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AERIAL SERVICES FOR AUSTRALIA

THIS is the generation of the motor car and the submarine.

It listens with amused indulgence to the last generation.

The last generation listened in much the same manner to those who ventured to suggest the possible advent—at some future date—of the horseless vehicle or of the vessel which would travel beneath the surface of the ocean.

The last generation has lived to realise the fallacy of its prejudices.

The present generation—influenced, to some extent, by the discomfiture of the last—is, perhaps, slightly more tolerant of the modern scientist than was its predecessor. But there are many points on which it still requires to be convinced.

In its youth the present generation has scoffed at any reference to human mastery of the air. "As much chance of doing that as of flying!" was a simile no less popular with him than with his ancestors. And although each day brings us word of some new development in the aerial activity of other nations, the present generation is yet to be finally persuaded that we, in Australia, are to-day on the threshold of a revolution in our own methods of travel and communication.

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A prominent Australian, Mr. G. F. Holden, Chairman of the Melbourne Harbour Trust Commissioners, and regarded by many Victorians as "the Head of the Port," last month made the following statement:

"I believe the aerial mail service is bound to come. The possibilities of such a service are exceedingly large and we have not heard nearly all that has been done in aerial work and construction since the war began." Mr. Holden further gave his opinion that the greatly accelerated delivery of mails by aerial craft would produce a far-reaching effect on Australian commerce, but that it could not be practically handled until after the war because until then the people of the Commonwealth would not be fully acquainted with the progress made in aerial navigation during the past few years.

In conclusion Mr. Holden declared that the question of aerial mail service has become an extremely practical one.

In a word—Mr. Holden is convinced that we shall have an Australian aerial mail service—*after the war*. But so far no steps have been taken to secure one.

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Sir Joseph Ward, Prime Minister of New Zealand, has, according to recent cables, decided upon the adoption of aeroplane mail-carriers for the Dominion. It is proposed that a series of aerial services will be commenced—*shortly after the war*.

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It is the mission of this journal to deal—to the fullest possible extent—with the development of aerial resources throughout the world, and we feel justified in printing a remark recently made to us in this connection by Lieutenant-Colonel E. H. Reynolds, D.S.O., O.B.E. This officer is in supreme command of the Australian Flying Corps and was recently invalided back to Australia. Said Colonel Reynolds, during an interview with the writer at Victoria Barracks, Melbourne: "Until a few months ago Australasia possessed no institution or publication of any description whereby its citizens could obtain accurate information on aeronautical questions. *Sea, Land and Air* is undoubtedly the pioneer in this direction and fills a wide gap."

We recognise the soundness of this statement and shall endeavour to keep our readers in close touch with all that is new and practical in aircraft.

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Our immediate object is to secure for Australia a series of aerial mail services and aerial passenger services. And to secure them without delay: not *after the war*.

There will be Australian inter-State aerial services, *viz.*:—Western Australia to South Australia, Queensland to New South Wales, Victoria to Tasmania, etc. There will be transcontinental aerial services from Port Darwin to Adelaide; from Brisbane to Perth—and a large number of other clearly-defined point-to-point routes. Our readers need no reminder of the importance of direct communication between the mines of Broken Hill and the steel works of Newcastle, a journey which under existing conditions is accomplished in four tedious stages, entailing some 1,500 miles of travel and inter-changing between three State railways systems, *viz.*:—Newcastle-Sydney: Sydney-Albury (New South Wales Railways), Albury-Melbourne, Melbourne-Serviceton (Victorian Railways); Serviceton-Adelaide (South Australian Railways) and thence a further journey of some 400 miles back into New South Wales.

The entire distance, as the crow flies, is 630 miles and could be covered by aeroplane in a trifle over six hours.

That these aerial services will *eventually* be introduced is beyond the slightest shadow of doubt. Our present concern is that Australia shall not lag behind the other nations of the world.

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Aerial mail services are already established in Great Britain, France, Italy, Germany and Austria. China and Norway are now experimenting in this direction.

The Spanish Cabinet is considering the institution of aerial postal and passenger services between Spain and the United States.

Japan builds her own aeroplanes.

America, in May of this year, began an aerial mail service between Washington, Philadelphia and New York. The first American aerial mail service (described in the August issue of *Sea Land and Air*) has been extended and to-day operates between New York and Chicago, and covers the entire distance—945 miles—in 7½ hours.

Among Imperial Dominions the lead has been taken by Canada, and on September 5, of this year, Canadian mails were carried by aeroplane between Ottawa and Toronto—the return journey (540 miles) being accomplished at an average speed of 100 miles per hour.

That South America will come into line with the older nations is indicated by the announcement, recently cabled from Rio de Janiero, that thirty aeroplanes, with flight instructors, are to be sent from France to form the nucleus of an air force for Brazil.

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Some day we may be permitted to publish official comments by the British War Office on the work of Australian Flying Squadrons in France, Flanders, Egypt, Mesopotamia and Palestine. We have applied for permission to do so. Meanwhile we may assert, on the highest authority, that the Imperial War Office has repeatedly written and spoken of our aviators in the most laudatory terms; affirming that Australian airmen are second to none.

Many of the airmen thus referred to are already back in our midst, and conversations which we have had with them reassure

us that there is not the slightest necessity for Australia to seek advice in other countries on how to set to work on founding an aerial service of our own, and, further, that we shall very soon be able to entirely build our own aeroplanes from our own raw materials.

What Australia has achieved during the past few months in the construction of her ships, may be accomplished with equal success in the construction of her aeroplanes.

As a preliminary to the manufacture of our aeroplane engines it will perhaps be necessary to obtain certain machinery from overseas, and this will most assuredly be done. It will be necessary, too, to train a large number of workmen in the industry—just as it became necessary to train Australian artisans in the matter of ship-construction. In Great Britain this work is at present being done by women and girls—so we need anticipate no real difficulty in the direction of obtaining labour to keep the industry in a flourishing condition.

Australia enjoys many natural facilities for the manufacture of aircraft and is especially fortunate in possessing unlimited supplies of suitable timbers, some of which are to-day being used in British aeroplane factories, as substitutes for those of other countries. Queensland maple is replacing American walnut in the manufacture of aeroplane propellers, while in other structural parts (notably struts and longerons—the latter being a technical term applied to the main ribs of the framework) the Huon pine from Tasmania has proved an altogether excellent substitute for American and Canadian spruce.

Another important preliminary to aircraft manufacture — the production of "three-ply" wood—is already overcome in Australia. This process consists in uniting three sections of wood, transversely, one above another; the "cross-grain" result, which is obtained by hydraulic pressure, ensuring remarkable stability of the whole. "Three-ply" is at present produced in New South Wales, and is largely employed in the manufacture of Australian pianos.

The first practical step towards the inauguration of aerial mail and passenger services, should, in our opinion, be the immediate appointment of an Australian Air Board. This would be comprised of civilians, and would include a proportion of returned flight-commanders and air-mechanics from the Australian Flying Corps. Under the direction of this body an Advisory Board would be appointed to ascertain and report on Australia's natural resources for aircraft manufacture, and on the industrial facilities already existing.

Capital to finance the new industry would undoubtedly be forthcoming. Aeroplane factories, aerodromes, landing-grounds etc. would automatically follow.

With an abundance of raw materials close at hand and no shortage either of capital or of labour, or of practical men to direct the enterprise along practical lines, we can foresee no logical reason why the inauguration of Australia's aerial mail and passenger services should be postponed until after the war.

The preliminaries to commercial aviation in Australia are further discussed in an article—by Mr. C. A. Jeffries—which appears in another section of this journal. In the same section we reproduce an aerial route-map of the Commonwealth which has been designed especially to illustrate this article.

The Editor will welcome correspondence on this subject and will be pleased to publish the opinions of our readers; we are already familiar with those of our Postmaster-General, Mr. Webster.

AUSTRALIA'S MERCANTILE MARINE

THREE KEELS LAID AT WALSH ISLAND

Another big step in the development of Australia's merchant fleet was made on September 6, when keels of the three 5,000-ton cargo-vessels under construction to the order of the Commonwealth Government were laid at Walsh Island, Newcastle.

The triple ceremony was performed respectively by His Excellency the State Governor, Sir Walter Davidson, K.C.M.B.; the State Premier, Hon. W. A. Holman; and the Acting Minister for Navy and Minister in charge of Shipping and Shipbuilding, Hon. A. J. Poynton.

The new vessels, until officially christened and launched, will be known as: "Commonwealth Ships Nos. 3, 4 and 5."

The administrative arrangements in connection with the ceremony were in the hands of the Hon. R. T. Ball, Minister for Works and Railways and Chairman of the Walsh Island Board of Control.

From Sydney a special train conveyed the Ministerial guests to Newcastle. This party, which comprised some 150 ladies and gentlemen representing many branches of ministerial, professional and civic activity, included:—

The Hon. W. A. Holman, Premier of New South Wales; Hon. A. J. Poynton, Acting Minister for Navy (accompanied by Mr. J. J. Mullaney); Mr. G. L. MacCandie, Naval Secretary; Hon. R. B. Orchard, Miniser for Recruiting; Hon. J. Garland, K.C., Minister for Justice; Hon. W. Elliott Johnston, M.P., Speaker of the House of Representatives; Mr. John Storey, Leader of the Opposition; Mr. J. L. Brittain, Consul-General for U.S.A.; Mr. W. H. Curchin, Chief Executive Officer for Commonwealth Ship Construction; Mr. Kenneth Watson, Chief Engineer for Commonwealth Ship Construction; Mr. J. J. King-Salter, R.C.N.C., M.I.N.A., General Manager, Commonwealth Naval Dockyard, Cockatoo Island; Messrs. the Hon. C. W. Oakes, E. A. Birkenshaw, A. Bruntnell, A. W. Buckley, P. B. Colquhoun, J. B. Doe, A. Eddon, J. Fallick, A. Graff, T. J. Hoskins, T. Keegan, M. Morton, F. J. Thomas, W. E. Wearne and Private R. W. D. Weaver (A.I.F.), Ms.L.A.; Messrs. the Hon. W. Bennett, T. H. Bryant, N. J. Buzacott, G. F. Earp, A. E. Hunt, J. Lane Mullins, J. Travers and Dr. J. B. Nash, Ms.L.C.; Mr. J. W. Holliman, Under-Secretary for Treasury; Mr. T. B. Cooper, Under-Secretary for Works; Mr. C. E. D. Meares, President of New South Wales Chamber of Commerce; Mr. J. P. Franki, Managing Director Mort's Dock and Engineering Co.; Mr. J. Kell, Deputy-Governor Commonwealth Bank; Mr. W. J. Millner, President Sydney Water and Sewerage Board; Messrs. W. J. Hanna, L. Deer and G. Mason Allard, of the Public Service Commission; Mr. F. A. Coghlan, Auditor-General; Mr. Archdale Parkhill, Secretary Nationalist Party; Mr. R. S. Drummond, Chairman Wheat Board; Mr. E. T. Fisk, M. Inst. R.E., Managing Director Amalgamated Wireless (Australasia), Ltd.; Alderman Thorburn, Mayor of Jerilderie (N.S.W.), and Mr. Walter Reeks, M.I.N.A.

From Newcastle the visitors were conveyed in special launches to Walsh Island. On arrival, shortly afterwards, of His Excellency the Governor and Lady Davidson (attended by Captain Stanham, A.D.C.) luncheon was immediately served in a marquee erected near the slipways.

The luncheon ceremony, which was brief and informal, was presided over by Mr. Ball, who announced that no speeches would be made until the keels had been laid.

Toasts to the King and His Excellency having been honoured, the visitors, preceded by the Vice-Regal party, hastened to the scene of operations, which were conducted during a particularly heavy rainstorm. This, however, failed to damp the enthusiasm of a large crowd of spectators.

At 2.45 p.m. His Excellency, amid loud cheers, laid the keel of Commonwealth Ship No. 3 and signalised the successful completion of his task in the following words:

"I declare that the keel has been commenced on this important ship. May she sail the seas with great pleasure and glory to the country and may she carry prosperity to those who sail in her!"

The party then crossed to the adjoining slipway, where the Premier, having in a

The Hon. R. T. Ball, Minister for Works and Railways,
Chairman of Walsh Island Board of Control.

brief speech wished prosperity to those who built her and to those who would man her, laid the keel of Commonwealth Ship No. 4.

Ten minutes later a similar operation was performed on Commonwealth Ship No. 5 by the Acting Minister for Navy.

Enthusiastic cheers greeted the conclusion of the ceremony at each of the three slipways and the presentation to His Excellency, the Premier and Mr. Poynton of the three silver hammers with which the first rivets had been driven into the respective keels.

A platform from which it had been proposed to address the visitors and workmen had been erected near the slipways; the proposal was, however, abandoned, owing to the severity of the storm. The speeches, which we reproduce below, were delivered instead from the platform of one of the workshop offices.

The Hon. R. T. Ball, Minister for Works and Railways and Chairman of the Walsh Island Board of Control, in proposing a hearty vote of thanks to His Excellency the Governor, the State Premier and the Minister for Shipping, said:—

"I look upon the laying of these three keels as the laying of the foundation of the shipbuilding industry, not only at Walsh

Island and New South Wales generally, but throughout the entire Commonwealth. I think it may safely be claimed that Walsh Island possesses natural facilities for the successful development of this important field of activity. Our ability to obtain steel plates and all structural materials from the adjoining Steel Works places this dockyard in a singularly fortunate position.

"The Premier, by facilitating arrangements with the Federal Government for the construction of Commonwealth ships at cost price and without profit, has given abundant proof, not only of the Government's patriotism, but of its desire to do everything possible to advance the shipbuilding industry.

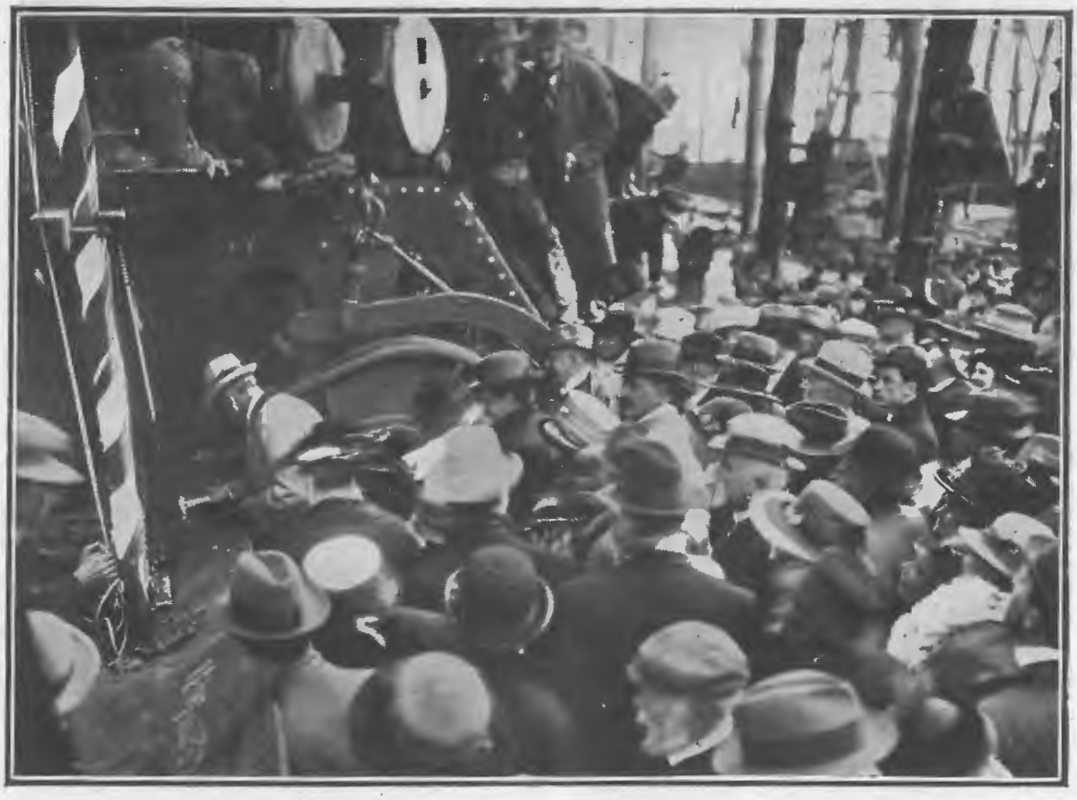
"I hope the time is not far distant when the boats whose keels have been laid to-day will be christened and launched by Lady Davidson; not only launched, but equipped and carrying our products across the ocean."

Proceeding, the Minister declared that he could not bring himself to retire from the speakers' platform without a word in praise of those who had participated in the work of the dockyard, especially Mr. A. E. Cutler, M.I.M.E., M.I.C.E., Director of Engineering, and Mr. A. M. Bomphrey, M.I.N.A., Director of Shipbuilding.

"Mr. Bomphrey," said the Minister, "comes to us from some of the biggest shipyards in the Old Country; with him and Mr. Cutler to guide the enterprise, and myself as a sort of soothing factor between all parties, I hope we shall continue as we have begun.

"Up to the present," concluded Mr. Ball, addressing himself to the workmen, "we have been a very happy family, and I hope that every workman associated with the Works will consider himself as one of a large happy family associated with the management.

"Strive to do all that is possible to build



Laying the Keel of "Commonwealth Ship No. 3."
His Excellency Sir Walter Davidson, K.C.M.B., Governor of New South Wales—Silver Hammer in Hand—Drives Home the First Rivet.

ships; to build them not only quickly, but cheaply; that, I believe, is the foundation upon which the success of this Island rests.

"Shipbuilding is a new venture for Australia and one which will not only enable us to meet conditions arising out of the present war, but which will, we hope, endure for all time and provide employment for many thousands of men; for, after the war, Australia will have to build ships in competition with other parts of the world."

The vote of thanks was then carried with applause and cheers for His Excellency.

His Excellency the Governor, in reply, said:—

"If Mr. Ball, Mr. Cutler and Mr. Bomphrey will supply the raw material, I see lots of lads here who will supply the brawn and muscle.

"Twenty years ago I used to fear that the worst thing that could happen to us would be the loss of our shipping industry. In the early stages of the present war there appeared, for a while, the remote possibility that this terrible thing might actually come to pass; but it was very soon realised that Germany's diplomats could never deprive us of our naval supremacy by the action of their submarines.

"I am confident that, in a very few months, the U-boats will have completely ceased their course of destruction and that English-speaking nations will again control the seas and the freedom of the seas.

"We are now under way with building ships for the future peace of the world. Here in Australia we have begun the Australian mercantile marine. We will build ships, not only better than Germany can, but faster. We will construct them in large numbers at Walsh Island. In a short time we hope to have laid the keels of from thirty to fifty new cargo-boats, which will carry the flag of Australia as proudly as our fighting men have carried it in France and in Palestine.

"I wish to back my ship ('No. 3') for speed on completion against the ship started on to-day at Williamstown.

"If you can make first-class soldiers—as you undoubtedly have—you can make first-class operatives. I hope you will carry the flag as high as our boys have at the Front and that Australia will earn as high a reputation for shipbuilding as is its reputation for fighting. God bless you all!"

The Premier said:—

"I am very proud and happy to be a participant, even if only in a humble way, in this important ceremony. It is a ceremony which emphasises an all-important occasion in the history of Australian industry and marks the commencement of a new chapter in Australian industrial life.

"I wish the very best possible luck to all those connected with the building of the boats.

"At the commencement of the war the safety of Great Britain and Australia depended solely on warships. I refer particularly to the British Navy, in the first instance; for although our mercantile marine later played an enormously important part in the operations, it must be remembered that, for the first two years of the war, the warships of Great Britain were the all-important factor.

"Germany's attempts to wipe these warships from the seas and to accumulate a naval force of her own strong enough to attack Great Britain, have now been abandoned in despair. At the outbreak of war Germany decided upon building vast numbers of submarines and by this means—she hoped—gradually starving the people into submission. There was a time—that time has long passed—when the German submarine policy appeared to have some glimmer of hope of success; but it has never been more than a hope. Her scheme never had a real chance of success, although there can be no doubt that the enemy really did believe in his own ambitious programme. That hope the British Navy has now confounded, for ever.

"What was it that defeated this policy? It was the commencement of the building of merchant ships, and to-day we in Australia are backing the Mother Country's effort by building cargo-ships of our own. (Applause.)

"I should like"—resumed the speaker—"to say a few words concerning America's gigantic effort in this direction. During the first month of transporting American troops, the United States, by pressing into service all her own available vessels and all the other vessels then available, managed to send away 12,000 men. Next month she sent a few more, the month after still a few more—and so on, gradually increasing her transport tonnage until by the end of the year she was sending 50,000 men across to France in a single month. This was undoubtedly a triumph; but it didn't stop at 50,000. New cargo-boats were being launched in American dockyards every day of the year, and a few months later the

monthly total had swelled to 100,000 troops. And the expansion didn't even stop at that! She added and added to this number, and is still adding. To-day, thanks to the tremendous energies exerted by the whole of the American people American troops are being poured into France at no less a rate than 300,000 per month. The result is a handsome tribute to the American Shipping Board and to its employés.

"The men employed at Walsh Island are doing the same work to-day and in laying the security of the Empire on a sound foundation they are doing their share towards defeating our enemies."

The Premier, in conclusion, wished them all God-speed in the great work they were undertaking.

The Hon. A. J. Poynton, Acting Minister for Navy and Minister in charge of Shipping and Shipbuilding, who had travelled from Melbourne to lay the keel of "Ship No. 5," said:—

"I look upon this as one of the most important epochs in the history of Australia, particularly in its relation to Newcastle, for Walsh Island stands first among all the dockyards I have visited.

"It is but a few short months since I took charge of Australian shipbuilding, and when the scheme was commenced in the Commonwealth there were only about forty men employed. To-day, directly and indirectly, this number had grown to somewhere between 2,000 and 3,000, and the industry has hardly started yet!

"I have succeeded in making arrangements with the Government for the immediate construction of some fifty ships in New South Wales alone; of these, twenty-seven will be similar to those whose keels have just been laid. On the Parramatta River eighteen wooden ships are already under construction and eleven new shipyards are now working.

"It is expected that thirty more keels will be set down during the next month. I have received word from Melbourne that the keel of another vessel was laid to-day in the Williamstown yards."

In this connection the speaker mentioned that Mr. W. H. Curchin, Chief Executive Officer for Commonwealth Ship Construction, who was present with the Ministerial party from Sydney, had expressed his entire satisfaction with the progress made at Williamstown, and that the record established there compared favourably—in the circumstances—with anything done in England; a statement which he—the Minister—would fully endorse. "Williamstown," affirmed Mr. Poynton, "is equal to any of them, and shipbuilding had started there just as you are starting here; in a brand new industry.

"You may be skilled tradesmen in many other directions, but in Australia shipbuilding is an altogether new departure. I am convinced that what has been done at Williamstown can be done equally well at Walsh Island.

"I do not think I can sufficiently emphasise the importance of the work of shipbuilding. Our submarine losses have by no means been replaced and notwithstanding the large number of enemy vessels destroyed and interned we are still some millions of tons below pre-war figures. The Allied Fleets have sustained losses approximating 2,000,000 tons—or the equivalent of the total tonnage of Great Britain prior to our entry into the war.

"Moreover, despite all our shipbuilding activities, our tonnage to-day is still something like one-quarter below that of the pre-war period. Not only have we lost what the submarine has sunk, but also the normal increase which we should have had were we living in times of peace.

"The Premier has spoken to-day of establishing a new industry. By this he means, not only the building of future ships, but the establishment of a new industry for Australia, and one which places Newcastle among the most important cities of the Commonwealth, for we *must* have sufficient ships to get our products away. "Now to you boys" (addressing the workmen) "let me say that I look on you as doing your part in this war. You are engaged in a work of great national importance and I ask that you will remain continuously at work. There will possibly be some friction and everything may not always proceed as smoothly as we might wish. There will be pinpricks and grievances and little difficulties, here as in all other industries; but I want you to know that I am always ready and willing to redress them. Boys, I appeal to you; with you alone the problem lies. A tribunal has been appointed to deal with your grievances, and if you will keep at it and continue as well as you have begun I will see to it that there shall be no need for cessation. No matter what the cause, never

cease work. On my part I promise you that I will act straight and fair by you; and I believe you boys know I mean what I say. (Hear, hear.)

"You must realise that this is the greatest opportunity Australia has ever had; that you are the pioneers of an industry more important than any that exists, and that Newcastle is the greatest shipbuilding yard in the Commonwealth.

"Keep on going, boys; I am very well pleased with the work you have done."

The Premier, in calling for three cheers for the workmen and the shipbuilding enterprise, announced that the Government would immediately adjust any grievance that might arise among the men and "get it out of the way."

Escorted by Mr. Cutler, the party now concluded its visit by a tour of the workshops, special interest being displayed in a five-ton casting of the centre-piece of a sole-plate for one of the new vessels, also in the process of planing out the low-pressure cylinder to be used in the same connection, both castings being made in the Walsh Island foundry. A shaft lathe, engaged in turning the 17-cwt. piston of a steam hammer, arrested the attention of the Vice-Regal party, as did the forging of rivets, the operation of the turret-lathe, which produces bolts seven inches in length at the rate of fifteen to the hour; and finally in the steam-hammering of a gigantic casting for the main engine-shaft of one of the new Commonwealth ships.

Walsh Island, Newcastle.

Panoramic View of Naval Dockyard, where, on September 6, 1918, the Keels of Commonwealth Ships Nos. 3, 4 and 5 Were Laid by His Excellency the Governor of New South Wales, the State Premier and the Acting Minister for Navy.
—Photograph *Sun*, Newcastle.

THE PRELIMINARIES OF MERCANTILE AVIATION

BY C. A. JEFFRIES

The first day of commercial aviation dawned when the great Handley-Page aeroplane, fitted with two 450 h.p. Rolls-Royce engines, soared over England with 21 passengers on board, and kept them a height of never less than 7,000 feet (and sometimes 15,000) for nearly eight hours. These people travelled in comfort in a saloon heated by electric radiators and were supplied with a meal cooked on electric apparatus in the sky. Later on the same huge bi-plane made two celebrated trips—one a peaceful embassy to Rome and back, and the other to Constantinople, for destructive purposes.

The progress made during the four years of war will seem to future generations almost miraculous. Four years ago it was a wonderful achievement for two people to ascend to the outskirts of the empyrean and stay there for a few minutes. In those days there was a wonderful uncertainty attaching to flight in heavier-than-air machines, and the prophets of the day unanimously foretold that the passenger and parcel aerial mail would be carried by aerial ships of the lighter-than-air type.

To-day that uncertainty has been reduced to a minimum. One may go aloft in a modern aeroplane, manned by a competent pilot, with no more risk than attaches to travelling by an ordinary train. Of course, aviation will have its accidents, and even its disasters, as both steamships and trains have had at unfortunate intervals, but if commercial aviation is properly controlled it will be no more dangerous than any other form of travelling.

Curiously enough, probably the greatest risk to which travellers by aeroplane service will be subjected will be that of collision. It may sound bizarre to the man in the street, but it is, nevertheless, true that the first problem in preparing for commercial and passenger aviation is to obviate the risk of huge, heavily-laden aeroplanes crashing into one another while shooting through the skies at speeds varying from 120 to 200 miles per hour.

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In Britain and all Europe aerial travelling will most likely be severely restricted to long distances. In Australia we are almost certain to have both long and short distance travelling. In Britain and on the Continent, when there is no war, the roads are good. In Australia they are always, and are likely to be for a long while yet, very bad. This especially applies to the far-out settlements. Also, in Britain and Europe generally, the various districts are more self-contained and self-sufficient than in Australia. No one will want to fly from London to Bristol, though he might wish to shoot from London to Edinburgh.

In Australia, with its lack of good roads, and the impossibility of getting them owing to paucity of population, there will always be a strong tendency to use aerial transportation for comparatively short journeys. Most of our beauty spots could be made easily accessible to visitors to our capitals by aeroplane, whereas at the present time they represent a rather serious and fatiguing journey by rail and motor car. One of the most beautiful spots in Australia, the

gorgeous Grose Valley, is at present practically inaccessible except to the young and hardy. It can be seen from one end only by those who cannot rough it. The same applies even more forcefully to the wondrous depths of the glorious Capertee Valley, with its brave heights of red sandstone, its purple bush, and its wonderful blue clouds.

Who would wait indefinitely for the making of good roads through the fairy realms of the Grose or Capertee when they can be revelled in with perfect comfort in the nacelle of a giant aeroplane?

The same applies to every part of Australia. Victoria has its glorious fern country in Gippsland, its beautiful Dandenong Ranges. South Australia has its lovely Mt. Lofty Ranges; and Western Australia, like New South Wales, by means of the aeroplane can bring its wonderful caves within a few hours' flight of its capital. The caves of West Australia are said by those who have seen them to far excel the glories of Jenolan, Yarrangobilly and other New South Wales wonders.

The conditions of life and the temperament of the Australian people are strongly conducive to the rapid adoption of the aeroplane as a passenger vehicle once such services are established. The lack of good roads, the insufficiency of railway communication, and the financial difficulty of extending railway facilities in the face of the huge war debt will all conduce to the adoption of aerial travelling. Especially as, according to the investigations of Mr. Holt Thomas, there seems every chance that it can be carried on as cheaply as first-class railway travelling. Also, it must be remembered that the saving in time will count for a great deal.

Commercial aviation will have a most pronounced effect upon the settlement of the hinterland in every Australian State. When aeroplane services are established the man at the back of Bourke will be as close to Sydney as the man who to-day lives at Bathurst or Newcastle, as regards time. The man far out in Westralia and the hardy settler up near Goyder's Line in South Australia will not be cut off from Perth and Adelaide for years at a time. It must always be remembered that though we measure distance by miles we count it by time. It matters not that Bourke is 550 miles from Sydney if the journey can be done in five hours.

The fact that we count distances by time will introduce a new era into Australian country life. Isolation will be a thing of the past. Loneliness will die a natural death, for in the districts where population is scarce and scattered the aeroplane will make regular social intercourse possible between people who live 30 and 40 miles apart.

Commercial aviation will be carried along regular recognised and prepared routes. The man who lives 30 miles beyond Bourke will travel to that town in his own private aeroplane, and there join the big through Bourke-to-Sydney aerial express, which will leave about 7 a.m. and land him in Sydney in time for a good dinner in his hotel before he starts out to spend the afternoon in business. If he is really in a hurry, no doubt he could be back at his homestead in time for breakfast next morning after having had an afternoon and part of an evening in Sydney.

The wilderness will have lost its worst terror—loneliness—and by reason of that fact have become attractive. At present the distance from medical aid, educational establishments, shops, and all the doubtful advantages of close proximity to city life will be horrors of the past, like travelling by mail coaches.

On the other hand, the effect on city life will be even more far reaching. At present the people who have to come to the city every day on business are compelled by considerations of time to live within 18 to 20 miles of the city. The aeroplane service automatically increases that radius to at least 50. The people who were hitherto compelled to crowd into suburbs four or six miles from the General Post Office of any of our capital cities can at once move further out, miles further, where they can have the open spaces and the garden they crave for.

The effect will be electrical. The people who to-day live in huge piles of flats in the city will probably still live in more or less huge piles of flats. But they will be flats far from the city, by the dreamy waters of the great inlets scattered round our coasts, within 40 or 50 miles of all our capitals.

Commercial aviation will fall naturally into several widely separated divisions, as follow:—

1. Inter-State-Capital 'planes, carrying mails, parcels and passengers at speeds of anything from 150 miles per hour and upwards.

2. Long distance country services from various State capitals to their outlying settlements.

3. Subsidiary services radiating from the long distance service terminals.

4. "Suburban" and beauty-spot services for the benefit of city workers and dwellers.

Although the air is a big place, it will be seen at a glance that with all this mass of aerial traffic converging on one point—the city—it will be necessary to frame rules for the prevention of accident, just as it is with railway and tram services. The more we come to consider the details of commercial aviation, the larger grows the number of problems that have to be solved before the traffic can be allowed to become general.

First we have to decide which particular governmental power shall have control of aviation. Will it be under Federal or State control? A great deal can be said on both sides. But as it is another form of navigation, and such a large proportion of the services will be inter-State and trans-Continental, it will, presumably, come within the domain of the Commonwealth.

When the Department of Aviation has been formed it will first of all have to lay down rules to ensure that passenger and other aeroplanes shall be flown only by qualified pilots. Also, it will have to establish exactly what constitutes a qualified pilot.

The Board will then have to lay down rules to ensure that all aeroplanes used shall be reliable and conform to a certain standard, just as ships are rated at the present time. Engines, fuselage, accommodation, the question of spare pilots—everything, all have to be systematised, and all possible complications foreseen and prepared for.

Those two problems alone will require some solving, but the second will be the more difficult, as commercial aviation will be an entirely new thing, and the first necessity is that the men controlling it get all ideas of military aviation right out of their heads. Passenger and postal aeroplanes cannot be flown on the lines of the military air services, where the men took their lives in their hands every time they went forth, and where all trips were out and home again if possible.

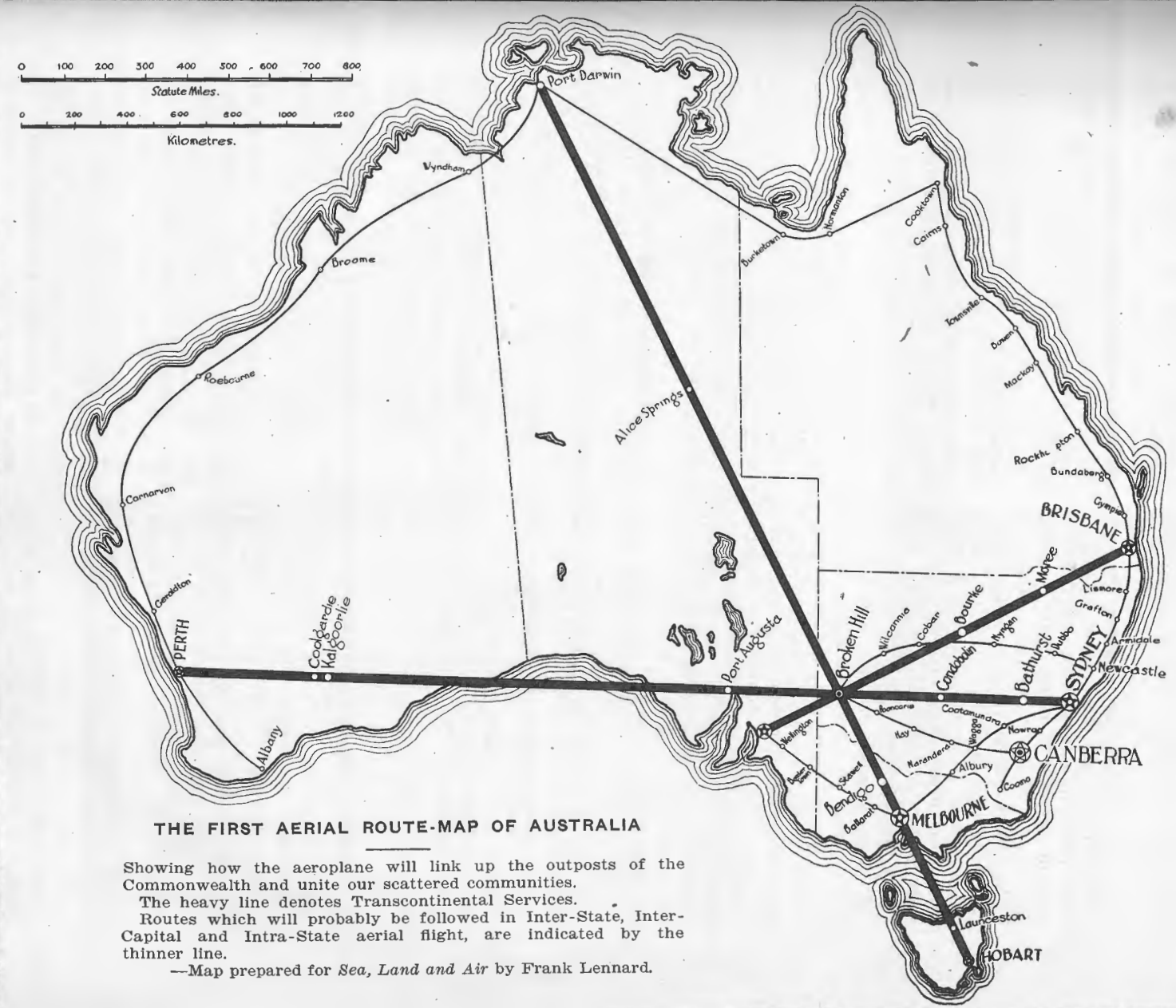
When the above problems have been solved comes the gigantic task of aerial regulation, or, to put it another way, the regulation of aerial routes. The huge inter-State Capital 'planes—the aerial dreadnoughts that will make up to 200 miles per hour in their headlong flight—must have absolute right of way, and all other 'planes of any sort must be kept absolutely out of their aerial channels or "tubes."

The question is, "How can it be done?"

Not only have these lanes, or "tubes," to be kept clear of other 'planes, but there must be no chance of the inter-State Capital 'planes flying from the north geting out of their lanes and colliding with the same type of 'planes flying from the south. Even with the light, most easily handled war-'planes there have been collisions. It is quite common knowledge that the latest weight-carrying aeroplanes, the huge Handley-Page bombers, fitted with four engines and two tractors and two propellers, developing over 3,000 h.p., will be the models on which the aerial mercantile fleets will be based. And such huge machines must have plenty of room. Of course, as time goes on these monsters will grow enormously, but even the problem of providing safe travelling for the ones already in use is somewhat of a staggerer.

But no matter how they grow it is extremely unlikely that they will evolve sufficiently to make only one Sydney-Melbourne, and one Sydney-Brisbane 'plane enough to carry all the mails and passengers who will wish to travel every day. There may be anything up to half a dozen flying within brief periods in the same direction in a sort of continuous, though invisible, procession.

Fortunately, the air is a big space, and there is height as well as horizontal space. The reservation of the routes, which will assuredly be called "lanes," after the



THE FIRST AERIAL ROUTE-MAP OF AUSTRALIA

Showing how the aeroplane will link up the outposts of the Commonwealth and unite our scattered communities.

The heavy line denotes Transcontinental Services.

Routes which will probably be followed in Inter-State, Inter-Capital and Intra-State aerial flight, are indicated by the thinner line.

—Map prepared for *Sea, Land and Air* by Frank Lennard.

Atlantic shipping courses, or "tubes," will possibly be arranged by limiting the inter-State expresses to certain maximum and minimum heights, as well as mapping out their regular course of flight. It might be decided, for instance, that all inter-State 'planes shall travel at a uniform speed, and those flying north-south shall never descend below 7,000 feet nor climb above 10,000; while the south-north flying 'planes should never descend below 12,000 nor ascend above 15,000 feet. But, in some way it must be arranged that these two processions of great 'planes shall never fly immediately over and under one another.

Having mapped out the high speed routes, with all their limitations above, below, and on both sides, the Ministry of Aviation will proceed to map out routes and regulations for suburban and other services. The rules, routes, etc., governing the operations of private aeroplanes, driven by their owners or private pilots, will all have to be threshed out and codeified and co-ordinated. Exactly what liberties shall be allowed in the matter of flight over cities and towns will have to be determined. It seems reasonable that private aeroplanes shall be prevented from flying over cities on the grounds of public safety, except by certain routes to the aerodrome. In the event of an accident, or a sudden descent out of control into a city street, the consequences might be fraught with fatal consequences to a large number of people other than the occupants of the aeroplane.

Yet, if the public is to get any real time saving from the "suburban" aerial services it will be necessary to fly over certain parts of the cities. In Sydney there would, presumably, be a number of aerodromes, or starting and alighting parks, practically within the city. Traffic departing to and arriving from the north, south and west and intermediate points would probably alight at different aerodromes. The provision of these grounds will be a matter of considerable cost, as, if the aerodromes are situated within the city, the land will have to be resumed.

* * * *

We now come to consideration of a phase of commercial aviation that the man in the street hardly ever thinks of. When the Melbourne-Sydney route has been laid down on the map means have to be devised to keep the pilots exactly to that mapped out route. How it can be done is a query that has worried some of the best brains in Britain, France, Italy, and many other countries a lot of late, as all are anxious to be in at the beginning of commercial aviation.

If the weather were always clear it would be simple enough. But there are such things as mists, and fogs, which are impenetrable mists, and in Australia, dust storms, which are worse than any mists or fogs. Also, we have bush fires, which fill millions of cubic yards of the atmosphere with impenetrable veils of drifting smoke. Some of our western dust storms would wreck any aeroplane by clogging the machinery and smothering the aviator. They could not be traversed, and would have to be avoided, and to do so it would be necessary to soar over them. Then in certain seasons the clouds drift low, and it might be impossible to see the route marks if the statutory height of flight was adhered to. Also, to enter the fog in the hope of keeping to the route might precipitate a disaster.

All these things have to be considered, and provided for.

But by far the greatest problem of the present time is how to mark those routes. Some authorities proposed skeleton towers with coloured lights, which would be visible under all conditions at from anything up to four miles. To this proposal it was objected that in the event of failure of the lights the towers would become an absolute menace. Tests were made from the Eiffel Tower, in Paris, and the results were disquieting.

The next proposal was that from underground chambers should be thrown upward by means of concentrating reflectors and lenses the glare of oxy-acetylene flame—about the most dazzling light on earth. This, it was believed, would pierce any fog.

Tests were made, and proved conclusively that this light, so wondrously bright, so exquisitely bright, so utterly blinding at nights, was worthless in a day-time fog.

The resources of careful and calculated

navigation by shooting the sun are extremely limited at the speed at which an aeroplane travels.

Then it was suggested that the routes should be marked out by captive balloons held by strong cables, which in times of fog could be let out so that the balloon would always be above the fog. And, of course, the aeroplanes would always have to travel above the fog, and therefore could not miss the guiding balloon. The captive balloons, it was suggested, should be fitted with wireless, as would be the 'planes, and warning signals could be discharged from the captive balloons. But travelling at 100 or 150 miles an hour one has hardly time to think.

In this connection the writer would like to refer to an extraordinarily interesting article on the steering of Zeppelins y wireless, which appeared in the March issue of *Sea, Land and Air,* from the pen of Mr. Ernest T. Fisk, member I.R.E., which succintly explains the possibilities of wireless control of aerial traffic, and which should be read in conjunction with this article. Apparently it is possible by wireless to indicate to trained men to the fraction of a second when they have entered a danger zone. The balloon, and the cable that held it, would, of course, be fitted with warning lights, by which, after receiving his wireless warning, the pilot would be able to safeguard his 'plane.

* * * *

When all these multitudinous problems have been solved the Minister for Aerial Navigation will be face to face with a matter of considerable expense. The best authorities in England, France and Italy are agreed that to make commercial aviation a business proposition to the travelling public and the aerial crews it is necessary to provide landing places at frequent intervals, in case of derangement of machinery, or impending peril of any nature. To confine the illustration to our own Continent, we may consider the case of the Melbourne-Adelaide route or the Sydney-Brisbane "tunnel," or "tube." All along those routes at regular intervals of not more than 20 miles adequate landing places, marked out by day by great painted designs and by nights by glaring signs, must be provided.

Twenty miles sounds an amazing short distance for such places; but the very best authorities in England, France and Italy are agreed upon that limitation. The present writer was absolutely astounded to read it in their printed statements. But the unanimity on the subject was overwhelming and altogether convincing. Mr. Holt Thomas, the famous English expert, explained it thusly:—

"With landing places at every 20 miles, barring being struck by lightning, and apart from collision, there can never be a great aerial disaster. From the height that such 'planes would fly a safe descent can always be made in ten miles; so if landing places are arranged every 20 miles a damaged 'plane can always come down at the one in front or the one it has just left, and alight in perfect safety."

* * * *

This article is not written to tell the people of Australia what commercial aviation is going to be. The object of the writer is to arouse the various Governments, and especially the Australian Government, to the fact that the time is ripe to establish a Department of Aerial Navigation. Immediately the battle drums have ceased to sound round the world, commercial aviation will be upon us. It is pecking at the shell now. The new world, phoenix-like, is about to rise from the ashes of war, and commercial aviation will be upon us before we are ready for it.

There is no country in the world where aerial navigation can be of such public service as in Australia. With the question of overseas flights, and the aerial line of Sydney and London, we will, with the editor's permission, deal in a subsequent issue. Before we can fly abroad we have to evolve the conditions of flight in Australia, and put commercial aviation on a sound, common-sense basis.

We are the land of vast distances. An aerial mail service between London and Sydney would reduce interchange of thought and ideas to a matter of hours. The whole future of our splendid Commonwealth of nations depends upon our development of aerial navigation. In a subsequent issue we propose to map out the flight from London, "the power house of the line," to Sydney and every other

Australian capital. In the ear of fancy we can already hear the weird screech of the tractors and propellers of the giant Handley-Page rushing the London mails from Port Darwin to Melbourne at 200 miles per hour.

It stands to reason that the same 'plane that bears the tourist and the letters across the seas will not be the same aerial ship that flies over the land. One will be a sea-plane, so that if a descent has to be made the great 'plane will still forge ahead on the surface of the waters while the wireless sends out signals telling the listening ships where to pick up the damaged Imperial Britannic mail. The other will be a land 'plane, capable of descending on anything like a decent site. It is hardly possible to contemplate establishing immediately landing stages at 20 miles intervals between Port Darwin and, say, Albany.

The accompanying map will give an idea of the long distance flights by which the aeroplane will consolidate our scattered communities into one solid Australian Commonwealth, and in a future number—most probably the next—we will show how the same giant aeroplanes will make the Briton of Chipping Norton one in heart, soul and instinct with the Briton of Sydney, Perth and Launceston.

(To be continued).

In the next issue of *Sea, Land and Air* Mr. Jeffries proposes to give special prominence to Queensland and the Northern Territory, and to their importance from an aviation standpoint.—Ed.

Australian Flying Men in England. Training-School Cadets at Queen's College, Oxford.

Back Row: R. H. Pillow, G. H. Cowan, W. R. Frane, F. S. Chapman, H. E. Richards, N. S. Donaldson, G. H. Johnson.

Second Row: J. C. Fowler, K. W. Stronach, Captain S. M. Arnold, Lieutenant H. H. Kildy, N. R. Burnell, D. Gulley.

Front Row: A. H. Darby, W. H. Deane, S. L. Farrell.

CONSCRIPTION OF WEALTH.

Especially Written for *Sea, Land and Air*

By the Hon. Alexander J. Poynton, M.H.R.,
Acting Minister for Navy.

We often hear the thoughtless ask "Why doesn't the Federal Government conscript wealth?" and one would think from these remarks that the Government had not done so. I have also heard the opponents of the Government say "You have not conscripted the last shilling." Well, that is quite true. We have not conscripted the last shilling, and there would be a sorry outlook if we had arrived at that stage of conscription of wealth, because for many years after the last man has returned from the war we will have to conscript wealth to pay for our commitments on the war, such as interest on all war loans, sinking funds, war pensions. On these charges there is general agreement amongst financiers that they should be met by direct taxation.

It will be of interest to your readers if I were to show what has been done by the Federal Government in this respect.

The following taxation proposals have been put into operation since 1914 in order to meet war expenditure, namely: Income tax, increased Land tax, Succession Duties, Entertainment tax, and War-time Profits tax. From this source of direct taxation we have collected £21,656,276.

I will now show what we have paid in interest, sinking fund and war pensions from the commencement of the war up to June 30, 1918:—

	1914-15.	1915-16.	1916-17.	1917-18. Approx.
Interest—	£	£	£	£
Aust'n War Loans ..	78,656	1,014,821	2,738,673	4,577,064
Loans from British Govt. ...	36,489	843,893	2,082,258	2,477,288
Sinking Fund—				
On Aust'n War Loans	—	200,777	689,384*	499,194
On Loans, from British Govt. .	—	—	477,743*	245,410
War Pensions	—	129,273	1,149,242	2,770,839
	115,145	2,188,764	7,137,300	10,569,795

Total: £20,011,004.

* In this year a Sinking Fund of 1% was provided, otherwise the contribution is ½% per annum.

Now it will be noted that we have raised by direct taxation £1,645,272 in excess of what the above commitments for war purposes come to. The next point at issue is who are the people who pay these taxes. As there is an exemption of £156 plus £26 for each child under sixteen years of age in the income tax, it is quite clear that the working classes do not pay this tax, whilst, on the other hand, this tax increases until 6/3 in the £ is paid on the "top rung" of the ladder of taxation.

Land Tax.

It cannot be said that the "struggling" farmer pays this tax, as there is an exemption of £5000 unimproved land values, and on the top grade there is a tax of 9d. in the £. There is also an exemption of £1000 on succession duties, which demonstrates the fact that the "man in the street" does not pay that tax, and as revenues from Customs and Excise are from two to three millions lower than they were prior to the war, the indirect taxation is not falling so heavily on the masses as prior to the war.

I think I have shown that we are conscripting wealth in sufficient quantities to meet all our commitments up to date. In my opinion there will be a greater charge upon the wealth of this country in the near future, and it is indeed fortunate to know that we have not yet conscripted the last shilling.

TWELVE THOUSAND MILES BY WIRELESS

THE NEW RECEIVER EXPLAINED

BY ERNEST T. FISK,*
Member Institute of Radio-Engineers

In the year 1895 Mr. Marconi's investigations led him to the conclusion that Hertzian waves could be used for telegraphy without wires, and within twelve months the great inventor had applied for the first British patent for a system of wireless telegraphy. That latter year saw communication successfully established on Salisbury Plain, when Mr. Marconi's apparatus worked across a distance of one and three-quarter miles.

Five years later Marconi received signals across the Atlantic Ocean, covering a distance of 1,800 miles, and in the year 1910 he received messages from the high-power station at Clifden, in Ireland, when 6,700 miles distant. This record of progress is, of itself, sufficiently remarkable, but in the present year, 1918, signals have been received at the extreme distance of *twelve thousand miles.*

Everyone knows that the measure of the earth's circumference is approximately 24,000 miles, and that, consequently, 12,000 miles is the greatest distance over which communication is necessary, unless, at some future time, we attempt to exchange intelligence with the supposed inhabitants of other planets.

The increase of range from 7,000 to 12,000 miles has been

* Managing Director, Amalgamated Wireless (Australasia), Limited.

Aerial Tuning Unit of the Magnifying Valve Receiver.
Designed and Manufactured in Australia.

accomplished in practically one leap, and it is due to the recent development of a new type of receiving apparatus, which the writer will attempt to describe, so that it can be understood by all readers of this journal.

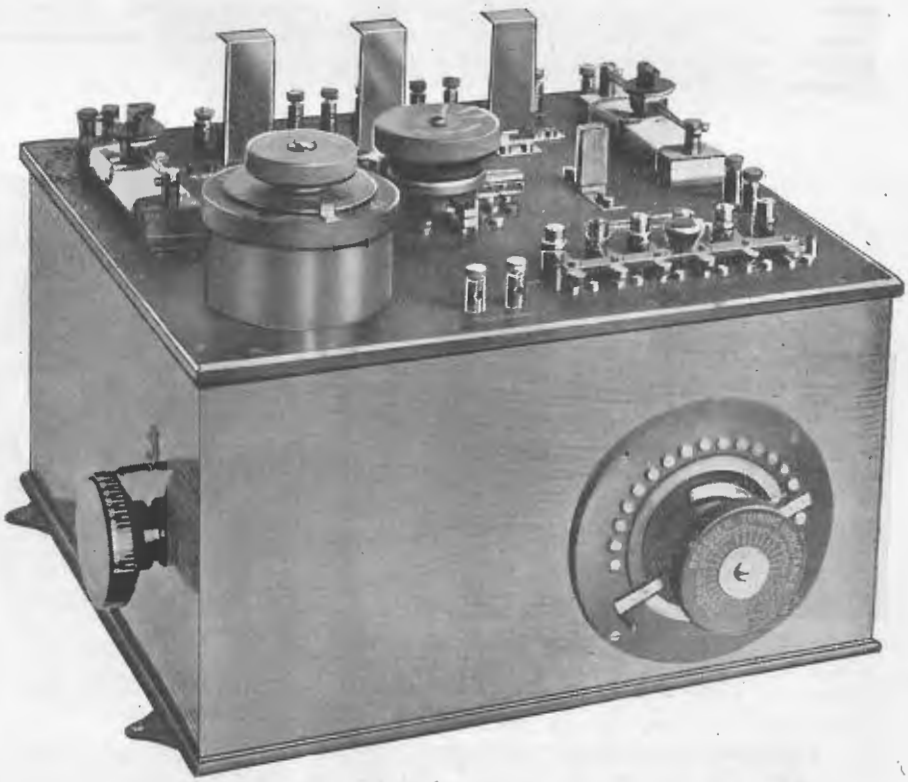
Probably one of the most satisfactory points about the receivers shown in the accompanying illustrations is that they were entirely designed and manufactured in Australia. This statement must not be misunderstood to suggest that the invention was made in Australia. The vital part of the new instruments is the modified Fleming valve, originally invented by Dr. J. A. Fleming, a noted English scientist, and since developed by the inventor, in conjunction with Senatore Marconi and his experimental staff.

But, having the main invention and a number of ancillary patents as a basis, a thorough knowledge of wireless engineering and physics is required to design workable instruments, and a long series of experiments was necessary to bring them to such a point of perfection as to obtain the extreme range of twelve thousand miles. After that the skill and knowledge of specialised instrument-makers was required to manufacture the complete apparatus.

Some idea of the intricate designing and manufacturing processes may be gained from the statement that each complete receiver contains no less than seven hundred different parts.

It would, of course, be impossible to describe such apparatus in detail to any person other than an expert in wireless engineering, but in spite of its intricacy a broad description can be understood by all intelligent laymen.

The reader is first invited to accept the statement that wireless communication is effected by creating electro-magnetic vibrations in elevated aerial wires at the sending station, these vibrations or impulses are communicated to that wonderful thing known as the ether, which is infinitely elastic, which fills all space and permeates all matter. At the receiving station aerial wires absorb these vibrations and conduct them to the actual detecting or receiving apparatus. To get a mental picture of this we might imagine that the ether is an enormous jelly and the aerials at the sending and receiving stations are enclosed in that jelly. In our case the jelly (or ether) is invisible, but its existence is no less real, therefore, although the sending and receiving aerials appear to be separated by



Valve and Secondary Tuning Unit of Magnifying Valve Receiver.
Designed and Manufactured in Australia.

great distance, they are really joined together by this wonderful ether.

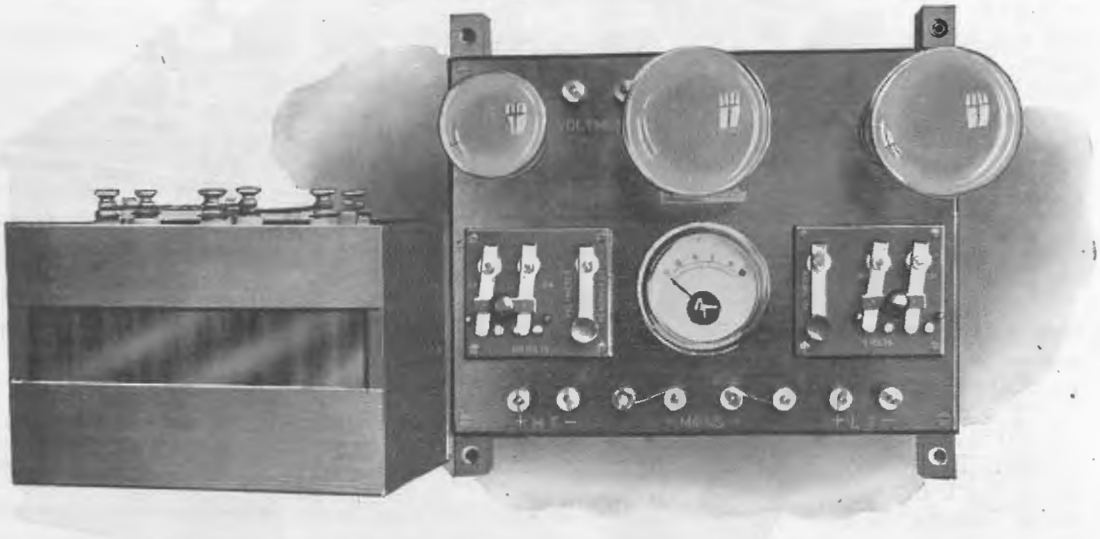
It is now easy to understand why something happening in a sending aerial can be felt by the receiving aerials 12,000 miles distant.

Powerful electrical generators, associated with special wireless apparatus, are used to create the vibrations at the sending station, and with our mental picture of the all-pervading ether we can believe that these impulses will travel through all parts of the jelly. There is a limit, of course, because, as vibrations spread out, they become weaker and eventually die out altogether, but that limit has not yet been discovered.

At the receiving station sensitive wireless apparatus is used to "detect" the vibrations picked up by the aerial wires. The more sensitive this apparatus the further away it will detect the impulses from a sending station.

We have said that the receiving apparatus is able to "detect" the existence of ether vibrations affecting the receiving aerials, but it must do something more than detect, it must make the existence of such vibrations apparent to the operator. To achieve this something must occur which can be either seen, felt or heard. In nearly all receivers the signal is made known by means of a buzzing sound heard in an ordinary telephone earpiece. This buzzing continues so long as vibrations are received by the aerials, therefore, by sending vibrations of long and short duration, the operator can transmit his message by Morse code to the receiving operator, just as it is done in land line telegraphy.

Quite apart from the duration of each period of vibrations, which is governed by the Morse signals, the vibrations have a definite frequency or rate of vibration, according to the manner in which the sending apparatus is arranged. The receiving apparatus can be similarly arranged, so that it will only respond to those particular vibrations. By this means it is possible for many stations to operate at the same time without mutually interfering. Each sending station adjusts its apparatus to radiate vibrations different from the others and each receiving station adjusts or "tunes" its apparatus to the particular station with which it is required to correspond.



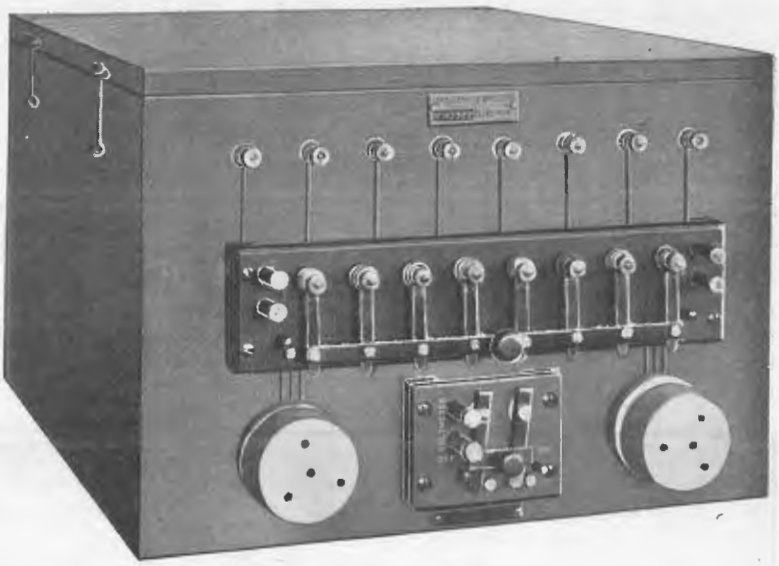
Charging Board and Filament Battery for Magnifying Valve Receiver.
Designed and Manufactured in Australia.

In addition to "tuning" for a certain sending station the receiving apparatus must be able to detect the very feeble impulses which arrive and convert them into audible sounds. All this is a very complicated and highly technical process. The actual vibrations which are received are much too rapid to affect our sense of hearing, and even if they were slow enough they are usually too feeble to be audible.

The receiving apparatus must therefore "tune" for a definite period of vibrations, detect them, strengthen them and convert

them into much slower vibrations, to produce audible sounds, and it must do this with every impulse sent from the corresponding station without error or failure.

The earliest type of wireless detector consisted of a tube of metallic filings, which were caused to stick together when an impulse was received and had to be shaken apart after each signal; the more modern detectors made use either of the electrical properties of certain minerals, such as silicon, galena and pyrites in contact with metals, or of the effects of impulses on magnetic lines passing through iron. The space available for this article will not permit those to be described, and we must pass on to our description of the latest and most wonderful of detectors, generally known as the "magnifying valve," but also known by certain other trade names, such as "audion," "electron relay," "amplifier," etcetera.



High-Tension Local Battery for Magnifying Valve Receiver.
Designed and Manufactured in Australia.

Dr. J. A. Fleming, F.R.S.

The ordinary electric lamp is a commonplace thing with which everyone is familiar, but few people realise that, besides giving light, the incandescent filament is constantly throwing out an invisible electric stream, which bombards the glass bulb on all sides. This phenomenon was discovered by Edison many years ago, but it remained for Dr. Fleming to make use of it and invent a method of applying it in the detection of wireless signals.

This electric stream consists of particles of atoms, which are known as "electrons" and which are really very minute charges of negative electricity. Although the stream of "electrons" is invisible, the reader is asked to picture it mentally.

The actual magnifying valve detector is an electric lamp, large or small, as required. Inside the glass bulb is placed a wire mesh or grid, which surrounds the filament without touching it. The grid is again surrounded by a metal plate. The electrons (or some of them) from the incandescent filament pass through the wire grid and strike the metal plate where, if nothing further is arranged, they are stopped, and probably many rebound.

In electricity, like repels like and opposites attract, therefore a negative charge

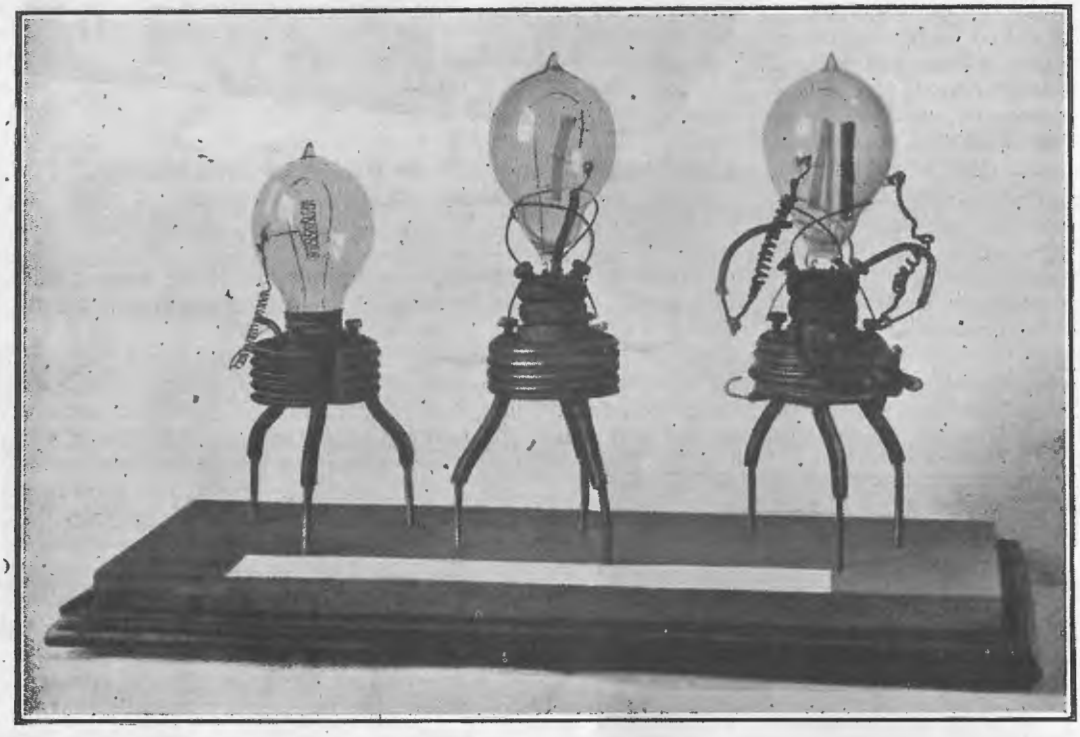
will oppose another negative, but will attract and assist a positive charge.

Since the negative stream travels from the filament to the plate, across the intervening space, it would oppose a negative stream going from plate to filament and assist a postive stream. From this we know that the electronic stream provides a path along which positive electricity can travel from plate to filament and if we put a battery outside the bulb and connect its positive end to the plate and negative end to the filament, a current will flow from the battery, through plate and space, and back to the negative pole through the filament.

If a path is provided whereby the impulses received on the aerials of a wireless receiving station are conducted to the grid in our bulb they will affect the electrons going from filament to plate. These received impulses alternate very rapidly from a positive to a negative direction.

While the charge is negative the stream is checked or reduced and while the charge is positive the stream is increased, because more electrons are attracted from the filament.

Since the feeble received impulses affect the stream and the stream affects the current from our battery we now realise that



Unique Photograph of Original Fleming Valves, Used by the Inventor in his Early Epxeriments.

If the battery voltage remains constant the current flowing will depend upon the strength or density of the path provided by the electronic stream. The current will increase or decrease in sympathy with any increase or decrease of the electron stream.

Now this invisible electronic stream is exceedingly more sensitive than anything which can be seen, and a very minute electric impulse will affect it. The effect produced will be governed by the same law of attraction and repulsion, as previously mentioned.

the signals made by the operator at the sending station, 12,000 miles away, affect the current flowing from the battery in the receiving station.

Although the received impulses are too feeble to operate a telephone receiver, the battery current which they control, is much stronger therefore the resultant effect is stronger than the actual incoming signals. Often, in very long distance communications, the original impulses are so feeble that even the variations of the local battery current are not strong enough to

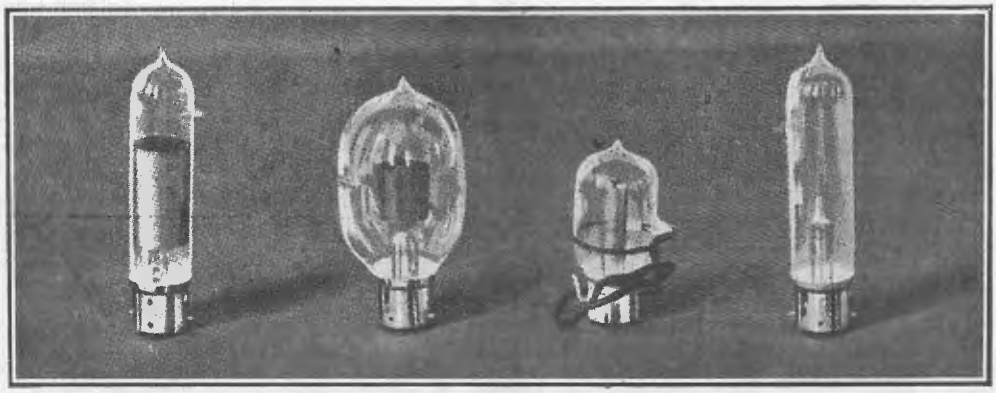
produce an audible sound in the telephone earpiece, but the local impulse can be conducted to the grid of a second bulb in which it will produce still greater local battery currents. This process of re-magnifying can be repeated as many as nine times if the instruments are skillfully operated, so that signals which in other types of detectors appeared to be non-existent may be magnified and re-magnified until they produce signals loud enough to be heard several feet away from the telephone earpice, and distances hitherto supposed impossilble can be bridged by direct wireless communication.

Experimenting with these receivers, the writer has magnified signals, received on a small aerial from a medium-powered station four thousand miles distant, to such an extent that they could be clearly heard in a closed room thirty feet distant from the room in which the receiving apparatus was situated, and signals from a station 12,000 miles distant have been heard at a distance of two feet from the telephone earpiece. In the same series of experiments signals from 12,000 miles' distance have been audible *when using a receiving aerial wire only four feet above the ground.*

The receivers designed and manufactured in Australia by the writer and his assistants are arranged for general operation with three magnifying valves, and are capable of being tuned for a wide range of different wave lengths or vibrations. They are so constructed, however, that the "tuning" range can be extended for any wave length up to the longest which it is practicable to use; also, if further magnification is required, two or more receivers can be connected in succession (or, as it is technically known, in series or cascade).

No more compact and easily operated set of instruments has yet been produced than those shown in the accompanying illustrations, and it is no small encouragement for the great future possibilities of Australian industry to realise that they are entirely of local manufacture and that the results which these instruments are producing are unsurpassed in any part of the world.

To describe in full detail all sections of the complete apparatus illustrated herewith would demand highly technical explanations, which are beyond the scope and intention of this article, but it is hoped that the object aimed at has been achieved, *i.e.*, to describe in plain language the main features of these wonderfully sensitive modern instruments, so that the layman and the student may understand the broad features of their operation.



Some Later Forms of the Fleming Valve.

In conclusion, it must be stated that, since the original invention of Dr. Fleming and its subsequent development a number of capable experimenters and scientists have contributed much to later developments. Among those referred to are Dr. W. H. Eccles (successor to Professor Silvanus Thompson, in London), Captain H. J. Round and Messrs. Franklin, Swann and Wright (of the English Marconi Company), Drs. Irving Langmuir (of General Electric Co.), Alfred Goldsmith, E. H. Armstrong and L. de Forest, and Mr. R. A. Weagent and others (of the American Marconi Company).

[We hope to publish further information upon this absorbing subject in a subsequent issue of *Sea, Land and Air.*—Ed.]

AUSTRALIAN SHIPBUILDING

FIRST MERCHANT VESSEL

An Interview with Mr. W. H. CURCHIN,

Chief Executive Officer for Commonwealth Ship Construction.

To Williamstown, an industrial maritime suburb of Melbourne, falls the honour of building the first Australian steel merchant vessel.

The original programme (which has since been extended) of the Federal Government provided for six steel vessels, three of which were to have been built at Williamstown and three at Walsh Island. Of the Williamstown vessels one was diverted to Cockatoo Island.

The first consignment of steel plates was delivered during the last week of May. Given satisfactory deliveries of material, Mr. H. W. Curchin, Chief Executive Officer for Commonwealth Ship Construction, states that the vessel would be ready for launching about four months from date.

Material From Abroad.

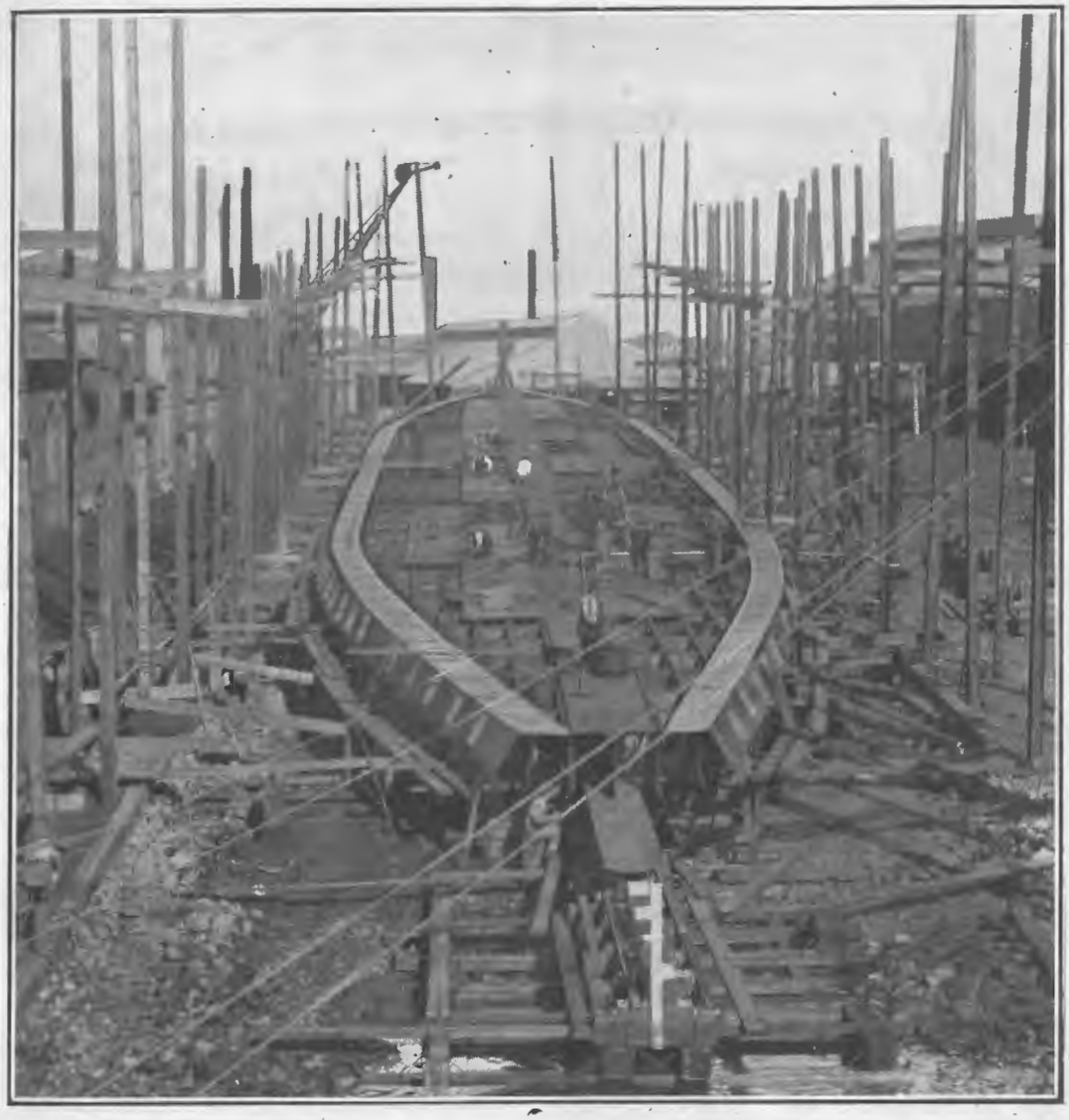
The steel plates for the first six vessels were ordered from the Steel Corporation in America. Owing to conditions arising from the war, the deliveries of 6,000 tons of these plates have been slower than anticipated, and, in consequence, the shipbuilding programme has been hampered. With

A Portion of the Commonwealth Naval Dockyard, Williamstown (Victoria), Showing Australia's First Cargo Boat as She Appeared at the End of June, 1918.

the material that has come to hand, satisfactory progress has been made. The accompanying photographs show progress of the work at the end of the months of June, July and August. In three months the double bottom of the ship had been plated in and the whole of the longitudinal and transverse framing erected. Mr. Curchin is satisfied with the workmanship and states that the progress made compares favourably with that in any yard of similar size and equipment in England or America.

Australian Supplies.

Apart from the steel plates and such articles as cables and shackles, wire ropes, compass outfit, signal lamps and steering chains and certain boiler parts, the whole of the materials required in connection with the hull, engine auxiliaries and equipment is being obtained in Australia. Australian firms are supplying anchors, windlasses, winches, steering gear, wireless and electric light installations, sanitary fittings, iron and steel castings, iron and



"Commonwealth Ship No. 1" at the End of July, 1918.

wood blocks, ship's boats, stores, canvas outfit, manilla and hemp ropes and galley outfit.

Propelling Machinery.

The engines for the Williamstown vessels are being built at the workshops of Messrs. Thompson & Co., of Castlemaine, Victoria, and will be by far the largest marine engines yet constructed in the Commonwealth. The engines are single-screw triple expansion, 25″—41″—68″ × 45″ stroke, working at 180 lbs. pressure, developing 2,300 I.H.P. at 75 revolutions, and will steam about 10½ knots. Steam will be generated by three water-tube boilers.

The vessels, which are on the longitudinal system of framing invented by J. W. Isherwood, are 331 feet in length B.P. by 48 feet beam by 26 feet 1 inch moulded depth, of approximately 5,500 tons dead-weight capacity on a draught of 28 feet 8 inches. The advantages of the "Isherwood" ship are decreased weight of iron and steel, thus obtaining increased dead-weight, carrying capacity, increased strength, larger capacity for bulk and bale cargo and greater accessibility for examination and cleaning. The reduced amount of iron and steel in an "Isherwood" ship of the dimensions of those building, compared with a transversely framed ship, is approximately 110 tons.

Piece Work.

Practically the whole of the work so far done at Williamstown has been on the piece work system. The branches of labour so far affected have been those of plating, riveting, caulking, drilling and angle-iron smithwork. It can safely be said that the system has operated to the satisfaction of both parties. The management is satisfied with the output, and the men have been earning higher wages.

[Mr. W. H. Curchin will contribute an illustrated article on the building of Australia's mercantile marine. This will appear in the October issue of *Sea, Land and Air*.—Ed.]

"Commonwealth Ship No. 1" at the End of August, 1918, Showing Longitudinal and Transverse Framing in Position.

THE COMMODORE

BY WILLIAM McFEE

He was one of those Scotsmen who had come down into England about the time Blair began to build those immensely heavy and solid triple engines of his at Stockton-on-Tees; engines still thumping and wheezing their way about the oceans; old-fashioned, deliberate and very dependable. He was, in fact, one of Blair's guarantee-chiefs at one time. A guarantee-chief, be it known, is a chief put aboad a new tramp steamer by the engine builders for the first six months, to guarantee an efficient consummation of the contract. There used to be money in it. But the Commodore of whom I speak, while putting the brand-new *Benvenuto* through her paces decided that he would remain in the employ. He did.

When I knew the *Benvenuto* a dozen years ago she was so old I could scarcely believe the brass plate on the bulkhead. She was nearly as old as I was. But the Commodore was still in the employ. He had been away at intervals, trying various schemes for getting rich; but he had always come back. At the time I was in the company they had about a score of vessels, from decaying old crocks like the comfortable *Benvenuto* to smart, new hurry-up freighters like the *Aretino* and the *Petnechio,* and Mr. Gowrie, the Commodore as we call him, had been at various times chief of them all. And I used to wonder why he had not been appointed superintendent, until I learned that the Superintendent himself had been Second with the Commodore. Yes! And it wasn't that the latter was so old. He was then an active, alert and extremely competent man of fifty-five, and whenever a new ship was launched, he was kept ashore to take her over at the end of the six-months guarantee. The fact was, he was too valuable afloat. Moreover, at sea the Commodore's ineradicable vice of uttering forcible truths spiced with sardonic humour did no harm. Indeed it did good, for part of the time I was Third with him, and I had to sit under the rich stream of acrid wisdom that poured from his lips.

For he knew the world. He had knocked about. He had had shore billets in China and Nicaragua. He had put his money into a repair-shop in Rotherhithe and gone into bankruptcy in some style. He had won a lottery prize in Havana and lost it all in a bank failure. He had read deeply in many directions, and he could talk. He was a good mathematician, one of those men to whom algebraic formulæ are merely semi-transparent screens behind which a shy truth is vainly trying to hide. And I remember one joyous New Year's Eve, when the *Curio, Petnechio, Aretino, Mario* and *Malvolio* were all in Genoa together, and we had marched back to the harbour seventeen abreast singing "Auld Lang Syne." I caught sight of old Gowrie taking a turn up and down the deck, his big pilot-coat with its collar up against the keen night air. I stepped aboard and made a light remark excusing the hilarity that was now audible further on along the quay. The chief nodded, and I heard a distinct mutter of *haec olim meminisse juvabit.* And he told me afterwards that his father had been dominie in Perthshire, and had often waled him for his poor success in the classics. And then the railway came up to Perth and the dominie discovered that there were other things in the world not near so dead as Latinity.

But the dominie had built well, for his son had a keen eye and a long nose for the meretricious. "Heh, Hinny!" he would say to a new Fourth, "What'd ye call that?" and the "hinny" would have to do it again. And part of his lack of success on shore was due, I believe, to his sardonic comtempt for the rewards meted out to the cunning and the subservient and the knavish. He would jerk out tales as he walked to and fro in a half-gale in the Irish Sea, we sheltering in the lee of the engineers' quarters. He had a habit of walking rapidly away from you, head down, as though he had taken leave of you for ever, and then, stopping abruptly, begin to talk over his shoulder, moving his hand in a passionate way as though he were taking the words

and throwing them down the wind at you. He would jerk out tales, as I said, and the burden was the bizarre disparity between merit and reward.

He told me once that a politician or civil servant whose work involved as much responsibility, skill, tact and knowledge as a shipmaster's or engineer's, would be getting £2,000 a year. And I daresay that was a very moderate estimate of the case. He was getting £200 himself. Not that he coveted wealth for its own sake. He was, if anything, an idealist, for he had a vehement conviction that neither wealth nor birth nor cunning was any adequate substitute for achievement. Sometimes he would pose as a disappointed man, and I remember one evening in Liverpool, sitting in the engineer's mess after supper (for it was my night on duty), and hearing him tell his wife how once he had been full up to the eyebrows with ambition. He would jeer at me for studying, and then incontinently express regret at having abandoned it himself. His wife would soothe him by saying softly: "Oh, nonsense, Jack," and he would turn on her with a flash of his sardonic humour: "*You* don't care so long as the half-pay's safe," he would say, and she would look at me as though to ask, "Did you ever see such a man?" I never had, and he made a very profound impression on me, so that when I heard the tale of his latest exploit, his caustic individuality illuminated the whole thing and made it real. For he is still at sea, though he must be sixty-five. I once expressed astonishment to his wife that he did not retire, but she said he was so restless they were glad to see him out of the house.

A year or more ago he was chief of the *Malvolio,* eight thousand tons dead weight, bound westward after discharging oats at a Mediterranean base. She was flying light, of course, doing eleven knots and unarmed. At seven o'clock on a Sunday morning a submarine emerged about two thousand yards abeam and fired a shot warning her to stop. The commander immediately put the helm over to bring the enemy astern and sent word of what was happening to the engine-room urging full speed. Pa Gowrie was already below in his pyjamas, opening the expansions to their utmost limit and ordering the spare bunker doors to be raised, for he had about fifty tons of Norfolk Virginia steam coal (the famous Pocahontas brand) which he was saving to catch a tide. And then he went up on deck, where things were happening, for the enemy had found the range. The mizzen mast had been struck just below where the wooden top telescopes into the hollow steel part, and had collapsed; but as she carried no wireless this was nothing. The mate, standing on the high poop, had been nearly blown overboard by a shell which buried itself in the ice box and exploded, flinging timber, sheet-lead, sawdust and beef in all directions. On the bridge the man at the wheel and the carpenter, who was taking orders from the "old man," had been killed outright. The commander had taken the wheel for the time, and he informed the Commodore that he was going on for the present. The latter went back to his room and put on his working serges.

Down below he found the other engineers clustered about the starting platform discussing the situation. His orders were that they should carry on in the engine-room while he took charge of the fires. When he reached the stokehold he discovered nobody to take charge of. The firemen had all gone up on deck. Pa Gowrie in his young days had been an expert fireman. He knew coal. He used to tell me the curse of the modern engineer was he didn't know coal. In this case he was in his element. He grasped a shovel and flung door after door open. There were nine fires in all and three fires to a man is a good allowance. Pa Gowrie worked through the lot. Now and again a shell would strike some part of the ship and explode, but he went on with the job. Then he took the slice, a long bar of inch-and three-quarters steel flattened at the end, and proceeded to loosen the clinger from his bars. The sweat ran in streams from his lined, obstinate yet dignified features. Suddenly with a terrific bang, a shell tore through the 'tween deck bunkers, which were empty, ricochetted against the beams and ventilators in the fiddley and fell thump on the plates a couple of yards away from him. Pa Gowrie regarded it over his shoulder as he worked. When he had slammed the fire door to, he took a shovel and scooped the sinister pointed twelve-pound visitor into a bucket of sea-water standing under the ash-cock. Then he went on. He could hear, above the hum of the furnaces, the steady seventy-eight a minute beat of his engines. The third engineer dashed in to give the news—shell in

the after hold just above the water line. The enemy were nearer too. Pa Gowrie had nothing to say to that. He relighted his pipe with a live coal and nodded. Watch the bilges, he advised. The third said "Aye," and sprinted back to the engine-room. It was very exciting.

High up above him, Pa Gowrie could see a black weather-cloth, which he knew to be the back of the bridge. Suddenly a bearded face looked over the black cloth, a big bearded mouth opened and let out a far away yell: "There, Chief?" "Yes, what's the matter?" asked the Chief in a sort of surly defensive tone. He was always defensive in talking to skippers. "Game's up. Come on out of it. Rudder's jammed."

It appeared that they were going to take to the boats, which were already in the water, one of them in splinters. You might imagine that this was the end of the story. Not at all. After stopping the main engines and easing the safety valves, the engineers, shepherded by Mr. Gowrie, trooped up on deck, and slid down into the boats. It may be conceded that the Chief had abundant material in this adventure on which to exercise his sardonic humour as they pushed off and began rowing for the North African coast. But it never caused him to deviate in the slightest from his conception of what ought to be done. The enemy, having finally managed, after using enough ammunition to demolish a large town, to sink the *Malvolio,* a very ordinary unarmed tramp steamer, disappeared on the horizon, for this was before he thought of the delightful sport of practising on lifeboats.

The three boats of the *Malvolio,* two lifeboats and a cutter, put up their sails, and, favoured by fair weather, made the desolate coast of Morocco early next morning. Four of the crew, including the second officer, had been killed. Several were badly hurt and useless in a boat. Both the friendly fishermen and the bloodthirsty tribesmen of fiction were absent from the picture, and the old man, anxious to get himself and the ship's papers back to London as soon as possible, decided to make for Europe in the boats. Fortunately for them they were no sooner under weigh than a Spanish coasting-steamer overhauled them and took them into Almeria, an iron-ore port midway between Gibraltar and Cartagena. Here, to their intense astonishment and disgust, they were "interned until the end of the war."

Even this is not the end of the story. The first steamer that arrived to load iron ore was British. What passed between the commander and the bedraggled, unshaven crowd from the *Malvolio* is not known; but when the British ship, loaded to her marks with iron ore, left Almeria, the *Malvolio* crowd were aboard of her, in defiance of all the printed regulations on the back of the ship's articles.

They landed at Cardiff, and Pa Gowrie, after a hurried visit to his startled family at Penarth, where he lives, went on with the others to London, where they presented themselves before the owners who, very glad to see them, promised them billets as soon as they could get another ship.

So that even this is not the end of the story really, for the *Cortegiano,* a nice new tramp, with a useful twelve-pounder gun astern, passed through Port Said the last time I was there, and the Commodore was chief.

TRAINING OUR WIRELESS OPERATORS

BY VINCENT GARDINER

To many persons wireless telegraphy suggests some vague and intricate method of communication. Many, too, regard it as a closed book to all but experts in meteorology and electricity. It is true that a wonderful relation exists between the two branches when applied to wireless, but those important factors have now been thoroughly mastered by the pioneers of radio-telegraphy, and so complete is the data available that the subject can be readily understood to-day by anyone possessing an ordinary school education.

The way of the ambitious youth was paved by the opening in Sydney a few years ago of the Marconi School of Wireless. Its success was ever assured. From the giving of its first lesson the school has always been fitted throughout with the very latest improvements of the day, the managerial policy being that none but up-to-date equipment be installed.

—*Photo. Oxford Studios.*

Mr. Vincent Gardiner,
Superintendent of the Marconi School of Wireless, Sydney.

Even in pre-war days it had been obvious that wireless communication would be adopted almost generally and that its adoption would open a wide field and ensure continuous employment for all graduates of its instructional schools.

From its inception the instructors at Wireless House found the demand for its trained operators considerably in excess of the supply, and this has always been the position.

With the outbreak of war the profession of radio-telegraphy received an enormous impetus. The Allied world had to be linked up by an endless chain of wireless communication. Ships had to be hastily fitted with wireless installations and competent men were required in large numbers for the wireless branches of the A.I.F. Everywhere the demand for trained operators was extraordinary. The Marconi School, with its staff of experts—many of whom are to-day on active service with wireless units — was severely taxed to meet Australian requirements. In this it was successful, but vacancies still remain for a large number of operators.

The thoroughness of the Marconi School instructional systems is confirmed by official returns showing appointments already granted to its successful students, *viz.*:—

Navy Transport	110
Military	115
Mercantile Marine	235

The Military figures include appointments to the Field-Wireless Sections and the Australian Flying Corps.

The difference between the total number of students enrolled and the total of appointments secured is infinitesimal. The instructors, having a personal record of each student, know exactly what degree of efficiency he has attained and just when he is ready for examination. The importance of this point cannot be over-estimated, for therein lies the secret of the school's success.

The newly-enrolled student becomes absorbed in his work from the moment of

entering the classrooms. These apartments are so arranged that artificial lighting—except, of course, at night—is never employed. The student sees and manipulates the actual wireless apparatus. This is set up in the form of complete "stations." In learning the Morse code no apt student is ever held back by the slowness of another. Having mastered the alphabet, he is transferred to another table. Here he practises at a speed of five words per minute. This accomplished, he moves to a ten-word-a-minute table, progressing from table to table at an increasing speed of five words a minute, until he reaches the twenty-five standard. At fifteen words per minute the student takes up work on the telephones and sounders.

The preliminary work on the "buzzer" is interesting, but so much more so is the theory of electricity in its application to wireless telegraphy that the beginner at once becomes deeply engrossed in the new branch of tuition. It is at this stage that he commences to learn how a message can be sent from one end of the world to the other merely by tapping a key. He receives practical instruction on three complete installations and learns too the fundamental principles of the whole business of radio-telegraphy.

When the course calls for an explanation of a wireless "ship station," a complete equipment of this form of station is set in working order. When the lecture relates to what is technically known as the "quenched spark" system, that particular installation is there, ready for demonstration. The very latest in "sets"; the type which has but recently been fitted to aircraft, is also installed. Thus, under the guidance of qualified instructors, every possible problem in the employment of wireless is readily mastered by students.

The profession of the wireless operator is one of inestimable value, and one which very adequately repays any time spent in acquiring proficiency.

The military course requires but two months of day-attendance or four months for evening classes. For service in the mercantile marine a more thorough training in the theoretical and practical branches is necessary and the time set down is five months for day-classes and ten months for evenings, taking lessons three evenings per week. In these periods everything known concerning the practical operation of radio-telegraphy is dealt with and presented to the student in the simplest possible terms.

For the young man of ambition few occupations offer opportunities for advancement equal to those which await the wireless operator. His profession is lucrative and interesting; he may travel to all parts of the world and so enjoy that broadening influence which is the natural heritage of all widely-travelled men. The operator who can recognise his own capabilities finds fields for self-advancement both at home and abroad; moreover, the operator serving on board ship enjoys the knowledge that he is serving the cause of freedom, for it has been officially stated that:—

"In the opinion of the Naval Board all persons engaged in wireless duties serve their King and Country equally with those who have enlisted for active service ashore and afloat."

A Melbourne branch of the Marconi School of Wireless has lately been opened in spacious premises at 422-424 Little Collins Street. Every facility for the training of its students has been installed, and already, although the School has been in operation for little more than two months, a number of students are well on the way to becoming qualified in their new profession.

So good, indeed, has been the progress that its Superintendent, Mr. H. Firth, who gained his commission with the Australian Wireless Unit on Gallipoli, hopes to hold the first examination for the Government Certificate of Proficiency in Radio-Telegraphy next month.

Names of successful candidates and appointments obtained by them will be published in this journal.

Australia's Wireless Operators in the Making. A Class-room in the Marconi School of Wireless, Sydney.

MRS. DUGAN'S DISCOVERY.

Wan day win I was after rummagin' in me cellar Oi found wan dozen champagne bottles goin' t' waste, and t'was a pity t' see thim go t' waste. Oi tuck a look at thim and Oi seen they was all in good condition, except they was full of champagne water. Puttin' the twilve bottles t' wan soide Oi procured a cork screw and houldin' the bottle tight between me knees—which Oi had covered wid rosin t' prevent th' bottle slippin'—Oi drew out the cork.

Oi laid th' cork t' wan soide an' emptied th' contints ov th' bottle down th' drain, excipt a small tumblerful, which Oi drank.

Oi thin removed th' cork from another bottle, an' emptied th' contints down th' drain, excipt a small tumblerful, which Oi drank.

Oi thin removed th' cork from another bottle, an' emptied th' contints down th' drain, excipt a small tumblerful, which Oi drank.

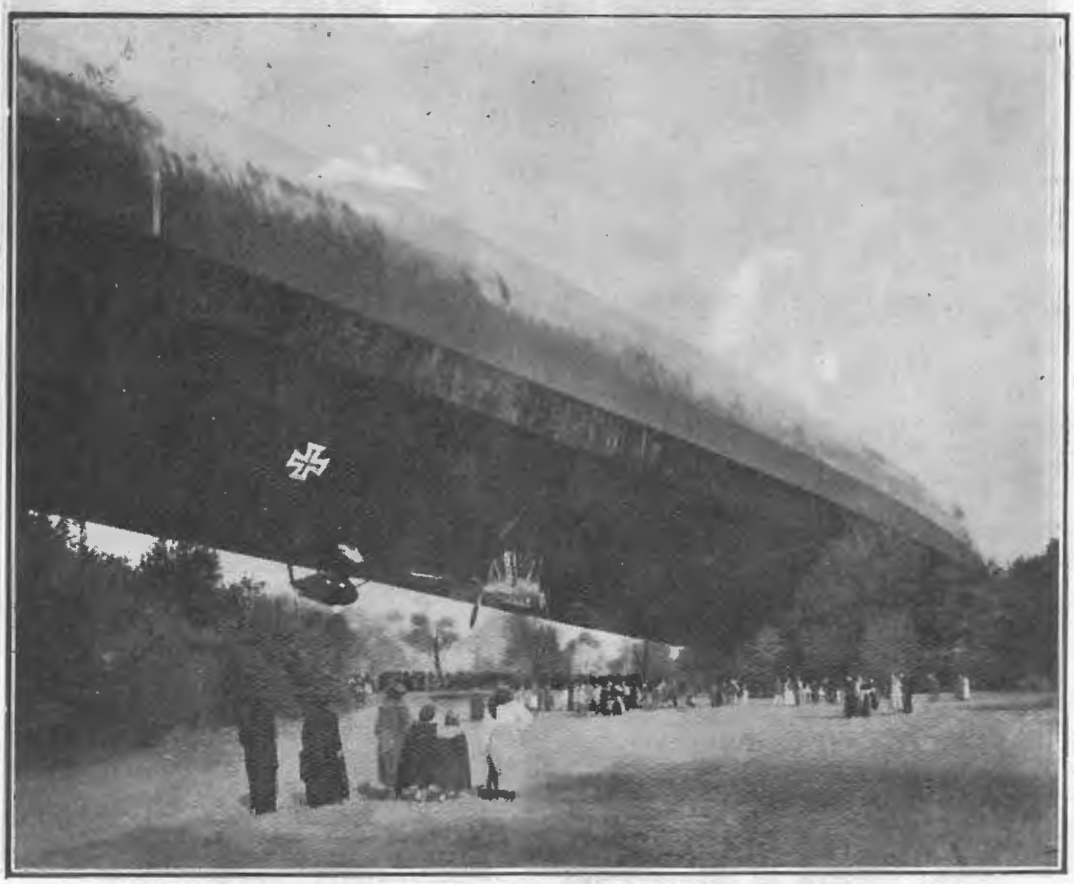
Oi thin removed th' cork from the cork an' emptied th' drain down th' contints, excipt a small tumbler, which Oi drank.

Oi thin removed another drain from th' contints—and emptied th' small cork down th' tumblerful, excipt a bottle, which Oi drank.

Oi thin bottled another small remove—from th' tumbler—excipt a small corkful—which Oi drained—and continued th' drink down th' bottle.

Oi thin tanked a bump from 'nother bottle an' Oi mean Oi dranked a kump—Oi mean Oi cackled a—Oi mean Oi conkled—Oi—Oi well, anyhow, Oi did it t' all thim twilve bottles.

—*Marconi Service News*



Another Zeppelin Accounted For.
The L49 Lies Stretched Across the Tree-tops of Bourbonne-les-Bains.
—*French Official Photograph.*

In Command of the Australian Flying Corps, Lieutenant-Colonel E. H. Reynolds, D.S.O., O.B.E.

THE OVERSEAS AERIAL LEAGUE AND THE IMPERIAL AIR FLEET COMMITTEE

AN INTERVIEW WITH LIEUT.-COL. E. H. REYNOLDS, D.S.O., O.B.E.

By courtesy of Lieutenant-Colonel E. H. Reynolds, D.S.O., O.B.E., whose portrait faces this page, we are permitted to publish particulars of the Overseas Aerial League and the Imperial Fleet Committee. It is understood that the scope of both institutions will shortly be extended to Australasia.

The former, which has its headquarters at Windsor House, Kingsway, London, is affiliated to the Aerial League of the British Empire and to the Overseas Club. It was formed in England before the war and is conducted on lines similar to those of the Imperial Navy League (the objects of which are detailed on page 428 of this journal).

The Overseas Aerial League has as President General H. T. Arbuthnot, C.B. and its Vice-Presidents include the Hon. Andrew Fisher, and the High Commissioners for Overseas Dominions. And among its most energetic supporters was the late Sir George Reid.

The League directs the operations of a number of sections now established throughout the Empire for the purpose of carrying out the work which has been performed so successfully within the British Isles. Its office-bearers are, naturally, influential men, the majority having held public offices, either in Overseas Dominions or in the Crown Colonies.

As with the Navy League, which has as its primary object the naval supremacy of the British Empire, so with the Aerial League, whose main determination is our aerial supremacy.

The following is reprinted from official publications issued by the Overseas Aerial League and the Air League of the British Empire:—

Primary Objects of the Overseas Aerial League.

(*a*) To encourage and stimulate the invention, manufacture and practical use of aircraft and matters appertaining thereto.

(*b*) To disseminate knowledge and spread information showing the vital importance to the British Empire of aerial supremacy, upon which its commerce, communications, defence and its very existence may largely depend.

(*c*) To employ every constitutional means to bring about the objects for which the League is established, and to invite support of British subjects of all shades of opinion throughout the Dominions and Dependencies of the British Empire.

Other Objects.

Among other proposed objects of the League are the following:—

(1) The provision of reading rooms and of aeronautical reference and lending libraries for the use of members at important centres overseas.

(2) The appointment of honorary expert Advisory Committees in each of the Dominions to report and advise on aeronautical inventions, in consultation with the Central Committee in London, and to afford information with regard to aviation in general.

(3) To give information concerning schools for learning the art of flying, and to assist Britons overseas desiring appointments in the Royal Flying Services.

(4) To assist the dependents of airmen whose lives have been lost on active service.

(5) To hold lectures, give demonstrations and generally arouse public interest in aviation overseas.

The Committee of the Overseas Aerial League suggests that it may be found desirable to establish landing grounds for airmen in the various Dominions, on lines similar to those approved for the United Kingdom by the Air Departments of the Admiralty and War Office.

* * * *

THE AIR LEAGUE OF THE BRITISH EMPIRE.

The Provision of Aviation Landing Grounds, etc.

The Committee has embarked on a scheme for acquiring areas for landing

grounds for airmen, and for the provision of aerodromes and direction towers along clearly defined aerial routes at various important centres throughout the United Kingdom.

These areas have been selected upon the recommendation of a Committee of Officers from the Air Departments of the Admiralty and War Office, which has been formed for that purpose and dealing with this specific undertaking, and before whom the whole scheme, which meets with their full approval, has been laid.

The actual site of the landing ground in each respective area will be selected by the Aerial League, in conjunction with experts appointed by the Air Departments.

As soon as funds are available wireless telegraphic apparatus will be installed within convenient distance, in such positions as will not endanger aviators on landing.

The landing grounds, which will be situated as near as possible to large towns, will be placed at the service of all aviators on reasonable terms.

Commodious sheds will be provided, where supplies of fuel, etc., can be obtained.

Each landing ground, with its buildings, will be managed by a Local Committee, in direct affiliation with the League.

Local Committees will be empowered to let the grounds on suitable days for cricket, football and other games and sports, from which a substantial revenue is anticipated.

* * * *

Working conjointly with the Overseas Aerial League is the Imperial Air Fleet Committee. This Committee, at the head of which is the Right Hon. Lord Desborough, has as joint Vice-Presidents the Duke of Portland and the Right Hon. Sir Joseph Ward, Bart., P.C., K.C.M.G., Premier of New Zealand. The latter Dominion is further represented on the Committee by the Hon. Sir Thomas Mackenzie, K.C.M.G., and the Commonwealth of Australia by the late Sir George Reid, to whom a successor has not yet been announced.

The Imperial Air Fleet Committee fulfils two very important functions, *viz.*, the provision of a chain of aerodromes throughout the main routes of the British Empire, and the provision of aeroplanes for active service by means of public donations. Prior to the outbreak of war the Imperial Air Fleet Committee drew up a scheme for a chain of aerodromes throughout England and Wales. This scheme was fully approved by the Imperial War Office.

Colonel Reynolds states that the number of aeroplanes secured for war purposes by the activities of the Imperial Air Fleet Committee is approximately two thousand, and that, shortly before his departure for Australia in June of this year, he was invited by the Liverpool Chamber of Commerce to accept on their behalf an aeroplane for presentation to the Australian Flying Corps.

In Colonel Reynold's opinion there is not the slightest doubt that commercial aviation will come in Australia, and that it will come far sooner than we anticipate.

"So rapid has been the development of flying in other parts of the world," concluded Colonel Reynolds, "that there is no doubt that immediately at the conclusion of the war aeroplanes will be used along main routes for commercial purposes, and it is most essential that Australasia should be well to the fore in these matters.

"The assistance of influential, public-spirited citizens in Australasia is urgently needed to commence and develop a scheme for linking up main centres of population by means of a system of aerodromes, hangars and landing stations."

THE NAVY LEAGUE

The Navy League is a non-party organisation, whose main object is to educate the Empire in the principles and employment of Sea and Air Power. The paramount importance of a Navy both sufficient and efficient is the best guarantee for a long peace and a sure shield in time of war.

The functions of the Navy are threefold:

(1) Protection from invasion.

(2) Maintenance of Sea communications to all ports in the British Empire and to ports of British Allies.

(3) The denial of Sea communications to the enemy in time of war by the establishment of strict siege of enemy territory by cutting his sea lines of communication, whether directly to his own coasts or through neutral ports.

Next month we hope to publish an account of the work already done by the Navy League in Australia and New Zealand.

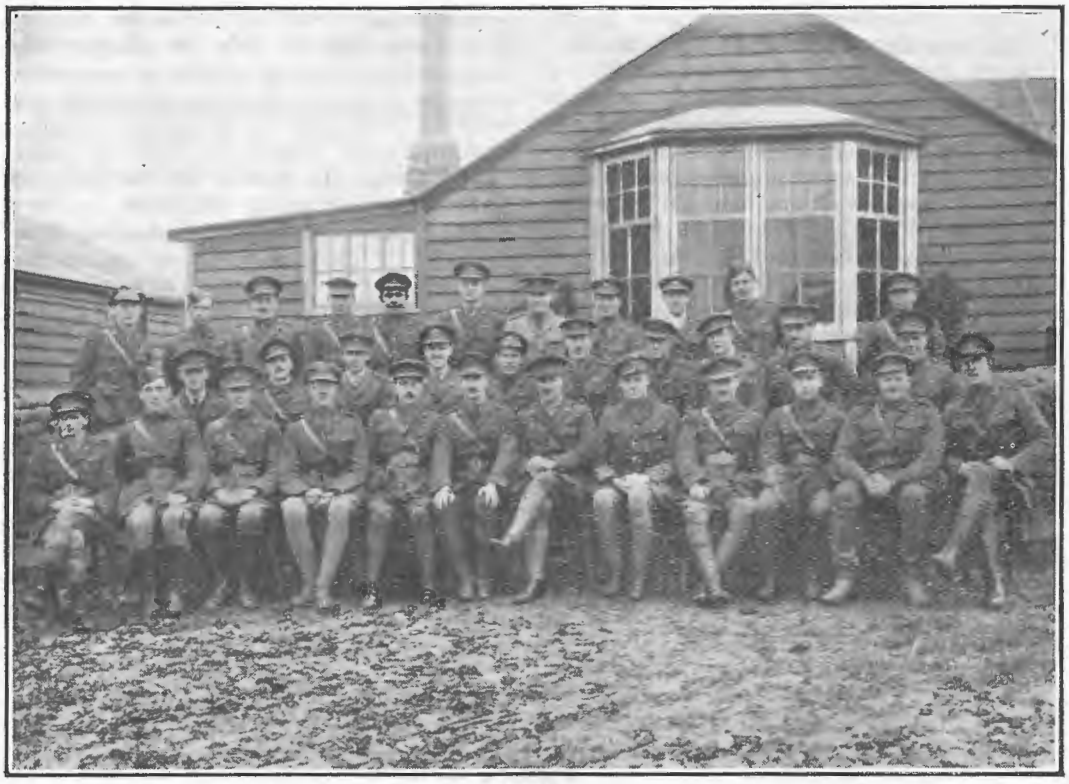
Readers who may desire further information concerning the above institutions, are invited to communciate with the Editor, *Sea, Land and Air.*

AUSTRALIAN FLYING CORPS COMFORTS FUND

WELCOME TO LT.-COL. E. H. REYNOLDS AND MAJOR W. SHELDON

At a General Meeting of the New South Wales Branch of the Australian Flying Corps Comforts Fund, held on August 21 at 59A Wentworth Avenue, Sydney, the guests of honour were Lieutenant-Colonel E. H. Reynolds, D.S.O., O.B.E., and Major W. Sheldon, who have recently been invalided back to Australia.

Replying to an address of welcome by the President and Committee of the Fund, Colonel Reynolds declared that he personally had done very little; it had been the officers and men of the A.F.C. who had done all the work, and so far as he was concerned it was merely a matter of getting them together and putting them on the right track. There was nothing in the world like the Australian Flying Corps. (Applause.) That was not only his own opinion, but the opinion of the War Office, the Air Board and everybody concerned with the work of the Australian Flying Corps and the Royal Air Force. In the A.F.C. they had splendid material, splendid men and splendid officers—men who had taken to flying like a fish took to water, and whose enthusiasm was unequalled. With regard to the work of the Comforts Fund, it would be impossible for him to adequately describe the happiness that it had brought to the men of the Corps. Unfortunately, during both this year and the last, there was much trouble with the transport; some ships were lost and many of the Australian Comforts Fund Christmas presents went to the bottom. The only thing to do was to pool all the comforts that came to hand, so that the Australian Flying Corps did not



Officers of No. 3 Australian Flying Squadron, Commanded by Major Blake (New South Wales).
—Photo. Copyright *Sea, Land and Air.*

always get the presents that were sent to them. Still, they got fine presents, and were pleased to have an equal division with other Australian units of such gifts as were available.

Regarding the work of the A.F.C., the headquarters, which were in London, directed the administration of the various squadrons. There was a training squadron at Wendover, not far from London, to which all officers and cadets from Australia were sent—this was under command of Major Brown; there was a training squadron in England and a training wing in Gloucestershire, near Cirencester, where officers, chiefly, were trained at pilots. One squadron was in Egypt, and had done magnificent work. He had the honour of taking it there in 1916. There was nothing to equal it, and the British Government would not allow it to be removed from there, because it could not be replaced. It was equal to any other two squadrons. Major Sheldon was one of the flight-commanders there for some time, and he might tell them something about it. Major Sheldon also commanded a second squadron, now fighting in France. There were also in France an artillery squadron and fighting squadron. One of these was commanded by Major Williams, a fine officer in every possible way; in fact, he (the speaker) did not think that he had an equal in the Flying Corps. Another was commanded by Major Murray Jones, who, he believed, was the Australian major referred to in that morning's papers—he was a Victorian; a third squadron was commanded by Major Blake, of New South Wales, and a fourth by Major McLoughlin. Major Sheldon might perhaps now be able to give them some more detailed information. (Applause.)

Major Sheldon said he could only bear out what Colonel Reynolds had said regarding the quality of both officers and men of the A.F.C. He (the speaker) was rather fortunate in having had the luck to command three squadrons of the A.F.C. at different times. He went away originally with No. 1, and he realised in Egypt what a fine crowd of men they were. He was only flight-commander then, and when he left Egypt he would have been glad to have taken them with him. Their duties in Egypt were of a very varied nature; they had to perform every branch of the work, whereas now there were special squadrons each for bombing, fighting, reconnaissance and photographic work, and this gave them excellent, all-round experience.

In England he took over command of a squadron which had come from Australia, and he was glad to find that the officers and men were of the same splendid type as those he had left in Egypt. They would work their soul-cases out for one in order to get their jobs done. At the end of last year he went to France and took over command of No. 2 Squadron, and it had made a good name for itself. General Birdwood wrote to him a fine letter, complimenting the squadron on its work up to the middle of the last push. When he went over to France they were doing what was known as "peace-time warfare." There was no "push" on, and their work was regular every day. Their orders were sent out the night before, and much time was spent in tennis, hockey, football and so on, because it was essential to keep fit. Before the March offensive their aerodrome resembled a sports ground; there were sports and games of all kinds in progress, including "two-up"—the Australian national game. (Laughter.) On March 21 the Germans started pushing south, and then the men of the Flying Corps were kept going from daylight till dark, and had not much time for meals or recreation. They were continually moving about, but when he left they had again settled down to more or less "peace-time warfare," and were in a comfortable aerodrome between Arras and Doullens. Before he closed he would like to voice the appreciation of every man in the Flying Corps of the work of the Comforts Fund. They could have no idea of the immense pleasure that their gifts gave to the men, especially those in Egypt, where they were more hard put to it than elsewhere in procuring delicacies. (Applause.)

ENEMY MINES IN AUSTRALIAN WATERS

Whilst on a voyage from Newcastle to Port Pirie the steamer *Kilbaha* (formerly *Emerald Wings*), owned by the Wing Steamship Co., Ltd., Sydney, narrowly escaped destruction off Green Cape, New South Wales, by an enemy mine.

On her return to Newcastle the chief officer of the *Kilbaha* stated that the mine was seen on August 11 by the second officer, Mr. C. Stibbing, in a latitude 36.47 South, longitude 150.15 East, approximately 20 miles off Green Cape. From the bridge Mr. Stibbing mistook the dark object for a whale sporting about in the water. Noticing that it remained stationary, he sent for binoculars and recognised something that resembled a floating buoy. He altered the steamer's course and reported the matter to the captain. The *Kilbaha* steamed close to the object, and prongs, some six inches in length, were seen protruding from its "head." Concluding that it was a mine, the master attempted to explode it. Although repeatedly hit by revolver fire from a range of about thirty yards, the mine failed to explode. It was subsequently ascertained that aim should have been directed at the prongs. The chief officer then launched a boat and, approaching within ten yards, fired point blank at the mine. Fortunately even this failed to bring about an explosion. Finally, by means of a line and a lifebelt, the captain had the missile towed to the signal station at Green Cape. He was next instructed to tow it to Twofold Bay. Here they were relieved of further responsibility by the harbour master, who exploded the mine by rifle fire. The explosion was terrific, *débris* being blown for hundreds of yards and a huge volume of water rising to a height considerably above the *Kilbaha's* masthead.

To illustrate the necessity for official instructions as to the correct method of destroying enemy mines, the chief officer confessed that in attempting to draw the mine closer to the boat he *made a hit at the prongs with a boathook.* Fortunately, he missed.

The adventure of the *Kilbaha* was referred to in the Press throughout the Commonwealth. The views of the Acting Minister for Navy are, we believe, best expressed in an interview reported by the Melbourne *Herald* on August 31. As this interview appears to cover every aspect of the matter we reproduce it herewith.

"I notice in the press that the chief officer of a ship is said to have fired at a floating mine at a distance of ten yards. This is a very dangerous procedure," said Mr. Poynton, Minister for the Navy, to-day. Proceeding, he outlined what action should be taken by navigators or members of the public in the event of their finding a mine.

It is understood that the Naval Authorities will issue shortly a poster containing these instructions in full, and will also offer rewards for any person who gives information leading to the destruction of one of these dangerous weapons of sea warfare.

Mr. Poynton stated that the greatest care should be exercised in approaching an object at sea or stranded on the shore which might bear any resemblance to a mine. If, upon inspection, the stranded object should prove to be a mine, it should not be interfered with in any way by unskilled persons. A report should immediately be made to the local Naval Authorities, preferably by telegram to the District Naval Officer of the State. The police in the district should also be informed, in order that action may be taken to prevent members of the public approaching within the danger zone.

Referring to the exploding of stranded mines, Mr. Poynton said that, whenever possible, the Naval Authorities would undertake this duty. Independent action should not be taken by private persons, except in extraordinary circumstances. When a floating mine explodes the danger area

extends over a radius of at least 200 yards, and when the mine is ashore the area may be greater. If circumstances render it impossible to obtain assistance from the Naval Authorities, or, owing to a special emergency, it is necessary to destroy the mine at once, the work should be carried out by rifle fire from a distance greater than that of 200 yards. The marksman should assure himself that all persons in the vicinity are out of danger, and should himself take up a protected position.

Must Inform Authorities.

In conclusion, Mr. Poynton pointed out that the provision in regard to no action being taken by private persons did not apply to ships at sea which sighted a floating mine. It was the duty of all navigators to assist in ridding Australian waters of mines, and they should immediately endeavour to sink the mine by rifle fire from a distance of not less than 200 yards. Failing this, they should take whatever action the captain may think fit for the disposal of the mine. In the event of their being unable to do so, the finders of the mine should immediately inform the Naval Authorities of the exact locality in which the mine was sighted.

In view of the recent discovery of mines along the Australian coast, the subject is one of much interest. The Naval Authorities state that they have no reason to believe that mines had been laid at any point along the coast other than at Gabo Island. They consider that the two mines sighted recently probably broke away from the Gabo field before it was swept.

Naval Authorities foresee great danger to shipping in all parts of the world as a result of the indiscriminate sowing of mines by Germany and by mines which have broken away from Allied fields. Carried about the world's seas by countless currents, these "death-eggs" will remain a menace to ships for years after the peace treaties are signed. Although the number of mines used in the Russo-Japanese war was infinitesimal as compared with the huge quantities which have been employed in the present struggle, the aftermath was a serious matter. A year after peace was declared the Russian steamer *Varyag* struck a mine off Vladivostock and sunk, only 60 persons being saved out of a complement of 200.

Though certain rules have been drawn up by the nations in connection with the use of mines, Germany has, of course, treated them as mere scraps of paper. Among the provisions of the agreement were that all unanchored mines must become harmless an hour after they are placed in the water, and that anchored mines should become useless as soon as they break away from their moorings. Writing recently in *The Windsor Magazine,* Mr. H. C. Ferraby points out that Germany has consistently disregarded the provisions. As an indication of the number of mines at present loose which have been set afloat the same writer points out that 500 mines drifted ashore on the coast of Jutland in two years, and, up to March 1, 1915, 918 had gone ashore on the coast of Holland.

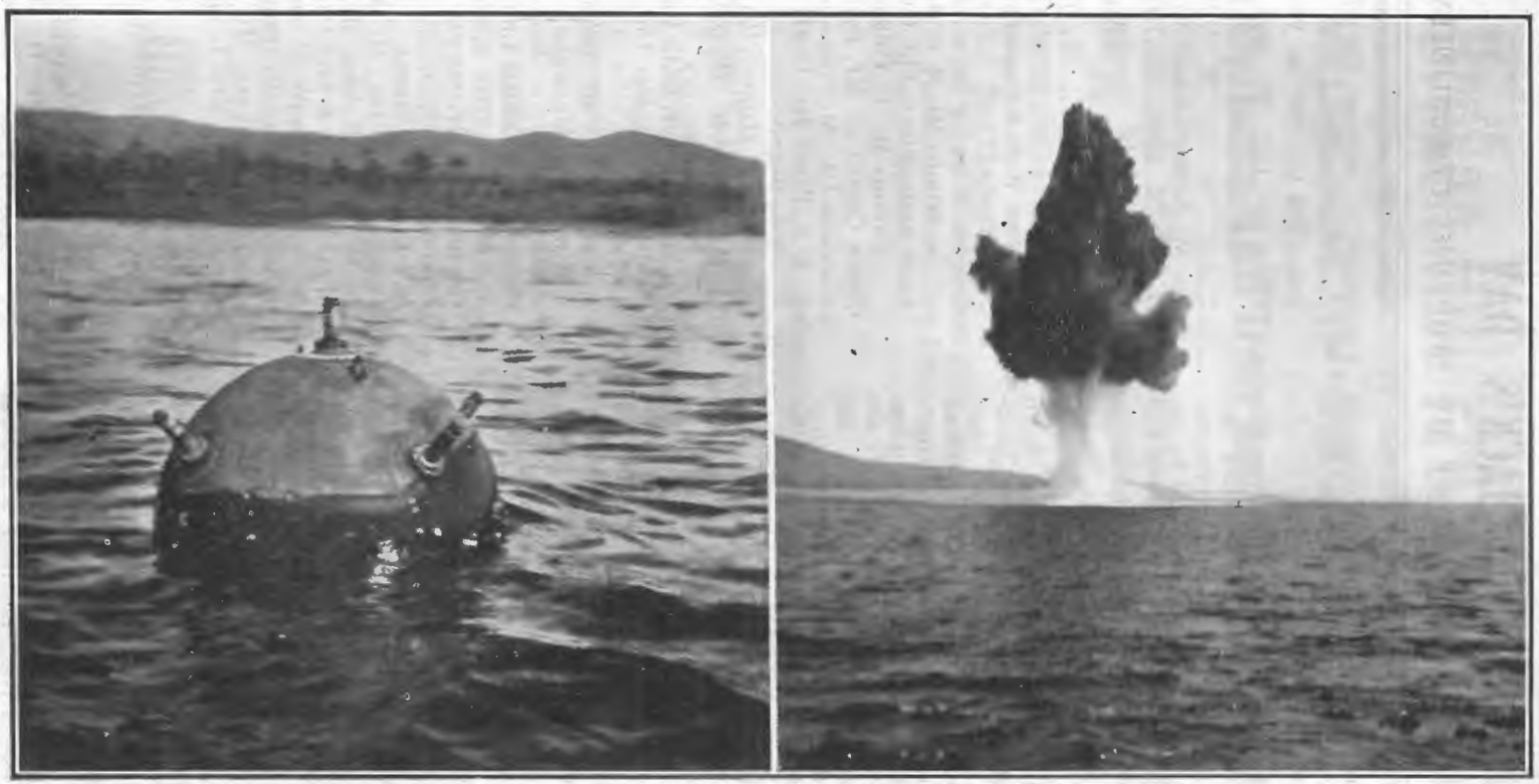
Construction Described.

The ordinary form of mine consists of a metal globe which is buoyant and enables it to float. In the top of the globe is explosive material, ranging from 200 lb. in the small sizes to 290 lb. This charge is fired by some object coming in contact with four or six small prongs which project from the case. These features are essentially the same in all classes of mines, but some are anchored by means of an intricate apparatus, and others are simply sown into the water and left to reap a harvest of death wherever wind and tide may carry them. When an endeavour is being made to explode a mine by rifle-fire, the marksman should, of course, aim at the small prongs.

At various times it has been necessary to sweep the seas in all parts of the world, and the remarkable experience of a Boer farmer and his son, who discovered a mine stranded on the beach at Eland's Bay, South Africa, recently formed the subject of an official report to the Admiralty. That their adventure did not end in death for both of them is surprising. Being unable to understand what the queer globe could be, they dismantled it, cut off the prongs with a chisel, and put a match to the T.N.T. explosive. A sheet of flame 200 feet high shot into the air, but the investigators were not harmed, and survived to explain that their only idea was that the thing was "a new sort of boiler used to make wireless telegraphy."

GERMAN MINE PHOTOGRAPHED IN AUSTRALIAN WATERS

FOR DESCRIPTION SEE PRECEDING PAGES



Adrift.

Exploded by Rifle Fire.

—Photographs Copyright, *Sea, Land and Air.*

JACK'S DAY

GIGANTIC EFFORT BY SHIPPING COMMUNITY

An organising meeting of the shipping community was recently held at the Royal Naval House, Sydney.

Sea, Land and Air is informed by Mr. Percy Hunter (organiser of the Jack's Day movement) that the work done in this connection by the shipping houses will be the greatest community effort yet made in any patriotic movement.

"We have," said Mr. Hunter, "brigaded the whole of the interests, starting with the shipping companies and going down right though the allied industries (suppliers, ships' chandlers, docks and engineering companies, stevedores, etc.) taking in also the various Government Departments chiefly associated with shipping, *viz.*, Customs, Harbour Trust, etc. We are levying on friends actively interested, but no longer directly associated with the shipping business. The Ancient Mariners' Association, Naval Veterans and various kindred institutions are actively co-operating with the Navy in making the shipping effort."

Under the presidency of Sir Owen Cox, a separate sub-committee has been formed. This body acts as a Directing Committee, and comprises the following gentlemen:—

Mr. W. N. Cuthbertson, Chairman (Newcastle & Hunter River Co.)

Mr. T. S. Gordon (Birt & Co., Ltd.)

Mr. M. Z. Throsby (Orient Co.)

Mr. W. Service (P. & O. Co.)

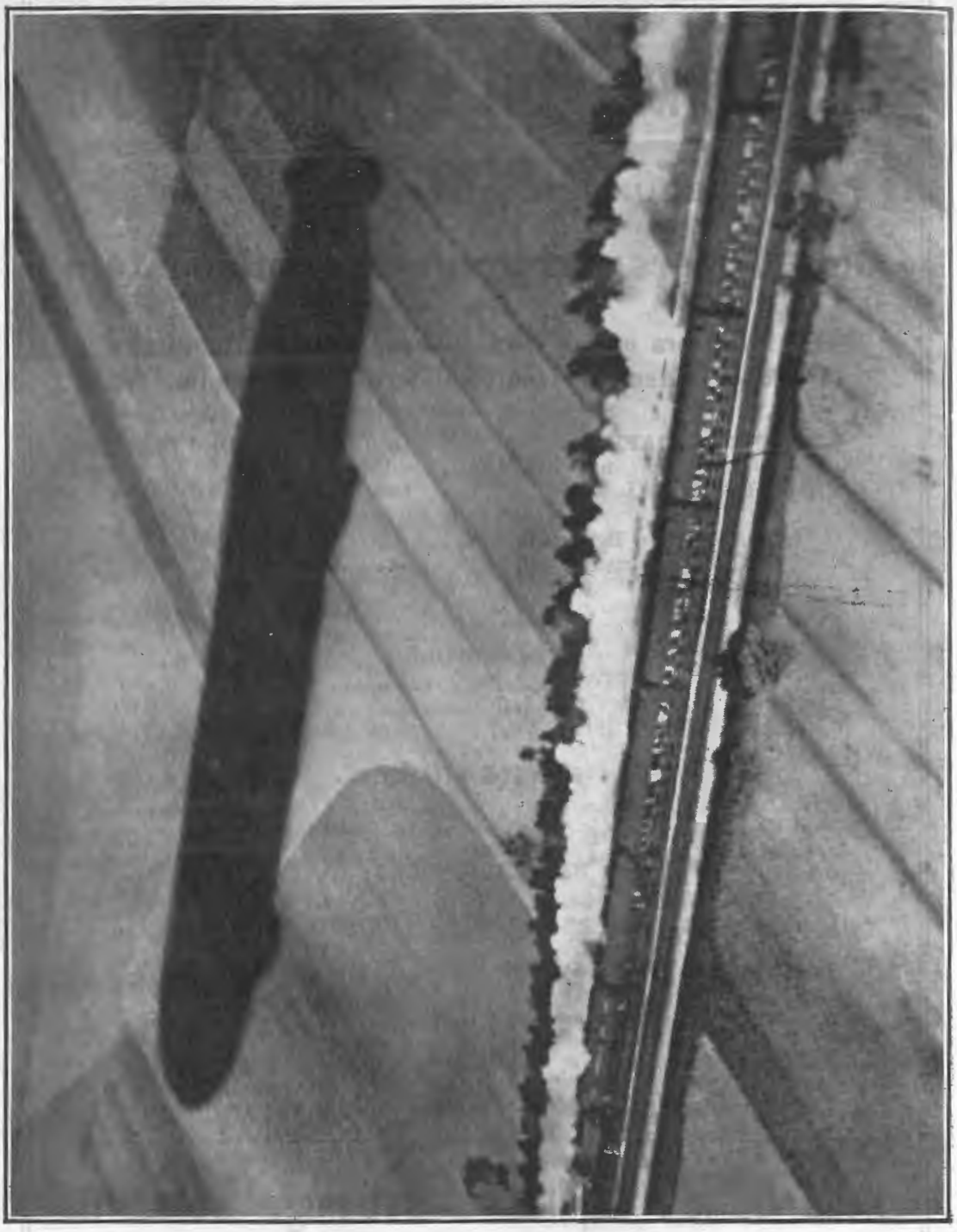
Mr. N. C. Seale (Oversea Shipping Representatives' Association)

Mr. C. Dillon (Inter-State Steamship Owners' Association)

A section of the city has been set apart for street displays. Among the numerous features already decided upon are a series of Boxing contests to be held at the Sydney Sports Ground, and an Art Union, with a first prize of one hundred guineas.

The following Shipping Companies and their representatives constitute a General Committee to manage the effort of the Shipping Community:—

Dalgety & Co.: Mr. A. W. Richards.
Birt & Co., Ltd.: Mr. T. S. Gordon and Mr. Ramsay.
P. & O. Co.: Mr. W. N. Service, Mrs. W. N. Service and Mr. C. R. Duncan.
Orient Co.: Mr. Throsby, Mr. Straker and Miss Wilson.
Gibbs, Bright & Co.: Mr. R. C. Reed.
C. & D. Line: Mr. H. W. Corry.
Gilchrist, Watt & Sanderson: Mr. J. B. Milne.
Oversea Shipping Representatives' Association: Mr. N. C. Seale.
Inter-State Steamship Owners' Association: Mr. C. Dillon.
North Coast Co.: Mr. Bell.
Illawarra Co.: Mr. Sim and Mr. Miller.
E. & A. Line: Mr. F. D. Phillips and Miss Shand.
Newcastle & Hunter River Co.: Mr. Cuthbertson, Mr. Sheehan and Miss King.
Huddart, Parker, Ltd.: Captain Webb.
Adelaide Steamship Co.: Mr. Wareham.
Howard Smith: Mr. Murdoch.
McIlwraith's: Mr. Kelso.
Union Co.: Mr. V. Johnson.
Canadian-Australian Line: Mr. Crauford.
Oceanic Co.: Mr. Sproul.
Susuki & Co.:
N.Y.K.: Mr. Williams.
Burns, Philp & Co.: Mr. McMaster.
Osaka Shosen Kaisha: Mr. Jefferson.
W. G. Deuchar & Co.: Captain Davidson and Mr. W. F. Smith.
Rosenfeld & Co.: Mr. Smith.
Australien Oriental: Mr. Rowntree.
Langley Bros.: Mrs. Langley.
Customs Department:
Navigation Department:
Quarantine Department:
Harbour Trust:
Light Houses:
Various Ferry Companies:
Mort's Dock: Mr. D. Horsfidd and Miss O'Toole.



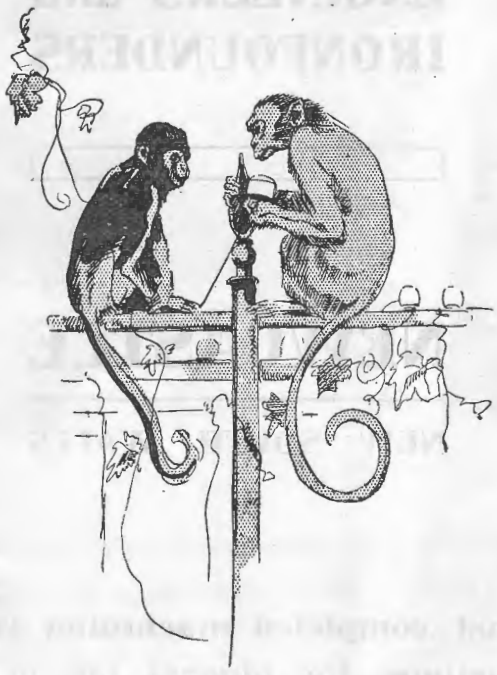
German Zeppelin Racing with British Troop-Train.

This Unique Photograph was taken from the Carriage of a Zeppelin, the shadow of which is seen. Anti-aircraft fire brought down the airship in French territory and killed the bomb-dropping pilot. Photographic plates found on the latter were developed by the French Intelligence Department, and included the one reproduced (lengthwise) on this page.

WIRELESS VERSUS WIRE IN JUNGLELAND

A GLANCE at a map of the world on which is marked the distribution of vegetation will immediately reveal the fact that dense tropical forests occupy considerable portions of South America and Africa. India, too, has its fair share, together with a number of islands scattered throughout the Southern Pacific Ocean.

Now it happens in many cases that where these jungles exist there is also to be found immense natural wealth, be it in rubber, timber, copra, or other forms. Some of the most romantic adventure stories have been written around the exploits of early traders who, pushing their way towards the interior with a small following of trusted natives, succeeded in tapping a portion of this wealth, only to be plundered on their homeward voyage across the southern seas by the Barbary pirates, or cast on a desert shore.

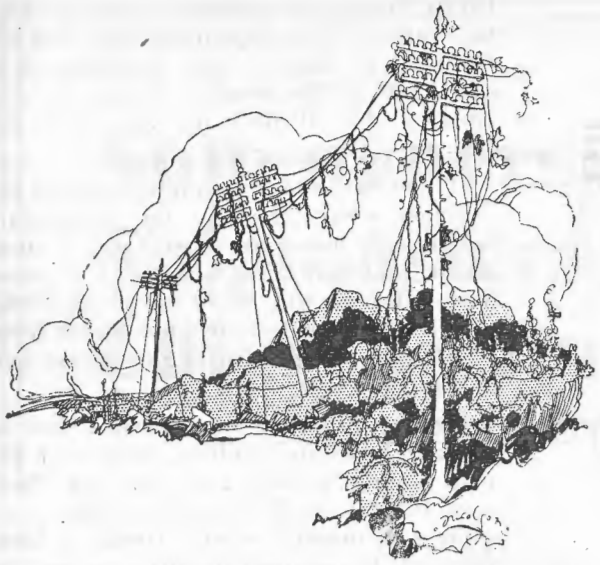


Unscrewing Insulators is Great Fun.

The adventures of the modern trader are, perhaps, no less exciting, even if they have lost an element of the picturesque. No longer are great bales carried on the shoulders of weary slaves, who wind their way down to the sea through the fevers and morasses of the dark continent, and rarely do we hear nowadays of a trader falling victim to wild beasts. The pioneer of today carries with him modern machinery by which great clearances are made, and, mile by mile, the ever lengthening railway track provides an easy means of transport from settlement to sea.

In order that trade can be carried on to the best advantage, some well-organised means of communication must be at hand, so that the inland trader may be able to keep in touch with his agents at the ports or in other settlements throughout the country. The days of the native runners who carried the letters in a cleft stick and who as often as not lost either the messages or themselves, is long since past, and nothing less than the almost instantaneous electric telegraph will satisfy the modern business man. As a consequence, thousands of miles of telegraph wire have been used to form a network of communication throughout equatorial and tropical regions. So long as these wires are able to carry messages everything is satisfactory, but, unfortunately, there are immense difficulties confronting the telegraph engineer who attempts to maintain a line through the jungle, and for days and sometimes for weeks on end the line is "down" and the trader isolated. It is because of these difficulties that the wireless telegraph is so rapidly displacing the the wire telegraph in "jungleland," for the wireless telegraph can communicate across the jungle as easily as across the sea.

A little consideration of the problems which face the line telegraph engineer who is ordered to connect up two settlements separated, let us say, by a couple of hundred miles of dense vegetation, will bring out very clearly the advantages of the wireless telegraph over its older brother. Having built his two terminal offices, with their equipment of telegraph instruments, the line engineer will have to survey the inter-

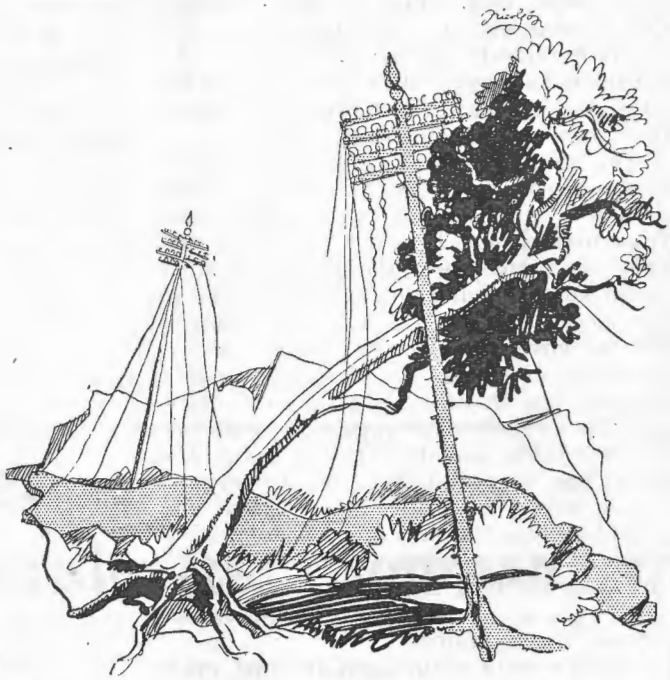


The Creeper is Pretty, but Inefficient.

vening country and decide the track to be taken by the long wire. This survey alone may take more than a year, and, in any case, considerable time will elapse before the first poles can be erected. It is obvious that it is not sufficient merely to dig a hole and plant a telegraph pole therein; a wide clearance must be made along the whole track, so that the wire may be clear of the surrounding trees and vegetation. Sometimes a mountain chain has to be crossed and frequently a wide *détour* has to be made to avoid the swamp or lake, for, of course, one cannot plant a pole in water or in any place where the foundation is insecure.

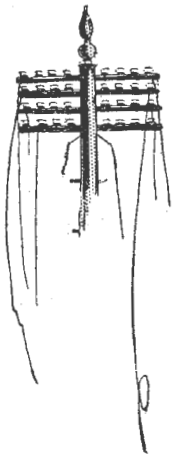
Clearing a path through the jungle for a mile is a work not lightly to be undertaken; clearing the jungle for 200 miles is a feat which taxes the ingenuity of the greatest civil engineer. And the task is not lightened or improved by the knowledge that new vegetation will sprout almost as fast as the old is cut down. Even when the almost insuperable difficulties of clearance have been overcome and an army of labourers are occupied for their whole time in keeping the track open, the telegraph engineer is still struggling with further problems and wishing he had never undertaken the task. There is, for instance, the comparatively small problem of poles. Sometimes, it is true, the ingenious engineer is able to utilise trees already in position to carry the wire, but in most cases poles have to be erected along a great proportion of the track. Generally, we may say a distance of 100 yards will separate these poles, although frequently they may be only half this distance apart. Even if we assume but 20 poles to the mile, and if, again, we make our track quite straight between the two points and allow for no *détours,* there are four thousand poles to be provided!

Our worried engineer, for his telegraph posts, can now choose between metal and wood. Each substance has its disadvantages. Metal will corrode and rust away in the hot, damp mists arising from the swamps; wood, on the other hand, will



Falling Trees are a Frequent Source of Trouble.

sooner or later fall a prey to the innumerable insects which bore their way even into the living trees.



Innumerable patents for making wood poles proof against the ravages of insects and rot have been taken out and processes tried, such as impregnation with creosote, but the trouble still exists, even if it has to some extent been reduced.

Once the posts are in position (and the engineer will heave a sigh of relief when this part of the work has been completed), insulators must be fitted to keep the wire away from the wood or metal supports, and finally the wire itself has to be fixed in place. The instruments will now be connected at the terminal station, and the patient trader, delighted to be rewarded for his long period of waiting, receives from the hand of the new telegraphist the first message. Congratulations are exchanged, everyone shakes everybody else by the hand, and the telegraph engineer, with a great load off his mind, sends up a fervent prayer to heaven that nothing may go wrong.

But something does go wrong inevitably. The patrol of native linesmen, whose duty it is to see that the wire is kept clear from obstruction, is new to its work and fails to notice how thousands of little forest spiders, building cosy little nests in the hoods of the insulators, are spreading a film of gossamer over the surface of the porcelain and along the wire. These tiny threads are invisible from ground level, and the insulator will appear to be in perfect condition, but directly the heavy dew rises, the whole surface will be covered with a film of moisture in the form of tiny globules, such as one sees on any misty morning on a spider's web in the garden. As soon as this happens all insulating properties are gone and the line becomes "dead" to all traffic.

While a gang of linesmen are busy evicting the spiders from their new homes, a happy family of monkeys forty or fifty miles away are perhaps using their best endeavours to unscrew the insulators in a quiet part of the jungle. It may be very amusing, but it does not not make for efficiency!

If fortune should favour our friend the engineer, communication may be re-established in a few days when some of these minor faults have been traced and remedied. But he will be an extremely lucky man if he misses trouble with falling trees, which may break the wire and uproot half a dozen poles at a time.

Day by day the forest creeper will be putting forth its tendrils, embracing the poles in its growth and covering them, even as it covers the dead tree trunks, with a layer of delicate green. Gangs of linesmen will be occupied in cutting down this plant, which, if once it reaches the wire, will conduct the current to the ground and stop communication. The undergrowth, sprouting fast, will threaten to choke the track in a wonderfully short time, and any section left for more than a week or two will appear even as the virgin forest.

More pages than are contained in this magazine (says our British contemporary, *The Wireless World*) could easily be occupied in recounting the hundred and one difficulties of the wire telegraph in jungleland. The few we have already mentioned will serve to indicate to some extent what has to be faced when such lines are erected. We have so far made no reference to the predatory instincts of the wily native, who knows of no better substance than telegraph wire for making elaborate bangles,

The Native Exhibits a Fondness for Wire.

earrings and other ornaments. It is a common occurrence in Africa to find whole stretches of the line cut away and stolen by the blacks, and, as a linesman cannot be in two places at once, such robberies are hard to detect. Wild animals are not behindhand in aiding the natives to ruin this frail system for linking up the distant communities. It needs to be a very strong pole, and still stronger wire, which will stand up to a charging elephant, and a crowd of monkeys holding earnest consultation on the stretch of wire between two poles is no light weight to support!

If all the troubles above detailed have been avoided (and it is certain that some will eventually come the way of the worried engineer), there still remains the ever-present danger of the forest fire, which, in its relentless progress, may destroy

A Forest Fire May Destroy the Work of Years.

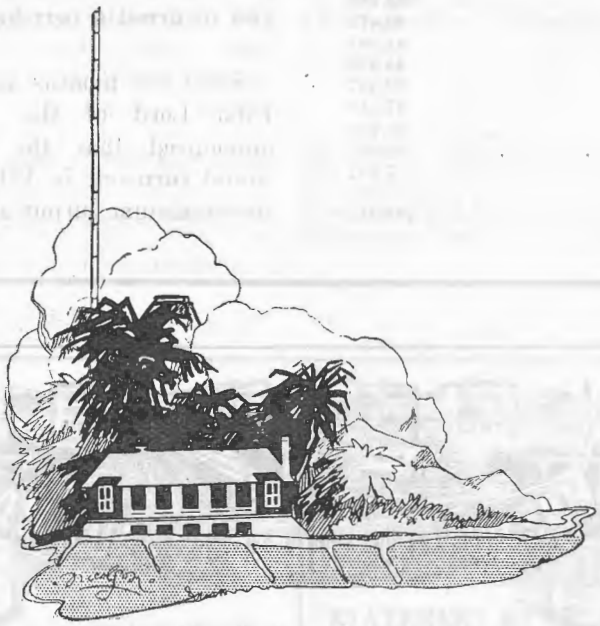
In Some Regions Wild Animals are Very Troublesome.

at the same time half of the system and the work of years.

Let us now see how admirably the wireless telegraph serves as a means of communication in these tropical regions. Considering again our imaginary case of two communities separated by a distance of 200 miles, we have no long pole line to worry about and no winding track through the jungle. If it is decided to erect a wireless telegraph system the Marconi engineer will inspect the ground at each terminal and quickly decide upon suitable sites. In most cases there will be sufficient open ground near the townships (only comparatively small areas are required), but, even if a site has to be cleared in the jungle, the space needed is so small that the whole preliminary work can be quickly carried out. Experience will immediately indicate what power and type of station are required, and in a short time a neat station building will be erected, with accommodation for the instruments and the staff. Tall steel

masts, arriving in sections and merely requiring bolting together, will soon rear themselves above the sea of trees, and in a shorter time than the wire telegraph engineer would take to make his preliminary plans the new wireless station will be ready to work. No falling trees or charging animals can break down the system, for the messages will be flashing through the ether unhindered, and with the speed of light. The myriad of insects boring their way through rotting wood will now be left undisturbed; no army of linesmen will patrol the malarial swamps of the primæval forest; the worst that could happen would be a severe atmospheric storm, which might interrupt communications for a few hours, but even this trouble will probably be overcome before long.

Wireless in jungleland is no new proposal. Very many stations are now working in various parts of the world in conditions every whit as difficult as those described in this article. Success has invariably attended them. It is as easy to erect a pair of stations to communicate over a thousand miles as over a couple of hundred, and of their reliability there is no question. As a typical case we have only to mention the Marconi stations now operating at Manaos and Porto Velho. These Amazonian stations, which were erected some years ago, are separated by some 700 miles of tropical forest, through which it had been found impossible to carry the wire telegraph, although numerous attempts had been made. They handle an enormous volume of traffic and have proved of the greatest value to the Madeira-Marmoré Railway, for which they were erected by the Marconi Company. Other Marconi stations in similar surroundings are working successfully in other parts of South America, in Africa, and in India, and the day is not far distant when this form of communication will rule supreme throughout the jungle. The old and abandoned wire telegraph, with its rotting and creeper-covered poles, will then be left to the denizens of the forest.



The Wireless Man, in His Snug Little Station, Can Work Unhindered and Unworried.

WIRELESS AND THE GERMANS

From various sources it is gathered that Government agents have discovered certain German agents making use of wireless equipment in New England, U.S.A. According to one report, these alien enemies make use of indoor aerials, while another hints at the use of aerials in wooded localities and connected with the operators some distance away by means of discarded or little used telephone wires. All of which is quite plausible as far as receiving wireless massages is concerned. However, when it comes to transmitting wireless messages the chances are that either of these systems would be of little value. It requires only a small aerial to receive signals from the powerful German stations, provided the best of apparatus is available. Indeed, it would seem almost impossible to prevent the enemies in their midst from receiving messages from abroad because of the ease with which an aerial can be concealed, save by a house-to-house search. But as concerns the transmission of messages to tramp steamers or U-boats operating somewhere off their shores, the size and efficiency of the aerial required must needs lead to detection in short order. And it is that transmission rather than the reception of intelligence that constitutes the greatest menace to America.

WORLD'S NEW TONNAGE

According to such incomplete data as has been received, the world's output of new shipping in 1917 was over 1,000,000 tons greater than in 1916. In that year the world's greatest tonnage was reported to have been 1,935,943. This tonnage may be divided as follows:—

	Tons.
United States	506,239
United Kingdom and British Dominions	619,336
Japan	246,234
Holland	208,180
Italy	60,472
Norway	44,903
Sweden	40,090
France	39,457
Denmark	37,150
Germany	25,950
Spain	10,071
China	7,861
Total	1,935,943

Shortly after the beginning of Germany's unrestricted submarine campaign, Earl Curzon made a statement in the House of Lords, giving the status of British shipping on March 31, 1917. In November he made a supplementary statement and pointed out that in the seven months which had elapsed since his first statement was made, Great Britain's mercantile tonnage had incurred a nett loss of only 1,600,000 tons.

Some few months ago Sir Eric Geddes, First Lord of the British Admiralty, announced that the British Shipyards would turn out in 1917 the equivalent of the maximum output attained in 1913.

THE RUBÁIYÁT OF FLIGHT-SERGT. SMITH, A.F.C.

(With Apologies to Omar Khayyám.)

John Smith, when young, did eagerly frequent
The aviation grounds, but lacked the rent
To fly himself; and ever and anon slunk home
Without the solace of a single short ascent.

Dreaming whilst other nations got to work,
The caliphs, who in Austral climes did lurk,
One day awoke—and formed the A.F.C.
Smith joined, and gave a broad, ecstatic smirk.

He thought to fly—alas! from morn till night,
His "stunts" were on the square, and none too bright
At that. For weeks he trudged around the barrack square,
And oft' confused his left foot with his right.

With sounds like Dutch and Greek, the air was cleft,
High-piping sergeants bleated: "*Left! left!! left!!!*
Right! left!" with sundry words incarnadine,
Until of reason he was nigh bereft.

And strange to tell, among that harsh-voiced lot,
Some waxed infuriate and others not,
While suddenly one more impatient cried:
"What *are* you? Say!" and Echo answered: "What"!

But lately down his native street there swings
One much adorned with stripes and other things,
Wearing a badge upon his bosom, and
Swanking like H——; 'tis Smith. He's got the "Wings."

Alike for those who wings already wear,
And those who after a "To-morrow" stare,
A warning word may well be here insert:
Who finds it fit the cap is free to wear.

The "Bus" no question makes of fars and nears,
But up and down glides as the Pilot steers.
And he who "pancakes" hard upon the ground,
He hears about it all; *he hears, he hears!*

And that inverted bowl we call the sky,
Whereunder, strangely garbed, you chance to fly;
Lift not thine hands to it in swank—lest thou
Dive down impotently—perchance thou'dst die!

Thou! who dost with petrol and with oil
Fill up the "Bus" on which ye daily toil,
Thou shalt not leave a spanner on the plane,
Lest on thy head it might, perchance, recoil.

And lo! with crayon blue and fixèd stare,
The Editor cries: "Hold! Enough!! Beware!!!
Conclude thy mournful wail, we've brighter things
To fill the pages of *Sea, Land and Air.*"

BATTLE PLANES FROM AUSTRALIA

STATEMENT BY MR. C. A. BAKER

Interviewed on September 4 at the Carlton Hotel, Sydney, Mr. C. Alma Baker stated that as many thousands of persons in Australia have subscribed to his appeal for battleplanes, and as that appeal had been made under the authority of the Federal and State Governments and of the Imperial War Office, it would, no doubt, be of general interest to publish the reason for preventing the patriotic non-combatants of Australia from subscribing to something that would fight in their stead.

To readers of *Sea, Land and Air* Mr. Alma Baker hopes, in the near future, to give full details of progress of the appeal up to the date of this being closed by the Minister for Repatriation.

RECORD OF THE DEVELOPMENT OF WIRELESS TELEGRAPHY AND TELEPHONY AND INTERESTING ITEMS IN RELATION THERETO

The record below is intended to constitute, arranged in chronological order, a résumé of the outstanding events in wireless telegraphy from year to year.

(Continued from August Issue.)

1909.

The *Republic,* after collision with the s.s. *Florida* off the coast of the United States on January 23, succeeded in calling assistance by wireless, with the result that all her passengers and crew were saved before the vessel sank.

Mr. Marconi lectured before the Dutch Royal Institute of Engineers in May and in December.

The Marconi British coast stations were taken over by the Postmaster-General on September 29, who was granted a license to use the company's patents.

In December Mr. Marconi lectured at the Royal Academy of Science, Stockholm, and (with Prof. Braun) was awarded the Nobel Prize for Physics.

1910.

Mr. Marconi, *en route* for Buenos Aires on board the *Principessa Mafalda,* received messages from Clifden at a distance of 4,000 miles by day and 6,735 miles by night.

The Compania Nacioñal de Telegrafia sin Hilos was formed on December 24 to exploit the Marconi system in Spain.

1911.

On February 21 judgment was given in the action instituted in December, 1910, by the Marconi Company against the British Radiotelegraph and Telephone Company for infringement of their tuning patent No. 7777 of 1900. Mr. Justice Parker's decision was in favour of the Marconi Company, and he granted them a certificate of validity of their patent and an injunction, together with costs and damages.

A contract was made between the Marconi Company and the Canadian Government for operating wireless telegraph stations in Canada for a period of 20 years.

Stations at Teneriffe, Cadiz, Barcelona, and Las Palmas were opened for public business by the Compania Nacioñal de Telegrafia sin Hilos, the *concessionnaires* of the public wireless telegraph service of Spain.

The Imperial Conference held in May approved the proposal that an Imperial Wireless Telegraph system should be created.

Mr. Marconi lectured on "Radiotelegraphy" at Royal Institution on June 2.

The Lodge-Muirhead patents were acquired by the Marconi Company, and Sir Oliver Lodge became a scientific adviser to the company.

1912.

Early in the year the American Marconi Company absorbed the United Wireless Company of the United States.

On January 27 the central station of the Spanish wireless service (Aranjuez) was opened by King Alfonso XIII.

In February the Marconi Company secured the patents of Bellini and Tosi, including those for the wireless direction-finder.

On April 15 the s.s. *Titanic* struck an iceberg and sank, but, owing to the prompt wireless call for assistance, the lives of more than 700 of her passengers were saved.

Mr. Marconi, whilst in America, delivered an address on the "Progress of Wireless Telegraphy" before the New York Electrical Society, on April 17.

The International Radiotelegraphic Conference, opened in London on June 4, approved important regulations to secure uniformity of practice in wireless telegraphic services.

The British Government entered into a contract in July with the Marconi Company for the erection of a chain of high-power Wireless Telegraph stations, as recommended at the Imperial Conference held in 1911.

The Marconi Wireless Telegraph Company of Canada was entrusted by the Dominion Government on September 17 with the working of the existing stations on the Great Lakes until 1931, and also with the erection of further stations. A similar arrangement was made in December with the Newfoundland Government for stations at Belle Isle, and on the Labrador coast.

Mr. Marconi was decorated with the Grand Cross of the Order of Alfonso XII., and made a Grand Officer of the Order of St. Maurice and Lazarus.

1913.

During this year the Governments of France and the United States experimented between the Eiffel Tower station and Washington by wireless, in securing exact data for comparing the velocity of grounded electro-magnetic waves to that of light.

In January the High Court of Justice of France delivered a judgment declaring the validity of all claims of the Marconi patent 305060, which corresponds with the "four sevens" patent.

On January 23 the Postmaster-General appointed a committee "To consider and report on the merits of the existing systems of long-distance wireless telegraphy, and in particular as to their capacity for continous communication for the distances required by the Imperial Chain." The Committee reported that "The Marconi system is at present the only system of which it can be said with any certainty that it is capable of fulfilling the requirements of the Imperial Chain."

As a result of the official enquiry into the loss of the *Titanic,* the *Scotia,* equipped with a Mar-

coni wireless installation, left Dundee on March 8 to patrol the waters of the North Atlantic and to collect information regarding the movement of ice.

In June a Wireless Telegraph Bill was presented to the Ottawa Parliament, and passed under the title: "Radiotelegraph Act of Canada."

On October 11 the *Volturno* was burnt in mid-Atlantic, and in response to the wireless appeal ten vessels came to the rescue, 521 lives being saved.

The Wireless Society of London was formed in October.

On November 12 an International Conference for the purpose of considering means of saving life at sea was opened in London by the President of the Board of Trade.

On November 24 the first practical trials with wireless apparatus on trains were made on a train belonging to the Delaware, Lackawanna and Western Railroad of America.

On November 25 Commander H. A. Edwards, who was at the head of the Bolivian Survey Commission, reported that the Commission had been able to determine the difference of longitude between the Brazilian towns Mañaos and Porto Velho by means of wireless signals.

Dr. Mawson, whilst exploring in Antarctica, was enabled by means of wireless to keep in touch with the outer world through the station on Macquarie Island.

During his expedition to Central Asia in 1913, Dr. Filippo de Filippi, the Italian explorer, frequently determined his longitude by means of wireless time signals transmitted from Lahore.

1914.

On January 20 the Safety of Life at Sea Convention, drawn up by the International Conference which met on November 14, 1913, was signed at London. That section of the Convention which deals with Wireless Telegraphy lays down the minimum wireless telegraphy equipment to be carried by vessels of different grades.

Early in the year an International Wireless Conference met at Brussels. The object of the Conference was to adopt a programme whereby careful observations could be taken with a view to arriving at some practical explanation of the laws governing the variation in the strength of wireless signals.

During the early part of March Mr. Marconi joined one of the Italian war vessels attached to the squadron commanded by the Duke of Abruzzi. Experiments in wireless telephony were carried out between several vessels lying at anchor ⅝ mile apart, ordinary receivers being used with great success. The wireless telephone experiments were continued between two warships on the high seas, and the reception was consistently perfect over a distance of 18½ miles. Later successful wireless telephone communications were effected, using only very limited energy between vessels on the high seas 70km. (44 miles) apart. These experiments were repeated where land intervened between the communicating vessels, and in this case again excellent results were obtained. On this day radiotelephonic communication was constantly maintained for twelve hours.

This year saw the first practical application of wireless to lifeboats belonging to large ocean steamships, the Marconi Company having designed a special type of apparatus for this purpose.

On April 12 the Council of the Royal Society of Arts presented the Society's Albert Medal to Mr. Marconi for his services in the development and practical application of wireless telegraphy.

On April 15, at Godalming, a memorial was unveiled to the memory of Jack Phillips, chief wireless telegraphist of the ill-fated *Titanic,* who "died at his post when the vessel foundered in mid-Atlantic on the 15th day of April, 1912."

On May 29 the s.s. *Empress of Ireland* foundered after a collision with the Norwegian collier *Storstad,* and over 500 people were saved.

On June 8 a report was issued by the Committee appointed by the Postmaster-General to consider how far and by what methods the State should make provision for research work in Wireless Telegraphy. This report recommends (1) that the Government should establish a National Committee for Telegraphic Research which would promote in the public interest, both by theoretical investigation and by experiment, the progress of scientific telegraphy and telephony, and (2) that the Government should establish a National Research Laboratory, with a special scientific staff to undertake, under the direction of the Committee and on the lines laid down in this report, telegraphic investigation, the results of which should be available for all departments of the public service.

In June important tests were made with the Marconi-Bellini-Tosi wireless direction finder on board the s.s. *Royal George.* During a voyage from Bristol to Montreal the liner, even in the thickest weather and without the aid of compass or sextant, was enabled to find her position when within a radius of about fifty miles of a land wireless station.

On July 24 the King conferred upon Mr. Marconi the Honorary Knighthood of the Grand Cross of the Victorian Order.

On July 24 judgment for plaintiffs was delivered in an action brought by the Marconi Company against the Helsby Wireless Telegraph Company, Limited, for infringement of patent 7777 of 1900.

War was declared by Great Britain on August 4 and all *private* radiotelegraphy was suspended. From this point, therefore, our record is necessarily incomplete, and the *lacunæ* must await attention until the close of hostilities.

On August 9 the wireless station at Dar-es-Salaam, German East Africa, was announced to have been destroyed by the British.

The German station at Yap, Caroline Islands, was destroyed on August 12.

(To be Continued.)

Editorial Announcement

The Next Issue of "Sea, Land and Air"

(due October 15)

will feature the following Special Articles:—

TRAINING ON H.M.A.S. "TINGIRA,"
By Mr. E. J. HILL,
Formerly Special Naval Representative of "The Sydney Morning Herald" and "Evening News."

BUILDING AUSTRALIA'S MERCHANT FLEET,
By Mr. W. H. CURCHIN,
Chief Executive Officer for Commonwealth Ship Construction.

THE DIARY OF A WIRELESS OPERATOR IN PALESTINE,
By PRIVATE GEORGE V. SHAW, A.I.F.

ANOTHER INTERESTING ARTICLE ON "WIRELESS,"
By Mr. E. T. FISK,
(Member Institute of Radio-Engineers.)

The first of a new series of illustrated articles on

AVIATION,
By a returned A.F.C. airman of high rank and wide experience on many Fronts.

AUSTRALIA'S RAW MATERIALS FOR AUSTRALIA'S NEW SHIPS

Under this heading will be published a series of industrial articles, describing in simple terms the various processes of converting our raw materials into the finished product. The first of these will feature

THE BROKEN HILL STEEL WORKS

and will detail the Romance of Steel, tracing the metal from the ore beds at Iron Knob (South Australia) to the Company's Works at Port Waratah (Newcastle) and explaining its final conversion into steel plates for the construction of Commonwealth ships.

The above article, which we had hoped to publish in our current issue, is unavoidably held over till our next, owing to pressure on Editorial space and to the non-arrival of certain photographs from other States.

Subsequent Industrial Articles in this connection will deal individually with the subjects of

AUSTRALIAN TIMBERS, PAINT, AND MACHINERY

All will be fully illustrated.

In addition to a further instalment of

THE PRELIMINARIES OF MERCANTILE AVIATION,
By Mr. C. A. JEFFRIES,

the October issue will contain numerous Topical Features relating to

THE AUSTRALIAN NAVY, MERCANTILE MARINE, WIRELESS AND AVIATION.

To ensure prompt and regular receipt of your monthly copy, order a Yearly Subscription (**9s. post free**) from

The Wireless Press

97 Clarence Street, Sydney

THE PHENOMENA OF LIGHT

By MRS. SELWYN LEWIS, B.Sc.

"Let There Be Light."

The Creation story of Genesis has been criticised by some scientists on the grounds that it describes the making of the earth before the making of light. Science may be wrong, for perhaps the order described does not correspond to the actual facts, or it may have been that, in the early darkness the dangerous creatures, hating the light, were evolved and the condition of the coming of higher forms was the coming of light.

Microbes were probably born when the face of the earth was dark and the sun's rays could not get through the air, which was thick and heavy all round, on account of the earth's great heat.

All other life is due directly to sunlight, and the simple rule is "no light, no life." Microbes then were thought to be the strange exceptions, for they still love the dark; direct sunlight kills all these in a few minutes, but they can only live on the bodies and products of higher beings.

As we stand in the sun we feel its heat and see its light. In the daylight our eyes give us the sensation of the "white light" of the sun, but this light is really composed of many colours all blended together to give the sensation of white.

A tiny hole in your shutter will admit a ray of light into the darkened room, but place a prism—that is, a piece of glass cut in a particular shape—in its path and the ray of white light will be divided up into coloured rays which fall upon the opposite wall as a band of bright colours, red at one end and violet at the other, this is called the spectrum of light. White light then is like a chord of several notes—really an infinite number of notes, and the prism breaks up the chord into a band of colours, like an octave of keys upon a piano, because the rays are differently bent as they pass through the glass, according to their wave-length and are then thrown side by side upon the wall which receives them. These coloured rays are always vibrating at an enormous rate; deep red rays vibrate 400 billion times in a second and deep violet 760 billion times per second. Why the ordinary, shade-giving, green blind appears green and so restful is that all the rays constituting white light are absorbed by it, except the green, and the latter are reflected back to our eyes. But a piece of blue glass, being transparent, absorbs all the other coloured rays, allowing the blue only to pass through, thus giving it its colour.

Why the Sky is Blue.

The sky is blue because a great deal of the blue in sunlight is stopped by the particles of dust in the air; these allow the red rays to go through, but stop the blue, which is reflected back.

Balloonists say that the sky, at a height of 10,000 feet, appears black.

Have you noticed that in a fog the sun always looks red? That is because the red waves of light are the most difficult to stop, and these alone are able to penetrate the thickened atmosphere.

At midday the layer of air is not strong enough to absorb the blue rays, so it does not appear red, but when the sun is setting we are looking at it sideways through an ocean of air, thus most of the little blue waves are stopped and we see only the setting sun by the red rays, which, being the longest, are able to get through to our eyes.

So much for the sun and its rays; but why does grass appear green?

The sun makes it green in quite a different manner from making the sky blue. If we try to grow grass or any other green plant in the dark the leaves will always be white instead of green. The green stuff is only produced when and where sunlight falls on the growing plant, but once it is produced this green stuff uses sunlight for the purpose of the plant's life.

Have You Ever Seen the Shadow of the Wind?

Lord Tennyson wrote in his "Poet's Song":—

"A light wind blew from the gates of the sun,
And waves of shadow went over the wheat."

Shadows are cast by some solid substance coming in the line of the sun's rays, so that the cutting off of this amount of light makes a darkness on the ground that we call a shadow; so it is easy to see that, unless a substance is solid enough to impede the passage of light in this way, it cannot cause a shadow.

Wind is composed of particles of air in motion; these are not solid, so how can they cast a shadow? Yet it is true that we do see something like the shadow of the wind. What is really seen in such cases is the shadow of something being moved by the wind. When you see what are apparently shadows of the wind crossing the harbour, look up at the sky and you will no doubt see light clouds being blown along which were just at that moment in a position to interfere with the light and cast a shadow.

Light smoke, when carried by the wind, will also cast a shadow.

The Battle Between the Earth and the Sun.

Look at those wonderful clouds! They are the battlefield of the empyry of the sun and the power of the earth.

Should the sun win, the earth would become a desert as barren as the Sahara, but should the sun lose, all land life would be at an end: there would be no more rain, no rivers, nothing but a brimming sea.

We have often seen long rays of water being drawn up by the sun out of the sea; these clouds then represent sheer weight drawn up by the sun, and what enormous power they must contain; but for them there would be no rivers like the Congo, the Mississippi, the Amazon, or Niagara Falls. There would have been none of the wonderful valleys of New South Wales had it not been for those white, floating clouds. The total weight of the water drops waiting to be condensed again by the cold and brought back to Mother Earth must be enormous.

The light from the sun travels to us at the incredible speed of 186,500 miles per second; it is almost beyond the imagination that such a speed as this would carry a body round the earth's equator seven times in one second.

Eyes Have They, But They See Not.

Our perception of colour is due to the presence in the retina of the eye of three sets of nerve endings; one of these is particularly sensitive to red light, another to blue and the third set to green, and by these the sensation of the colours we see is conveyed to the brain.

The blind fish of the Mammoth Cave of Kentucky have lived so long in the darkness of this subterranean home that they have lost not only their sight but also their eyes. It is a law of Nature that when an organ is not used it becomes unusable and eventually disappears, so in the real darkness of the Mammoth Cave creatures that have lived there for generations—fish, crustaceans, shrimps, spiders, beetles, centipedes, have lost both sight and eyes.

The blind crayfish in this cave have the stalk foot for eyes still, but the eye is gone.

Darwin said: "The stand for the telescope is there, though the telescope, with its lenses, has been lost."

The very young crayfish have visible eyes, which disappear as they grow older, giving a convincing proof that their ancestors really had eyes when they lived in the light and were able to use them.

Colour Photography.

The ordinary photograph is a black and white, incomplete representation of a scene or object full of wonderfully graded tints.

Pure red colours come out as mere blacknesses, because the chemicals with which a photographic plate are treated are insensible to the long red rays of light.

Of late years though, several ingenious methods of actually photographing the natural colours have been worked out. Coat a glass plate with a layer of very minute potato-starch grains, which have been dyed in equal quantities, violet, green and orange-red, and then mixed so as to have a neutral tint. Apply a protective waterproof varnish and spread on this a film that has been treated with dyes which make it responsive to red, yellow and green vibrations of light, as well as to the blue and violet.

When the plate is exposed in the camera the glass side is put towards the lens, so that the light has to pass through the layer of coloured grains before it affects the sensitive film. When the plate is developed the colours of the objects are seen.

WELL KNOWN AUSTRALASIAN CARGO BOAT TORPEDOED.

Officers of s.s. "Waitemata" (Union Steamship Co. of New Zealand) Torpedoed in the Mediterranean.

Survivors Aboard Italian Trawler Shortly after their Rescue.

WIRELESS COMPANY'S MEETING

The tenth half-yearly general meeting of shareholders of Amalgamated Wireless (Australasia), Limited, was held at the company's head office in Sydney on August 29, when a dividend at the rate of 5% per annum was declared.

For information of the large section of our readers who have shown interest in the progress of wireless in Australasia we print below reports of speeches made at that meeting.

Sir Thomas Hughes, M.L.C., Chairman of Directors, delivered the following interesting address:—

"In moving the adoption of the report and balance sheet, I wish to direct your attention to the fact that the profit for the period shows a slight increase over that of the preceding period, and that our reserve accounts have been further increased by £2,000. In view of this satisfactory result, your directors have been pleased to recommend the payment of a 5% dividend for the year, 2½% of which was paid in February last.

"You will notice an increase in the figures shown in the balance sheet for apparatus, stock, stores, etc.; this increase is due to the necessity for carrying greater stocks of raw material for manufacturing purposes and to an increased number of vessels fitted with the company's apparatus during the year.

"I wish to remind shareholders that the company has received no revenue from wireless telegraph messages during the period, although it has to maintain a staff for dealing with official ships' messages, which have to be handled free of charge. Private wireless telegrams are prohibited during the war.

"The company's factory has been very fully occupied in manufacturing wireless telegraph apparatus, largely for the company's own use, and consequently the profit shown by the manufacturing department is small. The company, however, is becoming widely known as manufacturers of high-class electrical instruments and apparatus, and the inquiries which are being received from several directions indicate that a profitable business could be done as soon as a portion of the factory can be released from special wireless work.

"Shareholders will be interested to learn that our Managing Director, Mr. E. T. Fisk, in conjunction with his experimental staff, has produced a new type of wireless telegraph receiver, based on the Marconi Company's patents, the sole rights of which are held by this company in Australasia. This receiver is producing results hitherto unequalled in this part of the world, and, using it in conjunction with a very small aerial, messages have been successfully received over a distance of twelve thousand miles. A number of these receivers has been manufactured and the instruments have been installed in certain Australian vessels trading overseas. The apparatus in one vessel was inspected by the United States Government Inspector, who commented most favourably upon the design and workmanship of the receiver and upon the results which are being obtained. A further quantity of these receivers is now being manufactured, to be installed in Australian vessels.

"You will also learn with pleasure that a number of complete wireless telegraph stations manufactured by the company in Sydney last year have now reached England and have given every satisfaction. We have been informed that our apparatus is equal in design, construction and workmanship to the best which can be produced in England and America. The company's officers and staff are systematically kept in touch with all latest developments by means of experiments, through the usual channels of information and through highly authoritative special channels of which the company enjoys the exclusive benefit. In consequence of this and of the experience and organisation of our factory, the company is able to produce wireless telegraph apparatus of the most modern types, as well as other electrical instruments and apparatus of the highest grade.

"In view of the increasing demand upon our organisation for high-grade electrical manufacturing and repair work, your directors have decided to establish a subsi-

diary company for carrying on this work. This company, which will be registered under the Firms Act as the Australectric Company and which will subsequently be formed into a separate limited company known as Australectric, Limited, will carry on manufacturing and repair work in electrical engineering and other allied directions. Only high-grade work will be catered for, and it is proposed to confine the electrical manufacturing work to supplying the requirements of existing electrical trade houses. It is not proposed to employ any external capital for this business, and consequently all benefits arising therefrom will accrue to the shareholders of the Amalgamated Wireless Company.

"I have to record with deepest regret the death of the company's operator, Mr. Arthur Bomont, who sacrificed his life through sticking to his post when the s.s. *Wimmera* was mined off the North Cape, New Zealand, on June 26 last. Other members of our operating staff who have shown conspicuous devotion to duty at the sinking of the vessels upon which they were employed are Mr. A. R. Mancer, of the s.s. *Kyarra,* Mr. L. S. Lane, of the s.s. *Waitemata,* and Mr. John Durrant, of the Hospital Ship *Warilda,* all of whom were saved."

At the close of the meeting a vote of thanks to the directors and officers of the company for their efforts during the half-year was proposed by Mr. Q. L. Deloitte and carried unanimously.

This was responded to by the Managing Director, Mr. E. T. Fisk, who, after expressing thanks on behalf of the directors and officers, spoke as follows:—

"The company's business has been profitable and there is no reason to suppose that it will not continue to be profitable. Among the many interests which we have, I think a few words regarding wireless telegraphy might be appreciated.

"It is doubtful if many people realise the vast possibilities of wireless communication. I should like to tell you here that, using the receivers to which the Chairman has so kindly referred at our experimental station, we are able to read messages direct from Berlin. These messages can be heard practically all day, and they consist largely of the Kaiser's attempt to explain to the world his view of things as they should be. Further experiments are being conducted with these receivers, details of which I am not able to give you to-day, but I hope that an interesting announcement will be made shortly.

"This leads us to one great possibility which will come—we cannot say whether it will be this year or whether it will be several years hence, but that it will come is certain—that is the possibility of *direct wireless communication between Europe and Australia.* At the present time we pay 3s. per word for full-rate cables, but when such direct wireless communication is established I see no reason why we should not send our messages for 1s. per word at the most. When we consider the vast number of messages which are now sent to and fro, the possibility of this appears to be very great indeed.

"The developments of the present day are becoming very important and the future of wireless communication more and more alluring. I have spent many years in wireless work and—having seen it grow from early infancy to its present stage—I may say that the achievements of to-day appear to be greater than at any period since Senatore Marconi first invented wireless telegraphy. I say that Senatore Marconi invented wireless telegraph advisedly, because in this country there have been many doubts on that point, but I state with all the authority I can command that Senatore Marconi was the inventor of the first practical system of wireless communication, and, further, that many of the later inventions, which brought it from its first crude state to a practical method of communication, have been due to Senatore Marconi's personal work; I believe that at some time in the near future we shall probably hear of another epoch-making invention of Senatore Marconi's. I cannot say this is certain, but I believe it is very probable.

"In many directions other than those I have mentioned the possibilities of wireless development are great. We have seen its development in mercantile marine and the world at large has learned of its great value in saving human lives. There will be a further development in connection with aviation. I am certain that aviation has a big and an early future before it, and since wireless is particularly applicable in transport, I can truly say that there will not be an airship nor an aeroplane which will not carry a wireless installation.

"That is all I wish to say at the present time, and I renew my thanks for your expressions of appreciation to the Board."

The "Cethana" Reaches Sydney.

First of the four motor-schooners ordered in America by the Commonwealth Government. The "Cethana" is of American soft timber, built at Olympia, Seattle. Has a dead-weight carrying capacity of 3,200 tons. During trial trip she averaged 10.3 knots, and on the voyage to Australia (via Powell River and Honolulu) averaged over 9 knots for the entire distance. On her maiden voyage she carried a cargo of paper, timber and steel plate for ship-construction. The "Cethana" will be employed as a wheat-carrier between Australia and the Pacific Coast of America.
—Photograph *Sydney Mail.*

ADMIRALTY ASSISTS SALVAGE.

One of the British Government departments which has done excellent work practically from the outbreak of war, is the department of the Admiralty for handling all salvage operations. It was fortunate that the Government were able to secure the services of the most capable salvage officers in the country, and employ them in work which was familiar to them. The result has been an enormous extension in Government salvage operations and, while other departments have been the subject of adverse criticism, there is no doubt that salvage work has been effected most efficiently and with an enormous saving to the country. It is some satisfaction to learn, therefore, that further developments are in progress and that recent changes which have been made are likely to result in still greater efficiency. Underwriters will welcome the development very cordially for the more efficient the department is made, the greater chance there is of securing Government assistance (under the Admiralty agreement) for vessels which may be in trouble. It is a further satisfaction to know that the department is in the hands of a well-known salvage officer whose work in the past has earned for him an international reputation.

Abandoned by the Hun.

Aerial Photograph of crew of British Cargo Boat torpedoed by the Hun. Abandoned in open lifeboats they remained at the mercy of the waves, until sighted by the pilot of an Australian seaplane. Photograph taken during the latter's descent to the rescue.—Copyright *Sea, Land and Air.*