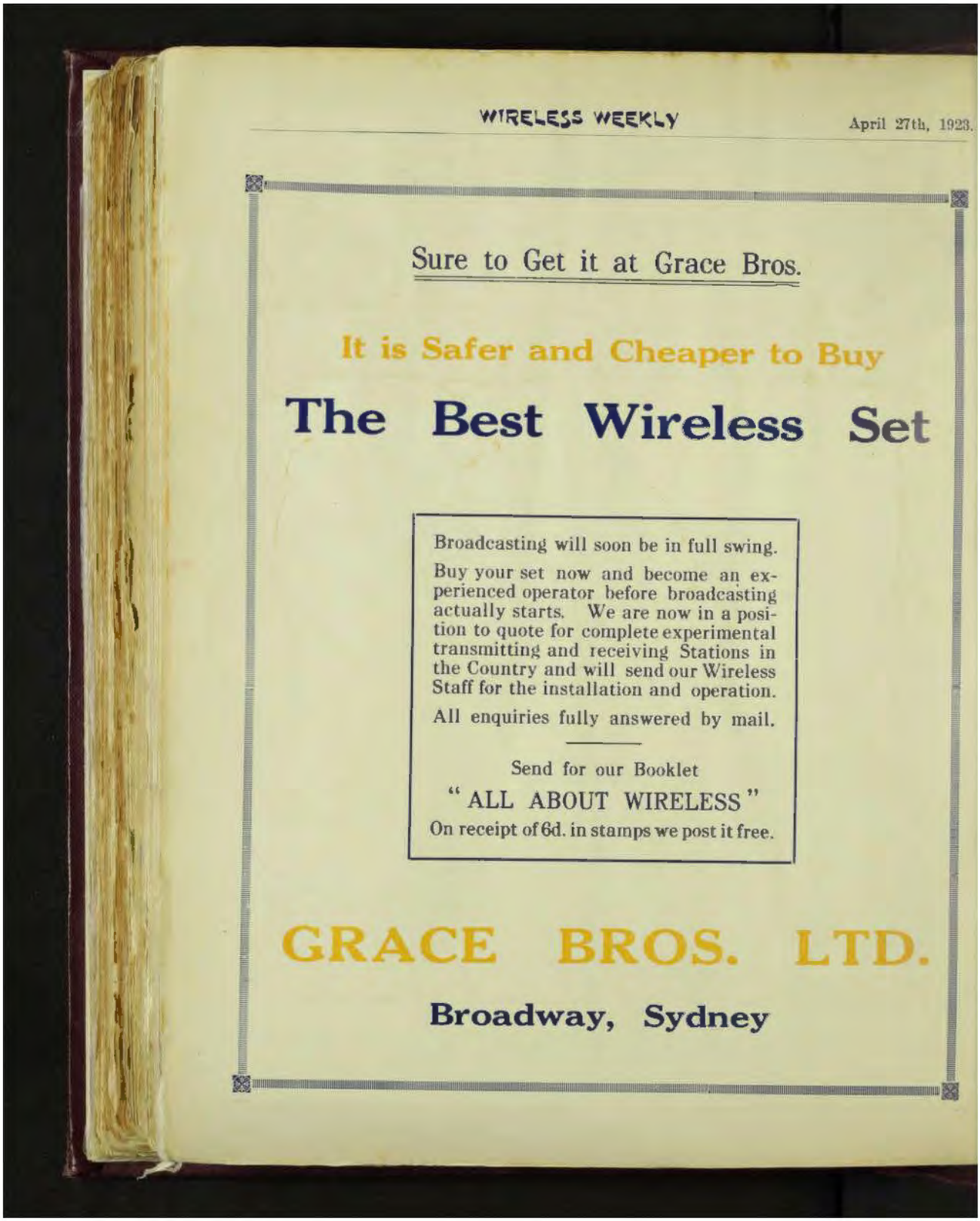
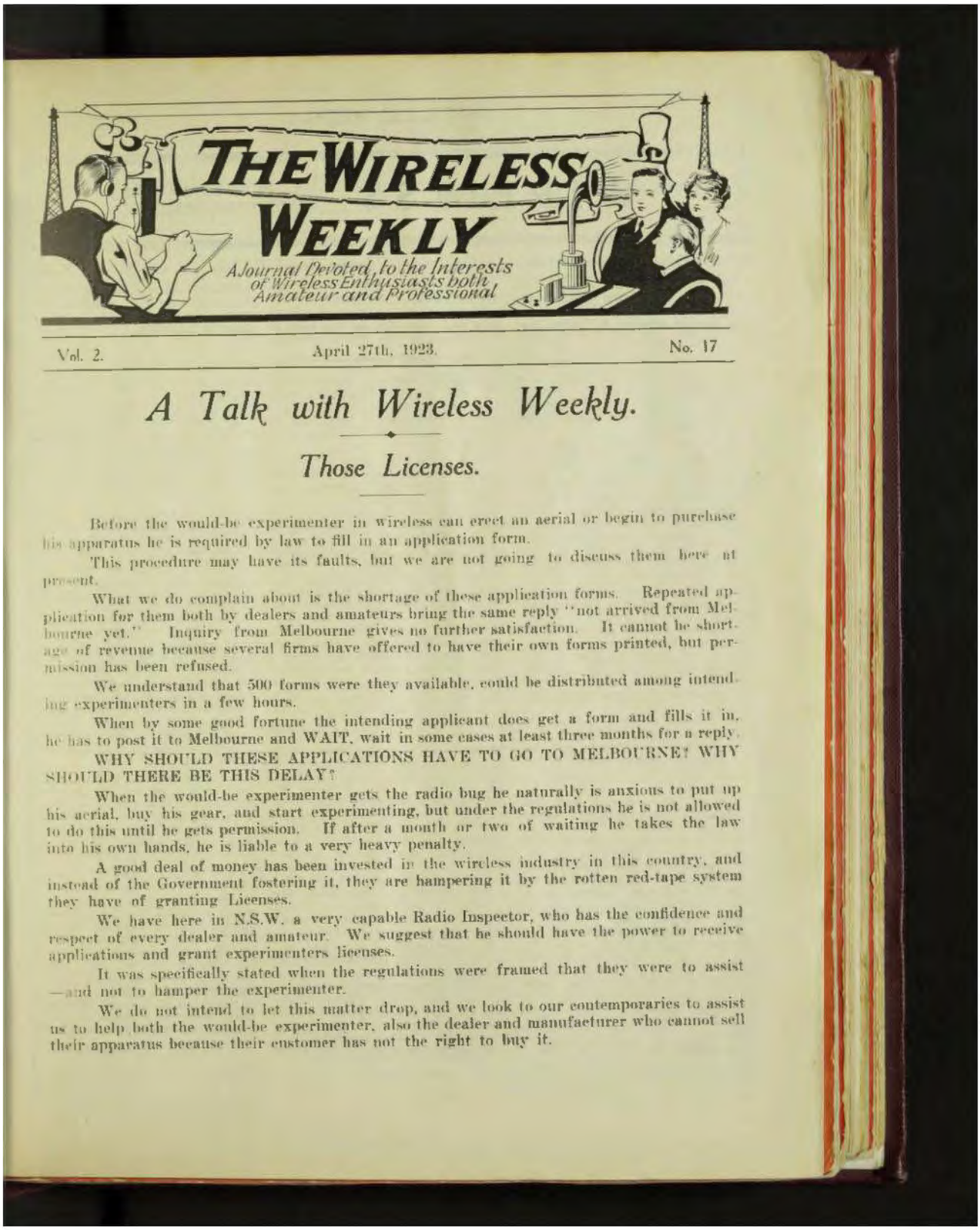






THE WIRELESS WEEKLY
A Journal Devoted to the Interests of Wireless Enthusiasts both Amateur and Professional

Vol. 2. April 27th, 1923. No. 17

A Talk with Wireless Weekly.

Those Licenses.

Before the would-be experimenter in wireless can erect an aerial or begin to purchase his apparatus he is required by law to fill in an application form.

This procedure may have its faults, but we are not going to discuss them here at present.

What we do complain about is the shortage of these application forms. Repeated application for them both by dealers and amateurs bring the same reply "not arrived from Melbourne yet." Inquiry from Melbourne gives no further satisfaction. It cannot be shortage of revenue because several firms have offered to have their own forms printed, but permission has been refused.

We understand that 500 forms were they available, could be distributed among intending experimenters in a few hours.

When by some good fortune the intending applicant does get a form and fills it in, he has to post it to Melbourne and WAIT, wait in some cases at least three months for a reply.

WHY SHOULD THESE APPLICATIONS HAVE TO GO TO MELBOURNE? WHY SHOULD THERE BE THIS DELAY?

When the would-be experimenter gets the radio bug he naturally is anxious to put up his aerial, buy his gear, and start experimenting, but under the regulations he is not allowed to do this until he gets permission. If after a month or two of waiting he takes the law into his own hands, he is liable to a very heavy penalty.

A good deal of money has been invested in the wireless industry in this country, and instead of the Government fostering it, they are hampering it by the rotten red-tape system they have of granting Licenses.

We have here in N.S.W. a very capable Radio Inspector, who has the confidence and respect of every dealer and amateur. We suggest that he should have the power to receive applications and grant experimenters licenses.

It was specifically stated when the regulations were framed that they were to assist —and not to hamper the experimenter.

We do not intend to let this matter drop, and we look to our contemporaries to assist us to help both the would-be experimenter, also the dealer and manufacturer who cannot sell their apparatus because their customer has not the right to buy it.

WIRELESS — A PLEA FOR ITS ENCOURAGEMENT

Address Before the Wireless Institute of New South Wales by George A. Taylor, Assoc. M. Inst. E. Aus.

The following article was an address given before the Wireless Institute of Australia, N.S.W. Division, by Mr. George A. Taylor, Assoc. M. Inst. E. Aus., one of those men who have really helped forward science in Australia.

In reading this address, it will be seen that Australia has not been so far behind, in fact it is in advance of many other countries who are really getting the credit of many inventions that should rightly belong to Australia.

The world to-day is alert. For ages it had wearied on. Events happened and the world woke for a space, then it slept again in its matter-of-fact way.

To-day it is wide awake; the crash of the Great War upon history sounded a thump that is still reverberating round the earth in the changing conditions of national Governments, in the altered views of human rights, but more in the realm of scientific achievement; and nowhere more than in "wireless communication" have better results been achieved.

Yet, different from other scientific investigations, wireless development did not want war pressure to stir it to activity. On the strength of its own merit, its wonders would have risen it to the great place it now holds in human attention. Though the world to-day is aware of wireless wonders of almost daily happening, it is not truly aware of what wireless really is, in fact its development has been so rapid that there has not been time to give the new science a proper name!

Since Hertz, in 1887, marshalled electro-magnetic forces, and by means of an oscillator sent out "beatings" that created waves that were received by a resonator, wireless has swiftly developed; and we note a great procession of clever inventors in the new science, from Branly, with his coherer, in 1890, Oliver Lodge, Ducretel, Marconi, Fleming, Fessenden, Lee de Forest, Poulsen and Armstrong, who have brought the science to the most wonderful on earth to-day; in fact, within the brief space of 30 years, wireless has developed from a spark between two metal balls one inch apart, to the spread of a song from Madame Melba to "listeners-in" almost all over the world.

The mention of Madame Melba (Australia's soprano) brings to notice the fact that Australia holds an interesting position in the world's wireless achievements, both from an experimental as well as from other points of view.

It is interesting to look back to 1909, when the great liner "Waratah," probably with a broken propeller shaft, drifted into obscurity without ever being heard of again; and there arose a general appeal for expediting wireless development. At that time very few considered its practical possibilities; hence the speaker, in order to interest the Australian Military Authorities as to its great value, had an interested party, Messrs. Kirby, Hannam and Wilkinson, joining with him in a demonstration at the Easter Artillery Camp at Heatheote (April, 1909), when the first two military wireless stations were established in Australia.

The aerials were rapidly erected from rough saplings, and what would to-day be called cumbersome apparatus, was carried over some of the roughest country in Australia. One station was a tent at Headquarters. Material found by the wayside being used to fit up a cave for the second station, a dilapidated door being utilised as a table. Wireless was to be used for transmitting the result of the artillery action. After a very anxious time, in which difficulties such as rain-water coming and shortening the circuits in the cave, communications were made between the two stations, and success was achieved.

In mentioning the ardent enthusiasm of the wireless operators, one cannot refrain from putting on record the encouragement given us by Lieut.-Col. Wells, Captain Christian, Captain Cox-Taylor and Major Rosenthal, the latter now being General Sir Charles Rosenthal.

Although this is but a few years ago, it seems a long time when one studies the heavy apparatus that was utilised at that period, such as the 6 inch coil, the large tuning inductance, and the case of "Leyden" jar condensers and the heavy gear, compared with the thermionic-valves and other handy fitments of to-day, yet the speaker's seemingly bulky wireless apparatus of that past period won the happy appreciation of Dr. Graham Bell, the inventor of the telephone, and also many happy moments with him during his visit to Sydney in 1910.

There was, however, one hindrance to experimenting, and that was a Wireless Act, that had been in operation since 1905, imposed a fine of £500 on unlicensed experimenters, and charged £3/3/- per year for those who desired to experiment. This so crippled wireless development, that in 1909 the Wireless Institute was formed, and the speaker, who had the honour to be its first Chairman had a motion carried by which the Postmaster-General reduced the license fee from £3/3/- to 10/6.

It is interesting to-day to look back at the first meeting that inaugurated an Australian Institute of Wireless Telegraphy, which some claim was the first in the British Empire, the minutes of the first meeting reading as follows:—

"On Friday, the 11th March, 1910, a number of persons interested in wireless telegraphy met at the Hotel Australia for the purpose of inaugurating an Institute of Wireless Telegraphy. On a motion by Mr. Hannam, seconded by Mr. Pyke, Mr. George Taylor was elected Chairman, and pointed out that investigations of wireless were to-day on the verge of an arena of wonder. They were like explorers of a strange country, where every step

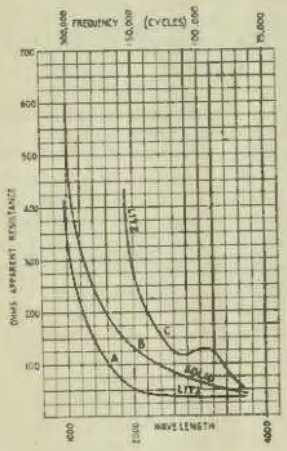
Continued on Page 14

Litzendraht v. Solid Wire.

By RALPH R. BATCHER
(Engineering Staff, Western Electric Company)

Litzendraht, a special cable composed of a number of strands of fine insulated wire, has long held the reputation of giving lower losses with radio-frequency currents than any other type of wire. The statement is not without foundation, for in most cases coils of high-grade Litzendraht may show a five to fifty per cent. decrease in resistance, compared to solid wire, if all the strands are perfect.

On test, it has been found that a coil employing Litzendraht may act perfectly for six months or a year, and then develop troubles which indicate a broken strand or so in the cable with which the coils are wound. This often occurs, no matter how carefully the coils are manufactured, mounted and tested, although it does not make the set inoperative and would pass unnoticed by many users. Manufacturers who are



intent on satisfying the most discriminating amateur have investigated all factors which cause excessive resistance in Litzendraht coils.

Recent experiments have shown that solid copper (No. 25 B. & S.) with one layer of cotton and one of silk, is equivalent to the Litzendraht used (20 strands of No. 38). Complete measurements were made on equivalent coils so that a direct comparison might be made. To make sure that there was no broken strands to begin with in the Litzendraht, each strand was tested for continuity separately, stripped of enamel and separately tinned. Upon soldering, the complete direct-current resistance of the cable was measured and checked with the theoretical resistance. When tests were completed on this coil, one strand was intentionally broken at one end and the tests repeated, after which another wire was broken at the opposite end.

The first was a practical test in a receiver. It was found that the solid wire coils will oscillate (for c.w. reception)

with the filament current just as low as when the perfect stranded wire coil was used. This test was thought to represent actual receiving conditions.

The high-frequency resistance was next measured. With ordinary methods of measuring high-frequency resistance, it is impossible to separate the resistance from the impedance, and as the measurements were made at frequencies very near the natural period of the coil, the resistance was apparently greatly increased at the higher frequencies. The reason for this will be taken up later.

A graphical presentation of the results is shown on the accompanying graph. Curve "A" represents the apparent resistance of the coil wound with Litzendraht in which each strand was tested and found perfect, and perfect connection made with each strand at each end. Curve "B" shows the apparent resistance for the similar coil wound with solid wire. Curve "C" shows the same coil as used in "A" with one strand purposely broken near one end.

It will be seen that Coil "A" has the lowest resistance. Strictly speaking, however, Curve "B" should be moved 25 metres to the left in order that direct comparisons may be made, as it happened that in this case the solid wire coil had a natural wavelength 25 metres higher than the Litzendraht coil. This difference is relatively small and may be due to any of a number of reasons.

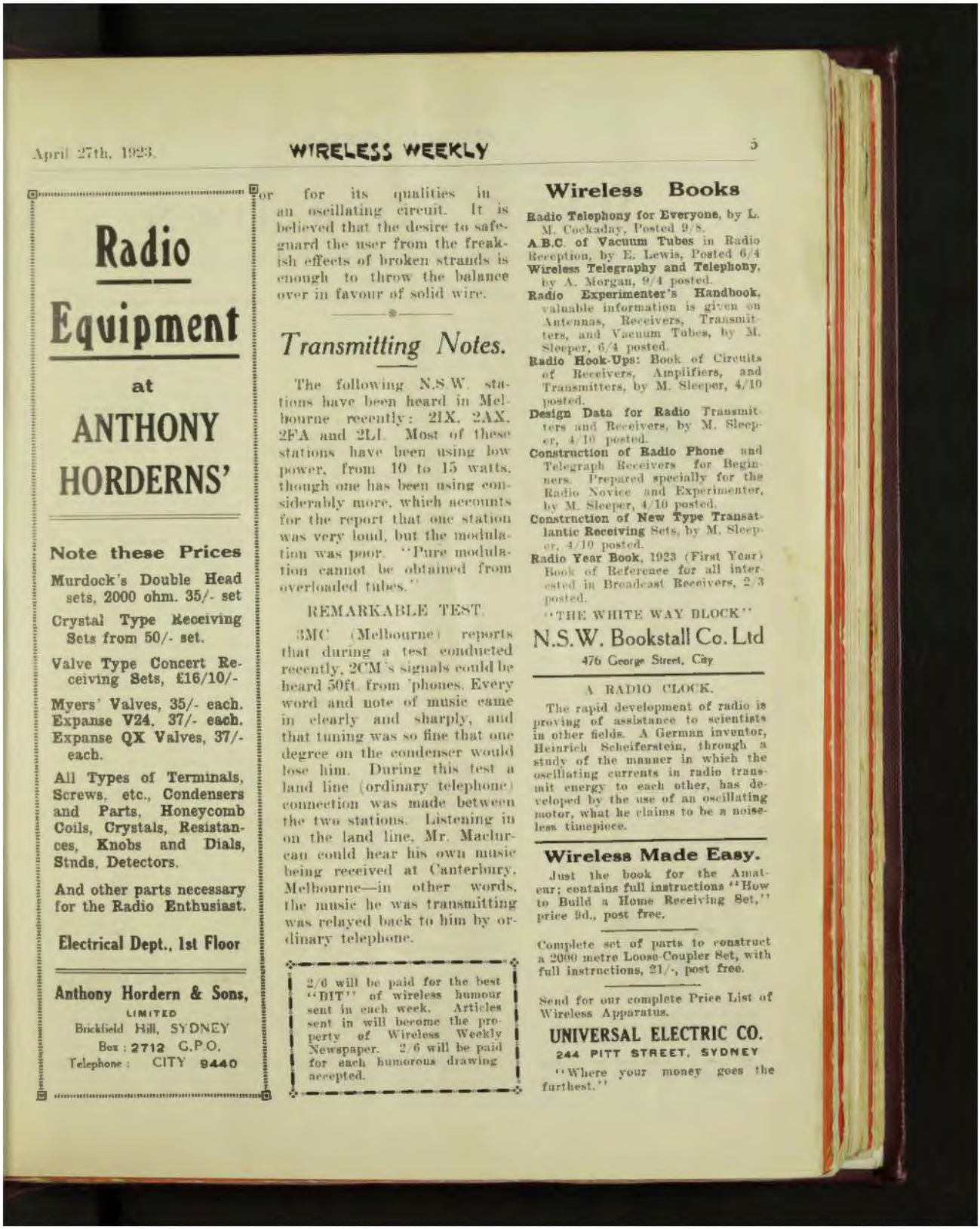
Curve "C" has several outstanding features: the distributed capacity has increased apparently to about four times its original value, since the natural period is about doubled. There is also another frequency lower than the fundamental, at which the resistance increases.

Another strand was broken, this time at the end opposite the first break. The result was that the coil seemed to respond slightly to several wavelengths other than its natural one, giving a curious effect in tuning and being very poorly adapted for precise work in a regenerative receiver.

The apparently high resistance shown on the curves at the lower wavelengths may surprise some radio experimenters. That these results are logical may be shown by the fact that theoretically a coil has infinite impedance at a frequency corresponding to its natural wavelengths. In fact, any inductance shunted by a condenser (in this case it is shunted by the distributed capacity) will act as a very high impedance to frequencies at and near the natural or resonant frequency of the combination.

We can, however, console ourselves by the fact that a large part of this apparent resistance at such frequencies is due to the reactance, and so will not absorb energy and produce heat as a real resistance would. The method used for measuring the above resistance was to couple the coil very loosely to a vacuum-tube oscillator. A thermo-couple, condenser (variable, having negligible losses) and a high frequency resistance box made up the rest of the circuit with the coil. The change in the deflection of the galvanometer across the thermo-couple was noted when resistance was added to the circuit and the coil resistance computed from such data.

The problem then resolves itself into choosing the lesser of two evils. Laboratory measurements show Litzendraht superior as long as it is in good condition. Actual tests in a receiver show apparently no difference as far as sharpness of tuning is concerned



or for its qualities in an oscillating circuit. It is believed that the desire to safeguard the user from the freakish effects of broken strands is enough to throw the balance over in favour of solid wire.

Transmitting Notes.

The following N.S.W. stations have been heard in Melbourne recently: 2IX, 2AX, 2FA and 2LI. Most of these stations have been using low power, from 10 to 15 watts, though one has been using considerably more, which accounts for the report that one station was very loud, but the modulation was poor. "Pure modulation cannot be obtained from overloaded tubes."

REMARKABLE TEST.

3MC (Melbourne) reports that during a test conducted recently, 2CM's signals could be heard 50ft. from 'phones. Every word and note of music came in clearly and sharply, and that tuning was so fine that one degree on the condenser would lose him. During this test a land line (ordinary telephone) connection was made between the two stations. Listening in on the land line, Mr. Maclurcan could hear his own music being received at Canterbury, Melbourne—in other words, the music he was transmitting was relayed back to him by ordinary telephone.

2/6 will be paid for the best "BIT" of wireless humour sent in each week. Articles sent in will become the property of Wireless Weekly Newspaper. 2/6 will be paid for each humorous drawing accepted.

A RADIO CLOCK.

The rapid development of radio is proving of assistance to scientists in other fields. A German inventor, Heinrich Scheiferstein, through a study of the manner in which the oscillating currents in radio transmit energy to each other, has developed by the use of an oscillating motor, what he claims to be a noiseless timepiece.

MAKE YOUR OWN

Valve Current from A.C. Mains

Notes on the Derivation of Current for Plate and Filament in Receiving Circuits.

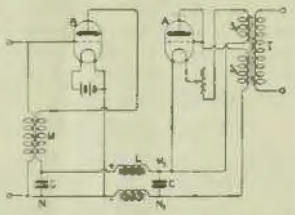
Great increase in the number of receiving stations, and the advantage which would result from the suppression of accumulator batteries has directed the attention of many experimenters to endeavour to utilise the current from the public main, both for filament and plate circuits of receiving apparatus, writes L. F. Fogarty, A.M.I.E.E., in "Wireless World."

Early in 1919, M. Vallette, of Messrs. Ducretet, had developed and had in regular use an arrangement which furnished direct current to the plate circuit, operating from the mains at 100 volts alternating, and several three-valve H.F. amplifiers were constructed on this system.

The combination consisted of a small transformer T (Fig. 1), and one valve A. The transformer was equipped with two secondaries, S1 and S2, the first, S1, furnishing a high voltage alternating current of which one phase was rectified by an ordinary three-electrode valve connected in the customary manner, and whose filament was supplied by energy taken from the additional low voltage secondary S2. The choking coils L and the condensers C, when suitably chosen, form an energy storage system which ensures that the voltage available at the points M and N was continuous despite its pulsating nature at the points M1 N1. This was the first satisfactory attempt to use alternating current for this purpose within the knowledge of the writer.

The same year Mr. Barthelemy took out a patent on behalf of the Societe Independante de T.S.F. for an arrangement using alternating currents for filament heating, and having the object of overcoming the humming noises usually associated with any attempt to utilise this current in wireless work.

To reduce to a minimum the noises produced by the nature of the supply, it was proposed to bring what is usually known as the common or neutral point to a position electrically equidistant between the ends of the filament, as for example in the diagram Fig. 2, illustrating the so-called potentiometer method.



Immediately following this, M. Moye disclosed his ingenious solution of the problem which comprised a high frequency amplifier supplied entirely from alternating current (plate circuit supplied with H.T. rectified A.C. analogous to M. Vallette's method), and in which a galena crystal rectified the high frequency amplified currents.

The foregoing methods have been fully described by Dr. P. Corret in the course of a highly interesting article appearing in No. 15 of T.S.F. Moderne, and many French amateur experimenters using the information there made known have succeeded in producing very convenient and moderately efficient three to five stage amplifiers. It was found that in general these were more noisy than those whose energy was drawn from accumulators and dry cells.

The difficulties encountered in using amplifiers supplied from A.C. arise mainly from the fact that any attempt to make even moderate use of reaction for amplification will immediately set up self oscillations, and in addition the following inconveniences were experienced:

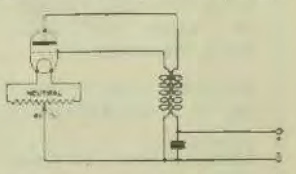
1. A slow waxing and waning of strength in the received signals.

2. A humming sound at the supply of frequency, which increases rapidly as the reaction is brought into use, and which becomes gravely inconvenient before the coupling of the reaction coil has become sufficiently close to give maximum amplification. It was therefore necessary to work far from the point of maximum amplification to obtain freedom from distortion and parasitic noises.

Experts were convinced that a more perfect solution of the problem could be found, and in fact the Societe Ducretet, after a long period of study and experiment on a single valve receiver, was able to elucidate several obscure matters and published several alternative diagrams of suitable circuits. It appears that the central feature for success is the use of a valve having special patented characteristics.

They set up a single valve receiver in accordance with Fig. 3, comprising a tuned grid circuit, with a reaction coil B, a telephone in the plate circuit, and further arranged for the plate to be supplied from a true source of direct current such as dry cells, and the filament with alternating current by means of a transformer shunted by a resistance enabling access to be gained to the middle point of the filament potential.

Having set up and put into operation this arrangement a periodic

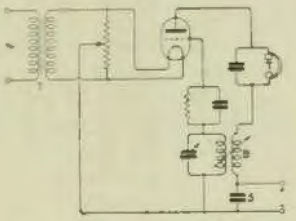


humming noise of A.C. even with very loose coupling of the reaction circuit was still experienced, but on the other hand, and using the circuit shown, it is easy to see that this noise cannot be due to any L.F. inductive effects, and the conclusion therefore is that the noises heard in the telephone are due to harmonic variation in the temperature of the

filament during a complete A.C. cycle.

If we now slowly bring into use the reactance coil B, we shall cause a roaring noise to be heard in the telephones, which will increase rapidly with the degree of coupling.

This noise has its origin in the aforesaid temperature variation of the valve filament, as the varying plate current due to this cause is being amplified in the usual manner.



It is well known that the temperature of the filament controls to a considerable extent the conditions under which a valve will oscillate, and it is easy to imagine circumstances such that the valve only oscillates when the filament of the valve is at its maximum temperature, i.e., when the voltage of the transformer T (Fig. 3) is at peak value, and equally that the valve stops oscillating when the filament temperature falls. Under the foregoing circumstances there will be produced in the circuits "chopped" trains of continuous waves of group frequency, not necessarily equal to that of the main alternating current supply to the filament.

The foregoing explains the distortion and variation in strength of signals received on those sets. For the degree of amplification obtained with a reaction coil varies very rapidly when nearing the point of oscillation, the temperature of the filament being constant; but if this latter varies and is sometimes high enough to oscillate, and at others too low, there will be set up periodic variation in the value of the amplified current produced of a frequency akin to that of the associated A.C. supply. This tends to explain the partial failure of M. Moye's ingenious method of rectifying the plate circuit current by a galena crystal.

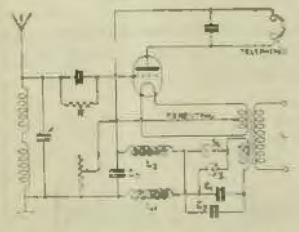
The cause of the noise having been thus determined, it was easy to suggest various possible solutions, and trials were made with valves fitted with several filaments, each simultaneously heated by alternating currents differing in phase, special attention being given to a valve with two filaments supplied from two phase A.C. and another having a single filament heated with high frequency currents.

Ultimately the firm of Ducretet adopted a method which, whilst not necessarily the most perfect, was certainly the most practical, and took the form of a valve with a heavy filament of considerable heat storage capacity, and requiring 3 amperes at 2 volts. Such a filament is of great strength and durability as compared with the standard type, and a valve as described was covered by a French provisional patent No. 182570.

One of these special valves incorporated into the circuit shown in Fig. 3 resulted in an almost perfect avoidance of noise, for although a very slight humming persists it is negligible as compared with other noises, such as jamming, heterodyning, etc., and serves to show that variation of filament temperature still exists, but highly diminished in magnitude, for broadcast concert music can be excellently received, pure in tone, and with reaction amplification close to the point of oscillation.

Where alternating current is available, the slight increase in energy consumption from 3 to 6 watts is of no importance as will readily be seen, for the current in the one case is taken from accumulators, and in the other from a public supply main.

Energy from the main will cost from 4d. to 6d. per 1000 ampere hours, while from accumulators of the portable type the same energy would cost at least as many shillings. Therefore in addition to cheaper running costs we are enabled to dispense with the troublesome accumulator battery, and the bother of conveying same to the charging station at regular intervals.



From the experiments outlined above, experience has been gained and incorporated into a set shown in diagram Fig. 4. This receiver is entirely supplied with alternating current, but is arranged so that the usual high tension and accumulators may be substituted if and when desired.

The transformer was fitted into a separate box, and wound to provide 100 v rectified continuous current to the plate and 2 v. to the filament circuit of the valve. The main feature of the transformer box is the two minute sealed electrolytic cells, for rectifying the plate circuit supply.

Experience over some weeks has shown that the small rectifier cells have proved satisfactory in normal work, and in addition the cells are easily made, and can be replaced in a few seconds.

A considerable number of receivers of this kind are in use in France, and the Eiffel Tower telephony transmissions are regularly received even in the southern confines of that country.

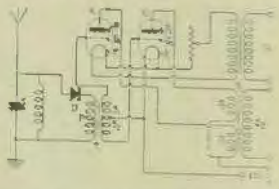
Additional to the foregoing, it may be of interest to indicate an example of a two-valve amplifier operating on alternating current.

Suppose for example it is desired to amplify signals received on the crystal detector D, on Fig. 5. We can utilise for the first stage two valves V1 and V2, having equal characteristics, and a transformer T1, with two secondaries S1 and S2 connected to the grids G1 and G2, in such a way that an oscillation in V1 whilst making the grid G1 positive, simultaneously makes Grid G2 negative. From this it follows that there will be an increase in the plate current of V1, and a diminution of plate current in V2.

Now, if we pass these two plate currents into the two primaries P2 and P3 of the transformer T2, in such a way that the resultant oscillation transferred to secondary S2 is the sum of the two oscillations, i.e., that the flux produced by each D.C. plate current is in opposition, and that the two secondaries are alike, we can readily see that any disturbance of an alternating nature will produce equal and opposite ef-

fects, and the resultant flux will be zero. Therefore there will be no parasitic currents in the secondary S2, but only those oscillations which it is desired to amplify.

The secondary S2 may be connected to a further stage comprising a duplication of the above, but in such case the combined effect of the four valves would be equal to three only connected in the usual manner, and which is ordinarily considered as



about the limiting number of stages for low frequency amplification.

These notes have been prepared from a considerable series of experiments, on the lines indicated by many writers in the French technical press, and are contributed in the hope of stimulating keen amateurs in this country to continue these, as good and efficient receiving apparatus operated direct from the public supply will represent a considerable advance in the practical application of radio science.

OLD DR. RADIO MAY CURE INTERNATIONAL ILLS.

Some idea of the effect which radio is destined to have in welding together the fragments of a broken world may be derived from the recent announcement of a "radio letter" service to London and Germany at the rate of only six cents a word. To what extent the nations will be brought into closer political, business and social contact by the extending use of radio is an interesting theme for speculation.

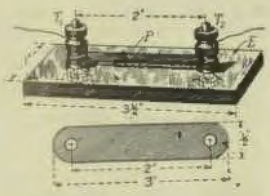
* * *

RECEIVING SETS AS BADGES OF DISTINCTION.

Foreign governments have not shown a consuming interest in the radio amateur; indeed, the American amateur cannot really appreciate his unusual advantages until he knows of the restrictions that are placed upon his fellows in other countries. The latest European country to exact tribute from the amateur is Czechoslovakia, which announces that each radio receiving set must be registered, and taxed—and not everyone will be permitted to own one.

A Simple Gridleak.

The accompanying figure shows a very simply constructed grid-leak or anode resistance. On a small piece of ebonite or wood E are fixed to terminals, T1 and T2, of substantial size, say, 2 B.A., of the double type. Between the two lower nuts is tightly clamped



a piece of blotting paper P, which has been thoroughly soaked in Indian ink and allowed to dry. The size of this blotting paper is shown in the lower portion of the figure. A washer above and below each end of the piece of blotting paper P is arranged, so that the paper is not torn by tightening up the middle nut. Various resistances may be obtained by double or treble soakings of the blotting paper in Indian ink. When an anode resistance (of about 70,000 ohms) is required the terminals may be brought within one inch of each other, and several strips of paper on top of each other may be used.

THE VALUES OF CONDENSERS GRID LEAKS, ETC.

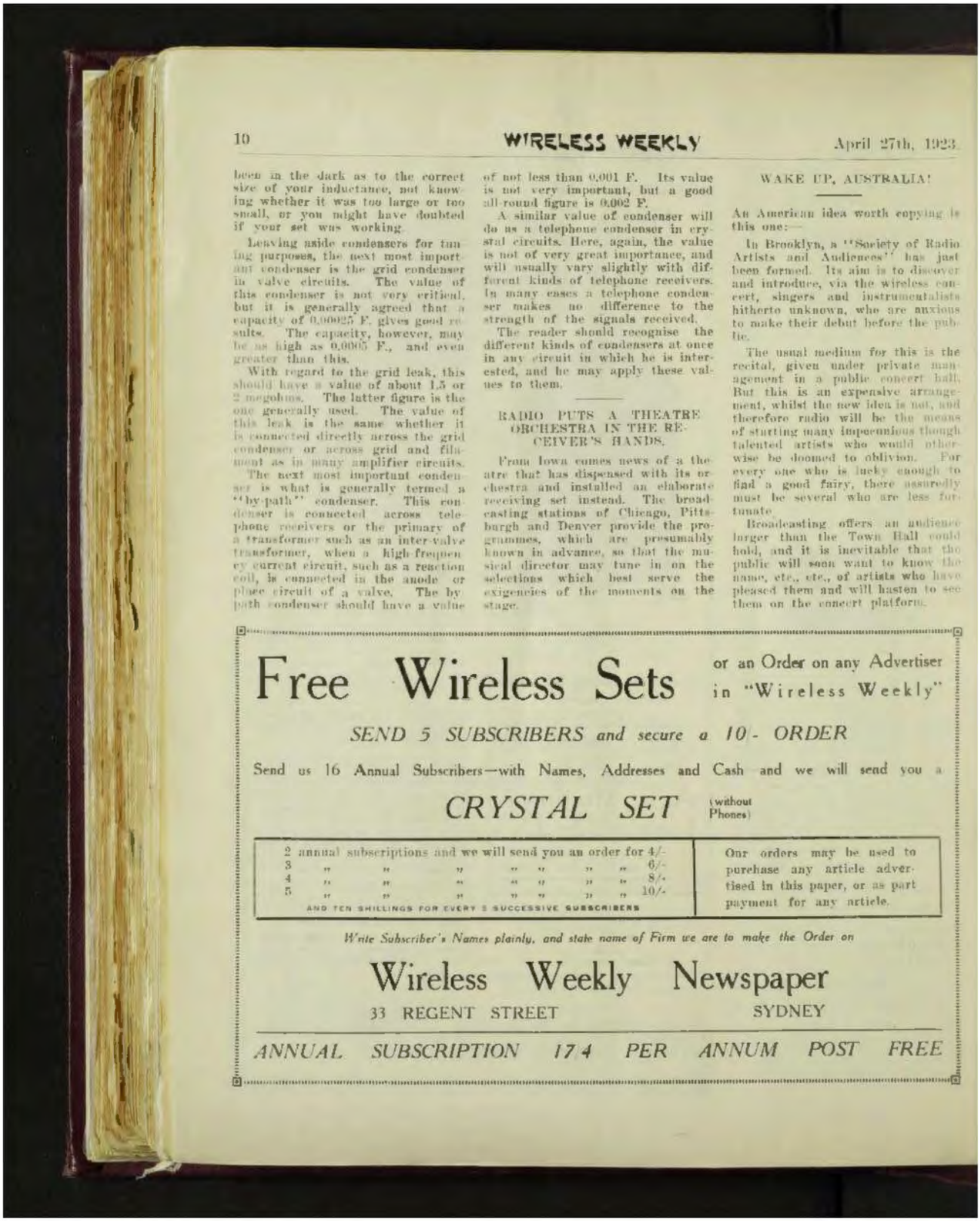
A few words on a subject of great importance to the experimenter.

It is a curious fact, but the values of condensers, grid leaks, etc., always present a difficulty to the beginner. He will see a circuit and will immediately begin to wonder what the various values of the condensers are, and if they are not given, he will feel disappointed.

If one knows what a condenser is for, there should be no question as to its best value. As a matter of fact, the values of condensers are not particularly important in most circuits. The most important condenser, of course, is the variable condenser for tuning purposes, and in this case its maximum capacity is the one which chiefly counts. For tuning purposes, a capacity of 0.001 F. (F. is, of course, the correct abbreviation for "microfarad"), may be taken as a good all-round figure for general reception. With such a condenser it is possible to cover an appreciable range of wave lengths with a fixed inductance, or, if an inductance fitted with tappings is used, the tappings may be cut down to a minimum.

In the case of the ordinary type of condenser, a capacity of 0.001 F. would be rather large when working upon low wave lengths. When such a large condenser is employed, the slightest movement of the handle causes a large variation in the capacity of the condenser, and consequently very fine tuning is not possible on short wave lengths. If, however, a very small variable condenser is connected in parallel with the main condenser, this trouble is avoided. Such a variable condenser is generally known as a "vernier" condenser.

A vernier condenser for tuning purposes is not needed if a smaller variable main condenser is used, e.g., 0.0005 F., or even smaller. When, however, you wish to receive long wave lengths, you will find that this condenser will not be sufficiently large to give you a wide variation of wave lengths with a minimum of inductance variations. It is, however, a matter of choice in each individual case. It is to be noted, however, that the loudest signals will be obtained when a fairly large inductance is used and only a small value of capacity. On the other hand, a condenser having a fairly large capacity is very useful when carrying out experimental work, as it is much easier to pick up a station. For example, if your inductance is found to be on the small side and you pick up Paris with a condenser having a capacity of 0.001 F. full in, you would probably add more inductance and work lower down on the condenser. If, on the other hand, you had used a 0.0005 F. condenser, you would probably not have heard the Paris signals at all, and you would have



been in the dark as to the correct size of your inductance, not knowing whether it was too large or too small, or you might have doubted if your set was working.

Leaving aside condensers for tuning purposes, the next most important condenser is the grid condenser in valve circuits. The value of this condenser is not very critical, but it is generally agreed that a capacity of 0.00025 F. gives good results. The capacity, however, may be as high as 0.0005 F., and even greater than this.

With regard to the grid leak, this should have a value of about 1.5 or 2 megohms. The latter figure is the one generally used. The value of this leak is the same whether it is connected directly across the grid condenser or across grid and filament as in many amplifier circuits.

The next most important condenser is what is generally termed a "by-path" condenser. This condenser is connected across telephone receivers or the primary of a transformer such as an inter-valve transformer, when a high frequency current circuit, such as a reaction coil, is connected in the anode or plate circuit of a valve. The by-path condenser should have a value of not less than 0.001 F. Its value is not very important, but a good all-round figure is 0.002 F.

A similar value of condenser will do as a telephone condenser in crystal circuits. Here, again, the value is not of very great importance, and will usually vary slightly with different kinds of telephone receivers. In many cases a telephone condenser makes no difference to the strength of the signals received.

The reader should recognise the different kinds of condensers at once in any circuit in which he is interested, and he may apply these values to them.

RADIO PUTS A THEATRE ORCHESTRA IN THE RECEIVER'S HANDS.

From Iowa comes news of a theatre that has dispensed with its orchestra and installed an elaborate receiving set instead. The broadcasting stations of Chicago, Pittsburgh and Denver provide the programmes, which are presumably known in advance, so that the musical director may tune in on the selections which best serve the exigencies of the moments on the stage.

WAKE UP, AUSTRALIA!

An American idea worth copying is this one:—

In Brooklyn, a "Society of Radio Artists and Audiences" has just been formed. Its aim is to discover and introduce, via the wireless concert, singers and instrumentalists hitherto unknown, who are anxious to make their debut before the public.

The usual medium for this is the recital, given under private management in a public concert hall. But this is an expensive arrangement, whilst the new idea is not, and therefore radio will be the means of starting many impecunious though talented artists who would otherwise be doomed to oblivion. For every one who is lucky enough to find a good fairy, there assuredly must be several who are less fortunate.

Broadcasting offers an audience larger than the Town Hall could hold, and it is inevitable that the public will soon want to know the name, etc., etc., of artists who have pleased them and will hasten to see them on the concert platform.

OUR WIRELESSES COLUMNS.

Mr. Chas. D. Maclurean, 2CM, has become a member of the American Radio Relay League.

Everyone will be pleased to know that the Burwood Radio Club are at last seriously tackling the problem of "Bad Hum" that spoils their otherwise excellent telephony. In the near future listeners-in may expect much improved modulation. Other transmitters please copy.

Mr. J. W. Robinson is concentrating on radio frequency amplification. He is at present building a two stage panel.

Mr. J. S. Marks and Mr. Marsden are both nearly ready with their transmitting sets. No doubt within a few days you will hear their voices per medium of the aether.

Mr. Crocker has just completed a Hetrodene wavemeter, which has been calabrated from Mr. Maclurean's standard.

Mr. Todd, the well-known amateur at Tamworth, reports hearing the following stations on telephony: 2CM, 2IX, 2FA, 2LI, 3JU, 3BY, 3BQ and 3MC.

It is reported that Mr. Sandel, of Manly, is now using a correct wave-length, i.e., since his station has been visited by the Radio Inspector.

Mr. Maclurean's rough joke re Fluffy Ruffles, last Wednesday evening, was not in keeping with his wave-length—it was broad.

North Sydney Church of England Grammar School have started a Radio Club. We would be pleased to see more clubs started at schools.

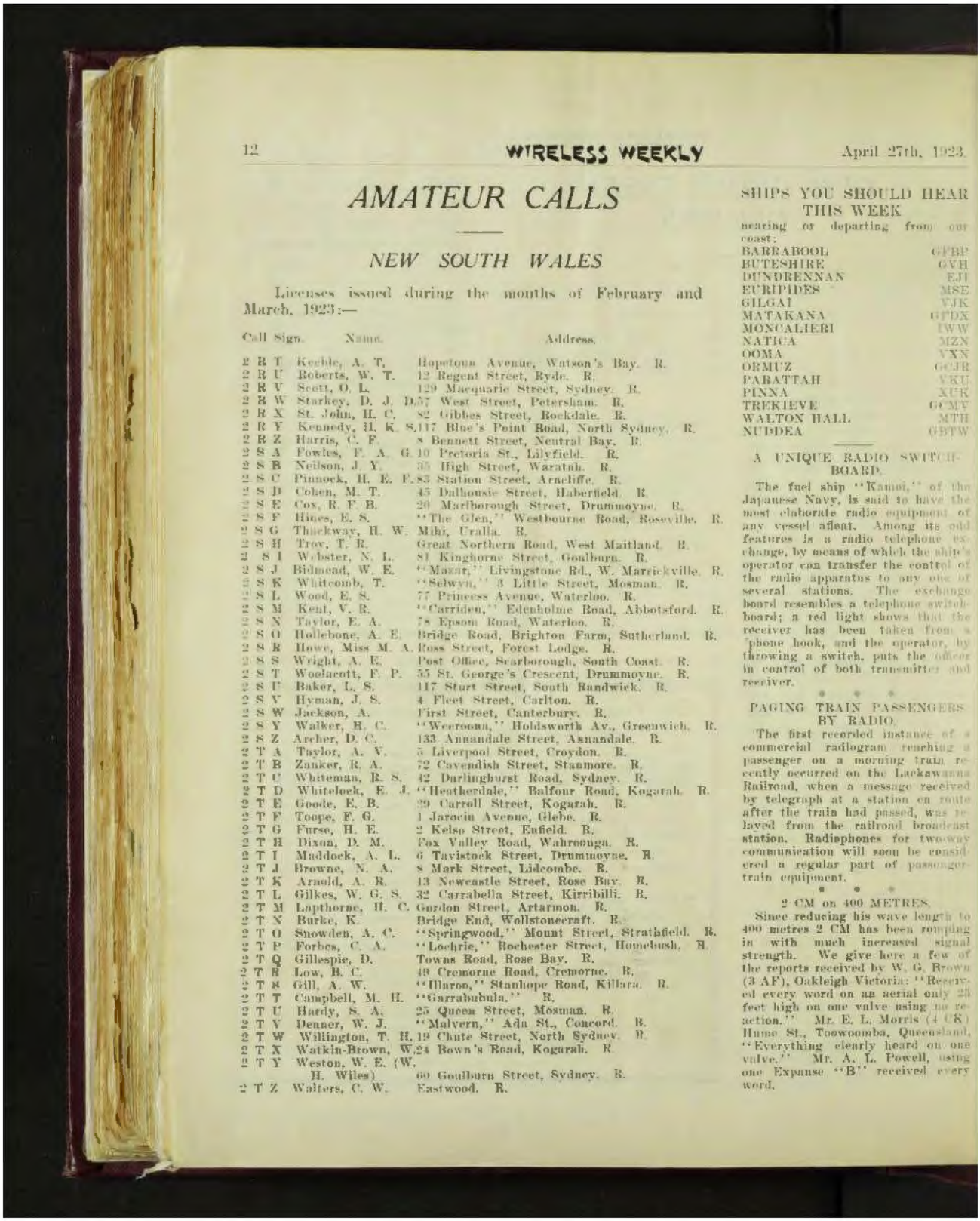
Mr. C. Joseph, the well-known electrical engineer, sometimes concentrates in circles other than wireless. Many readers will probably appreciate the fact.

Mr. L. S. Beckett, a prominent dental surgeon, has just taken on wireless as a hobby, which has completely fascinated him.

Mrs. Richards, at present in Sydney on a visit from Bega, is a most enthusiastic "radioist," and is actively engaged in the formation of a Radio Club at Bega.

Mr. F. Basil Cooke, F.R.A.S., will probably be next President of the Wireless Institute, New South Wales Division.

Mr. Charlsworth, 2CI, is not transmitting at present. He will be resuming in about three weeks' time, after he has completed erecting his instruments on a suitable panel.



AMATEUR CALLS

NEW SOUTH WALES

Licenses issued during the months of February and March, 1923:—

Call Sign.	Name.	Address.
2 R T	Keeble, A. T.	Hopetoun Avenue, Watson's Bay. R.
2 R U	Roberts, W. T.	12 Regent Street, Ryde. R.
2 R V	Scott, O. L.	129 Macquarie Street, Sydney. R.
2 R W	Starkey, D. J.	D.57 West Street, Petersham. R.
2 R X	St. John, H. C.	82 Gibbes Street, Rockdale. R.
2 R Y	Kennedy, H. K.	S.117 Blue's Point Road, North Sydney. R.
2 R Z	Harris, C. F.	8 Bennett Street, Neutral Bay. R.
2 S A	Fowles, F. A. G.	10 Pretoria St., Lilyfield. R.
2 S B	Neilson, J. Y.	35 High Street, Waratah. R.
2 S C	Pinnock, H. E. F.	83 Station Street, Arncliffe. R.
2 S D	Cohen, M. T.	45 Dalhousie Street, Haberfield. R.
2 S E	Cox, R. F. B.	20 Marlborough Street, Drummoyne. R.
2 S F	Hines, E. S.	"The Glen," Westbourne Road, Roseville. R.
2 S G	Thackway, H. W.	Mihi, Uralla. R.
2 S H	Troy, T. R.	Great Northern Road, West Maitland. R.
2 S I	Webster, N. L.	81 Kinghorne Street, Goulburn. R.
2 S J	Bidmead, W. E.	"Mazar," Livingstone Rd., W. Marrickville. R.
2 S K	Whitcomb, T.	"Selwyn," 3 Little Street, Mosman. R.
2 S L	Wood, E. S.	77 Princess Avenue, Waterloo. R.
2 S M	Kent, V. R.	"Carriden," Edenholme Road, Abbotsford. R.
2 S N	Taylor, E. A.	78 Epsom Road, Waterloo. R.
2 S O	Hollebone, A. E.	Bridge Road, Brighton Farm, Sutherland. R.
2 S R	Howe, Miss M. A.	Ross Street, Forest Lodge. R.
2 S S	Wright, A. E.	Post Office, Scarborough, South Coast. R.
2 S T	Woolacott, F. P.	55 St. George's Crescent, Drummoyne. R.
2 S U	Baker, L. S.	117 Sturt Street, South Randwick. R.
2 S V	Hyman, J. S.	4 Fleet Street, Carlton. R.
2 S W	Jackson, A.	First Street, Canterbury. R.
2 S Y	Walker, H. C.	"Weeroona," Holdsworth Av., Greenwich. R.
2 S Z	Archer, D. C.	133 Annandale Street, Annandale. R.
2 T A	Taylor, A. V.	5 Liverpool Street, Croydon. R.
2 T B	Zanker, R. A.	72 Cavendish Street, Stanmore. R.
2 T C	Whiteman, R. S.	42 Darlinghurst Road, Sydney. R.
2 T D	Whitelock, E. J.	"Heatherdale," Balfour Road, Kogarah. R.
2 T E	Goode, E. B.	29 Carroll Street, Kogarah. R.
2 T F	Toope, F. G.	1 Jaracin Avenue, Glebe. R.
2 T G	Furse, H. E.	2 Kelso Street, Enfield. R.
2 T H	Dixon, D. M.	Fox Valley Road, Wahroonga. R.
2 T I	Maddock, A. L.	6 Tavistock Street, Drummoyne. R.
2 T J	Browne, N. A.	8 Mark Street, Lidcombe. R.
2 T K	Arnold, A. R.	13 Newcastle Street, Rose Bay. R.
2 T L	Gilkes, W. G. S.	32 Carrabella Street, Kirribilli. R.
2 T M	Lapthorne, H. C.	Gordon Street, Artarmon. R.
2 T N	Burke, K.	Bridge End, Wollstonecraft. R.
2 T O	Snowden, A. C.	"Springwood," Mount Street, Strathfield. R.
2 T P	Forbes, C. A.	"Lochrie," Rochester Street, Homebush. R.
2 T Q	Gillespie, D.	Towns Road, Rose Bay. R.
2 T R	Low, B. C.	49 Cremorne Road, Cremorne. R.
2 T S	Gill, A. W.	"Illaroo," Stanhope Road, Killara. R.
2 T T	Campbell, M. H.	"Garrahubula." R.
2 T U	Hardy, S. A.	25 Queen Street, Mosman. R.
2 T V	Denner, W. J.	"Malvern," Ada St., Concord. R.
2 T W	Willington, T. H.	19 Chute Street, North Sydney. R.
2 T X	Watkin-Brown, W.	24 Bown's Road, Kogarah. R.
2 T Y	Weston, W. E. (W. H. Wiles)	60 Goulburn Street, Sydney. R.
2 T Z	Walters, C. W.	Eastwood. R.

SHIPS YOU SHOULD HEAR THIS WEEK

nearing or departing from our coast:

BARRABOOL	GFBP
BUTESHIRE	GVH
DUNDRENNAN	EJI
EURIPIDES	MSE
GILGAI	VJK
MATAKANA	GFDX
MONCALIERI	IWW
NATICA	MZN
OOMA	VXN
ORMUZ	GCJR
PARATTAH	VKU
PINNA	XUK
TREKIEVE	GCMV
WALTON HALL	MTH
NUDDEA	GBTW

A UNIQUE RADIO SWITCH-BOARD.

The fuel ship "Kamoi," of the Japanese Navy, is said to have the most elaborate radio equipment of any vessel afloat. Among its odd features is a radio telephone exchange, by means of which the ship's operator can transfer the control of the radio apparatus to any one of several stations. The exchange board resembles a telephone switchboard; a red light shows that the receiver has been taken from a 'phone hook, and the operator, by throwing a switch, puts the officer in control of both transmitter and receiver.

* * *

PAGING TRAIN PASSENGERS BY RADIO.

The first recorded instance of a commercial radiogram reaching a passenger on a morning train recently occurred on the Lackawanna Railroad, when a message received by telegraph at a station en route after the train had passed, was relayed from the railroad broadcast station. Radiophones for two-way communication will soon be considered a regular part of passenger-train equipment.

* * *

2 CM on 400 METRES.

Since reducing his wave length to 400 metres 2 CM has been romping in with much increased signal strength. We give here a few of the reports received by W. G. Brown (3 AF), Oakleigh Victoria: "Received every word on an aerial only 25 feet high on one valve using no reaction." Mr. E. L. Morris (4 CK) Hume St., Toowoomba, Queensland, "Everything clearly heard on one valve." Mr. A. L. Powell, using one Expanse "B" received every word.

THE NORTH SYDNEY RADIO CLUB

The usual fortnightly business meeting of the North Sydney Radio Club was held on the 17th inst., when various matters were brought forward for discussion.

It was moved by Mr. Planner that the general meetings, as held at present, be dispensed with and that the business management of the club be left entirely in the hands of the committee with a general meeting half yearly for the purpose of receiving the committee's report and election of officers, etc., which, it was pointed out, would leave the club free to discuss wireless matters.

In supporting the motion the vice-president (Mr. McIntosh) emphasised the fact that every alternate meeting was taken up with business which, in his opinion, only wasted the time of the members generally, and could be dealt with much more expeditiously by a smaller administrative body.

Other members also voiced opinions upon the matter, and the motion was put and carried unanimously.

On the motion of Mr. McIntosh it was decided to push on with the transmitting set, and it is expected that the club will be experimenting on about ten watts in two or three weeks.

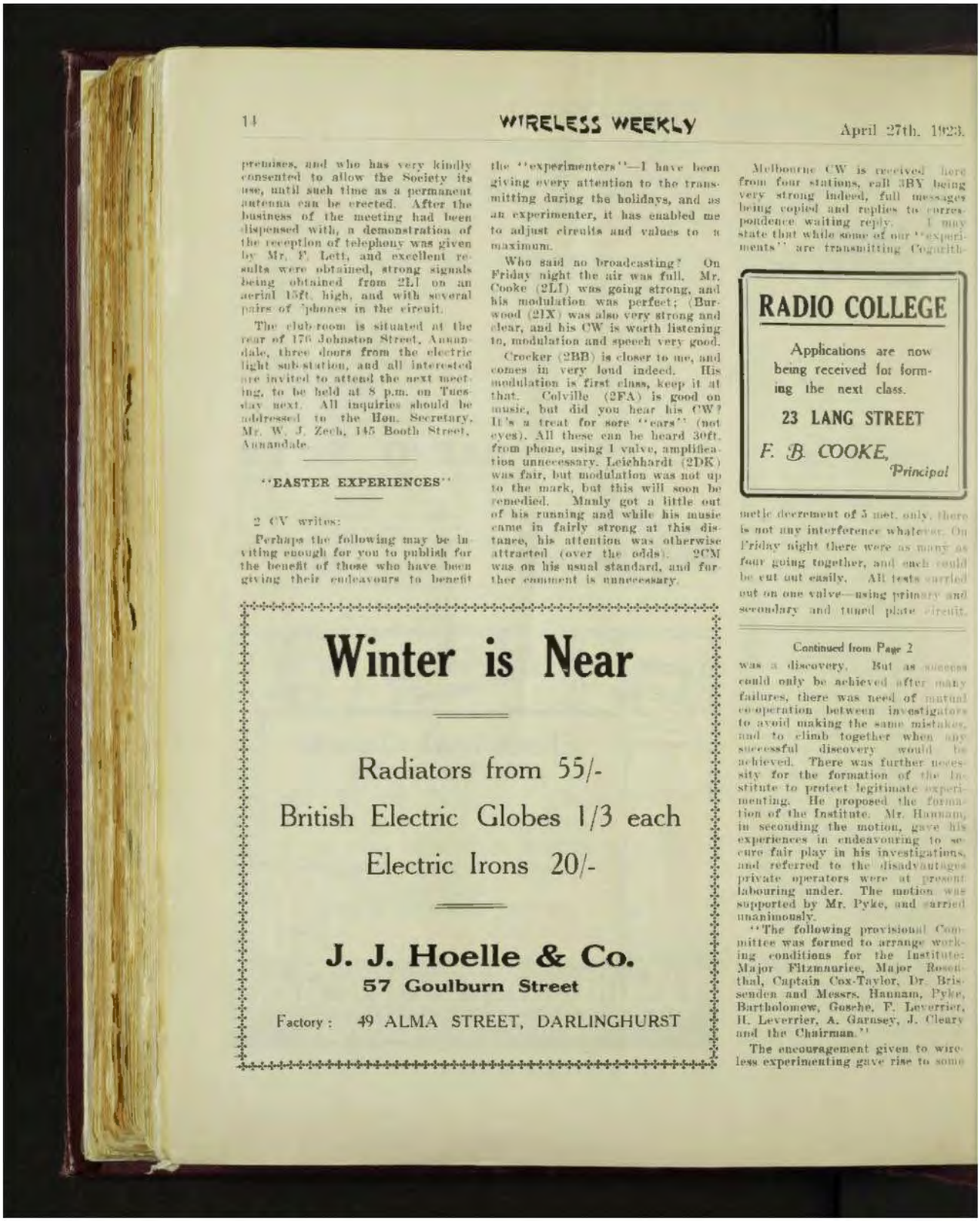
The club is becoming very much alive to the increasingly serious aspect of the howling valve question, and efforts are to be made towards assisting the authorities in the solution of it.

With the new system of administration it is intended to increase its activities as an experimental club and all experimenters are invited to get into touch with the Secretary, cr. Alfred and High Streets, North Sydney, or to call upon Mr. Planner, 25 O'Connell St., City, during the day, when all particulars can be given.

The next meeting will be held on Tuesday night when all interested are invited to be present.

LEICHHARDT AND DISTRICT RADIO SOCIETY.

On Tuesday, April 17th, members of the Leichhardt and District Radio Society assembled together in their new Club-room for the first time, and the occasion was one for much congratulation on behalf of members who expressed their appreciation of the move in no uncertain manner. The evening was spent very pleasantly, and members were invited to offer suggestions for the betterment of the Society as a whole. Many useful suggestions came to light, and these having been noted, will be of much assistance to the Council in its efforts to adopt a vigorous "go ahead" policy on behalf of the Society. An aerial will be erected and a set installed in the rooms as early as possible, and, in the interim, members have the use of a temporary aerial, the license for which is held by one of the members who resides on the



premises, and who has very kindly consented to allow the Society its use, until such time as a permanent antenna can be erected. After the business of the meeting had been dispensed with, a demonstration of the reception of telephony was given by Mr. F. Lett, and excellent results were obtained, strong signals being obtained from 2LI on an aerial 15ft. high, and with several pairs of 'phones in the circuit.

The club-room is situated at the rear of 176 Johnston Street, Annandale, three doors from the electric light sub-station, and all interested are invited to attend the next meeting, to be held at 8 p.m. on Tuesday next. All inquiries should be addressed to the Hon. Secretary, Mr. W. J. Zech, 145 Booth Street, Annandale.

"EASTER EXPERIENCES"

2 CV writes:

Perhaps the following may be inviting enough for you to publish for the benefit of those who have been giving their endeavours to benefit the "experimenters"—I have been giving every attention to the transmitting during the holidays, and as an experimenter, it has enabled me to adjust circuits and values to a maximum.

Who said no broadcasting? On Friday night the air was full. Mr. Cooke (2LI) was going strong, and his modulation was perfect; (Burwood (2IX) was also very strong and clear, and his CW is worth listening to, modulation and speech very good.

Crocker (2BB) is closer to me, and comes in very loud indeed. His modulation is first class, keep it at that. Colville (2FA) is good on music, but did you hear his CW? It's a treat for sore "ears" (not eyes). All these can be heard 30ft. from phone, using 1 valve, amplification unnecessary. Leichhardt (2DK) was fair, but modulation was not up to the mark, but this will soon be remedied. Manly got a little out of his running and while his music came in fairly strong at this distance, his attention was otherwise attracted (over the odds). 2CM was on his usual standard, and further comment is unnecessary.

Melbourne CW is received here from four stations, call 3BY being very strong indeed, full messages being copied and replies to correspondence waiting reply. I may state that while some of our "experiments" are transmitting Cognith-

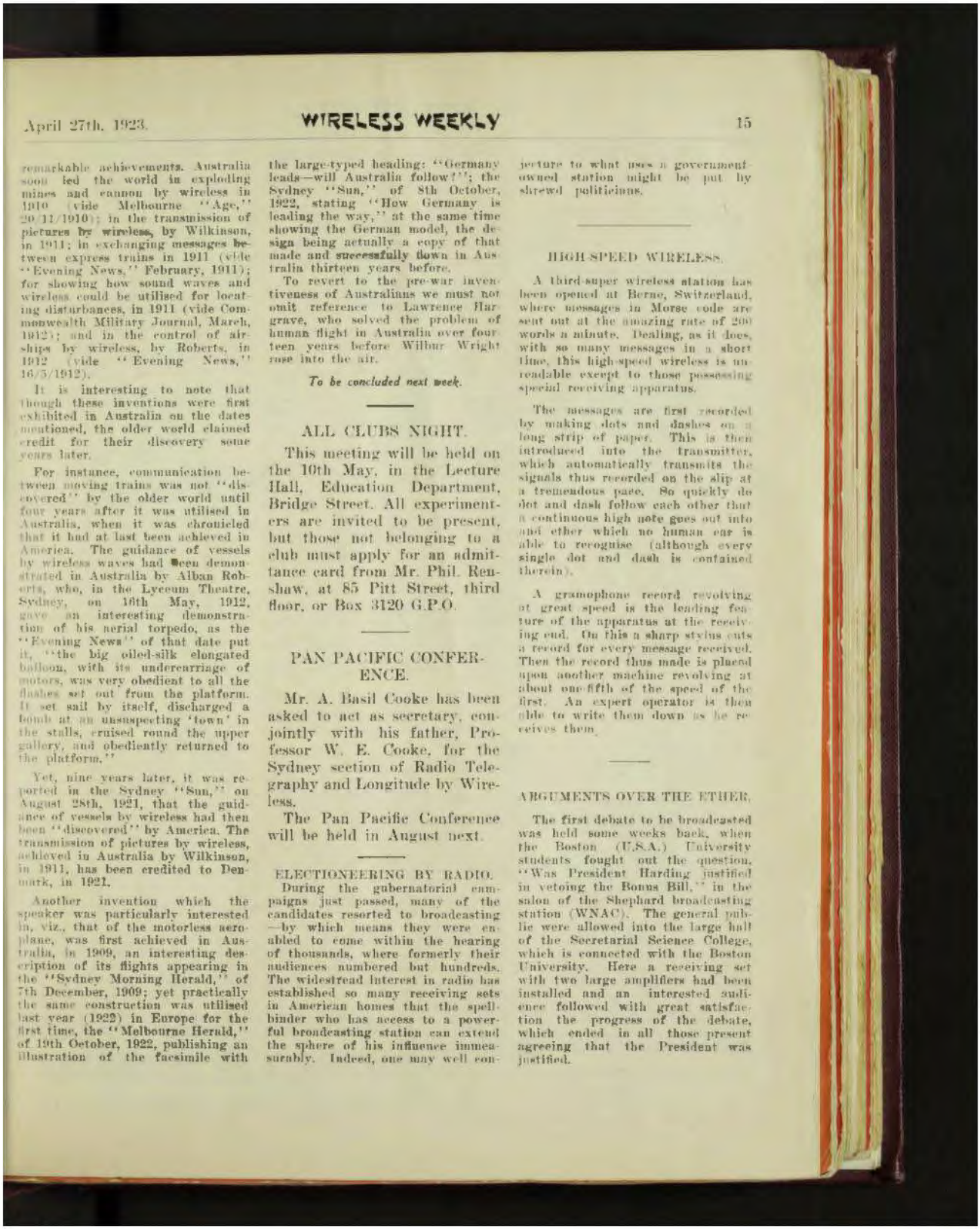
metic decrement of 5 met. only, there is not any interference whatever. On Friday night there were as many as four going together, and each could be cut out easily. All tests carried out on one valve—using primary and secondary and tuned plate circuit.

Continued from Page 2

was a discovery. But as success could only be achieved after many failures, there was need of mutual co-operation between investigators to avoid making the same mistakes, and to climb together when any successful discovery would be achieved. There was further necessity for the formation of the Institute to protect legitimate experimenting. He proposed the formation of the Institute. Mr. Hannam, in seconding the motion, gave his experiences in endeavouring to secure fair play in his investigations, and referred to the disadvantages private operators were at present labouring under. The motion was supported by Mr. Pyke, and carried unanimously.

"The following provisional Committee was formed to arrange working conditions for the Institute: Major Fitzmaurice, Major Rosenthal, Captain Cox-Taylor, Dr. Brissenden and Messrs. Hannam, Pyke, Bartholomew, Gosche, F. Leverrier, H. Leverrier, A. Garnsey, J. Cleary and the Chairman."

The encouragement given to wireless experimenting gave rise to some



remarkable achievements. Australia soon led the world in exploding mines and cannon by wireless in 1910 (vide Melbourne "Age," 20/11/1910); in the transmission of pictures by wireless, by Wilkinson, in 1911; in exchanging messages between express trains in 1911 (vide "Evening News," February, 1911); for showing how sound waves and wireless could be utilised for locating disturbances, in 1911 (vide Commonwealth Military Journal, March, 1912); and in the control of airships by wireless, by Roberts, in 1912 (vide "Evening News," 16/5/1912).

It is interesting to note that though these inventions were first exhibited in Australia on the dates mentioned, the older world claimed credit for their discovery some years later.

For instance, communication between moving trains was not "discovered" by the older world until four years after it was utilised in Australia, when it was chronicled that it had at last been achieved in America. The guidance of vessels by wireless waves had been demonstrated in Australia by Alban Roberts, who, in the Lyceum Theatre, Sydney, on 16th May, 1912, gave an interesting demonstration of his aerial torpedo, as the "Evening News" of that date put it, "the big oiled-silk elongated balloon, with its undercarriage of motors, was very obedient to all the flashes set out from the platform. It set sail by itself, discharged a bomb at an unsuspecting 'town' in the stalls, cruised round the upper gallery, and obediently returned to the platform."

Yet, nine years later, it was reported in the Sydney "Sun," on August 28th, 1921, that the guidance of vessels by wireless had then been "discovered" by America. The transmission of pictures by wireless, achieved in Australia by Wilkinson, in 1911, has been credited to Denmark, in 1921.

Another invention which the speaker was particularly interested in, viz., that of the motorless aeroplane, was first achieved in Australia, in 1909, an interesting description of its flights appearing in the "Sydney Morning Herald," of 7th December, 1909; yet practically the same construction was utilised last year (1922) in Europe for the first time, the "Melbourne Herald," of 19th October, 1922, publishing an illustration of the facsimile with the large-typed heading: "Germany leads—will Australia follow?"; the Sydney "Sun," of 8th October, 1922, stating "How Germany is leading the way," at the same time showing the German model, the design being actually a copy of that made and successfully flown in Australia thirteen years before.

To revert to the pre-war inventiveness of Australians we must not omit reference to Lawrence Hargrave, who solved the problem of human flight in Australia over fourteen years before Wilbur Wright rose into the air.

To be concluded next week.

ALL CLUBS NIGHT.

This meeting will be held on the 10th May, in the Lecture Hall, Education Department, Bridge Street. All experimenters are invited to be present, but those not belonging to a club must apply for an admittance card from Mr. Phil. Renshaw, at 85 Pitt Street, third floor, or Box 3120 G.P.O.

PAN PACIFIC CONFERENCE.

Mr. A. Basil Cooke has been asked to act as secretary, conjointly with his father, Professor W. E. Cooke, for the Sydney section of Radio Telegraphy and Longitude by Wireless.

The Pan Pacific Conference will be held in August next.

ELECTIONEERING BY RADIO.

During the gubernatorial campaigns just passed, many of the candidates resorted to broadcasting—by which means they were enabled to come within the hearing of thousands, where formerly their audiences numbered but hundreds. The widespread interest in radio has established so many receiving sets in American homes that the spellbinder who has access to a powerful broadcasting station can extend the sphere of his influence immeasurably. Indeed, one may well conjecture to what uses a government-owned station might be put by shrewd politicians.

HIGH-SPEED WIRELESS.

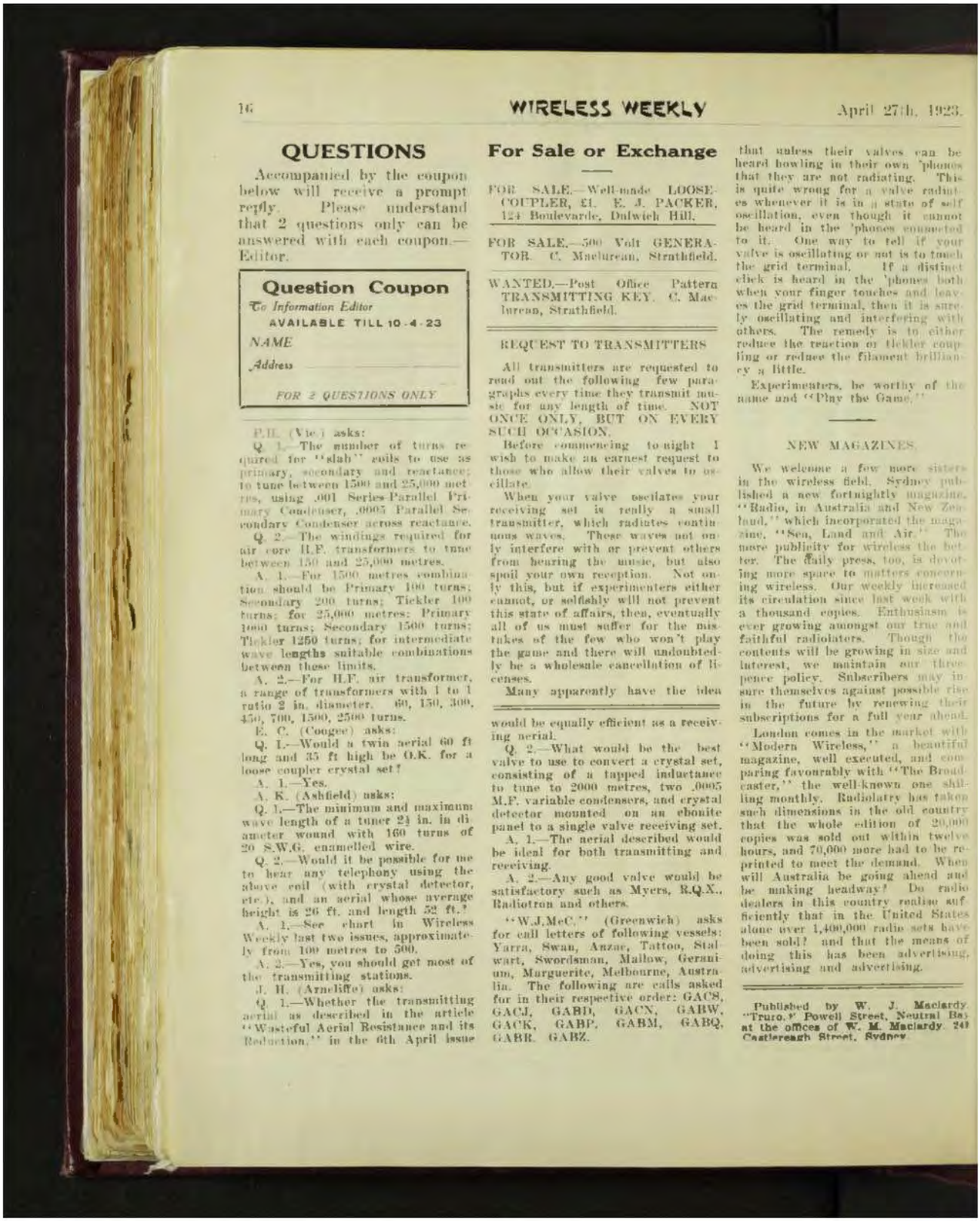
A third-super wireless station has been opened at Berne, Switzerland, where messages in Morse code are sent out at the amazing rate of 200 words a minute. Dealing, as it does, with so many messages in a short time, this high-speed wireless is unreadable except to those possessing special receiving apparatus.

The messages are first recorded by making dots and dashes on a long strip of paper. This is then introduced into the transmitter, which automatically transmits the signals thus recorded on the slip at a tremendous pace. So quickly do dot and dash follow each other that a continuous high note goes out into and ether which no human ear is able to recognise (although every single dot and dash is contained therein).

A gramophone record revolving at great speed is the leading feature of the apparatus at the receiving end. On this a sharp stylus cuts a record for every message received. Then the record thus made is placed upon another machine revolving at about one-fifth of the speed of the first. An expert operator is then able to write them down as he receives them.

ARGUMENTS OVER THE ETHER.

The first debate to be broadcasted was held some weeks back, when the Boston (U.S.A.) University students fought out the question, "Was President Harding justified in vetoing the Bonus Bill," in the salon of the Shephard broadcasting station (WNAC). The general public were allowed into the large hall of the Secretarial Science College, which is connected with the Boston University. Here a receiving set with two large amplifiers had been installed and an interested audience followed with great satisfaction the progress of the debate, which ended in all those present agreeing that the President was justified.



QUESTIONS

Accompanied by the coupon below will receive a prompt reply. Please understand that 2 questions only can be answered with each coupon.—Editor.

Question Coupon

To Information Editor

AVAILABLE TILL 10-4-23

NAME

Address

FOR 2 QUESTIONS ONLY

F.H. (Vic.) asks:

Q. 1.—The number of turns required for "slab" coils to use as primary, secondary and reactance; to tune between 1500 and 25,000 metres, using .001 Series-Parallel Primary Condenser, .0005 Parallel Secondary Condenser across reactance.

Q. 2.—The windings required for air core H.F. transformers to tune between 150 and 25,000 metres.

A. 1.—For 1500 metres combination should be Primary 100 turns; Secondary 200 turns; Tickler 100 turns; for 25,000 metres: Primary 1000 turns; Secondary 1500 turns; Tickler 1250 turns; for intermediate wave lengths suitable combinations between these limits.

A. 2.—For H.F. air transformer, a range of transformers with 1 to 1 ratio 2 in. diameter. 60, 150, 300, 450, 700, 1500, 2500 turns.

E. C. (Coogee) asks:

Q. 1.—Would a twin aerial 60 ft long and 35 ft high be O.K. for a loose coupler crystal set?

A. 1.—Yes.

A. K. (Ashfield) asks:

Q. 1.—The minimum and maximum wave length of a tuner 2½ in. in diameter wound with 160 turns of 20 S.W.G. enamelled wire.

Q. 2.—Would it be possible for me to hear any telephony using the above coil (with crystal detector, etc.), and an aerial whose average height is 26 ft. and length 52 ft.?

A. 1.—See chart in Wireless Weekly last two issues, approximately from 100 metres to 500.

A. 2.—Yes, you should get most of the transmitting stations.

J. H. (Arncliffe) asks:

Q. 1.—Whether the transmitting aerial as described in the article "Wasteful Aerial Resistance and its Reduction," in the 6th April issue would be equally efficient as a receiving aerial.

Q. 2.—What would be the best valve to use to convert a crystal set, consisting of a tapped inductance to tune to 2000 metres, two .0005 M.F. variable condensers, and crystal detector mounted on an ebonite panel to a single valve receiving set.

A. 1.—The aerial described would be ideal for both transmitting and receiving.

A. 2.—Any good valve would be satisfactory such as Myers, R.Q.X., Radiotron and others.

"W.J.McC." (Greenwich) asks for call letters of following vessels: Yarra, Swan, Anzac, Tattoo, Stalwart, Swordsman, Mallow, Geranium, Marguerite, Melbourne, Australia. The following are calls asked for in their respective order: GACS, GACJ, GABD, GACN, GABW, GACK, GABP, GABM, GABQ, GABR, GABZ.

For Sale or Exchange

FOR SALE.—Well-made LOOSE-COUPLER, £1. E. J. PACKER, 124 Boulevarde, Dulwich Hill.

FOR SALE.—500 Volt GENERATOR. C. Maclurean, Strathfield.

WANTED.—Post Office Pattern TRANSMITTING KEY. C. Maclurean, Strathfield.

REQUEST TO TRANSMITTERS

All transmitters are requested to read out the following few paragraphs every time they transmit music for any length of time. NOT ONCE ONLY, BUT ON EVERY SUCH OCCASION.

Before commencing to-night I wish to make an earnest request to those who allow their valves to oscillate.

When your valve oscillates your receiving set is really a small transmitter, which radiates continuous waves. These waves not only interfere with or prevent others from hearing the music, but also spoil your own reception. Not only this, but if experimenters either cannot, or selfishly will not prevent this state of affairs, then, eventually all of us must suffer for the mistakes of the few who won't play the game and there will undoubtedly be a wholesale cancellation of licenses.

Many apparently have the idea that unless their valves can be heard howling in their own 'phones that they are not radiating. This is quite wrong for a valve radiates whenever it is in a state of self oscillation, even though it cannot be heard in the 'phones connected to it. One way to tell if your valve is oscillating or not is to touch the grid terminal. If a distinct click is heard in the 'phones both when your finger touches and leaves the grid terminal, then it is surely oscillating and interfering with others. The remedy is to either reduce the reaction or tickler coupling or reduce the filament brilliancy a little.

Experimenters, be worthy of the name and "Play the Game."

NEW MAGAZINES.

We welcome a few more sisters in the wireless field. Sydney published a new fortnightly magazine, "Radio, in Australia and New Zealand," which incorporated the magazine, "Sea, Land and Air." The more publicity for wireless the better. The daily press, too, is devoting more space to matters concerning wireless. Our weekly increased its circulation since last week with a thousand copies. Enthusiasm is ever growing amongst our true and faithful radiolaters. Though the contents will be growing in size and interest, we maintain our three-pence policy. Subscribers may insure themselves against possible rise in the future by renewing their subscriptions for a full year ahead.

London comes in the market with "Modern Wireless," a beautiful magazine, well executed, and comparing favourably with "The Broadcaster," the well-known one shilling monthly. Radiolatry has taken such dimensions in the old country that the whole edition of 20,000 copies was sold out within twelve hours, and 70,000 more had to be reprinted to meet the demand. When will Australia be going ahead and be making headway? Do radio dealers in this country realise sufficiently that in the United States alone over 1,400,000 radio sets have been sold? and that the means of doing this has been advertising, advertising and advertising.

Published by W. J. Maclardy, "Truro," Powell Street, Neutral Bay, at the offices of W. M. Maclardy, 249 Castlereagh Street, Sydney.