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A REVIEW OF RADIO

WHERE AUSTRALIA STANDS

The Royal Commission and Its Scope



The President's Address to the Association for Developing Wireless in Australia, New Zealand and Fiji, at the Annual Meeting, January 25th, 1927, being the Fourth Anniversary of the Foundation of the Association.

**THE ASSOCIATION FOR DEVELOPING
WIRELESS IN AUSTRALIA, NEW ZEALAND
AND FIJI.**

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A REVIEW OF RADIO

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THE ROYAL COMMISSION ON RADIO

Radio came to Australia as one of the greatest gifts of science with its simplicity and speed of communication in linking our wide-spread communities together. By bringing music and story from the cities it was a great factor to make Australian country life more pleasant, as our country population had been gradually drifting to the capital cities; in fact the proportion of population of the metropolitan areas in the aggregate to the total population of Australia in 1911 was 38.03 per cent., whilst last year (1926) it had increased to over 45 per cent.

Radio has not been developing at the speed that its value to Australia merited. There were too many licensed listeners becoming dissatisfied with the broadcasting arrangements; 4843 licenses being abandoned during November and December, 1926.

For some considerable time the control of the science called for criticism from almost every point of view, particularly with regard to broadcasting, hence the Association for Developing Wireless in Australia called a Conference that was opened by the Lord Mayor in the Town Hall, Sydney, on May 3rd, 1926, at which delegates were present from all Australian States; and at which Conference, the President (George A. Taylor) proposed the motion that was unanimously approved that the Commonwealth Government be requested to appoint a Royal Commission to investigate the obstructions hindering the progress of Radio in Australia.

The Commonwealth Government, to its credit, desiring that the best conditions be secured for the public and all interested in Radio, agreed to appoint the Royal Commission requested, and in order to help to simplify as much as possible the work of the Commissioners, the President of the Association for Developing Wireless has arranged the various sections of Radio that many consider are calling for reform. In doing this work he feels he is not only helping the best development of the blessings of Radio for Australia, but for the world generally; as his three round-the-world journeys to study this question during 1914, 1922 and 1924 have proved that the wonders of this new gift to humanity are in many places being handicapped by many mistakes that calm unbiassed consideration on the part of authorities could have avoided, and can alter.

THE ROYAL COMMISSION.

The Australian Royal Commission to consider Radio, therefore carries a very great responsibility as its decisions will be keenly studied by the world generally.

The scope of investigation by the Commission is very wide, and the Association for Developing Wireless has suggested that it be divided into five sections as follows:—

1.—The Commonwealth Aspect.

Section 1, to define the position of the Commonwealth Government as to the best use of Radio for communication over Australia and its mandated territories, as well as its significance in Empire and International affairs. This covers the control of Broadcasting with all other methods of Radio communication and possibilities of raising revenue from same, as well as the association of Radio with National Defence and with aerial, rail, road and marine transport.

2.—The States' Aspect.

The second section could define the position of the separate State Governments as to any special rights they may claim for the unchecked use of Radio for Relay Stations for Press, Commercial, and Political purposes; for local Broadcasting for police, fire-brigades, hospitals, education, religious and other objects; as well as requesting subsidies for State Universities from Radio revenue for research work in Radio.

3.—The Commercial Section.

The third section could consider the financial standing and administration of Amalgamated Wireless (Australasia), Ltd., as a Government concern; "A" and "B" Broadcasting Stations; shipping intercommunication, and the commercial aspect of Radio Development covering the arrangement of best trading facilities for the benefit of traders and purchasers.

4.—The Scientific Section

The fourth section could consider the scientific aspect of Radio Development covering the encouragement of experiments and research work generally, and the protection of worth-while results for public benefit.

5.—The Legal Section.

The fifth section could define the legal aspect covering the foregoing, including the question of patent rights, copyrights and the matter of legislating to secure the reforms the Commission may recommend.

The Royal Commission of Australia therefore takes on a work of particular importance in these days of scientific development in considering what would be an ideal method of giving humanity the best advantages of the latest and greatest

of scientific discoveries, and as the writer's experience in Radio Research extends from 1909 when he was appointed to the Intelligence Corps in the Australian Military Forces as the first officer to report on the possibilities of Radio for Military purposes, he will briefly record his experience of the past 17 years from which he will endeavour to shape what may be considered useful recommendations. He is encouraged in this action by the following statement of the Postmaster-General of Australia (Hon. W. J. Gibson), whose Department has had the administration of Broadcasting:—

"Wireless is so new that we have not precedent to go by, and searching inquiries will be necessary before any determination can be arrived at."

The writer feels that such opinion encourages him to go fully into the subject and show that precedents prove that mistakes have happened that can be taken as guide posts to direct us to better methods.

The Postmaster-General of Australia also said:—

"One of the matters to be investigated will be whether it will be advisable to follow the example of France and Great Britain with regard to Government administration of Radio and Broadcasting services."

As the writer visited those nations during his three round-the-world journeys to study the Radio position he will explain where there is any example that may be followed or otherwise.

The Scope of the Royal Commission

1.—THE COMMONWEALTH ASPECT

Broadcasting and Communication.

Taking the first part of the first section recommended for the Royal Commission to investigate the position of the Australian Government as to the best use of Radio for communication over Australia and its mandated territories as well as its significance in Empire and International affairs, it brings into review Broadcasting as well as other matters of Radio communication; hence it may be advisable to note the subject where it comes of special interest to Australia.

In 1921 the Westinghouse Company of America began broadcasting on a somewhat wide scale, by providing the possibility of concert music being transmitted from a central station and received by a number of small receiving sets. The novelty became very popular. Broadcasting Stations began to be rapidly established, and thousands of people began to buy sets and listen-in, creating a mixed state of affairs that was being carefully studied by Great Britain, which nation in 1922, to avoid America's chaotic conditions, called a Confer-

ence of Manufacturers of Wireless apparatus to advise a scheme to prevent the state that wireless had reached in America.

The writer therefore went to England in that year to study the British attitude in the matter.

He was armed with the information he had won by careful study of the action of Australian Governments regarding the handling of Radio services in Australia.

Attempts to Make Monopolies.

It may be mentioned that the subject has been under his attention since July 2nd, 1910, when he was visited in his Sydney office by a representative of the German Telefunken Co., whose representative in Australia was endeavouring to win a monopoly of the whole of the Australian Wireless business, including "establishing schools where only Telefunken would be taught" so that the Shipping Companies trading with Australia would have to instal the Telefunken in order to keep in touch with Australian Stations, and as no other firm could use the "Telefunken" patents, and as it considered "it had the right, not only to all present patents but to all future improvements," it boasted it would not sell any set under £800, and that the Shipping Companies would have to purchase Telefunken sets.

Previous to that time the writer had formed the Wireless Institute of Australia which was the first Wireless Association in the Empire, and on July 4th, 1910, he drew the attention of the public (in the "Sydney Daily Telegraph" of that date), to the important step the Federal authorities were about to take in introducing Wireless Telegraphy, for Australia was then only beginning to wake up regarding Wireless and its possibilities, as since the Wireless Act of 1905, under which a fine of £500 practically prohibited private experiment, little had been done.

The Federal Government had called tenders for two official stations and had accepted the tender of the company that was using the German Telefunken system for the first station, which tender was £4,150, the highest being that of the Marconi Company, £19,020. The Marconi Company thereupon endeavoured to block the Telefunken system as controlled by the Australasian Wireless Co. (the company whose tender the Australian Government had accepted), by making their operators refuse to receive messages transmitted from ships fitted with the Telefunken system. A message sent on Sunday, July 16th, 1910, from the S.S. Cooma (Telefunken) near Cape Everard to S.S. Marathon (Marconi) a few miles off, was refused by the operator on the latter.

The public appeal in the "Sydney Daily Telegraph" of July 4th, 1910, by the writer (whom the "Age" (Melbourne)

of November 11th, 1910, generously referred to as "the leading military Authority on Wireless in the Commonwealth"), closed with the following paragraph; which, though written over 16 years ago, is of special interest to-day:—

"Wireless is bound to be more especially valuable to Australians than to residents in Europe. Its use in Australia, 'the land of magnificent distances,' is destined to be more necessary and more generally adopted than perhaps in any other country in the world; hence every possibility of its being 'cornered,' any trammelling of its best possibilities, any movements that would over-burden its cost, should be carefully watched."

An understanding was arrived at between the rival Telefunken and Marconi companies, the latter being represented by E. T. Fisk, who has done much work in Australia for Radio, and a new combine was formed, which later had the Commonwealth Government linked with it in the formation of the Amalgamated Wireless (Australasia) Ltd., in which the Government holds 500,001 out of 1,000,000 shares, and which is referred to later. (See Commercial Section, page —).

The writer specially emphasises these early attempts in Australia to form monopolies in Wireless, which attempts he found were being continued on his visit to Great Britain in 1922, and this explains to a considerable extent the reason why the British Government took what steps it did in order to arrive at what it considered a commonsense attitude regarding Broadcasting.

What Great Britain Was Doing

On the writer's arrival in London in 1922, he got in touch with the leaders of the Electrical Industry. He found that it was generally considered that the Marconi Company had not only been endeavoring to get a virtual monopoly over Wireless "Services" throughout the Empire, but was also endeavouring to extend it into a monopoly of the Wireless "Industry" within the Empire.

The Battle Against Monopoly.

One of the leaders of the British Electrical Industry who was most active in fighting against the alleged Marconi attempts at monopoly wrote to the writer on October 11, 1922, that "the Marconi Company hoped to get a monopoly of Broadcasting Stations. They hoped by a number of more or less important patents, to keep other manufacturers out and secure a tremendous business of supplying the public with listening-in apparatus, and having secured that in England the rest of the Empire lay at their feet."

"You are aware how a monopoly cripples development of an industry," he continued, "and both from the personal and

national and Imperial point of view, I thought it was a fight worth waging to keep this first new Wireless Industry free from the fetters of monopoly."

The British Manufacturers of electrical apparatus noting the danger of what seemed the attempts of the Marconi Company, gathered together as soon as the British Postmaster-General announced in the House of Commons the intention to permit Broadcasting in Great Britain.

The Postmaster-General of Great Britain saw the justice of their views and a Committee was formed, of which the former Engineer-in-Chief to the General Post Office, Sir William Noble, was Chairman, and it was considered that individual jealousy should be buried and the country would be best served by one Broadcasting Company.

The British Broadcasting Company.

Six of the firms, the General Electric Company, the Metropolitan-Vickers Co., the Marconi Company, the British Thompson-Houston Co., the Radio Communication Co., and the Western Electric Company, guaranteed to find the necessary capital for erecting the required number of Stations, and they formed a Company with a nominal capital of £100,000 to be called the "British Broadcasting Company." To make clear it was not a monopolist company they agreed to be satisfied with a $7\frac{1}{2}$ per cent. dividend, and after providing a reasonable reserve fund for depreciation of plant, should there be any surplus after amortisation, it was to be at the disposal of the Postmaster-General for reducing license fees or broadcasting fees as paid by manufacturers and the public.

The revenue of the Broadcasting Company was to be one half share of the licenses which the Postmaster-General collected from the public and a fee of about 10 per cent. on the selling price of each apparatus from the manufacturers; the license issued by the Postmaster-General to be 10/- per set per year, the manufacturers' license to be only a royalty fee for each set.

Although the capital for the Broadcasting Company was found by the six firms mentioned, other manufacturers would have to be admitted as members of the Company even if such only bought one share each of £10, but that share obliged him to pay the royalty on any sets he manufactured for the Company, providing his sets were approved by the Postmaster-General.

The leading members of the Company at the time of the writer's visit to Great Britain in 1922 were particularly generous to him in giving him full particulars of the situation, and he was advised to do all in his power to prevent any monopoly in Radio happening in Australia.

The Association for Developing Wireless in Australia

After collecting much information the writer returned to Australia and immediately got in touch with the principal representatives of wireless interests. The Association for the Development of Wireless was formed on January 25th, 1923, and elected the writer as President, who pointed out that "instant action was necessary to prevent any firm or firms obtaining a monopoly of the industry, as a monopoly in any movement crippled industrial enterprise"

"Separating Broadcasting from Manufacturing."

Following the meeting at which the Association for Developing Wireless was formed, a Committee was appointed that met on January 31, 1923, and agreed that the Amalgamated Wireless (Australasia) Ltd., should be asked to discuss with selected members of the Association, the possibility of forming a nominal Company dealing purely with Broadcasting, quite apart from the manufacture and sale of wireless apparatus, with the possibility of having representatives thereof associated with a similar Company in Great Britain; the writer noting possibility of criticism coming if the Manufacture were allied with the Broadcasting, wished to prevent such arising. The Assistant-Manager of the Amalgamated Wireless (Australasia) Ltd., replied that nothing could be done until the next meeting of Directors was held; after that meeting he wrote that the matter was inopportune and that it should stand over for further consideration. No further information was received, although it was requested. The Postmaster-General of Australia was approached to call a conference of wireless experts in order that suitable broadcasting regulations be devised to avoid the difficulties and mistakes of older worlds."

The First Government Conference

The Federal Government called the first Conference on Broadcasting of fifty-eight leading Australian Wireless authorities, which was opened by the Hon. W. G. Gibson, Postmaster-General, on the 24th May, 1923, which Conference elected the writer as Chairman and heard and discussed some particularly interesting reports; a special vote of thanks being passed to the Postmaster-General for so encouraging wireless experts to discuss the matter, as well as for giving his assurance that in the event of any of the regulations being found unfair to anyone, steps would be immediately taken to have them altered. Proof of his sincerity in this matter has been shown in his agreeing to the appointment of the Royal Commission of Radio Enquiry of 1927.

The First Australian Broadcasting

On August 1, 1923, Australian Broadcasting was inaugurated at Government House, Sydney, in the presence of His Excellency Sir Walter Davidson, the following being part of the report on same in the "Sydney Morning Herald" of August 2, 1923:—

"The proceedings, which were entitled 'Ethereal Harmonies,' were opened at 9 o'clock by an 'ether greeting' from Mr. George A. Taylor (President of the Association for the Development of Wireless in Australia, New Zealand and Fiji). Addressing the Vice-Regal party at Government House and the army of wireless enthusiasts who were 'listening-in,' Mr. Taylor said he had much pleasure in sending the message through the ether as the first of the messages broadcasted on such an important day in the history of Australia's scientific development. To-day Australia was the last of the great dominions to proclaim broadcasting regulations, so they were starting with the world's experience to guide them. The address concluded with greetings to the King, as it was felt that the latest achievement of science linked the peoples of the Empire."

The transmission and reception was most successful for which great credit was due to F. Basil Cooke, F.R.A.S., and J. I. Carroll. It was the first Australian broadcasted address and was heard far north at Cloncurry and south at Hobart, and His Majesty the King was pleased to receive it very graciously.

So Australian Broadcasting came into operation.

At the Federal Conference in 1923, an interesting scheme was submitted by E. T. Fisk known as the "Sealed Receiver," by which special wave lengths would be broadcasted to clients with receivers sealed to only receive that wave.

The "Sealed Receiver" was put through a number of tests and failed, so the "Open Receiver" was advocated.

Difficulties and misunderstandings began to clog the development of Australian Radio, and the Association for Developing Wireless strongly appealed for reasonable arrangements for giving the public as well as administrators best satisfaction, in which work credit must be given to the three gentlemen previously mentioned, as well as to the Hon. W. G. Gibson (Postmaster-General), the Hon. Major Marr (Assistant Minister for Defence), H. P. Brown, J. Malone, L. D. Rudolph, J. G. Pritchard, E. Hirst, W. J. Maclardy, W. H. Wiles, Maclurcan, Burgin, Mingay, Holloway, Rydge, Watt, Perry, Fahey, Wilson, Scott, and Bean.

There were parties advocating the "Sealed Receiver," "One Company to have complete control of Broadcasting," the "Open Receiver," and "Limited Competition between

Transmitting Stations"; and so to be of best possible assistance to Australian enthusiasts, the writer left early in 1924 on another world-tour to study International operations in Radio, particularly the British system.

On April 8th, 1924, during the writer's visit to Great Britain, a conference was held in Sydney under the chairmanship of the Hon. Major Marr to discuss abolishing the Sealed Receiver and arrange a scheme for using "Open Receivers." Many proposals were presented but unanimity was not secured.

The British Broadcasting Corporations.

The writer found the efforts of the leaders in the British Electrical Industry in preventing one firm obtaining a monopoly in Wireless had been most successful, and in the Company that had been formed as the British Broadcasting Company, there were 1715 manufacturers; the controlling power, however, being held by the original six concerns that formed the Company in 1922. The arrangements were working most satisfactorily, the programmes being of particular excellence and the operating expenses apparently small for the amount of work being done, as it was all being carried out under the one control, which from the consequent saving of expenses permitted the accumulation of a great reserve fund.

Broadcasting Companies had subscribed £400,000 to build the first station, and public interest in Broadcasting had increased from the issue of 186,000 licenses in 1923 to about ten times that number in 1924, whilst the number in 1926 reached 2,225,000. Listening-in boomed, and as the British Broadcasting Company was restricted to only $7\frac{1}{2}$ per cent. dividend, the money from the great receipts over the reserve fund was used for artists' fees and the building of new stations with other assets worth many hundreds of thousands of pounds.

The British Broadcasting Company received its license on January 18, 1923, and immediately erected eight transmitting stations to broadcast till December 31, 1924, on which date its license was extended for another two years, until December 31, 1926, the Company then erected eleven relay stations, all with different wave lengths; a new main station and high power station at Daventry, the latter operating a wave length of 1600 metres that could readily be picked up by crystal sets in 200 miles range.

Although the standard of transmission of the great Broadcasting Company was excellent and the results unquestioned, complaints were being made by listeners that as all the directors of the British Broadcasting Company, with the exception of the Chairman (Lord Gainsford), were connected with the manufacture of Wireless apparatus, there was a sug-

gestion of monopolising broadcasting to the trade. This possibility of such a criticism, though no doubt undeserved, had been foreseen in Australia.

A Royal Commission to review the position in Britain was appointed, over which the Earl of Crawford presided, which went thoroughly into the whole situation, and after most careful investigation recommended that the control of Broadcasting should be transferred on January 1st, 1927, from the British Broadcasting Company to a new concern called the "British Broadcasting Corporation," which recommendation was accepted and the Corporation was appointed by the King, and is allowed as much freedom as possible in operating Broadcasting Stations. Expenses are being paid as before out of the annual fee of 10/- charged for a receiving license, and the whole of the great reserve of hundreds of thousands of pounds that the British Broadcasting Company has accumulated, has gone to the new Government concern for nothing, only the nominal capital of £100,000 of the British Broadcasting Company is as originally arranged, being repaid to the original investors.

Great Britain therefore considers that one authority is essential to prevent confusion, for the chaotic state of Radio in America had not bettered greatly from the position of 1922 when there were no proper regulations, when anybody could put up a Broadcasting Station, there being too much freedom, with jamming being the rule rather than the exception.

Imperial and International Broadcasting.

From an Imperial point of view the British Broadcasting Corporation is spreading its field around the Empire in arranging a system of inter-Empire Relay Broadcasting from Daventry, the first Relay Station to be at Monckton, New Brunswick, 2,440 miles from England.

This, no doubt, will be later extended to interlink with the various Broadcasting Stations of the world; in fact, it may help to bring to world-wide utility the scheme initiated by the writer in Geneva when during the Assembly of the League of Nations in 1922, he proposed the formation of an International Broadcasting Committee, as a factor in spreading the maxim, "Peace and Goodwill," and was favoured by the President of that Congress, Signor Don Augustine Edwards with a special message carrying the wish that Australia would ever be a grand link for peace in the great chain of Nations. At the 1924 Assembly of the League of Nations at Geneva, he was favoured by the President with a world greeting which he arranged to be broadcasted to the leading nations of the world at a definite time, the message being translated

into the languages of twenty-eight nations and posted to the various stations of those nations., so that at the time of its reception the translations could be read.

Radio was thus emphasised as an important factor in International Peace, and on the writer's return to Australia, in 1924, he noted the possibility of the increase of the power of Radio for world peace, as well as for the spreading of universal delight from stations broadcasting entertainments; hence, at the General Meeting of the Association for Developing Wireless, held in Sydney, August, 1926, he had a motion passed that arrangements be made to consider the allocation of definite wave lengths to the leading Broadcasting Stations of the world, so that when International interlinking is general, the possibility of the clashing of waves will be eliminated, which proposal is now being considered at Geneva.

It is well that we should give keen attention to the best encouragement of Radio research, not only in Australia, but in the British Empire, for we note that Russia is taking up Radio with greater keenness than practically any other nation at present. Russia uses Radio for education, and to show how Radio is developing this year orders for Radio shows increased to over 500 per cent. of those of last year, whilst there is a scheme to provide 1,300,000 new receiving sets within a short period. Russian trade unions have their own Radio stations which are used for general education purposes, and the widest encouragement is given for its best development.

The United States Scheme to Control

There is at present much controversy in the United States regarding the proper control of Broadcasting. Secretary Hoover recently suggested that the Licensing Act of August 13th, 1912, should be amended "to make more definite the jurisdiction of the Commerce Department over the operations of transmitting stations in order to give the Secretary of Commerce the right to modify the wave-length of any transmitting station, its power, the character of its apparatus, and the time of transmission."

This, however, appears to the writer to be going to the other extreme, as vesting such a power in a Minister may be satisfactory whilst such Minister is of the best of intentions at the time of passing such a law, but in these days of changes of Governments with variations of political creeds there is a possibility of a Minister coming into office who could utilise his power regarding control of broadcasting for ends that might not be to the best service of the nation, either by the prejudicial handicapping of the development of Radio or in utilising its remarkable utility for nefarious purposes.

In drawing attention to such a possibility the writer in no way has in mind present-day Governments, either in Australia, Great Britain, the United States or any other civilised nation, but it is well known that occasions have happened in history when a mass of people have been wildly swayed during a moment's loss of thought into taking action that calm judgment would have prevented, and such a state of affairs could place into Government office a person who could be dangerous to national development and, perhaps, civilisation.

To further illustrate the lack of wisdom that giving a Minister such power would mean, one has only to note that the Postmasters-General in Australia, Great Britain, and America, although they have great powers, cannot limit the circulation of newspapers that must go through the mails in their millions.

A Commonwealth Communication Commission

So Radio, developing rapidly as it is into millions of listeners and with its wonderful capabilities and possibilities for communication of sound, pictures and power, calls attention to the necessity for it being considered with other means of communication, including cables, telegraph and telephone, as to whether it could be not best administrated by a special "Communication Commission."

This Commission could be appointed for a term of five years and include at least one representative of each of the five sections of administration considered in this report; the Federal Government, whose representative must be well acquainted with Defence (Aerial, Land and Naval); the States' Governments, whose representative must be national in thought and aware of local development opportunities; Science, whose representative must be an adept at Electricity and particularly Radio development; Commerce, whose representative must be an adept at Accountancy as well as understanding the trade, and able to deal with Shipping intercommunication; and a representative of Law, who must be particularly versed in patents and copyright responsibilities. This Commission could appoint Committees where necessary, such as an Education Committee of Censors.

A Committee of Censorship seems necessary to prevent overlapping of programmes, ensure efficiency in the selection of items, and as far as possible to prevent any mishaps in public demonstrations, as there have been instances of similar items being transmitted at the same time from Broadcasting Stations, whilst certain transmissions were not up to a definite standard of excellence; amongst some lectures broadcasted during six months from a Sydney station being seven on "The Psychology of Fate." The first lecture dealt

with "the influence of haphazard and chance attempts to indicate that so-called chance is not merely coincidence, but the outward evidence of the eternal law which is subject to the limits of mathematics."

It has to be kept in mind that the success of Wireless depends on the success of reception, for it is very easy to offend public taste for Radio by the broadcasting of inferior entertainments; hence the Committee of Censorship could carry representatives of Broadcasting interests, which could co-operate to secure excellence of items and transmission.

National Defence

With regard to associating Radio with Australian National Defence, it should be mentioned that practically the best of experimental work in Australia has been done by Australian Military Forces, from firing field guns by ether waves at Liverpool Camp in 1911, to, during the same year, achieving the location of the centre of Radio transmission, as well as recording of the centre of sound disturbances.

During the Great War the use of Radio by the Royal Air Force was excellently utilised, whilst during the past year almost daily messages were exchanged on short waves with low power, from Point Cook (Victoria) and the Navy Station at Garden Island (Sydney), with Great Britain, principally on machines almost completely made on the spot.

The use of Radio for the transmission of news and power will increase its value for Defence purposes; hence in all discussions concerning Radio, the Defence Authorities are deeply concerned, and in all authority given to any concern associated with Radio, the Defence Authorities should have pride of place. The same affects Transport, in which time saving with speedy transmission and reception of news, will mean using Radio to a considerable extent.

THE STATE ASPECT

"A" and "B" Class Stations

The "A" Class Stations in Australia are giving fairly satisfactory broadcasting though there is rather too great a tendency to use too much of the unusual, such as "divers sending messages from beneath the sea."

2BL (Sydney) has been doing very creditable work, having practically the widest spread of pleased correspondents. 4QG, the Government Station (Brisbane), is winning much appreciation, as is 3LO (Melbourne) and 2FC (Sydney).

There is much controversy regarding the revenue that "A" Class Stations in Australia are receiving, and as to whe-

ther the return to the public is adequate to the charge. This is a cloud that can easily be cleared, as the Government has the right, under the Regulations, of having the profit and loss of the "A" Class Stations disclosed and as the "A" Class Stations consider it inadvisable to further lower the license fee charged the public for listening-in, they will only be too ready to show the cost of their services.

The "B" Class Stations, however, are not finding matters satisfactory from a financial point of view, as their main intention was to reimburse themselves from advertising which they find is not forthcoming.

Cables.

The development of Radio is however waking up Cable Authorities, who are beginning to devise improvements that will make the battle for supremacy between wire and wireless of particular interest, although Radio will be the great factor for linking shipping.

Scientific Research will be ever watchful for innovation, hence the facility of Radio for shipping communication must always be kept in keen review the world over, particularly in Australia where there are many hindrances to its best utility, for though inter-State vessels must be radio-fitted, those trading between ports in each Australian State need not be so, it apparently not being understood that a treacherous sea with a jutting rock is just as dangerous to an ocean vessel, no matter whether its interests be associated with a single State or with the world generally.

Relay Stations

The question of State Transmission is of particular importance at the present time in view of the keen advocacy of the Australian Provincial Press Association, particularly, the Country Press Association of New South Wales, for attention to be given to facilitating "listening-in" for country areas.

The Postmaster-General does not object to Relay Stations being established as he is aware such would benefit country holders of inexpensive sets.

A start is being made in the installation of Relay Stations by "A" Class Station (3LO) Melbourne, which is about to establish a Relay Station in Bendigo, which is 80 miles from Melbourne; and the two "A" Stations in Sydney (2BL and 2FC) are each considering establishing a Station at Newcastle, 74 miles from Sydney—the latter an instance of unnecessary overlapping and expense.

It may be pointed out that the applications of citizens of progressive country towns, such as Newcastle and others, for Transmission Stations to be established, have met with a report from the Post Office Officials that such would mean a

decrease of revenue from letters and telegrams.

This raises the aspect of how far wireless would affect postal revenue generally.

Interfering With Postal Revenue

In Australia the Commonwealth Government has been rather chary regarding the introduction of Relay Stations and the Postmaster General's Department has been somewhat adversely criticised in certain quarters because of this so-called "lack of attention," yet in justice to the Department it should be remembered that the question of expense and possible return is to be kept in mind, because it is easy to criticise a Government for showing a financial loss at the end of its period of office, and not give attention to the fact that much of that loss may have been due to carrying out schemes for public benefit without any satisfactory return. So with regard to Radio Relay Stations, the Postmaster General has had to consider the cost of telephone interlinking of the Transmitting and Relay Station as well as the possible loss of revenue to the telegraphic and telephonic departments through much of this work being superseded by Broadcasted information.

This, however, is a state of affairs that will have to be faced, for Radio is becoming of such national benefit, particularly to country areas, that any question of its interfering with possible loss of revenue from the telegraph and telephone will have to be met without reducing the development of Radio transmission.

At present the postal authorities only receive 2/6 from every license fee of 27/6, a very small return even at the present stage of Radio; so it might well be asked whether a larger part of the license fee should not go to a body that could do much to help the developing of Broadcasting.

What Britain is doing

This brings into the question the advisability of erecting Relay Stations as was done in Great Britain, where, until recently, the British Broadcasting Company operated 21 Relay Stations, which gave the special advantage of enabling listeners-in to get good results from inexpensive crystal receivers, as in England, component parts for valve receivers and especially manufactured sets seemed rather expensive for the general public, for they covered what were considered heavy patent royalties.

The British Broadcasting Company, therefore, found it much more profitable to build these widespread Relay Stations so that everyone who desired to get best results on the inexpensive crystal set could do so, and which would increase listeners and consequent revenue.

The new British Broadcasting Company, however, is replacing many Relay Stations by introducing fewer stations and equipping same with higher power as much as 50 kilowatt.

Very keen attention must be given to this point regarding its application to Australia. The multiplication of Relay Stations that would be particularly profitable from a financial point of view over areas with crowded populations, would hardly be so in widely-spread Australia, where the communities are few in comparison, and widely scattered at that. Yet, it is an aspect that must be faced particularly for outlying parts where Radio would have best advantages in making life more pleasurable and so help to stem the march to the city, hence Radio should be helped to be widespread and be reduced to the lowest possible cost, commensurate with good acoustical results, and a fair return to Broadcasting and Commercial interests.

This matter of how far Radio Transmitting Stations will affect Postal revenue has already had much attention given it, for the Prime Minister is reported to have said that the Federal Government was quite willing to license wireless stations in the country, but there was the problem of the telegraphs. A very great amount of money had been sunk in telegraph lines and the Government had a vested interest in them. However, the subject of wireless coming into competition with telegraphic work was a problem to be thought out. It was a question of vested interest in competition with a new idea.

This matter calls for clear judgment with two main factors kept in view, the giving of better living conditions to the country resident and the encouragement of the development of Radio, and it is hoped that the following note that the Director of Postal Services forwarded to the Country Press Association some time past will be cancelled, that the permission to broadcast a purely news service would not be allowed, as it would divert traffic for which the telegraph lines were provided.

The Press

This aspect of giving every encouragement to the widest use of Radio for transmission of information was discussed at the recent Annual Conference of the New South Wales Country Press Association. A proposition was placed before that Conference by E. T. Fisk, the General Manager of Amalgamated Wireless Limited, and in an interesting address he suggested a schedule of rates for daily Radio services to larger country newspapers.

He explained that his Company was prepared to give a daily Radio service to the larger country newspapers,

and for every hundred words broadcasted the charge would be 9/6, provided seven papers listened-in, but if twenty papers listened-in, the charge would be 22/6. A calm consideration of this charge compared to what it would cost to broadcast is interesting.

He estimated that his charge would amount to £17,550 per year for 5000 words per day to 20 newspapers; but it should be remembered that once each newspaper office has a receiving set, it will not cost the transmitting station any more to talk to all the newspapers in Australasia than it would cost to talk to one, and as there are 65 daily country newspapers in Australasia, if the scheme proposed by the Amalgamated Wireless Company were adopted it would mean a charge of £57,037 per year for what it would be winning a highly profitable investment on its quote of £7410 for broadcasting to at least seven newspapers.

The price of £7410 per year for broadcasting to seven newspapers is hardly reasonable when one compares the cost of installation of a transmitting station and the service of same for one hour per day, for the news matter could be broadcasted in that time, although it could be understood that there would be separate times of transmission for morning and evening papers, with a common time for news not urgent; yet, even assuming the charge be in any way reasonable surely it should not be multiplied according to the number of persons listening-in, each of whom under the present rule for the public would be paying his 27/6 license fee.

In justice to E. T. Fisk, who may be misunderstood, it may be mentioned that he may have in mind the supplying to each daily newspaper of a "Six-Valve Portable Radiola Super," fitted to a dictaphone for picking up and recording all news-matter received, and many other innovations to make in some way reasonable the estimate given to win business for the Company from the not too-prosperous Country Press.

Politics and Radio

The control of Radio has to be considered as far as it will be utilised for State or Federal politics. At present the majority of States are of an opposition political policy to that of the Commonwealth Government, and already the majority of these States are considering utilising Radio for political propaganda.

In New South Wales the high powered Trades Hall Station (2KY) is having a very decided effect in spreading its policy; in fact, a conference of the Australian Labor Party recently congratulated it on its success for party purposes,

which has been so great that the New South Wales Government is considering a widespread scheme of establishing Relay Stations in various country centres. Branches of the Labor League are at present having receiving sets installed in their local offices, so as to help to make them rallying centres for unionists, where political and social news can be listened to, and so widest interest won in the development of the Party. This is not written to criticise any action taken regarding the broadcasting of political propaganda by any political party, for any side will take every advantage to win influence, but it may fairly be asked if such information can be transmitted at a very low cost, and listened to by thousands for no extra charge; surely the Press, which is out to spread news of interest to everyone, should obtain at least as much consideration.

It will be understood that this matter of political broadcasting stations will not be confined to one party. When the Labor party has its six contemplated relay stations in active operation, the Nationalist Party will not be idle, whilst the Country Party, the Liberal Party and the multitude of political creeds that generally arise may also consider their opportunities, so that if the matter be not considered at once, there is a possibility of an "ether" war of considerable consequence at an early general election.

The Police

The question of State or Federal control of the "Police" use of Radio may arise, for the Police Force in each State is taking very keen interest in Radio as a factor for keeping order. Already the complete control of its wireless service has been requested in New South Wales, where the Police Department, having an allocation of £2000 per year, has requested the Chief Secretary's permission to hold its separate broadcasting station, the direction of which must be its own concern. There is no question of the value for police purposes, many instances already being on record. A recent case happening a few minutes after 11 p.m. on January 3, 1926, when the telephone operator at Sydney Police Headquarters received a message that a man was seen breaking into a house at 32 Australia Street, Camperdown. The message was broadcasted in Police code, and picked up by the police car some distance away, and in a few minutes the house was surrounded and a man was found hiding under a bed with several bundles of clothing and jewellery; whilst in Melbourne recently, Station 3LO broadcasted a message that a person named George Chant was required, and a short time later the message was picked up at New Norfolk, Tasmania, by the individual who was sought.

A recent case happened in England, when a chemist, after

a client had left his shop, found he had mistakenly added a poisonous chemical to the client's physic. He immediately telephoned the police who had a wireless message of the mistake broadcasted—the client receiving the advice in time.

Fire Brigades, etc.

The use of Broadcasting for Fire Brigades, Hospitals, and other public concerns, may also raise the point as to whether such should come under State or Federal control. Though such a matter may not create any anxiety at the present moment, yet may, on occasion, be an excuse for interstate or Federal misunderstanding that may develop into a serious outlook, any possible cause of which can be best eliminated by calm reasoning whilst there is at present harmony existing.

Religion.

The question of utilising Radio for religious services will yet be raised as to whether Federal or State permission will be necessary for the erection of a special station for transmitting sermons or lectures, although religion knowing no State boundaries will not be a factor to create discord on such a topic, yet there is a possibility of the matter being raised, and it may be better to give preliminary advice regarding it.

Education.

In Education, which is at present controlled by the States, Radio will take an important place. It is already being widely utilised for that purpose in other parts of the world.

In Great Britain, the British Broadcasting Company, from its inception, has been advocating the use of Radio for pupils attending all public and private schools, instruction being arranged with a Committee of Teachers and experts dealing with literature, nature study, music, and other subjects. In the London County Council school-area over 1500 schools are linked up, whilst in the Provincial centres throughout Great Britain, the number of schools is continually increasing. Since September 1st, 1926, the programme of Radio instruction for schools included addresses from the London and Daventry high stations and the main stations at Aberdeen, Belfast, Birmingham, Bournemouth, Cardiff, Glasgow, and Newcastle, as well as from relay stations at Edinburgh, Dundee, Hull, Leeds, Liverpool, Nottingham, Plymouth, Sheffield, Stoke-on-Trent, and Swansea. Each of these stations has an educational committee that arranges the subjects and lectures, the talks being short, not longer than 15 minutes, so that the interest will not weaken and are winning such wide interest that it is found that libraries are so increasing in popularity, that many have to be fitted with spec-

ial listening-in rooms with wireless apparatus, making it usual for a lecture to be followed by a wide request for books dealing with the subject.

The new British Broadcasting Corporation is giving every encouragement to this sphere of utility of Radio.

In the United States, Radio is widely encouraged for educational purposes; in fact, during a recent series of 20 lectures broadcasted from Hartford, Connecticut, over 250,000 pupils in Connecticut, Maine, Massachusetts, and New Hampshire listened to the same teacher.

Many Australian attempts have been made to encourage school children to take interest in Radio, but up to the present little success has been made. The writer gave a prize of £5/5/- two years ago for an essay on the subject by school pupils, but nothing happened, whilst he recently donated a prize for an article on Radio at the Sydney Technical College Radio Exhibition, but owing to lack of interest in the subject, the prize was transferred to the Cancer Fund. The only way therefore to interest the schools in Radio is to institute a definite programme of popular instruction to be carried out by the Public Instruction Department, which in New South Wales already has amongst its officers some enthusiastic Radio experimentalists, including the Director of Technical Education, James Nangle, F.R.A.S.

It may be pointed out in connection with Radio in schools that the New South Wales Minister for Education, Hon. T. D. Mutch, is in favor of the formation of clubs in country towns with the use of school buildings during evenings for those who desire to listen to matter broadcasted.

The Danger of State Controversy

In this summing up of some of the sections in which the States' are taking separate action regarding Radio, it is well to bear in mind that a proper understanding should be speedily arrived at as to how far the States' control can be extended, for on such a subject misunderstanding can easily arise that could develop into a very serious situation.

THE COMMERCIAL ASPECT.

The Amalgamated Wireless (Australasia) Ltd.

The Amalgamated Wireless (Australasia) Ltd. as a "Government Department" should be considered as to its value to the public from the two aspects from which every Government concern must be judged: its value from a financial point of view, and its value as regards public benefit.

The financial aspect cannot be said to be satisfactory. the last balance-sheet of the Company, dated June 30th, 1926, showing a deficit of £178,589, and no dividends have been paid to shareholders since June, 1922.

If the financial aspect be unsatisfactory then we must ask if its public good makes up for the extra expense of its upkeep.

In studying its value as regards public benefit the reason, for its existence comes into consideration.

About 15 years ago 40 acres were selected at Pennant Hills, and as the area was covered with bush, a Sydney firm offered to clear it for nothing and give £250 for the timber. The Government, however, unwisely resolved to do the work, which cost £4000, including erecting two small buildings. The Government then decided to make wireless sets, so purchased the Shaw Works at Randwick for £50,000 for the purpose, giving £25,000 more than the works were said to be worth. The history of these works under Government control is a story of muddle, bungle and money-wasting, until we find that up to December, 1921, the annual loss had risen to about £75,000 per year.

This unbusiness-like state of affairs must have rushed the Prime Minister of that period to push forward the speedy adoption of the agreement with the Amalgamated Wireless (Australasia) Ltd. as at present existing.

The report of the first meeting of the Company after arranging the agreement with the Commonwealth opens with this phrase:—

“The agreement with the Commonwealth is the outcome of at least three years’ effort on the part of the Government and this Company, to establish an effective commercial wireless service between Australia and Great Britain, and to place the entire wireless industry on a basis from which the fullest measure of development and all the fruits of this valuable science could be made available to Australia.

“The Company will proceed immediately with a comprehensive plan of development, including—

“(a) direct commercial service between Australia and England.

“(b) direct commercial service between Australia and North America, and

“(c) feeder stations in each capital city.”

That report was made on April 24th, 1922, and nearly

five years have passed and it cannot be said that the aims referred to have been achieved.

Under the agreement with the Commonwealth Government the latter had to subscribe to the Amalgamated Company's capital £500,001 which the latter consider would cover the cost of erecting high-power wireless stations in Australia, Great Britain and Canada and which stations were to be ready by March, 1923 (see "Age" (Melbourne), January 16th, 1924). A contract was made with Marconi Company for the Australian Station to cost £487,000, but the Amalgamated Wireless Co. seemed to be unaware that the British Government was not prepared to issue a license to any private company; in fact, it was stated that the British Postmaster-General was of opinion that the Marconi 'Co., if granted unrestricted license, would establish an Empire monopoly. It was also considered that a private company with such power could in time of international stress be used for nefarious purposes, not that the Marconi Co.'s representatives would be so inclined, although they had much foreign interests interlinked.

How keen was the desire of the British Postal Authorities to have a high-power station solely controlled by the Government, will be understood when it is pointed out that prior to the high power station operating at Rugby, most of the news broadcasted over Europe came from Germany, and was of little interest to British people, as the Hon. W. G. Gibson (Postmaster-General) verified on his arrival in Yondon by the R.M.S. Ormonde, during the writer's stay in London.

The Beam System.

Nothing happened in Australia till Marconi announced the discovery of the Beam system, and the Marconi Company offered to build an inter-linking station with Canada for one-fourth the price of a high-power station.

The British Government at the time was building a high-power station at Rugby, but suspended operations to give Marconi an opportunity to prove his claim.

The Marconi Company, prior to the announcement of the Beam system, was not in a satisfactorily financial condition, in fact Marconi stated, at the Company's meeting, that "this system has contributed to the favourable change in the Company's prospects."

The British Admiralty considered (22nd December, 1924) the Beam system, with its short wave, could be easily interfered with in war time by another short-wave and low-power transmitter that could easily be placed, but it was a different matter to a high-power transmitter, which was not so portable.

The British Postal authorities considered that experi-

ments had proven that the Beam system was not always dependable; in fact, it only accepted the Marconi tender for the Beam station interlinking with Canada on condition that there would be no payment if the system did not work up to the speed and capacity claimed, and then payment only to be made in periods of three months during the first year's working of the system. The contract was not completed to time, hence, when the writer was informed in London that Australia was to permit the Amalgamated Wireless Co. to spend over £100,000 in erecting a Beam station and accessories, he cabled to three leaders of public opinion that it would perhaps be wise to await the result of the British experiment with the Beam and to withhold the spending of £100,000 on the Australian Beam station until it had been proved a success over a long distance.

The contract made by Amalgamated Wireless (Australasia) Ltd. with the Marconi Company for the Beam Station was for £75,000, the Marconi Company guaranteeing not less than 43,200 words per day each way, equal to 86,400 duplex traffic, and the station to be ready for tests September, 1924, the total cost of same being £120,000 for a 100-metre wave, the English tender being £50,420 different to Australia, a rather large difference in cost, considering the chief claim for the Beam was low cost for low power for short wave.

The claim that the Beam message is secret does not yet appear to be correct, as the England-Canada Beam service is regularly picked up by Australian listeners. This deletes the word "directive" from the claim, and does not give the Beam much more value in war time than any other system. The Marconi Company also claims that messages will be untappable owing to their speed; but the speed in recording can be mechanically overcome.

It may be found that the claim of "directional" will be difficult to maintain when it is considered that by the time the Beam has been directed as far as Australia, the small angle that the waves are confined to in the reflector at the transmitting station will have widened to about 2,000 miles; so by the time the returned message is directed from Australia to Europe, it can be picked up in an area of that width. This and other queries may yet be satisfactorily settled by the Marconi Company, but great judgment should be used in giving public information, for Marconi, on December 6th, 1926, was reported as saying that under the Beam system events will be "broadcasted" throughout the world, evidently using the word "broadcasted" for "directed."

It was hardly wise to make such a claim, as the tests to date have not been quite satisfactory. Also, in the reports of the early tests, the interviews with Amalgamated Wireless

Patents and Improvements.

There is considerable controversy the world over regarding the validity of Radio patent rights and without in any way questioning any claims that may now be under consideration a review of Wireless Invention generally will interest.

Marconi was not the inventor of Radio nor has he claimed that credit, as Faraday gave the theory over a century ago. He was followed by Maxwell in 1865, who established the fact that light and heat were forms of electro-magnetic energy, and who predicted existence of ether vibrations similar to those giving light and heat, but of greater wave-length. Hertz in 1888 studied Maxwell's theories and proved them correct by discharging a Leyden jar through a spark gap, so producing electric disturbances, the waves of which were "received" on a distant resonator "inducing" electric currents that caused minute electric sparks, so forming the first wireless transmitter and receiver.

This short-distance transmission was taken up by Marconi in 1896, who added an upright wire or "aerial" to the Hertz oscillator, and with a similar device at the receiving end, he found a way to extend the length of the range of communication, and having a keen business sense (unlike the average scientist), he had his scheme financed; and so the Marconi Company commenced its development.

Marconi improved his apparatus by adapting and improving upon various inventions, such as the Bramley "coherer," a tube of filings invented six years before, to give reception, but which became insensitive once insulation was destroyed. Marconi devised a "tapper" that automatically shook the filings, and so Wireless developed over many improvements till we have it to-day still on the track of discovery.

It can therefore be understood that the original theory of Wireless, with the simple arrangements for its display, is open for anyone to experiment upon and improve its use for communication; and though much of the apparatus facilitating its utility is protected by patent rights, no Company, as the Telefunken Company did in Australia in 1910, has the right to claim that it is entitled to all present and future patents affecting Wireless.

No Company or other concern has a monopoly on brains, inventive genius or enterprise to commercially develop it; but such commonsense reasoning often misleads an experimenter to step into a field protected by patents, and not being prevented, he considers he is safe not knowing that the Company holding the patent rights he may be using is aware that it is not worth while spending the time and money to

stop him. On the other hand, some Companies may honestly consider that the patents they hold give them a claim to improvements upon their apparatus, and so they threaten the manufacture to whom the improved scheme has been sold, or the shops who sell the manufactured article; and the average manufacturer starting to develop a new appliance, not, as a rule, having got the means to fight such claims, even if he is well aware he has justice on his side, and as he is usually alone, he cannot get brother-manufacturers to join with him to unitedly battle for his right.

This aspect is of particular importance in view of the action threatened Australian Traders by the Amalgamated Wireless (Australasia) Ltd., which on September 4th, 1926, issued a notice that it held an exclusive license in Australia to "all present and future patent rights" of the Telefunken Co. of Germany, Marconi's Wireless Telegraph Co. Ltd. (London), the Radio Corporation of America and others.

The notice stated, "We claim that it is not practicable to construct a Valve Receiver suitable for the market without infringing one or more of our patents."

It therefore claimed amongst other demands a payment of a royalty of 12/6 on every valve holder sold (if British or Australian made) or 17/6 if foreign made. In Germany the holders of the patent rights demand only 3/- for each valve holder, according to the writer's special representative in Berlin, and whose report is published in the November issue of "The Australasian Engineer."

The claim of the Amalgamated Wireless (Australasia) Ltd. that it is not practicable to construct a Valve Receiver referred to, brings to mind the claim of the Marconi Wireless Telegraph Co. in London against the manufacturer of the Mullard Radio Valve, which was decided during the visit of the writer to London in 1924, and proves it is risky for the holders of any Radio patent rights to be too extravagant in their claims.

The Marconi Company considered it held the right to certain improvements Mullard made in the thermionic valve by using a straight filament surrounded by an open spiral wire grid and an open-ended cylindrical plate.

The Marconi Company lost in the Lower Court, but took it to the High Court and again lost. Undeterred by these losses, which meant heavy costs, the Marconi concern took the case to the Court of Appeal and lost once more. Determined to go to the end, the Marconi Company chanced taking their case to the House of Lords and suffered a final defeat.

The writer mentions this case particularly as the Australian Company, being practically a Government and so a pub-

lic concern, should have a definite check upon any highly expensive risks it may **take in such matters.**

The judgment in the Marconi-Mullard catastrophe is specially interesting to Australia just now for Lord Dunedin confirmed the decisions previously given. Although the law was ready to afford the utmost protection to inventors who produce new and valuable devices it was manifestly unfair to others to extend a patent monopoly beyond the invention actually and clearly described in the patent specification. Any concern, therefore, claiming any rights to future improvements on existing appliances, will have to definitely specify on its patent specification what improvements are possible—an obvious impossibility.

Another concern of which the Amalgamated Wireless (Australasia), Ltd. claims to hold Australian "present and future patent rights," the Radio Corporation of America, has struck trouble in its claim for patent rights to the Hazeltine neutrodyne patents which it claimed were an improvement on its patent. It therefore sued Hazeltine and lost; and its appeal to the Federal Court was also lost.

Radio Traders should have their field of operations cleared of the weeds of misunderstanding, particularly when it is understood that the best public interests are hampered when best trading facilities are denied Radio merchants.

The interests of the public must have best consideration in such matters, even if any claims made for a monopoly of patent rights be upheld, for it has to be borne in mind that in certain Australian States there are laws in operation which arrange for a Court to decide on what are equitable charges in certain concerns; for instance, for house rents, when some owners of property charge a rent that may be found to be unfair, a court can re-arrange such charge. The same principle could, perhaps, be considered in connection with patents covering Wireless, to prevent any possible exploitation of the public, at the same time to be just to the holders of patent rights.

Copyright claimants could have their demands considered from the same point of view.

THE SCIENTIFIC ASPECT.

The Scientific aspect of Radio Investigation calls for keenest attention for its best encouragement is the basis of all development.

Encouragement of Radio Research is most necessary in Australia to spread pleasure by means of broadcasting to distant country districts and so make country living happier and stopping the march to the capital cities that is rapidly depleting the country of the population necessary for production.

Australia calls for the best encouragement of Radio experimenting for scientific research generally is on the verge of extraordinary development. We note many great minds to-day delving into the glories of science. New stars are being discovered in ever increasing space, each containing a solar system in itself. We find the heavens studded with solar systems akin to our own, each having its revolving series of planets, each system moving in a direction as to suggest a revolution around a Common Centre whilst looking at the other extreme, we peer into matter and find it but a series of atoms floating in ether, each atom being like a minute solar system of revolving electrons around a common centre; each electron being a minute sphere, in one instance one million times smaller than the five hundred and fifty millionth part of an inch.

An electron is particularly small, in fact its minuteness can be understood when it is pointed out that an atom of which it is a part is so minute that it would need 100 trillion trillions of atoms to cover the head of a pin; and the difference in size between one of these atoms and one of its electrons can be gauged when it is pointed out that if the electron were represented by a small dot such as a full stop in printing, the atom in proportion would be 80ft. in diameter.

An atom is a tremendous storehouse of energy and the movement of its electrons is so swift that it is considered that before long that energy will be harnessed and put to use.

Sir Oliver Lodge, with whom the writer had the pleasure of several chats during his recent visit to England, considers that harnessing of this remarkable atomic power, which should reach realisation within the next fifty years, will make a complete change in human life with conditions even more changed than the wonderful difference that the use of steam and oil power made. Professor James Norris goes further, and considers that with the harnessing of the power of the atom, toil will be banished and the old social system will be revolutionised.

Notwithstanding such a remarkable range of investigation, of the human brain, one ventures to the study of

Wireless with wonderment. To-day we find wireless waves of various lengths capable of moving across the world with the speed of light, carrying news and pictures, and even penetrating substance, that was hitherto considered solid matter, all matter, as mentioned, now being known as merely atoms floating in ether, the wireless waves moving through the ether, so giving the effect of passing through substance, a scientific revelation of remarkable interest.

We do not need to look beyond Australia to wonder what the world has done in scientific revelation. Only forty-two years ago the world saw an Australian inventor, Lawrence Hargrave, solve the mystery of flight; and to-day we find the air conquered—and the story of his success will never die for it not only covers the solving of the problem of flight, but also the invention of what was long afterwards credited to the French engineer, Gnome. The writer, to show this tendency to credit oversea achievements when such is due to Australians, gives an example shown in a motorless aeroplane in Germany, in 1922, as something just invented, yet the writer devised it and flew it thirteen years before.

The same is happening to-day in Europe. Cierva's Spanish aeroplane is being taken up as unique, whereas the same principle was invented by an Australian named Fortescue in 1915.

It is the same with Wireless. It is only a little over five years since Wireless was first broadcasted, and now we find clever young Australians, like Charles Maclurcan, sending messages around the world with the shortest of wireless waves.

This development of the short wave has been most interesting. When experimenters were being debarred from working long waves (to prevent interfering with Broadcasting Stations and Listeners-in), they were given, as a sort of sarcastic consolation, permission to use short waves, with the result that they have so developed short-wave transmission, that it is relatively less affected by atmospherics; and during the recent expedition to the North Pole, they proved superior to long waves; in fact, whilst the long-wave transmissions from Amundsen's Airship, "Norge," were not able to be picked up, the short waves from the Byrd and McMillan expeditions (waves of only 41 and 61 metres), were readily received around the world.

Almost every day we are winning something new in the world of Wireless; yet we cannot forget the early experimental work in Australia; and that brings one back to the early nineties, when the Wireless Institute of Australia was founded with pioneers in Radio in Wilkinson, Kirkby, W. H. Hannam, C. P. Bartholomew, and later Charles Maclurcan,

whose remarkable success with short waves across the world were the sensation of 1924.

It is interesting to look back to when the Military Authorities were convinced that in Radio, Australian Defence was winning a very useful ally; in fact, the interest of the Military Authorities was only won in 1910, when the writer established the first Military Wireless Station in Australia, which was located in a cave some miles beyond Heathcote, near Sydney, where the wireless gear used would seem second-hand rubbish compared to the dainty apparatus of to-day. The second camp was formed at the Officers' Quarters, some two miles away, where Wireless was out to compete with previous methods of sending messages, such as the telegraph, the waving of flags, and the flashing of searchlights. The Military Authorities recognised the value of Wireless, and adopted it. So encouraged, the writer began to apply wireless to moving trains, his apparatus being first successfully applied in 1910 to the Sydney-Melbourne Railway Express, so that in the event of a break-away on an incline and the brakes failing, the train could be saved from rushing backwards into the last left station. In the same year he first successfully applied a system of sending wireless between trains moving in various directions at Toowoomba.

Australia was also one of the earliest to send drawings by wireless, Wilkinson transmitting a sketch of Sir Frederick Darley in 1910. It was at a lecture in 1911, in Sydney, the writer had the honor of first describing a scheme for locating the centre of sound and wireless disturbances by means of Radio receivers, microphones, and compasses, though six years later others were given credit for it; still one does not mind, as there is always a happiness of spirit obtained as having done something to help this dear old world along, no matter how small that something may be.

Regarding the transmission of photographs, Alexander Graham Bell many years ago utilised the property of selenium of offering a greater resistance to the passage of an electric current in darkness than in light. Bell used a very thin metal mirror in a mouthpiece, against which a beam of light was thrown, and as the mirror vibrated to the sound waves, it reflected the vibrations of light on to a selenium tube, which converted the gradations of light into electric waves, which were transmitted by wire, received, and turned back into sound waves.

In 1913, the writer was devising an apparatus that covered a drawing in one line that made over a thin layer of tinfoil, which would only give variations of electrical connections at the parts where pressure was placed, the variations

being transmitted and picked up, but it was only with difficulty that any reproduction could be made. He worked on this scheme some years ago in experimenting with a pointer working on a continual line, and endeavored to transmit portraits of the Prime Ministers of those days, in the persons of Sir Joseph Cook and William Hughes, but he abandoned it in favour of revolving cylinders.

For such he had the picture photographed through a screen on to zinc, and etched in the ordinary method of making half-tone blocks, the print from the block being made and enlarged, so that the picture would be a zinc plate with a series of widely-spread dots of various sizes, deeply etched, the plate being bent round a cylinder with an endless screw, carrying a contact needle that traversed the length of the cylinder, sending forth the various dots and dashes, the breaks in the current being picked up, influencing a small magnet, which operated the balanced end of a pen with the result that the latter drew the picture represented by the zinc cylinder, which drawing could be reduced to any size required.

He worked upon this process to transmit coloured pictures by splitting the picture into three primary colours—red, blue and yellow—which, as is well known, give all variations of colour. The zinc plate representing each colour was enlarged, and its surface etched into dots and dashes, which were picked up as before, and printed over each other with the primary inks, so giving the original picture in its colors.

Consider what this swift photographing will mean of a scene from a motor car or aeroplane and its immediate transmission to any receiving station.

In America, Jenkins is developing a similar arrangement by which instead of the contact pin moving on an endless screw, it swings from a centre over the paper on which the picture has been drawn, and which is placed over a metal layer so that as the drawing would slightly move towards the axis of the swinging arm containing the pointer, the latter touching the drawing at the necessary places, so making metal contacts that would be transmitted and received on a similarly operated apparatus over which the metal pointer would swing giving a magnetic contact corresponding with the lines of the drawing on the transmitter, and which by means of a pencil reproduces the drawing on a similarly moving sheet of paper.

T. Thorne-Baker, in Great Britain, was a pioneer of phototelegraphy, who utilised a specially-prepared photograph on a transmitter, so that the photographic image would be reproduced on a sensitive film at another station, which effect was given by selenium, as was discovered by Alexander Graham Bell, the gradations of light giving the variations in electric current.

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Belin, in Germany, in 1923, introduced a system by which he used mirrors to speed the transmission; another scheme being the Karulus Telefunken System, which works on a similar system to Belin's, but at a very high speed, that it is hoped will later permit showing a moving picture.

Dr. Ranger, in America, in 1925, published a process by which the picture was photographed and the negative placed in a glass cylinder, and lines of light passing through the film, the variations of light and shade producing variations in a photo-electric cell, which were transmitted and afterwards reproduced by the receiving station an endless screw mechanism being used, somewhat similar to the Australian system of 1922.

The cylinders travel on an endless screw instead of the pointers. The cylinder of the transmitting station is of glass with a transparent film of the photographs placed round it and carrying a bright electric lamp, with its light focussed to a pencil point so that as the cylinder turns, the line of light shining through the film changes according to the light and shade of the picture. This line of light is allowed to play on a photo-electric cell, which is affected by the amount of light played upon it, the principle being that a vacuum bulb with a negative electrode covered with an alkaline metal as potassium or rubidium in a colloidal state, as the light flashes into the bulb the sensitive coating on the inside surface of the bulb sends out a number of electrons which jump to the metallic centre of the bulb completing a circuit that is strong or weak according to the amount of light that enters.

The photo-electric cell therefore translates the light impulses into electrical impulses. The latter travel through the ether and the fluctuations of current are picked up in the ordinary way by a receiver and are utilised to control the strength of an electric light so that the latter becomes strong or weak according as the amount of light is coming through the transparent negative picture on the cylinder of the transmitter to the photo-electric cell is strong or weak, and so it plays on a sensitised film on a similarly operated cylinder at the receiving station, the variations of light giving in a series of lines thickening and thinning on a positive photograph corresponding with the negative on the film at the transmitting station.

This describes the transmission and reception of a single picture which has to be developed, but the light can also be flashed on to a dark wall and be seen as a complete view if transmitted with sufficient speed, the light beam being

moved instead of the cylinder, and being made to traverse the picture from side to side, and when a series of such views as on a cinematograph film can be flashed and concentrated at the receiving station, one can get the moving picture.

Radio photography will rapidly come into general use as soon as apparatus for same is cheapened. Already it is being utilised in the broadcasting of weather charts to both land and ship stations. A German Shipping Company broadcasts complete maps to the various ships on its list.

To-day we are noting that in the older part of the world picture transmission by wireless is becoming almost a daily occurrence; whilst transmission of power is getting from the experimental stage.

In that respect, we note that Ohlson, Chief Engineer of the Waltham Watch Co., of U.S.A., is experimenting in connection with the transmission of power, so that what he calls "telechronometers" will before long be in operation, drawing motive power from a central radiocasting station. He states that soon, watches will be small radio-receiving sets, operated from "telechron" companies solely formed for radiocasting energy for such timepieces. Already systems of clocks are electrically wire-connected and accurately synchronised in accordance with time signals from Arlington Naval Observatory; and it will not be long before the "telechron" clocks will be without weights or internal main springs, and solely controlled by radio waves.

It may, however, be pointed out that it has been ascertained that at a distance of 100 miles, power generated by a 500-watt plant is so dissipated as to be too small to be of any use. Yet it is claimed to be but a matter of wave lengths; and as light waves from the sun can operate a motor by power, it is therefore claimed that when radio can be shortened to the length of light waves, say one centimetre, the problem of power transmission by radio will be almost solved; and that such an achievement will be early realised.

Consider what this will mean to this wide continent of Australia, which had lain unknown throughout the history of the world, only coming into prominence at a remarkable stage as the old world languished in a state of despair—a new world that came into history with a type of human being who seems to have a special faculty for quickly solving problems in physics and science generally; and in Wireless is that keen insight mostly manifest.

Wireless is entering many spheres of utility; in America, for instance, factories are installing loud speakers, as recent experiments proved that music by Radio can help production without any tiring effect on the part of the employed.

An Australian Radio Research Bureau.

In the encouragement of Radio Research in Australia an interesting suggestion was placed before the recent Conference of the Wireless Institute of Australia by Professor Madsen of the University of Sydney, who advocated that the Federal Government should, under the new system of Scientific Research, place a sum of money in the University of Sydney for establishing a Radio Research Bureau.

Encouragement of Radio Research in Australia should however be a Commonwealth matter, for if Commonwealth funds go to any particular State University, every State can reasonably ask for a similar amount, resulting in overlapping of experiments, waste of time and engendering of State jealousy. A Radio Research Bureau should be established by the Commonwealth Government but it should be located at Canberra (Federal Territory), with other Research Bureaux.

THE LEGAL ASPECT.

The "Legal" Aspect, in a review of Radio Development, would cover the investigation of the legality of patent claims, the protection for the public use of results secured in concerns financed by public funds, and facilitating the best and freest use of worth-while items to be transmitted to listeners-in who are paying licenses to the Government for the best utilities of Radio, the latter covering the question of Copyright; and as Copyright Law is International as well as Commonwealth, keen consideration would no doubt be given as to how far items can be utilised for public benefit, keeping in view what should also be considered the just rights of holders of Copyright.

What Radio Means

The world to-day is getting rather anxious. It is in fear of renewal of war-disease; but in Radio the writer suggests there is an item of power-possibility that can be developed to make any evil-thinking nation behave itself, as the war of to-morrow will be mostly mechanical, and one can easily vision it being carried out with an army of experts in Wireless—the newest and the greatest of sciences—directing operations by schemes, as high above modern military methods, as the latter are above the fighting methods of the aborigines: proof of this being the application of wireless waves to aeronautics. An interesting feature in that respect was the recently announced operation of an aeroplane solely by Radio, the impulses being transmitted on various wave-lengths that worked gyroscopes controlling the balance of the aeroplane as well as movements forward and to the right and left, an aero-

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plane so fitted at the Air Service Laboratories at Dayton, Ohio, in June, 1926, making a trip of 90 miles without anyone aboard.

This feat is recorded in American "Radio News" for July, 1926, as being "most marvellous," yet in 1912 an Australian, Alban Roberts, showed a similar apparatus to the writer, who secured the Lyceum Theatre, Sydney, for a demonstration, so that one afternoon (fourteen years ago), Roberts stood on the stage of that theatre with a small party, and directed a small balloon from a table, made it turn round the theatre, and on the request of the Lord Mayor of Sydney, E. M. Clark, drop a paper ball into the gallery, the machine returning to the stage.

For fourteen years after Roberts tried to influence the British War Office to recognise the value of his achievement, and it was only within the last few months that he succeeded.

This is noted not in any spirit of criticism of Authorities, but to show that Australian Radio has led the world in certain respects, and such examples furnish sufficient reasons for appealing for best attention being given to the developmental possibilities of Wireless in Australia.

Radio can be one of the greatest blessings to Humanity, for to-day we are on the verge of the solving of what may seem the miraculous. We see in wireless almost limitless possibilities for human betterment. Apart from the transmission of news, messages, drawings, photographs, colored views and moving pictures, we are entering into a field of research that makes one feel as if standing on the verge of the miraculous. Experiments are at present in hand and developing with every possibility of success in playing changes of light on the retina of the closed eye—that will mean, when fully developed, the possibility of helping those who are blind on account of the destroyed cornea to have vision given to them on their retina.

Let us try to realise what that will mean, the widest spreading of the glories of the heavens and the earth to those who specially plead the most appealing of all prayers: "Let there be Light"; and when we note the rapid improvement in radio transmission, we must give a happy thought to those pioneers such as Maxwell, Hertz, Bell, Lodge, Marconi and other wonder workers who have made them possible.

We feel to-day the world has been working through the ages a remarkable apprenticeship of research in order to reveal the glories of science for this generation. To-day we are standing on the brink of a cliff overlooking an ocean of wonderful wisdom, that makes us yearn to survey the sea of possibilities, which in Radio research is bringing us nearer to the Infinite than any other branch of science.

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A REVIEW OF RADIO

WHERE AUSTRALIA STANDS

The Royal Commission and Its Scope



The President's Address to the Association for Developing Wireless in Australia, New Zealand and Fiji, at the Annual Meeting, January 25th, 1927, being the Fourth Anniversary of the Foundation of the Association.