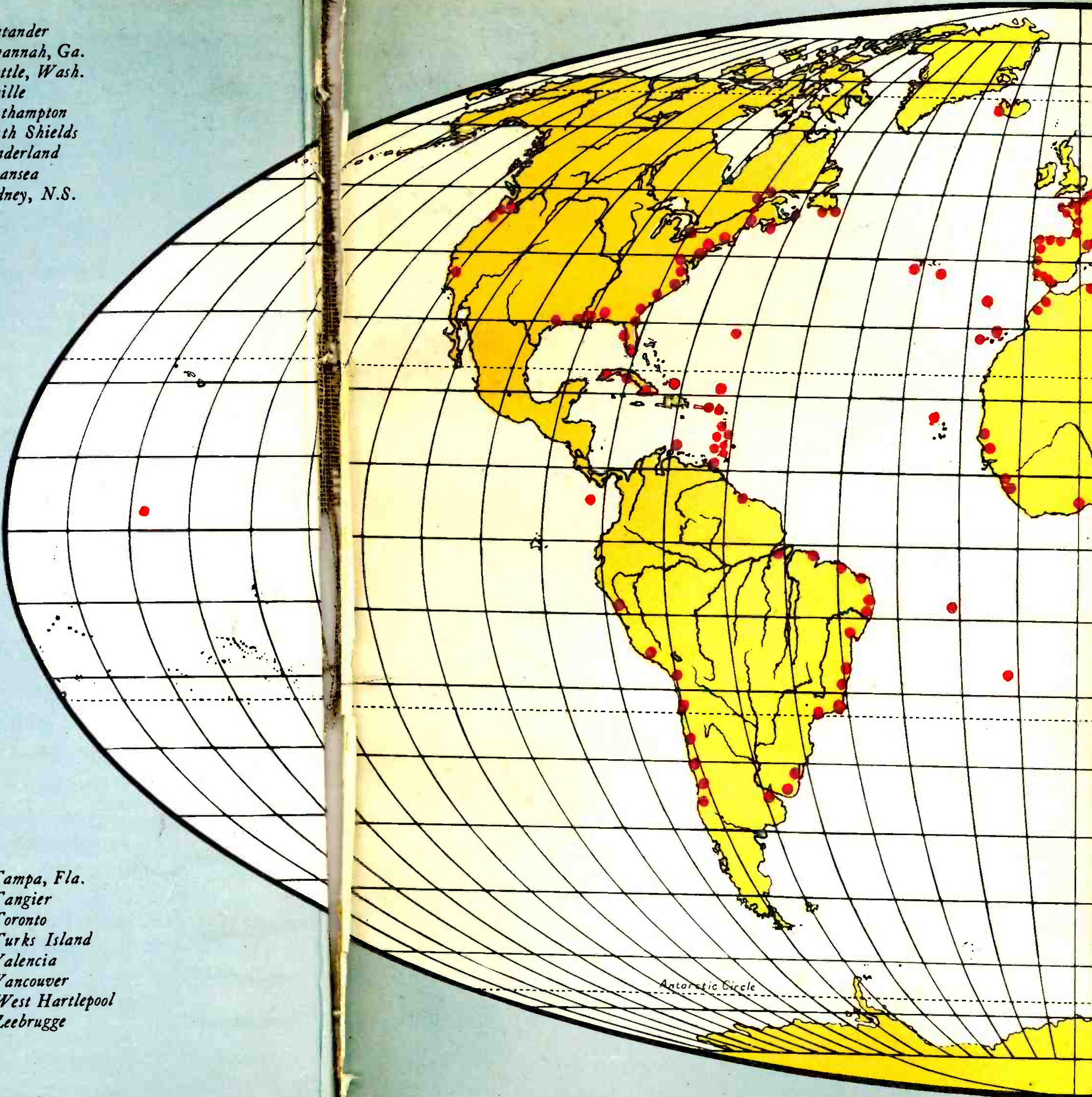
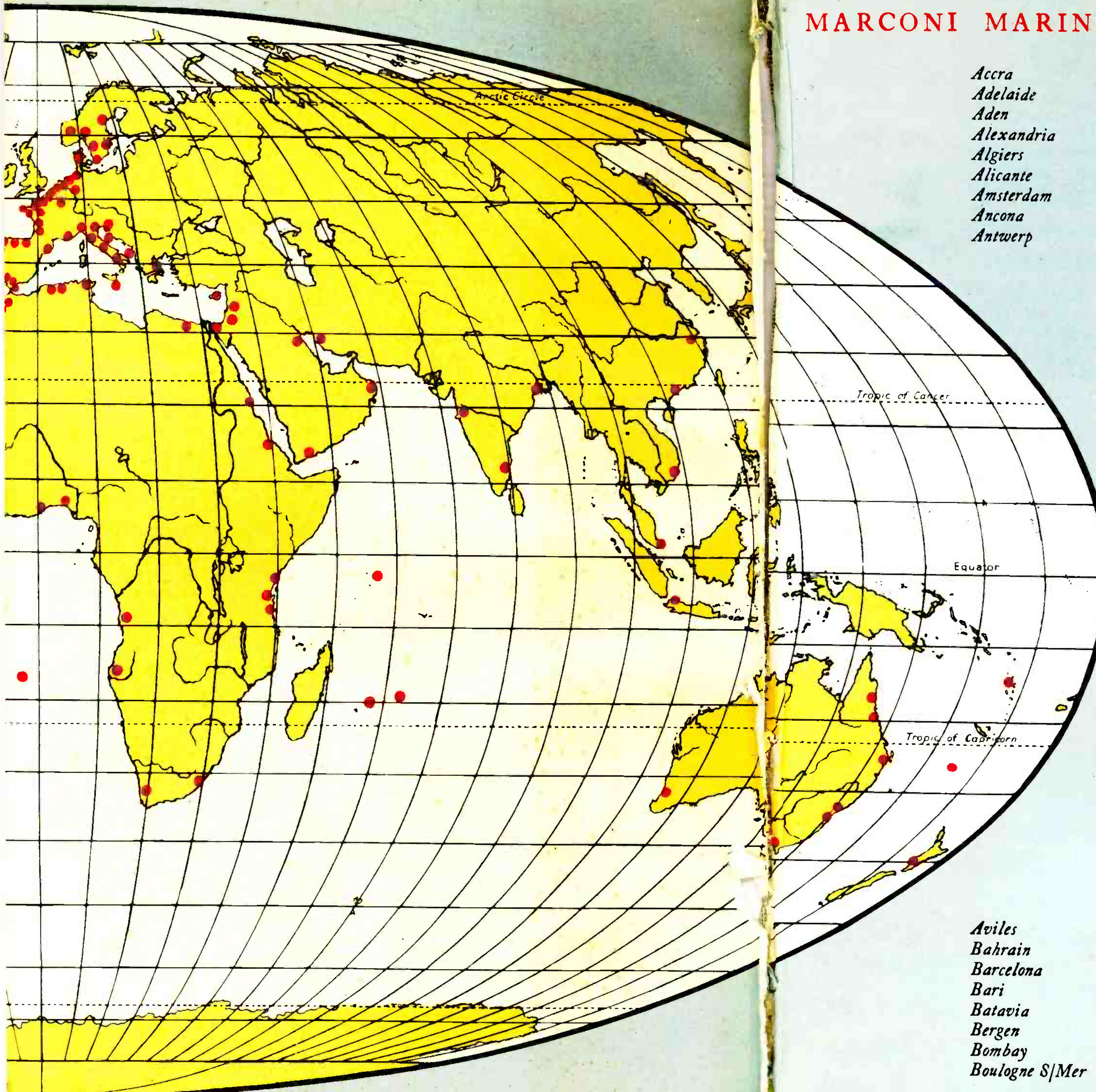
MARCONI MARINE SERVICE STATIONS

Aberdeen
Antigua
Arcachon
Ardrossan
Ascension Island
Avonmouth
Baltimore
Barbados
Bathurst
Belfast
Bermuda (Hamilton)
Bilbao
Bordeaux
Boston, Mass.
Brixham
Buenos Aires
Cadiz
Cardiff
Cienfuegos
Concarneau
Dominica
Devonport
Dublin
Dundee
Edinburgh (Leith),
Falmouth
Fanning Island
Fayal
Fécamp
Fleetwood
Galveston
Georgetown, British Guiana
Gibraltar
Gijon
Glasgow
Greenock
Grenada, B.W.I.
Grimsby
Halifax, N.S.
Havana
Hebburn
Huelva
Hull
Immingham
Jacksonville
Kingston, Jamaica
La Coruna
Larnaca
La Rochelle
Lima
Lisbon
Liverpool
London (East Ham)
Lorient
Madeira
Manchester
Miami
Middlesborough
Milford Haven
Mobile
Montreal
Newcastle-on-Tyne
New Orleans
Newport News
New York
Norfolk, Va.
North Shields
Oporto (Matozinhos)
Oran
Pasajes (San Sebastian)
Pernambuco (Recife)
Peterhead
Philadelphia
Port Arthur, Tex.
Portland, Ore.
Port of Spain (Trinidad)
Quebec
Reykjavik
Rio de Janeiro
St. Helena
St. John, N.B.
St. John's, N.F.
St. Kitts
St. Lucia
St. Malo
St. Nazaire (Nantes)
St. Vincent, C.V.
St. Vincent, B.W.I.
San Francisco
San Miguel, Azores
San Pedro (Wilmington)
Santander
Savannah, Ga.
Seattle, Wash.
Seville
Southampton
South Shields
Sunderland
Swansea
Sydney, N.S.
Tampa, Fla.
Tangier
Toronto
Turks Island
Valencia
Vancouver
West Hartlepool
Zeebrugge





MARCONI MARINE SERVICE STATIONS

Accra
Adelaide
Aden
Alexandria
Algiers
Alicante
Amsterdam
Ancona
Antwerp
Aviles
Bahrain
Barcelona
Bari
Batavia
Bergen
Bombay
Boulogne S/Mer
Bremen
Bremerhaven
Brisbane
Brussels
Cairns
Calcutta
Capetown
Cape St. James (Indo China)
Casablanca
Cocos Island
Copenhagen
Curacao
Cuxhaven
Dakar
Dar-es-Salaam
Dieppe
Delfzijl
Dominica
Dunkerque
Durban
Emden
Flushing (Vlissingen)
Fraserburgh
Fremantle
Genoa
Gothenburg
Haifa
Hamburg
Hamburg-Altona
Hong Kong
Harbour Grace
Karachi
Kiel
Lagos
Le Havre
Las Palmas
Les Sables d'Olonne
Lowestoft
Lubeck
Malta
Malmo
Marseilles
Manila
Matadi
Mauritius
Melbourne
Mombasa
Montserrat
Montevideo
Muscat
Naples
Newcastle, N.S.W.
Norfolk Island
Norrkoping
Oslo
Ostende
Penang
Piræus
Port Louis (Mauritius)
Port Said
Port Sudan
Rodriguez Island
Rome
Rotterdam
Rouen
Saigon
St. Pierre and Miguelon
San Juan, Porto Rico
Santiago de Cuba
Santos
Scheveningen
Seychelles
Shanghai
Sierra Leone (Freetown)
Singapore
Spezia (La)
Split
Stockholm
Suez
Sundsvall
Suva
Sydney, N.S.W.
Tandjong Priok
Teneriffe
Thorshavn
Townsville
Trieste
Valparaiso
Venice
Vigo
Wellington
Ymuiden
Zanzibar

Wireless at Sea

THE FIRST FIFTY YEARS

A history of the progress and development
of Marine Wireless Communications
written to commemorate the Jubilee of
The Marconi International Marine
Communication Company Limited

By H. E. HANCOCK

1950

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DEDICATION

This book is dedicated
to those British Marine Radio Officers,
who, in the performance of their duty,
laid down their lives in order that we,
their fellow countrymen and the peoples
of the world, should survive to live in
freedom and in peace.

'At the going down of the sun,
and in the morning,
we will remember them.'

FOREWORD

BY SIR GEORGE H. NELSON, F.C.G.I., M.I.MECH.E., M.I.E.E.

THIS YEAR The Marconi International Marine Communication Company Limited celebrates its fiftieth anniversary. It gives me great pleasure to contribute a foreword to this book which records the benefits which wireless has conferred on the merchant fleets of the world during the past fifty years.

The efficiency of marine wireless has been steadily improved, and the progress made by the Marconi Marine Company in wireless apparatus of all kinds during the fifty years of its existence has been immense.

To-day, wireless communication makes it possible for a shipmaster to have direct communication with his owners or agents from the remotest parts of the seven seas. In the field of wireless aids to navigation, progress has been even more spectacular. The development of the direction finder gives to the navigator a means of position finding entirely independent of astral observations; the echo sounder gives a continuous record of the depth of water under the keel, and now, with radar, the mariner has been provided with an electronic eye with which to penetrate fog or darkness, and obtain with accuracy the bearing and distance of all objects near his ship, whether fixed or mobile.

This book illustrates the revolution which wireless has brought about in maritime affairs, not only by increasing the safety of life and property at sea, but also the efficiency and economy in operation of the world's shipping. I, personally, have found reading it a fascinating and inspiring story of service—which was the mainspring of the work of the Company's illustrious founder, Guglielmo Marconi. In adopting the motto 'Service, Security and Progress' the Company epitomised the spirit which inspired him throughout his life.

Looking forward from this fiftieth milestone I foresee great possibilities for the future. The discoveries and accomplishments of the past seemed miraculous, but now new spheres are opening up in marine communications and aids to navigation which are a challenge both to the inventor and organiser, and I am confident that its Jubilee Year will see the Marconi Marine Company entering upon a period in which it will not only maintain its leadership in design and manufacture but improve upon its own record.

George H. Nelson

CHAIRMAN

'Wireless is now available to shipping for communication by means of long, medium, and short wave telegraphy and telephony, bringing to the ship information regarding time, weather conditions, navigational warnings, and news of happenings in the world at large, as well as facilitating social correspondence for passengers, and keeping shipowners in touch with their ships. On shore, a system of wireless coast stations has been organised by all maritime countries for communication with ships; and wireless beacon stations have been established for the purpose of providing signals upon which ships can take bearings with their direction finders. So far as the sea is concerned, therefore, and quite apart from the developments that have taken place in communication on land, I feel that my early belief in the possibility of this form of communication has been fully justified. As one who is deeply attached to the sea, I am proud to have been able to render this service to the sea-going community.'

G Marconi

Statement made by the late Marchese Marconi on the occasion of the fortieth anniversary of his earliest experiments.

CONTENTS

PREFACE

THE first wireless message ever to be sent across water was transmitted in May 1897 a distance of three and a half miles from a point on the South Wales coast near Penarth to an island in the Bristol Channel. Less than fifty years later, in January 1946, a newly-built ship running trials on the Clyde established wireless communication with Sydney, Australia, ten thousand miles away. That is a measure of the progress which Marconi's invention had made since those early experiments.

On April 25, 1950, the Marconi International Marine Communication Company will be fifty years old; for it was on that day, in 1900, that the Company was incorporated. In the following pages an endeavour has been made to trace the history and development of this Company during its first half-century. It was formed to make available to the shipping industry an invention which, in due course, was to revolutionise sea communication and to add materially—and to a far greater extent than could ever have been anticipated in its early days—to the safety of ships and all who voyaged in them across the oceans of the world.

Modern developments of Marconi's discovery as to how electrical impulses discharged into the ether could be made to carry messages over considerable distances are many. World-wide communication with ships, direction finding, radar, broadcasting and television have all grown out of that first discovery or series of discoveries and development therefrom; and perhaps the historical side of the science of wireless telegraphy has been somewhat obscured by the wonders of to-day. This historical aspect of wireless at sea, however, may be of interest to the present generation of shipping managers, seafarers and sea travellers—and perhaps to an even wider public; and the jubilee of the Marconi International Marine Communication Company provides a suitable opportunity for presenting it in book form.

No historical book has ever been written which has given complete and universal satisfaction. Many important facts may have escaped the attention of those who compiled it, and certain events of historical interest may have been lost to memory when those who participated in them had passed on. That is so in the story of the birth and early development of wireless telegraphy; and two wars, with the great destruction wrought by aerial attack on our towns and cities, have been responsible for the loss of many documents which might have added interest to this story. Many of the events and incidents related herein have only been brought to light as a result of extensive research; but it is believed that the book gives an accurate account, as fully detailed as circumstances permit, of the development of this great boon to shipping.

Of all the inventions and discoveries of the past fifty years none has had more beneficial results than the harnessing of electrical forces to provide communication across space. To stress the advantages which wireless has brought does not require deep and concentrated thought or a facile pen. They are obvious to all; but it is desirable to trace the various stages in its development from the time when Marconi first found the key to the problem, lest the world forgets the great debt it owes to that immortal genius who, despite discouragements and disappointments and in the face of ridicule and antagonism, brought safety to the mariner, not only in making it possible for a ship to communicate with other ships and with the shore but in enabling him to 'see' in dense fog and find his exact position by means of wireless signals.

We may at times fear that science has advanced too rapidly and that we are not yet prepared to make the best possible use of modern invention. Mr. Winston Churchill, in the first volume of his history of the Second World War, has referred to 'the unlucky discovery by an immature civilisation of the internal combustion engine and the art of flying', but scientific progress cannot be halted and we must harness these new discoveries to man's needs.

Man is a curious animal, never satisfied with existing things and conditions, always striving for something new, searching for something better, reaching out to touch the stars or endeavouring to plumb the depths. It cannot, of course, be denied that it is this restless urge that has opened up the world to trade, which literally and figuratively has made two blades of grass flourish where previously only one grew; that has produced, even in the time of many of us still living, the motor car, the telephone, the aeroplane, the internal combustion engine, broadcasting and television, and many another commonplace of to-day which was a miracle yesterday. In scientific achievement there has been enormous progress since the closing days of the nineteenth and the opening of the twentieth centuries.

It may be recalled that in one of the earlier novels of the late H. G. Wells a war between nations had got out of control. Science had provided mankind with many new and fantastic weapons—some of which have since become realities while others, fortunately, have not yet been invented—with the result that Governments and peoples were overthrown, cities and towns were laid waste, death and pestilence bestrode the land, and the few survivors were fast returning to a primitive state of living. It is now many years since I read that book, but I have always remembered the remark of one old man who had lived through that imaginary period of world disaster as he surveyed the ruins of the civilisation which he had known: 'I never did believe in all this progress.'

But there is no question regarding the benefits which have accrued to humanity as a result of the inventions of Marconi. Just over fifty years ago, the only means whereby messages could be sent to points overseas was by cable laid on the sea bed. Such messages could only be sent from and to land stations. So far as ships traversing the seas were concerned, there was no means of communication between them and the land except by visual signal when leaving or entering port or harbour or passing a headland or another ship. When a vessel left her home port nothing more would be heard of her until she happened to be 'spoken' by a passing vessel. If she met with serious accident, a report of what had happened might not be available for many days afterwards, if at all. It would probably be the merest chance, if accident should befall, that another ship would be near at hand to give assistance; and even then communication could only be made by means of flags by day or by signals made in the Morse Code at night by means of a lamp, and such signals could only be seen from a distance of five to ten miles under the most favourable conditions. In most cases once a ship was out of sight of land she was alone until she had reached her destination.

The advantages derived from the installation of radio apparatus in mercantile shipping cover a wide range. They include the offering to owners of the power to maintain constant touch with their ocean-going property throughout the voyage, a procedure which, for cargo-ship owners, provides valuable opportunities for changing the route or destination of the vessel in accordance with the advantages which may accrue to them from such change, and which also involves the certain gain of noting exactly on what date and almost at what hour their vessels are likely to reach their destination. This latter advantage leads to the natural result that preparations for immediate handling of passengers and cargo may be effected in advance, a course effecting great economy in time and expense.

Again, any passengers who may be carried are able to maintain their personal and business relations with friends and clients at both ends throughout the whole voyage, and the ever-increasing amount of telegraph traffic handled by Radio Officers bears eloquent testimony to the recognition of these facilities by ocean voyagers and by seafarers.

Any ship master receiving a wireless appeal for help is bound to take immediate steps, not only to pass on such an appeal to others, but to answer it himself or, in default thereof, to be prepared to give the most substantial and convincing reasons for omitting to do so.

The wireless station on board ship can be said to have many distinct functions besides that of calling for help in cases of distress. These include the transmission and reception of telegrams relating to ships' and passengers' business, weather, and navigation, by which the master is able to learn of the presence of ice and derelicts. Navigational aids include time signals, wireless bearings, storm warnings, depth of water under keel, and, nowadays, with radar, an 'electronic eye' with which the mariner is able to see fixed and mobile objects through darkness and fog. Medical advice can also be obtained by wireless.

There may be fears that 'science herself may destroy all that makes human life majestic and tolerable'. Nevertheless, whatever our doubts and despite past experience of man's misuse of new inventions and discoveries, the science of wireless has, through the progress it has made under the guidance of those responsible for the development of Marconi's invention, been used more for man's benefit than his hurt. It may not be possible to estimate with any degree of accuracy the number of lives which have been saved after misfortune has befallen those who navigate the seas, but it is not too much to say that innumerable lives and millions of tons of cargo have been saved through the ability which wireless gives to avoid accident.

The early years of development of wireless communication by Marconi were times of immense interest and great endeavour. Only those who were actively concerned with those days can, perhaps, appreciate the enormous difficulties which had to be overcome, but the efficiency of wireless to-day is the result of more than fifty years of painstaking endeavour, of numerous and costly experiments, and the unremitting labour of many great minds. They were years of hard and devoted labour and much disappointment, but, withal, great faith and enthusiasm. The success which crowned the efforts of those pioneers is evident in the widespread application of wireless to communication and navigation at sea, on land, and in the air, in broadcasting, television, and other applications of wireless principles which have revolutionised commercial and social life during the past fifty years.

And now, as a member of the great English Electric group of companies, under the chairmanship of Sir George Nelson, the Marconi International Marine Communication Company looks forward from its fiftieth milestone to still greater opportunities for service to the shipping and seafaring communities in the years which lie ahead.

PREFACE

Some years ago a humorous writer dedicated one of his books to his youngest daughter, 'without whose help', he said, 'this book would have been finished in half the time'. I cannot name every person to whom credit is due and who has helped me in the compilation of this volume; but it is not too much to say that without their assistance, 'this book could *never* have been finished'. In particular I would mention Mr. H. C. Van de Velde, the deputy to the managing director of the Company, for his encouragement and inspiration; Mr. Ronald Ferguson, the general manager, for his suggestions as to particular items which should be covered; Mr. W. G. Richards, the publicity manager, not only for valuable advice but for very practical assistance; the various depot managers, and many officials of the Company.

I wish also to place on record my thanks to Mr. H. O'Neill, the general secretary of the Radio Officers' Union, for giving me the opportunity to consult all the volumes of *The Signal*, the official organ of the Union, and its predecessor, which I found of enthralling interest. Other fruitful sources of information were the *Marconigraph*, the *Aerial*, and the *Marconi Mariner*—house organs, past and present, of the Marconi organisation; the last-named, especially, in my opinion, being one of the most informative and brightly-written magazines published to-day in connection with the shipping industry.

My thanks are also due to the editors of *Lloyds List and Shipping Gazette* and *The Shipping World* for opportunities to consult their files and past volumes; and I have also drawn to some extent upon other shipping journals, such as *Fairplay*, the *Syren and Shipping*, and the *Shipbuilding and Shipping Record;* also *The Times* and the *Wireless World*, to all of whom I give due acknowledgments in the text. My thanks are also due to the Press Officers of the Ministry of Transport and the Post Office for information on various aspects of wireless at sea, and to various shipping companies for the loan of photographs of vessels which, long before wireless became a compulsory installation, were given by their owners the means whereby greater safety for the passengers and crews was ensured. In many cases the reproductions were made from photographs of which only single copies exist, and are probably unique. It can, therefore, be said that this history of wireless was made possible only through the endeavours (past and present) of many people. It is this collective and co-operative effort which, as in other spheres of physical and mental activity, surmounts all obstacles and difficulties and makes it possible to accomplish anything worth while.

March 1950 H.E.H.

CHAPTER ONE

The Birth of Wireless

BEFORE dealing with the birth and development of the Marconi International Marine Communication Company—its triumphs and vicissitudes, its successes and disappointments—and recording the great services which it has rendered to world shipping during the past fifty years, it is necessary to look back a little farther than April 25, 1900, when the Company was incorporated, in order to ascertain the position which wireless telegraphy had attained before it could be developed as a commercial proposition and before its potentialities had been fully appreciated.

We must go back to the year 1895 when the young Guglielmo Marconi was experimenting on his father's estate at Pontecchio, near Bologna. It was as a result of these experiments that Marconi discovered the means by which electric waves could be transmitted and directed over distances which indicated the possibility of establishing a reliable system of telegraphic communication without the use of wires. Up to that time it had only been possible to detect the effect of electric waves over extremely short distances. Marconi's discovery of the effect of an elevated aerial and an earth connection at once removed the limitations besetting the transmission and detection of electric waves and opened up a new field of development.

From time to time claims have been made on behalf of others that Marconi was not the first to invent or to discover the means whereby messages could be sent without wires, and it may be well, before proceeding further with this historical record, to deal with this matter.

Many more than fifty years ago eminent scientists had predicted and indeed proved the existence of electro-magnetic—or wireless—waves, but it was Marconi who evolved the first practical application of the scientific theories which had been put forward, and this view or claim has been upheld in Courts of Law on several occasions. Marconi was quick to give generous praise and to acknowledge the debt he owed to these pioneers; and although it is unquestioned that he was the first to use the elevated aerial for the transmission and reception of wireless waves, there is no question that other scientists of that time were experimenting with the phenomena, groping their way step by step in a new and unknown science.

Although there may be no doubt in the minds of the rest of the world as to those who were responsible for the early discoveries and inventions from which wireless telegraphy was developed, in Russia the claim has been made that Popoff, the Russian physicist, was the inventor of wireless. It may be of interest as illustrating present-day Russian psychology, to reproduce a letter which was sent by the Russian Ambassador at Rome in reply to an invitation to participate in the celebrations in honour of Marconi in 1947 as follows:

> 'We have to inform you that the fiftieth anniversary of the invention of wireless by the Russian inventor Popoff was celebrated in the Soviet Union in 1945 and was followed by a series of official functions and lectures at the Academy of Science in the U.S.S.R. For this reason it is not becoming that the U.S.S.R. should be represented at the Marconi celebrations.
>
> M. Kostilev.'

A group of Russian scientists also wrote an open letter to the Rome committee responsible for promoting the Marconi celebrations in which they stated that the real inventor of wireless was Professor Popoff.

There are alive to-day very few witnesses whose evidence can be relied upon to throw more light on a matter obscured by the mists of the past fifty years. Let us, therefore, examine what is believed to be the only first-hand account of the meeting between Marconi and Popoff.

Marconi's Meeting with Popoff

The Marchese Luigi Solari, an early friend and collaborator of Marconi, has recalled that he and Marconi were on board the *Carlo Alberto* when that Italian cruiser was at St. Petersburg in July 1902 on the occasion of a visit paid by the King of Italy to the Czar of Russia. The Russian Press had published enthusiastic articles regarding the wireless communication which Marconi had established for the first time between Russia and Britain, namely, from the *Carlo Alberto* in Russian waters to Poldhu in Britain. Popoff visited the *Carlo Alberto* to pay tribute to Marconi, and, as he came on board, in shaking Marconi by the hand, he said: 'I should like to greet the father of wireless telegraphy'. Solari said those were the exact words. Marconi took the Russian down to the Admiral's cabin and asked him about his experiments. Popoff mentioned that he had conducted some experiments in 1895 for recording electrical discharges in the atmosphere, but, according to Solari, he 'stated most definitely that he had never effected any transmission of electrical waves before Marconi, or any wireless communication, and that his research had been confined to electrical discharges in the atmosphere'.

Among other names mentioned in this connection has been that of the late Sir Oliver Lodge; but in an article in *Wireless World* dated September 26, 1923, Lodge gave the following explanation of his failure to appreciate the possibilities which might follow the development of the generation and detection of electric waves:

'I was too busy with teaching work to take up telegraphic or any other development; nor had I the foresight to perceive what has turned out to be its extraordinary importance to the Navy, the Merchant Service and, indeed, land and air services, too.'

On June 1, 1894, Sir Oliver Lodge delivered a memorial lecture, 'The Work by Hertz', which gave many persons the opportunity of seeing, for the first time, striking experiments performed with Hertzian waves. Although replete with interest, this lecture did not contain even a hint of a possible application of these electromagnetic waves to telegraphy. The lecturer throughout fixed the attention of the audience on the similarity between the effects obtainable with these waves and those better-known effects produced by rays of light.

These experiments and some variations of them were repeated at a meeting of the British Association at Oxford in the following Autumn; and here again no mention was made of the application of these waves to telegraphy, the objects of the experiments being to illustrate an electrical theory of vision, and to expound the properties of the electrical waves.

The Russian, Popoff, then Professor of the Imperial Torpedo School in Cronstadt, Russia, was attracted by Lodge's lecture, and in the *Journal of the Physico-Chemical Society of Petrograd*, described experiments carried out with his apparatus and wave detector. That the primary object of his experiments was not telegraphy is shown by the paragraph with which he concluded his paper:

'In conclusion, I may express the hope that my apparatus, with further improvements, may be adapted to the transmission of signals to a distance by the aid of quick electrical vibrations as soon as the means for producing such vibrations possessing sufficient energy is found.'

As Dr. Fleming wrote in his well-known book, *The Principles of Electrical Wave Telegraphy and Telephony*, the scientific world was left, then, 'with this unquestionable fact, that at the beginning of 1896, although the most eminent physicists had been occupied for nine years in labouring in the field of discovery laid down by Hertz, and although the notion of using these Hertzian waves for telegraphy had been clearly suggested, no one had overcome the practical difficulties, or actually given any exhibition in public of the transmission of intelligence by alphabetic or telegraphic signals by these means. The appliances in a certain elementary form existed, the advantages and possibilities of electric wave telegraphy had been pointed out, but no one had yet conquered the real practical difficulties and exhibited the process in actual operation'.

Sir William Preece and Dr. Slaby

Sir William Preece (then Mr. W. H. Preece) on June 4, 1897, gave a lecture at the Royal Institution in London at the conclusion of which he combated the contention which appears to have been raised that Marconi had done nothing new. He said: 'He has not discovered any new rays; his receiver is based on Branly's coherer. Columbus did not invent the egg, but he showed how to make it stand on its end; and Marconi has produced from known means a new electric eye more delicate than any known electrical instrument, and a new system of telegraphy that will reach places hitherto inaccessible. . . Enough has been done to prove that for shipping and lighthouse purposes it will be a great and valuable acquisition.'

The news of the successful demonstrations which Marconi carried out spread abroad. Amongst those who had been giving some attention to the utilisation of Hertzian rays was Dr. Slaby, a professor in the Technical High School of Charlottenburg, Berlin; and he at once hurried to England to discover how Marconi had solved the problem which had baffled him. After seeing some of Marconi's experiments he wrote a magazine article in which he made the following remarks:

'In January 1897, when the news of Marconi's first successes ran through the newspapers, I myself was earnestly occupied with similar problems. I had not been able to telegraph more than one hundred metres through the air. It was at once clear to me that Marconi must have added something else—something new—to what was already known, whereby he had been able to attain to lengths measured by kilometres. Quickly making up my mind I travelled to England where the Bureau of Telegraphs was undertaking experiments on a large scale. Mr. Preece, the Engineer-in-Chief of the Post Office, permitted me to take part in these; and in truth what I there saw was something quite new. Marconi had made a discovery. He was working with means the entire meaning of which no one before him had recognised. Only in that way can be explained the secret of his success. In the English professional journals an attempt has been made to deny novelty to the method of Marconi. It was urged that the production of Hertz rays, the radiation through space, the construction of his electrical eye—all this was known before. True, all this had been known to me also, and yet I was never able to exceed one hundred metres.'

Professor Slaby became a partner in the Slaby-Arco system which was adopted by the German Government, but he probably never ceased to appreciate the debt he owed to the demonstration of Marconi's success in a field where he, himself, had been baffled.

Marconi, by availing himself of previous knowledge and working out theories already formulated, did nothing but follow in the footsteps of Howe, Watt, Edison, Stephenson, and many other illustrious inventors. It is to be doubted whether there has ever been a case of a useful invention in which all the theory, all the practical application and all the apparatus were the work of one man. Progress can only be accomplished on the foundations that others have laid, and this is just as true of pure science as of applied science.

As one writer has put it, when we make full allowance for all that previous scientists invented 'it still remains Marconi's incontestable merit that he developed a far-seeing initiative where others had not gone beyond timid projects or tentative research. In short, he carried into the domain of practical reality what had only floated indistinctly before the minds of others, or had served them for modest experiments. . . . Judged, therefore, by its practical results, Marconi's service to science in this matter resolves itself into a victory over innumerable practical difficulties, involving many apparently insignificant details and minor improvements, the successful dealing with which demanded the exercise of a gift that has been characterised as genius itself'.

American Legal Opinion

The whole question of 'Who invented wireless?' can perhaps best be answered in the words of Judge William K. Townsend, of the United States Circuit Court on May 4, 1905, in the action 'Marconi Wireless Telegraph Company of America versus De Forest Wireless Telegraph Company', as follows:

'It would seem, therefore, to be a sufficient answer to the attempts to belittle Marconi's great invention that with the whole scientific world awakened by the disclosures of Hertz in 1887 to the new and undeveloped possibilities of electric waves, nine years elapsed without a single practical or commercially successful result, and that Marconi was the first to describe and the first to achieve the transmission of definite and intelligible signals by means of the Hertzian waves.

'The exact contribution of Marconi to the art of spark telegraphy may be stated as follows: Maxwell and Crookes promulgated the theory of electrical oscillations by means of a disruptive discharge; Hertz produced these oscillations and described their characteristics. Lodge and Popoff devised apparatus limited to lecture or local experiments or to such impracticable purposes as the observations of thunderstorms. Marconi discovered the possibility of making these disclosures available by transforming these oscillations into definite signals and, availing himself of the means then at hand, combined the abandoned and laboratory apparatus and, by successive experiments, reorganised and adapted and developed them into a complete system capable of commercially utilising his discovery.

'Other inventors, venturing forth on the sea of electrical movement, met the rising tide of the Hertzian waves and allowed them to roll by without appreciating that this new current was destined to carry onward the freight and traffic of the world commerce. They noted the manifestations, suspected their possibilities, disclosed their characteristics, and hesitated, fearing the breakers ahead, imagining barriers of impracticable channels and shifting sand bars. Marconi, daring to hoist his sail and explore the unknown current, first disclosed the new highway.'

Scientific Development

James Watt did not invent the steam engine, but he invented separate condensation in a condenser and not in the cylinder, and made Newcomen's extravagant engine a useful one. Cooke and Wheatstone did not invent the electrical telegraph, but they certainly gave it a form in which it became a public utility. Marconi was not the first to suggest the employment of electrical waves for the transmission of intelligence to a distance; but, by his novel use of the elevated aerial wire and earth plate and his final perseverance and clear grasp of the fundamental principles, was the first to produce an apparatus which could be worked by anyone, and did communicate intelligible messages to a distance. He gave to the world not an isolated personal performance, but the definite possibility of it being done by anyone with no particular skill at any time and at any place. As Dr. Fleming wrote: 'It is just in this quality of progressive and persistent work, directed to bringing a desired achievement to the point at which it becomes independent of the skill or life of the originator, that the amateur usually fails. Either he has not the resources, or he rests satisfied with an initial feat or a single achievement which is not easily or perhaps at all repeatable by others.'

As a final contribution to the discussion let us quote here from an article in *The Electrician* of October 14, 1898:

'For some considerable time the scientific aspect of this development (Hertz and Clerk Maxwell) completely obscured its more practical applications. Scientists were so charmed with the experimental evidence it afforded as to the validity of Maxwell's electromagnetic theory, that for many years the fact that these experiments possessed any practical value as a means of signalling between two pieces of physically, mechanically disconnected apparatus almost escaped their notice. Thus all the essential features of this method of signalling were really outlined in scientific laboratories long before any idea of utilising them for commerce had occupied prominent attention. It is true that the suggestion was cursorily thrown out by one or two leaders of science that the Hertzian waves might be utilised for signalling, but this suggestion was never more than a mere bald idea, conveying no practical directions as to its detailed working, and it was largely received more with curiosity than with any serious idea of putting it into practical use. . . . All honour is due to Marconi for having been the first to bring prominently forward before official bodies and the public the possibility, and, indeed, the eminent practicability of using Hertzian waves for telegraphing between two places not connected by an electrical conductor.'

CHAPTER TWO

Marconi's First Demonstration

MARCONI came to England in 1896, and was fortunate enough to enlist the interest of Sir William H. Preece, C.B., F.R.S. (then Mr. Preece) who was Engineer-in-Chief of the General Post Office. Sir William was an ardent investigator in many branches of electricity, including inductive wireless telegraphy. His first experiment in wireless telegraphy dated back to 1882, and for some years thereafter he experimented in all parts of the country and published the results in numerous papers. The inductive method of wireless telegraphy depended for its effectiveness on the fact that an electric current moving backwards and forwards in one wire will cause another electric current to move forwards and backwards in another wire within its field. For practical purposes this system was limited in its value by the fact that in order to increase the distance over which signals are transmitted it is necessary proportionately to increase the length of the parallel wires opposing each other. As the parallel wires had, roughly, to be as long as the distance between them this method had limits to practical application even over short distances.

Sir William on one occasion tried to signal by these means between England and Ireland, and one Sunday night in 1896 he connected up the main telegraph lines through the length, north and south, of England and Ireland, thus making two enormous parallel circuits. The results were, however, unsatisfactory, and no definite messages from either Ireland or England were received.

It was about this time that Marconi demonstrated his invention—which was not that of inductive telegraphy, but which depended upon electro-magnetic waves—before Sir William Preece and other Post Office officials; and it was due to Sir William's influence that Marconi received considerable encouragement in the early stages of its development from the British Post Office.

It was at the end of a lecture on 'Telegraphy without Wires', which he delivered at Toynbee Hall, London, on December 12, 1896, that Sir William sprang a surprise on his audience when he announced that Mr. Marconi, 'a young Italian electrician', had come to him a short time before with 'a system of telegraphy without wires dependent not on electro-magnetic but on electro-static effects,' that is to say, on electric waves set up of a much higher rate of oscillation, 25,000,000 a second in fact. These oscillations cause waves to be projected through space in straight lines. These waves could be reflected and refracted like light; indeed they were capable of all the phenomena which light could go through. The invention which dealt with the method of receiving and sending messages by this means, was first experimented with on the roof of the Post Office, and then over 1½ miles on Salisbury Plain. The great difference between another system which had already been tried and Mr. Marconi's system was that in the former a horizontal wire of great length was employed at each station whereas in the Marconi system each station used only a short vertical wire. Oscillations were simply set up by one apparatus and received by the other, the secret being that the receiver must respond to the number of oscillations of the sender.

The apparatus was then exhibited. What appeared to be simply two ordinary boxes were stationed at each end of the room, electrical oscillations were produced in one box and a bell immediately rang in the other. 'To show that there was no deception' Marconi held the receiver and carried it about, a bell ringing whenever the oscillations at the other box were set up.

Post Office Backs Experiments

Continuing, Mr. Preece said he had the greatest possible pleasure in telling Mr. Marconi that day that the Post Office had decided to spare no expense in experimenting with the apparatus, and one of the first trials would be from Penarth to an island in the Bristol Channel. He added that he had the greatest faith in the apparatus. If the experiments were successful, it would be of inestimable value to our ships, for it would provide a new method of communicating with lightships and lighthouses. To take an instance: since last year they had had a cable connected with the Fastnet Light, but in the early part of this year it broke down, and they had never yet been able to land on the rock to repair it. But there was a possibility beyond this of enabling ships as they came near dangerous rocks and shoals to receive an intimation of the fact by means of these electric waves. Neither day nor night made any difference, neither rain nor snow would interfere with them; and if the invention were what he believed it to be, our mariners would have been given a new sense and a new friend which would make navigation infinitely easier and safer than it was then.

There were probably few present at that lecture who could foresee what the future held in store for the new invention, and Dr. E. W. Marchant has related how when Lord Kelvin was discussing the sending of messages by wireless telegraphy he said it was all very well, but that, for his part, he would rather trust 'a boy and a pony'. And if a man of Lord Kelvin's eminence took that view, it is not surprising that many who had fewer qualifications to express an opinion were sceptical as to the possibilities of sending messages over long distances by such means.

The main feature which appealed to everyone was the fact that Marconi's invention enabled telegraphic communication without the aid of wires to be established between lighthouses and lightships and the shore; and for ships at sea to communicate with and to warn each other and to receive warning from lighthouses and lightships and the shore, for in foggy weather this would be a very great safeguard against accidents and of immense benefit to the shipping community. It was suggested that the invention would be 'very largely adopted by the Government for the Post Office and Army and Navy purposes'.

First Wireless Signals over Water

The first transmission of signals over water was made by Marconi in May 1897. A series of demonstrations were carried out across the Bristol Channel. Signals were transmitted from Lavernock Point, near Penarth, to the Island of Flat Holm in the Bristol Channel, a distance of three and a half miles, and to Brean Down, Somerset, a distance of nine miles.

This demonstration was important in that it convinced Sir William Preece that Marconi's system held definite promise of commercial success, and thereafter he not only gave Marconi every support and encouragement but allowed him to engage one of his most trusted assistants, Mr. George S. Kemp, who continued to work with Marconi from that day until his death in 1933.

So successful was the demonstration that it was clear from that moment that the Marconi wireless system was capable of development along the lines indicated by Marconi, with the ultimate success which is now a matter of history.

This historic event was commemorated fifty-one years later, on May 12, 1948 (a year later than was originally intended), when a bronze plaque was erected by the Cardiff Rotary Club on the wall of St. Lawrence Church, Glamorgan, near the spot where the experiments were carried out.

It was unveiled in the presence of a distinguished gathering, which included the Lord Mayor of Cardiff, Alderman R. G. Robinson; Mr. Victor Cleves, President of the Cardiff Rotary Club; Rev. G. H. A. Stephens, M.A., Rector of Penarth; Rev. Gwilym Davies, M.A., Mr. R. J. C. Weber, B.A., Chairman of the International Service

Committee of Cardiff Rotary Club; Mr. H. Faulkner, Assistant Engineer-in-Chief, G.P.O.; Mr. R. D. Bangay, representing the Marconi Company; Mr. J. M. O'Meara, Manager of the Marconi Depot at Cardiff; and Mr. L. G. Kemp, a Marconi engineer and son of Mr. G. S. Kemp, who is commemorated in the memorial.

The wording on the memorial plaque reads as follows:

1897 1947

Near this spot
the first radio messages
were exchanged across water
by
GUGLIELMO MARCONI
and
GEORGE KEMP
between Lavernock and Flat Holm, May 11;
Lavernock and Brean Down, May 18, 1897.
Erected by the Rotary Club of Cardiff, 1947.

An interested spectator at this commemoration ceremony was Mr. Henry Mathews, then aged eighty-four, of Penarth, who had watched Marconi carrying out the experiments in 1897. He was a cab driver in those days, and went over several times 'to see what was going on' and to watch the experiments. 'I can see the young Marconi now', he told a representative of a Cardiff newspaper. 'He was so keen, so vital about what he was doing. I leant against this very wall and watched him and Mr. Kemp preparing for their experiments. I little thought then that I would live to see the day when all these people would come to the old church to honour the young Italian in this way.'

CHAPTER THREE

Early Long-Distance Experiments

THE first 'long-distance' experiment was made between Bath and Salisbury. The receiver in this case was given to a Post Office official who took it to Bath, and there rigged up a station, at which he received signals over a distance of thirty-four miles from their source of emission at Salisbury. After this a station was put up at Alum Bay, Isle of Wight. This station was at first used in connection with a small steamer which had been chartered for the purpose of cruising about in the neighbourhood of Bournemouth, Boscombe, Poole Bay, and Swanage, a distance of eighteen miles from the Needles Hotel Station, with which it was in constant telegraphic communication at all times. A Post Office official was on board on one occasion and afterwards drew and signed a map showing the course of the ship. Early in 1898 an experimental station was erected at Bournemouth. Towards the end of that year the distance between stations was still further increased and subsequently an experimental station was erected at the Haven Hotel, Poole. This station was maintained until the end of 1926 and many of Marconi's experiments were carried out there. A plaque in the hotel commemorates those experiments and the Poole museum contains exhibits connected with Marconi's work.

Another demonstration was given between the House of Commons and St. Thomas's Hospital. In less than an hour from the time the Marconi assistants arrived to put up the installation the system was at work and one of the first visitors was the Speaker, who sent a message and received a reply. This experiment in miniature was carried out at the request of Members of Parliament to demonstrate to them the capabilities of the Marconi system.

Many demonstrations were carried out at the Company's offices. Among those who came to see the system at work were Mr. John Brinton, a director of the Donald Currie Line. He was so interested in what he saw that he asked if a ship passing one of the Marconi stations could be reported to him. This was done. The ship was the *Carisbrooke Castle*, which was on her first voyage out, and when the vessel was signalled a message was sent by wireless to Bournemouth and there put on the ordinary telegraph wires for transmission to Mr. Brinton. The telegram read: 'Steamship Carisbrooke Castle, Donald Currie Line, outward bound, passed the Needles at five minutes past six'. Mr. Brinton was greatly impressed by this and wrote a letter to the Company, thanking them for what they had done and stating that he would be pleased to help the Company in any way he could.

First 'Commercial' Wireless Message

After this Lord Kelvin visited the station at Alum Bay, and was so pleased with what he saw that he sent various telegrams to his friends—among them Mr. Preece of the Post Office. One of these telegrams read as follows:

> To Maclean, Physical Laboratory, University, Glasgow. Tell Blyth this is transmitted commercially through ether from Alum Bay to Bournemouth and by postal telegraph thence to Glasgow—Kelvin.

Lord Kelvin insisted upon paying one shilling royalty on all these messages, wishing in this way to show his appreciation of the system and to illustrate its fitness at that time for commercial use.

Another visitor to the Isle of Wight was the Italian Ambassador, with various members of his staff. Among other messages, he sent a long telegram in Italian, a message of over forty words. This was sent to the first aide-de-camp of the King of Italy, and, as it was all in Italian, and Marconi's assistants on this occasion had no knowledge of that language, it might be assumed that to them the message might have been in code. The telegram was received exactly as it was sent.

Another demonstration was carried out for the *Electrical Review* and *The Times*, both of which newspapers sent representatives. They put the system to every possible test they could imagine, and among others they sent a long code message which had to be repeated exactly as sent. The message being sent in code, the Marconi assistants at the other end had no context to guide them, and the fact that it was repeated correctly proved that reception had been letter-perfect.

Then in July 1898 the Company was requested by the Dublin *Daily Express* to report the Kingstown Regatta. In order to do this a land station was erected in the grounds of the Harbour Master at Kingstown, who was good enough to lend them for the purpose, as well as a room in his house for the use of the instrument. A steamer, the *Flying Huntress*, was chartered and equipped with Marconi wireless apparatus, and the regatta was fully reported, messages being received from the ship at various distances. A telephone line was provided from the Harbour Master's house to the *Express* offices and as the messages came from the ship they were telephoned to Dublin and were published in the succeeding editions of the evening papers.

Queen Victoria's Interest

After this Marconi was requested to put up a station at Osborne House to communicate with the Prince of Wales' yacht, *Osborne*. This was done, and as soon as the masts were up regular telegraphic communication was established. Bulletins of the Prince's health (for he had just previously met with an accident) were reported to Queen Victoria daily by means of wireless telegraphy. Not only that, but the Royal family made full use of the system during Cowes week. Numerous messages passed between the Queen and the Prince of Wales, and messages were also sent by the Duke of Connaught, the Duke and Duchess of York, and other members of the Royal family as well as by some Cabinet Ministers.

After the regatta had concluded the Prince wished to cruise about, and this he did sailing on one occasion as far as Bembridge, and the next day to the Needles at the opposite side of the Isle of Wight. The Royal yacht was kept in telegraphic communication with the Osborne station on the first day, and on the second occasion was able to communicate not only with Osborne but also with the station at the Needles Hotel. A call was made to the Needles Hotel when seven or eight miles away and an immediate reply received, although, we are told, 'the highest land in the Isle of Wight lay between the Royal yacht and the Needles Hotel Station'. The messages were sent and received with perfect success in spite of the fact that the Needles pole and the mast of the *Osborne* were screened by hundreds of feet of intervening high ground. 'The messages, of course, had to pass over or through these hills.' The Royal family were exceedingly pleased with the demonstration.

Lloyd's Tests

About this time—in August 1898—a wireless telegraph installation was at work for Lloyd's on the north-east coast of Ireland. One of the first men to whom Marconi went for assistance in the development of his system of wireless telegraphy was Colonel Sir Henry Hozier, the secretary of Lloyd's; and it was due to his help that the apparatus was installed to operate between Ballycastle, Co. Antrim, and the lighthouse on Rathlin Island, a distance of seven miles.

According to Kemp's diary: 'Lloyd's complained of not being able to report steamers from Torr Head on the north-east corner of Ireland in spite of these steamers being able to report to the lighthouse on Rathlin Island. They requested me to fit a wireless station at Rathlin lighthouse and another at Ballycastle.'

On August 25, 1898, Kemp went over to Rathlin Island and fitted the station. On the following day he reported ten ships to Lloyd's and a report was sent to them from Ballycastle concerning the day's work in a dense fog.

In its issue of October 30, 1941, *Fairplay*, the weekly shipping journal, recalled the encouragement which underwriters gave to Marconi when wireless was in its early stages, and the generous return which the wireless service has since made to underwriters.

'Now that long-distance wireless is common', said *Fairplay*, 'it is just as well to recollect that in 1898 experimental stations over a distance of seven miles were considered adequate. The result of the experiments, however, satisfied the committee of Lloyd's that there was something in wireless, and shortly thereafter all Lloyd's main signal stations on the coast were equipped to receive and send wireless, and signalmen were specially trained for this purpose. With stations so equipped, it was quite usual to have positions wirelessed and then sent on to Lloyd's and posted in "The Room". Later on Lloyd's equipped their main signal stations abroad, but in 1909 the Government took over the control of all wireless stations on the British coasts, and later all the various Governments abroad took control of the wireless at Lloyd's signal stations. In those times morse was used for signalling, and it is a relic of that period that we have the present S O S . This signal was adopted as the easiest and clearest message by morse to be repeated over and over again.'

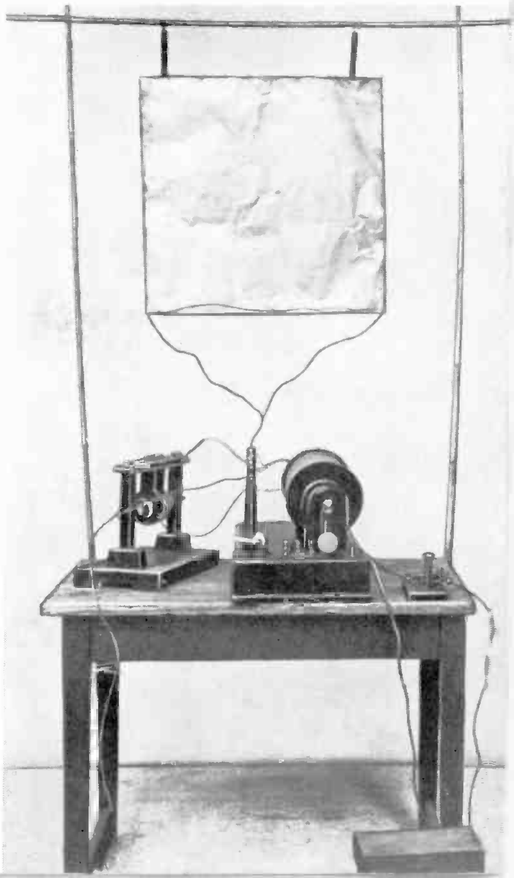
'The regular introduction of wireless', said *Fairplay*, 'had been of great advantage to underwriters, because a vessel could now indicate her position, and, if in distress, assistance could be sent to her. In pre-wireless days a vessel breaking down at sea might be at the mercy of the elements for a considerable period before by chance she was sighted and there was no doubt that many vessels were lost which would have been saved if they could have indicated their position.'

Incidentally, Lloyd's had played an important part in other activities extraneous to marine insurance, but of great value to seafarers. One most praiseworthy action which is worth recording, was the help and encouragement given to Henry Greathead in connection with the lifeboat. The inventor applied to Lloyd's in 1789 for assistance in developing his boat, and it was a marine underwriter who introduced him to the Duke of Northumberland. The latter put up a considerable sum of money, which was augmented by a group of members of Lloyd's, and this was used to build the first lifeboat and establish the first lifeboat station on the Northumbrian coast in 1798. In her first year of service this boat, the *Northumberland*, rescued seven men from the wreck of the *Edinburgh*, and so impressed were the underwriters at Lloyd's that they subscribed a further £2000 at once. By 1803 Greathead had built thirty-one lifeboats, and for the next twenty years the service was kept in being by Lloyd's. It was taken over by the National Lifeboat Institution in 1824.

The advantages of wireless to underwriters and the marine insurance world may be fairly obvious so far as the safety of the ships themselves is concerned, but it is also of value in regard to the insurance of cargoes. There have been many instances in which the course of a vessel has been diverted owing to dock disputes and for other reasons and orders given for the discharge of cargo in a port other than that originally intended. Much perishable material has thus been saved from destruction and consequent claims on insurance companies obviated.

It was some twenty years later, on April 9, 1919, that Marconi was elected an honorary member of Lloyd's. The chairman of Lloyd's, Mr. C. I. de Rougemont, in introducing Marconi as a newly-elected member, made reference to the beneficial results accruing from the introduction of wireless telegraphy.

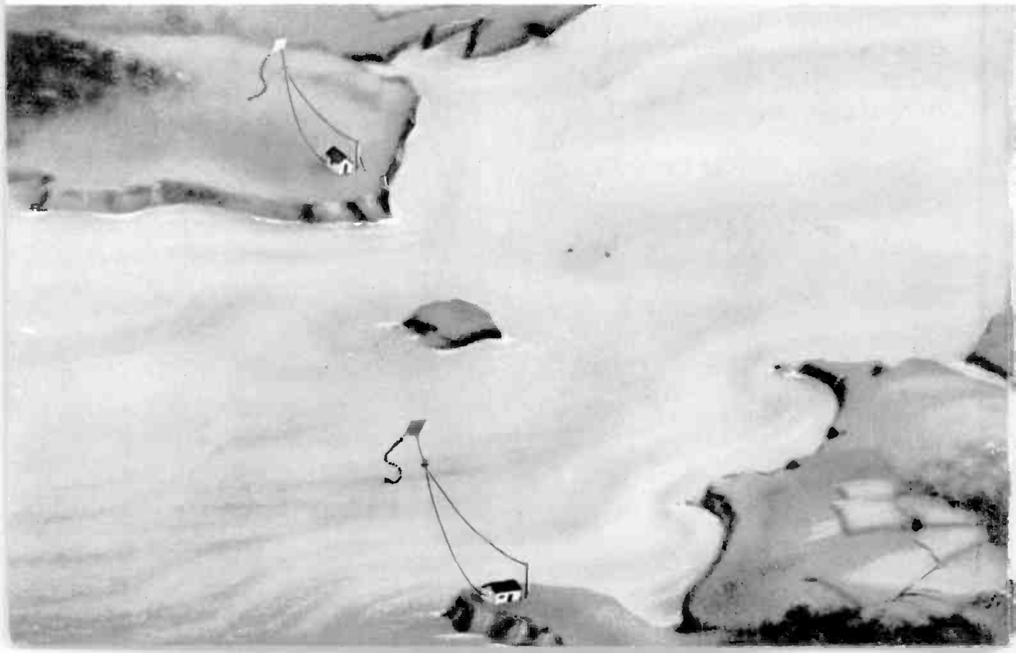
above: *Photograph of Marconi taken in London in 1896, showing the original apparatus brought by him from Italy, including the mysterious black box*
On the left is the Righi oscillator, transmitting 1 or 1.5 metres (now known as the Hertz dipole aerial)—the earliest short-wave transmitter. The black box contains the coherer with tapper and relay, connected between the two horizontal copper strips which acted as the receiving aerial. On top of the box is an ordinary Morse sounder which could be replaced by a bell or tape recorder as required



right: *Model of Marconi's earliest experimental transmitter with copper sheet aerial, induction coil, and spark gap*

Panorama of transmitting and receiving stations, used at Lavernock and Flat Holm Island, showing the construction of the aerials, which, for these experiments, consisted of metallic cylinders supported at the tops of the masts and connected by wires to the transmitting and receiving instruments

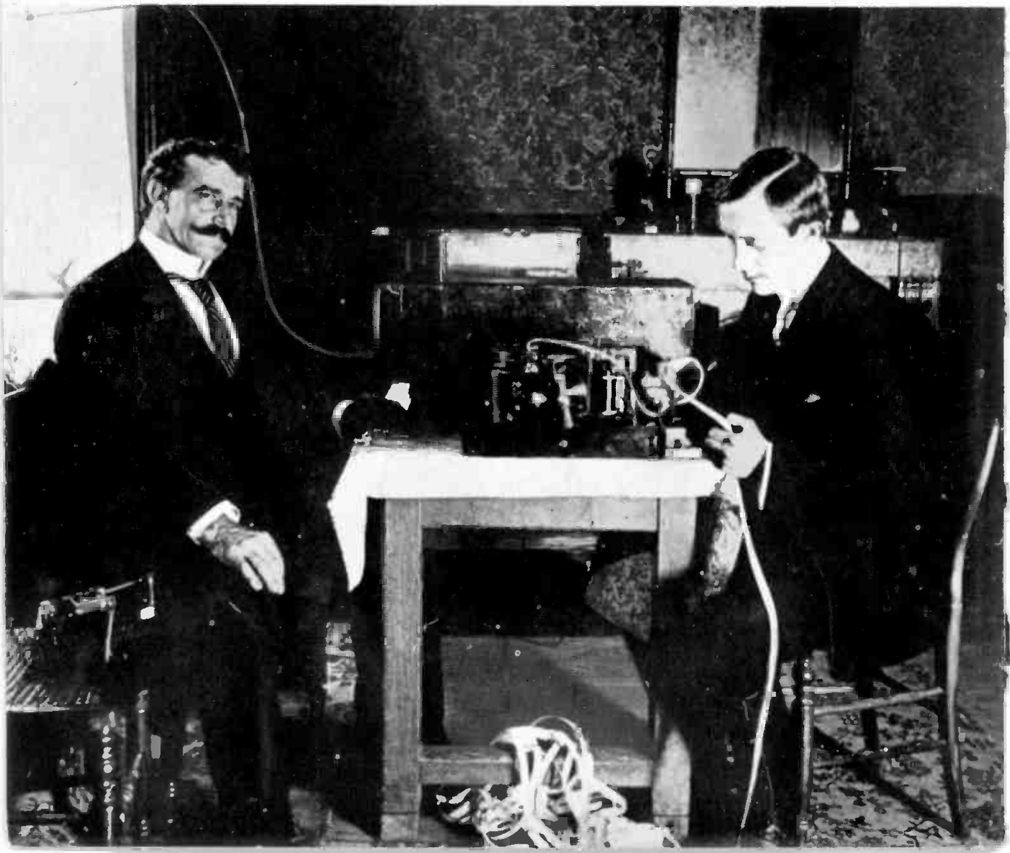
Lavernock and Brean Down experiments, May 1897, *showing the method by which an increase in distance from three miles to eight miles was obtained. For these experiments kites covered with tin foil and flown at a considerable height were used as aerials instead of the metallic cylinders supported on masts. The two kites were used by Marconi for his first demonstration of wireless telegraphy before the Italian Government in July* 1897



Early Marconi wireless installation on board a lightship, 1898

left: *The Marconi Station at Wimereux, from which communication was established across the English Channel with a station at South Foreland lighthouse in March,* 1899

below: *The Marconi Station at Wimereux. Mr. Kemp and Mr. W. W. Bradfield*



CHAPTER FOUR

Communication with Goodwin Lightship

IN December 1898 it was considered desirable to demonstrate the practicability of the system between lightships and the shore, and, with the permission of Trinity House, experiments were carried out between the South Foreland Lighthouse and the East Goodwin Lightship twelve miles distant. The apparatus was taken out to the lightship in an open boat, rigged up in one afternoon and set to work immediately without the slightest difficulty. Once there it continued to work admirably for over two years, during which time it played a part in saving several vessels and a number of lives. In one case it was proved in the Admiralty Court that property to the value of £52,588 was saved as the result of one short wireless message reporting that a steamer had grounded on the Goodwins. Thus very early in its history wireless proved its value to shipping as a means of safeguarding life and property.

The East Goodwin Lightship itself benefited from wireless on two occasions, once when a part of the bulwarks was carried away during a heavy gale and on another occasion when a vessel collided with the lightship. In each case prompt assistance was forthcoming as the result of messages telegraphed to South Foreland Lighthouse.

Dr. J. A. Fleming was the first scientist to visit the Bournemouth station. He later visited the South Foreland station, and, in a letter to *The Times* dated April 3, 1899—after spending some time in examining the appliances and their functions—he gave a graphic account of the achievements of wireless telegraphy at that period. The following are some extracts:

> "During the last few days I have been permitted to make a close examination of the apparatus and methods employed by Signor Marconi in his remarkable telegraphic experiments between South Foreland and Boulogne, and at the South Foreland lighthouse have been allowed by the inventor to make experiments and transmit messages from the station there established, both to France and to the lightship on the Goodwin Sands, which is equipped for sending and receiving ether wave signals. Throughout the period of my visit, messages, signals, congratulations, and jokes were freely exchanged between the operators sitting on either side of the Channel, and automatically printed down in telegraphic code signals on the ordinary paper slip at the rate of

twelve or eighteen words a minute. Not once was there the slightest difficulty or delay in obtaining an instant reply to the signal sent.

'. . . Marconi has placed a lightship on the Goodwins in instant communication, day and night, with the South Foreland lighthouse. A touch of a key on board the lightship suffices to ring an electric bell in the room at the South Foreland, twelve miles away, with the same ease and certainty with which one can summon the servant to one's bedroom at a hotel. An attendant now sleeps hard by the instrument at South Foreland. If at any moment he is awakened by a bell rung from the lightship, he is able to ring up in turn the Ramsgate lifeboat, and, if need be, direct it to the spot where its services are required within a few seconds of the call for help. In the presence of the enormous practical importance of this feat alone, and of the certainty with which communication can now be established between ship and shore without costly cable or wire, the scientific criticisms which have been launched by other inventors against Signor Marconi's methods have failed altogether in their appreciation of the practical significance of the results he has brought about.

'Up to the present time none of the other systems of wireless telegraphy employing electric or magnetic agencies has been able to accomplish the same results over equal distances. Without denying that much remains yet to be attained, or that the same may not be effected in other ways, it is impossible for anyone to witness the experiments without coming to the conclusion that neither captious criticism nor official lethargy should stand in the way of additional opportunities being afforded for a further extension of practical experiments. . . The public have a right to ask that the fullest advantage shall be taken of that particular service which ether wave telegraphy can now render in promoting the greater safety of those at sea, and that, in view of our enormous maritime interests, this country shall not permit itself to be ousted by others in the peaceful contest to apply the outcome of scientific investigations and discoveries in every possible direction to the service of those who are obliged to face the perils of the sea.'

Spanning the Channel

Nothing in the previous history of wireless telegraphy aroused such keen interest as the spanning of the Channel. It set the scientific world talking and filled the newspapers with descriptions, comments, and prophecies. In the late summer of 1899 the British Association held its meeting at Dover. Here is a quotation from Kemp's diary regarding the experiment carried out on that occasion:

'This was a great day in the development of wireless telegraphy. The meeting of the French Association was being held at Boulogne while that of the British Association was being held in Dover Town Hall. Dr. J. A. Fleming gave a lecture to the British Association on the stage in the Connaught Hall and it had been arranged that at a certain time during this lecture, I should transmit a long message of congratulation across the English Channel from the British Association to the French Association at Boulogne, via Wimereux and the French land line. The answer, sent from the French Association via the land line and wireless from Wimereux to the stage of Connaught Hall, was taped and read out to the British Association by Professor Fleming.'

Increasing the Range

At this time Marconi was directing his attention towards increasing the range of communication. By raising the height of the aerial it was possible to send messages to greater distances, but as there was a limit to the practical height of the masts on land as well as at sea a great deal of attention was also directed towards increasing the sensitivity of the receivers. In his early days Marconi had used an improved form of coherer consisting of a small tube containing metal filings which had the peculiar property of allowing a current of electricity to pass through them only when they were under the influence of a high-frequency electric wave, the passage of the current constituting a signal and being used to make a click in a telephone or to work a telegraphic recorder.

About 1899, however, Marconi introduced tuned circuits which made the receiver much more sensitive and more selective than it had been before. This improvement not only enabled messages to be recorded at greater distances but also enabled a number of services to be carried on without interfering with one another. The patent for this system, the number of which was 7777, became famous in the history of wireless.

At this time a number of experiments were carried out with the Marconi system in the Royal Italian Navy and in July 1899 this system of telegraphy was used for the first time during the British Naval manœuvres. H.M.S. *Alexandria*, *Europa*, and *Juno* were fitted with the apparatus. Marconi went on board one man-of-war and some of his assistants were on the other ships, and the Navy was shown what could be done with wireless telegraphy. It was with the Royal Navy that the parent Marconi company obtained its first contract of importance. This was for fitting twenty-eight naval ships and four land stations in

July 1900. A further agreement was made with the Admiralty in 1901, and this was again extended in later years. Another important result of the naval manœuvres in 1899 was the proof it gave Marconi of another of his beliefs—which had been received with some scepticism—that the curvature of the earth offered no obstacle to the reception of wireless signals.

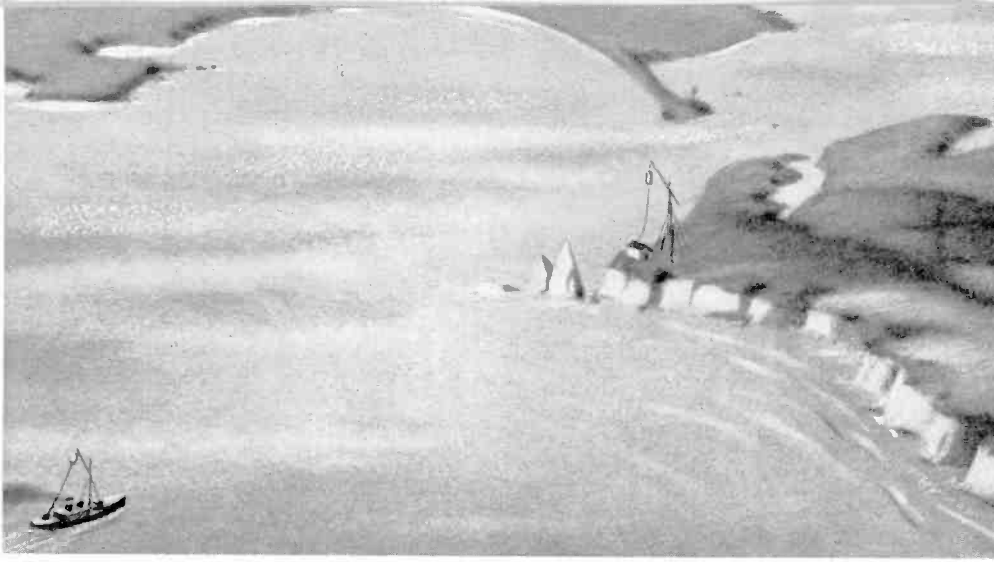
It was in this year that the South African war broke out, and to-day it comes as somewhat of a shock to read in one of Mr. Winston Churchill's books a description of the situation that existed as recently as the closing of the last century, when General Sir Redvers Buller was sent out from England to take command of the British Forces. The contrast between the complete isolation of Sir Redver Buller's party once they had put to sea in the *Dunottar Castle* in 1899, and facilities as they exist to-day, make us almost imagine that Mr. Churchill is describing those far-off days when beacons of fire were the accepted means of communication, instead of an episode which took place on the very threshold of the twentieth century.

'Whilst the issues of peace and war seemed to hang in their last flickering balance, and before a single irrevocable shot had been fired we steamed off into July storms', wrote Mr. Churchill. 'There was, of course, no wireless at sea in those days, and, therefore, at this most exciting moment the Commander-in-Chief dropped completely out of the world. After four days at sea the ship called at Madeira, where there was no news. Twelve more days passed in silence and only when the *Dunottar Castle* was two days from Cape Town was another ship sighted, coming from the "land of knowledge" from which it would be possible to obtain news. Signals were made to the steamer, a tramp, asking for news, upon which she altered course to pass within a hundred yards of the *Dunottar Castle*, and held up a blackboard bearing the words, "Three battles. Penn Symonds killed". Then she steamed on her way, and the Commander-in-Chief, whose troops had been in action without his knowledge, was left to meditate upon this cryptic message.'

Contrast this experience with the immediate communication there is to-day not only between Governments and their representatives in all parts of the world, at sea as well as on shore, but between the most humble ocean traveller and his friends, and we get some idea of the revolution in human relations which Marconi created.

Wireless used to report Yacht Race

In September and October 1899, wireless was used to report from the high seas the progress of the yachts *Shamrock* and *Columbia* in the



Metallic Cylinder Aerial used by Marconi at the Needles, Isle of Wight, 1897

Memorial to the Needles Wireless Station, Alum Bay, Isle of Wight. There are inscriptions on four sides, one recording that on June 3, 1898, Lord Kelvin sent from the Needles Station the first radio telegram for which payment was made; another, that it was on November 5, 1899, that the information for the first newspaper ever produced at sea—'The Transatlantic Times'—was transmitted from the station by wireless telegraphy and printed on the United States liner 'St. Paul' when fifty-six miles distant

G. Marconi

THE TRANSATLANTIC TIMES.

VOLUME I. NUMBER I.

THE TRANSATLANTIC TIMES

Published on board the "*ST PAUL*," at Sea, *en route* for England, November 15th, 1899.

One Dollar per Copy in aid of the Seamen's Fund.

Mr. W W Bradfield, Editor-in-Chief. Mr T Bowden, Assistant Editor. Miss J B Holman, Treasurer. Mr H H McClure, Managing Editor.

Through the courtesy of Mr G Marconi, the passengers on board the "St Paul," are accorded a rare privilege, that of receiving news several hours before landing. Mr Marconi and his assistants have arranged for work the apparatus used in reporting the Yacht Race in New York, and are now receiving dispatches from their station at the Needles. War news from South Africa and home messages from London and Paris are being received.

The most important dispatches are published on the opposite page. As all know, this is the first time that such a venture as this has been undertaken. A Newspaper published at Sea with Wireless Telegraph messages received and printed on a ship going twenty knots an hour!

This is the 52nd voyage eastward of the "St Paul." There are 375 passengers on board, counting the distinguished and extinguished. The days' runs have been as follows ;—

Nov.	9th	435
,,	10th	436
,,	11th	425
,,	12th	424
,,	13th	431
,,	14th	414
,,	15th	412

97 miles to Needles at 12 o'clock, Nov. 15th

BULLETINS

1.50 p m. . . . — . First Signal received, 66 miles from Needles

2-40 "Was that you "St. Paul"? 50 miles from Needles.

2-50 Hurrah! Welcome Home! Where are you?

3-30 40 miles, Ladysmith, Kimberley and Mafeking holding out well. No big battle. 15,000 men recently landed.

3-40 "At Ladysmith no more killed. Bombardment at Kimberley effected the destruction of ONE TIN POT. It was auctioned for £200 It is felt that period of anxiety and strain is over, and that our turn has come."

4.00 Sorry to say the U. S. A. Cruiser "Charleston" is lost. All hands saved

The thanks of the Editors are given to Captain Jamison, who grants us the privelege of this issue

The first ocean newspaper, autographed by Marconi on the date of publication, November 15, 1899

Reduced facsimile of the 'Cunard Daily Bulletin', issue of June 8, 1904

CUNARD DAILY BULLETIN.

CUNARD DAILY BULLETIN.

MARCONIGRAMS

DIRECT TO THE SHIP.

EDITORIAL OFFICE:
R.M.S. "CAMPANIA."

Wednesday, June 8th, 1904. 1-00 p.m.

Received from the Marconi Station Cape Breton, (Canada).

Distance from New York 1,300 miles.

CANADIAN NEWS.

Introduction of Budget.

Telegrams to hand announce that Mr. Fielding, the Canadian Minister of Finance, has introduced into Parliament his Budget, recommending that the duties be increased on the following articles :—Cloths, Cordage and China and reduced on Glass and Molasses. It is observed that no protection on steel has been announced.

—o—

STEEL STRIKE.

We are informed that the situation in connection with the Sydney (Canada) Steel Works remains unchanged, and that Government intervention has been refused.

—o—

ENGLISH NEWS.

The King has announced that he will open the Anglo-American University Athletic Meet at the Queen's Club.

STOP-PRESS.

Wednesday, June 8th, 1904, midnight.

Received from Marconi Station, Cape Cod (U.S A.).

Distance, 1,030 miles.

Travis, who won Golf Tournament last week made poor showing in open tournament. Nine players entered on first round at Toppingham.

WAR NEWS.

A fleet of junks from Dalny arrived at Chefoo and report several days' continuous firing between Dalny and Port Arthur. A rumour has reached London that Port Arthur has fallen.

Wednesday June 8th, 1904, 9.30 p.m.

Received (through Reuter's) from the Marconi Station, Poldhu England.

Distance from Liverpool 2,050 miles.

AMERICAN SUBMARINE

According to a report circulated yesterday, an American submarine during tests remained submerged 12 hours with 9 men on board.

Wednesday, June 8th, 1904, 10-30 p m

Received from the Marconi Station Cape Breton (Canada).

Distance from New York, 1,300 miles.

The Chairman of the Cunard Steamship Company has forwarded to Mr. Marconi on the "Campania" in mid Atlantic the following Marconigram :—

"I trust that this message will reach you promptly and wish you continued success with your Wireless Telegraphy."

"Inverclyde"

Cunard Daily Bulletin.

CUNARD DAILY BULLETIN. 3

FOREIGN NEWS

The residence of an Englishman at Tangiers was entered on Tuesday by party of armed Moors, who demanded and took away rifles and money. In consequence of this, the British Consul has demanded the immediate arrest of the malefactors. It is reported that the Officials hesitate to take action as the chief instigator is an influential Moor.

CRIPPLE CREEK RIOTS.

Conditions at Cripple Creek still remain very disturbed. A vigilance committee composed of mine owners and business men are in control of the mining districts. They have arrested two hundred Union sympathisers.

MEETING OF KING EDWARD AND EMPEROR WILLIAM.

A cable despatch from Paris states, that the approaching visit of King Edward with the Emperor William at Kiel, calls for no anxiety, it is even thought that the meeting may improve German French relations.

Lind, an American correspondent of the London "Daily Telegraph," has been shot by Chinese near Newchang (See our previous Marconigrams)

Heavy firing near Port Arthur points to the commencement of the final struggle.

It is reported that the Russian Fleet intends to emerge from the harbour at the crucial moment and fight for its life.

FINANCIAL

Latest advices report Stock Market strong and prices better all round

DAILY RUNS.

		Knots.	Lat.	Long.
Sunday, June	5	306	to noon from Liverpool	
Monday, ,,	6	518	49-52 N.	28 03 W.
Tuesday ,,	7	510	46 20 N.	34-18 W
Wednesday ,,	8	524	42 00 N.	45 23 W.

WIND AND WEATHER

Yesterday.

Day opened with a fresh E.N E breeze and rough sea. In the afternoon the wind went round to the W.S.W., and blew with the force of a moderate gale.

The sea decreased at noon but towards night it became rough again.

The temperature of the air at 4 a.m., was 53° Fahrenheit; at 8 p.m., the Mercury had jumped to 64°, that of the sea was 58° at 1 a.m., and at 8 p.m., it had risen to 67°

SHIPPING INTELLIGENCE

At 3-45 p m., yesterday in Lat., 41-19 North, and Long., 46-45 West, we passed two miles to the Northward of an American Line steamer bound West

—o—

R.M.S. "Campania," June 8th, 1904.

Mr. E. H JOHNSTONE,
Manager & Director,
"Daily Express,"
London,

Writes :—

Today's "Bulletin" is a model of what an ocean newspaper should be. We have all the news that counts from all parts of the world—all the news that is worth telling and nothing more—and we have it presented to us in a form which reflects the greatest credit upon the members of your editorial and mechanical staffs. Were all the resources of London or New York at your disposal it could not be better printed.

Reduced Fac Simile of the Cunard Daily Bulletin, Issue of June 8.

International Yacht Race in American waters. Marconi superintended the reporting of the races at New York where in less than five hours more than four thousand words were despatched between the ship carrying the apparatus and the shore station, from whence the messages were transmitted over land wires to the *New York Herald*. During this trip to America Marconi carried out tests in American warships. On the return journey Marconi fitted the steamer *St. Paul* with his apparatus, and on November 15, 1899, he established communication with the Needles station when over sixty miles distant. Major Flood Page described this great event in history in a letter to *The Times* which appeared in that paper on November 15, 1899. He wrote:

'As Mr. Marconi left New York, he cabled to the office of the Company in London that he would speak to the Needles from the s.s. *St. Paul* on their arrival in English waters. Having ascertained that the *St. Paul* was expected at Southampton on Wednesday, Mr. Jameson Davis and I met at Yarmouth, Isle of Wight, on Tuesday afternoon and arrived at the Needles about five p.m. We had an assistant with us and set to work at once to speak to the Haven. Even in those days the arrival of the Atlantic steamers could not be timed to an hour, but those whom we consulted seemed to agree that the *St. Paul* would pass up about ten to eleven o'clock on Wednesday morning. To make assurance doubly sure one of the assistants passed the night in the instrument room, but his night was not disturbed by the ringing of his bell, and we were all left to sleep in peace. Between six and seven a.m. I was down; everything was in order. The Needles resembled pillars of salt as one after the other they were lighted up by the brilliant sunrise. There was a thick haze over the sea, and it would have been possible for the liner to pass the Needles without our catching a sight of her. We chatted away pleasantly with the Haven. Breakfast over, the sun was delicious as we paced on the lawn, but at sea the haze increased to fog; no ordinary signals could have been read from any ship passing the place at which we were.

'The idea of failure never entered into our minds. So far as we were concerned, we were ready, and we felt complete confidence that the ship would be all right with Mr. Marconi himself on board. Yet, as may easily be imagined, we felt in a state of nervous tension. Waiting is ever tedious, but to wait for hours for the first liner that has ever approached these or any other shores with Marconi apparatus on board, and to wait from ten to eleven, when the steamer was expected, on to twelve, to one, to two—it was not anxiety, it was certainly not doubt, not lack of confidence, but it was waiting.

'We sent out our signals over and over again, when, in the most natural and ordinary way, our bell rang. It was 4.45 p.m.

'Is that you, *St. Paul?*'

'Yes.'

'Where are you?'

'Sixty-six nautical miles away.'

'Need I confess that delight, joy, satisfaction swept away all nervous tension, and in a few minutes we were transcribing, as if it were our daily occupation, four cablegrams for New York, and many telegrams for many parts of England and France, which had been sent fifty, forty-five, forty miles by "wireless" to be despatched from the Totland Bay Post Office.'

First Ship's Newspaper

It was on this occasion that the first ship's newspaper ever to contain news received by wireless was published on board the *St. Paul*, when she was steaming up the English Channel. The liner was fifty miles away from the Marconi experimental land station at the Needles when messages were received on board. During the next one and a half hours further messages were received on board, giving the latest news regarding the South African war. The master, Captain J. C. Jamison, gave instructions that some souvenir of the occasion should be prepared for those passengers who were prepared to pay a dollar in aid of the Seamen's Fund. And just before the vessel docked at Southampton copies of *The Transatlantic Times* were printed and available to passengers and crew.

Two items in this first newspaper to be published at sea may be of some interest.

3.30 Ladysmith, Kimberley, and Mafeking holding out well. No big battle. 15,000 men recently landed.

3.40 At Ladysmith no more killed. Bombardment at Kimberley effected the destruction of ONE TIN POT. It was auctioned for £200. It is felt that period of anxiety and strain is over, and that our turn has come.

CHAPTER FIVE

Formation of Marconi Marine Company

THE first British Marconi Company was formed in July 1897. It then went by the name of the Wireless Telegraph and Signal Company, Limited, but was later changed to Marconi's Wireless Telegraph Company, Limited. The main objects of the Company were to institute regular telegraphic services nationally and internationally, and negotiations were carried on between the Company and the British Post Office for many years from 1897 onwards.

The story of the parent company's relations with the Post Office has already been told in another recent Marconi volume and does not come within the purview of this book; but it is to be noted that, prior to 1904, it was free to anyone to put up stations in this country for communicating with places outside the United Kingdom or with ships outside the three-mile limit. It was, therefore, quite unnecessary for the Company to ask permission or to obtain a licence to do so. When a licence had been refused to the Company for communicating within the jurisdiction of the United Kingdom—that is, inside territorial waters—the Company started unaided to develop its own system of shore stations for communicating with ships at sea. Up to 1900, when The Marconi International Marine Communication Company, Limited, was formed, the parent company had twelve such stations which were all put up entirely at the Company's expense, without any Government licence, contract, agreement or assurance of any kind.

When The Marconi International Marine Communication Company was founded in April 1900, the authorised capital was £350,000 divided into 350,000 shares of £1 each.

The first directors were as follows:

M. de Volder, President de la Banque d'Outremer and Director of 'La Societe Generale, Brussels', President.

Major S. Flood Page, Managing Director of Marconi's Wireless Telegraph Company, Limited.

M. le Colonel Thys, Managing Director of the Banque d'Outremer and Managing Director of the Congo Railway Companies, Brussels. Managing Director for the Continent.

Mr. G. Marconi, Director and Technical Adviser of Marconi's Wireless Telegraph Company, Limited. Technical Adviser.

M. Balser, Banker, Brussels.

Mr. J. F. G. Ballantyne, D.L., Director of Marconi's Wireless Telegraph Company, Limited.

Colonel Sir Charles Euan-Smith, K.C.B., Chairman of Cape Electrical Railways.

Herr Adolph von Hansemann, of the 'Disconto Gesellschaft', Berlin.

Senor Moret Y. Prendergast, ex-Minister of Colonies, Madrid.

M. Naegelmaeckers, Managing Director of the 'Compagnie Internationale des Wagon-lits', Paris.

M. Albert L. Ochs, of Messrs. Ochs Brothers, London and Paris.

M. Renouard, Vice President of the 'Banque de Paris et des Pays-Bas', Paris.

M. Charles Roux, Vice-President of the Suez Canal Company, Paris and Marseilles.

Mr. Henry S. Saunders, Director of Marconi's Wireless Telegraph Company, Limited.

The Company's Aims

It was stated in the prospectus that it was proposed to add other representative gentlemen. Extracts from the prospectus are as follows:

> 'The above company has been formed for the purpose of working throughout the world, except in the United States of America, Hawaii, Chile, and colonies or dependencies of those states, an exclusive licence for all maritime purposes to be granted by Marconi's Wireless Telegraph Company, Limited. In Great Britain and Italy the licence is limited to maritime mercantile and yachting purposes, and does not extend elsewhere to vessels forming part of the Navy of Great Britain or Italy.'
>
> 'Mr. Marconi's wireless telegraphy will not only add to the safety and security of the vast fleets of passenger and trading vessels navigating all seas; but it may reasonably be anticipated that it will be the means of creating a sea telegraph business which will add considerably to the revenue of the existing Government telegraphs. The directors will endeavour to work hand in hand with all Governments whose interests seem for the most part identical with those of the Company.'
>
> 'It will be seen that the Company is "international" inasmuch as the directors represent British, German, French, Belgian, Italian, and Spanish interests, and they hope to establish marine wireless telegraphy on a sound commercial basis practically throughout the world.'

'The influence of the directors will be used to the utmost to establish and extend the business in England, on the Continent of Europe, and elsewhere.'

'Shares are only offered at present to the shareholders of Marconi's Wireless Telegraph Company, Limited, and the terms of issue are stated below.'

It was also stated that Mr. Marconi had accepted the position of Technical Adviser to the Company for three years with a seat on the Board. The circular and prospectus was signed by Henry W. Allen, F.C.I.S., Secretary, and was issued from 18, Finch Lane, London, E.C., on June 18, 1900.

The auditors were Messrs. Cooper Brothers and Company, the Manager Mr. H. Cuthbert Hall, and the Marine Superintendent Captain C. V. Daly.

First Ordinary Meeting

The first ordinary (statutory) meeting of the Company was held at the Company's offices, Finch Lane, London, on Wednesday, August 1, 1900, with Major S. Flood Page in the Chair.

This meeting was held just after the assassination of the King of Italy. Major Flood Page referred to the kind assistance, help and consideration of the King of Italy to Mr. Marconi at the commencement of his great work. He had heard Mr. Marconi speak over and over again of the kindness, courtesy, and help which the King and Queen of Italy had given him.

This was a purely formal meeting at which no resolutions could be proposed, but the chairman was able to give some information regarding the progress which had been made. The Board, of course, looked to the foreign directors of the Company to attend to its business abroad. They were all men of 'high consideration, great experience, and strong financial position, representing almost every country in Europe'. Many conversations had been held with the Belgian ministers concerned with the Telegraph and Posts and Marine and also with the Prime Minister of Belgium, and a site had been determined upon for the erection of the first Marconi station in Belgium. A Belgian steamer was about to be fitted.

Another director had been added to the Board in M. Edgar St. Paul de Sincay, of Paris, who was Administrateur des Chargeurs Reunis of Havre, a large and successful French shipping company. The French directors were approaching the French Government and were about to enter into negotiations with a view to obtaining permission for concessions for the Company in France. Negotiations had been commenced with the Spanish Government; and the Company, through its London offices, was in close communication with Newfoundland with a view to establishing stations there.

A Difficult Task

The Marconi Company's task—and it was admittedly a difficult one—was to persuade those Governments who had monopoly of the telegraph services that the Company was going to help them; that if the Company succeeded they would increase the Governments' revenue and would in no sense be in competition with them; and if they allowed the Company to erect shore wireless stations, they would undertake to establish a Marconi service with ships by which communication could be carried on and business would therefore accrue to them in that manner. The experiments which Mr Marconi was carrying out gave very great promise that the system would be successful, scientifically and commercially.

First Naval Contract

Some difficulty had been experienced with the British Post Office, but a contract had been made with the British Navy arranging that thirty-two ships or torpedo stations would be equipped with Marconi apparatus, but work had not yet been commenced. A ship was to be fitted at Portsmouth and another at Portland, and communication had to be established from one to the other. It was a long distance, and there was a range of hills between the two places. 'We know it is difficult', said Major Flood Page, 'but we expect to carry out the contract with confidence. We have had this Marconi apparatus at Delagoa Bay on four of Her Majesty's ships for several weeks, and in no case had it failed to give satisfaction'.

The Company had received a most flattering telegram which had been sent to their chief assistant, Mr. Bullock, from one of the captains of Her Majesty's ships stating that they were delighted with the work carried out and that it had given direct communication with the ships.

A Committee was sitting to determine various questions with reference to communication between the land, lighthouses, and lightships. The only thing that could be said was that the Company had communicated between a lightship and the land for twelve months, morning, noon, and night, and in fog, and had never met a failure of any kind. There could be no talk of dividends yet, but these were bound to follow good and successful work.

Next year, at the end of June 1901, the directors were able to report that Marconi stations had already been erected on various points of the coast of Great Britain and Ireland at Withernsea, Caister, North Foreland, Lizard, Holyhead, Port Stewart, Rosslare, Crookhaven, and at La Panne, Belgium, Borkum lighthouse and Borkum Riff lightship, Germany, in addition to which the following stations had been equipped by Marconi's Wireless Telegraph Company, Limited, and were available for communication: Nantucket lightship and Siasconset, U.S.A. They were daily expecting to hear that the station at Belle Isle—the entrance to the Gulf of St. Lawrence, Canada—was ready for communication.

CHAPTER SIX

Early Installations in Ships

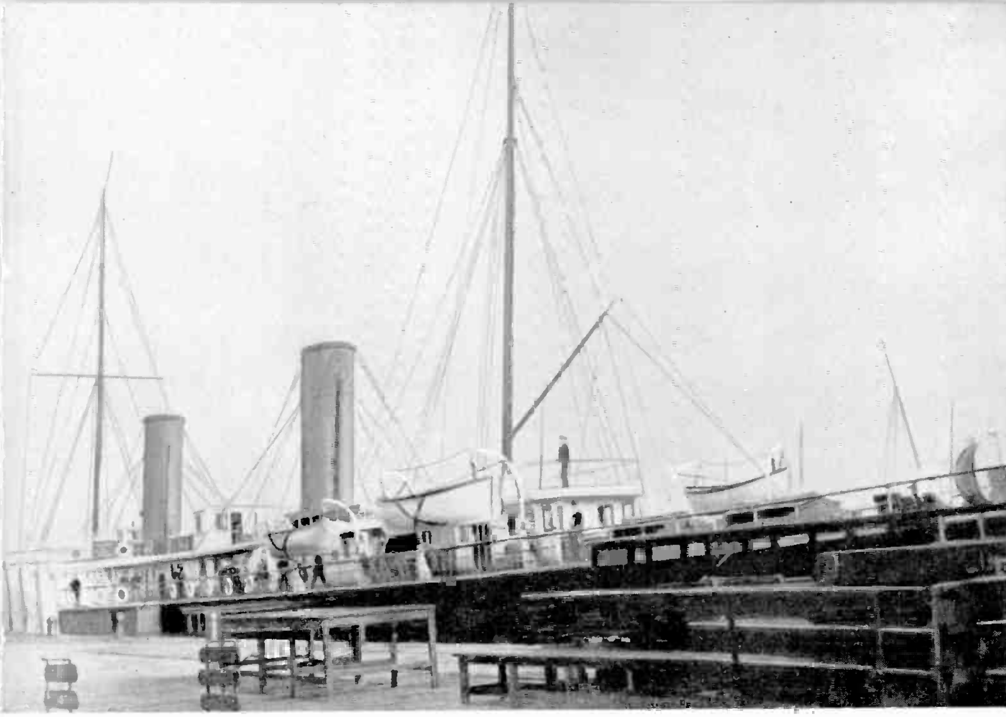
THE first merchant vessel to be equipped commercially with the Marconi system was the *Kaiser Wilhelm der Grosse*, owned by the Norddeutscher Lloyd. This was the vessel which Germany had built to capture the 'Blue Riband' of the North Atlantic from the Cunard liner *Lucania*. At the same time Marconi apparatus was installed on the Borkum Riff lightship and at the Borkum lighthouse.

These two stations were nominally erected for the Norddeutscher Lloyd Steamship Company, but there is no doubt that the German Government were highly interested in what they could do, realising even then the strategic importance of such stations for communication with ships at sea. The installations worked excellently and served to handle many messages to and from the *Kaiser Wilhelm der Grosse*, which, curiously enough, was brought to book through the medium of wireless telegraphy early in the war of 1914–18. Both these stations were installed by Mr. W. W. Bradfield, later to become General Manager of the Company. As electrical assistant to Signor Marconi he had previously taken part in the experimental work on Salisbury Plain, and assisted in the erection of the wireless station at the Needles, Isle of Wight.

During the second half of the year 1900 over 580 telegrams were received by the Borkum lightship from passing shipping equipped with wireless apparatus, and twenty telegrams by the lighthouse.

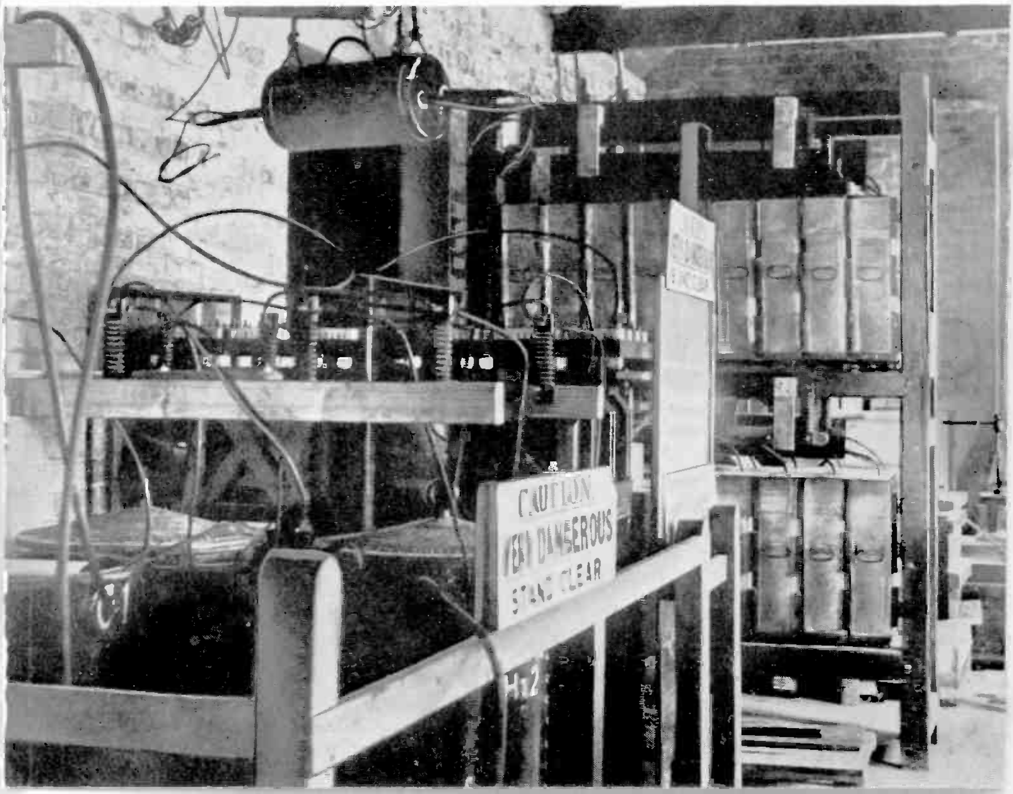
The total number of words transmitted during this time was over eight thousand, and the commercial value of the system was undoubtedly proved. Its utility was demonstrated in a dramatic manner when the lightship broke away from her moorings during a gale. A wireless message for help resulted in the rescue of the crew who would certainly have been drowned but for the existence on board of the Marconi apparatus.

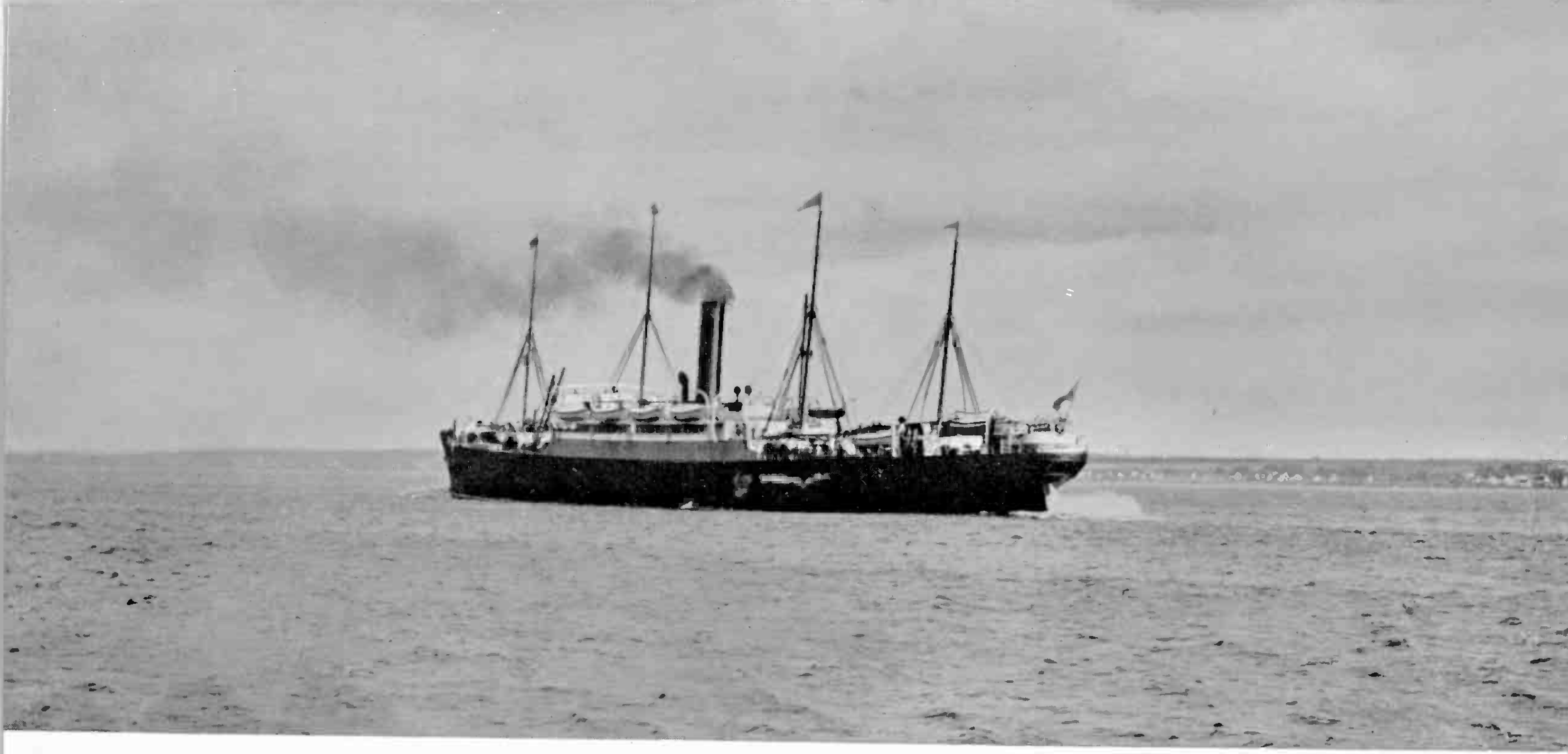
In November 1900 the Belgian Royal Mail Steam Packet, *Princesse Clementine*, plying between Ostend and Dover, was equipped by the Marconi International Marine Company and a Marconi station was installed at La Panne, near Ostend, on the Belgian coast. These installations frequently proved of great value in saving life and property. On New Year's Day, 1901, the barque *Medoro* was stranded, waterlogged, on the Ratel Bank. The *Princesse Clementine*, which happened to pass



The S.S. 'Princesse Clementine', showing the wireless cabin built between the funnels

Transmitting equipment at Poldhu, 1901





Photograph by courtesy of The Canadian Pacific Railway

The S.S. 'Lake Champlain' the first ocean-going British ship to be fitted with Marconi's wireless telegraph apparatus in 1901. This vessel was then owned by the Beaver line, which was a few years later taken over by the Canadian Pacific Railway Company near, at once sent a message to Ostend through the La Panne station, and before leaving was able to tell the shipwrecked sailors that assistance was on the way.

Shortly afterwards, upon coming into signalling distance of the Roytengen lightship, about fifteen and a half miles from Dunkirk, the master of the *Princesse Clementine* observed that he was being signalled. It appeared that the lighting apparatus of the lightship was out of order. The captain at once despatched a message via the La Panne station to the Lighthouse Department at Dunkirk, which immediately sent out to the lightship and effected the necessary repairs. The great inconvenience and danger involved in the lightship being unable to exhibit a light was thus avoided. On January 19, 1901, the *Princesse Clementine* herself ran ashore and news of the accident was telegraphed to Ostend by wireless.

'*Lake Champlain*'s' Equipment

The first British merchant vessel to be fitted with Marconi apparatus was the steamer *Lake Champlain*, of the Beaver Line, in 1901.

The wireless operator of the *Lake Champlain* on her first voyage with the new apparatus was Mr. F. S. Stacey, who had served as operator in the *Princess Clementine*. That vessel having proved successfully that wireless telegraphy was a reliable form of communication, Captain C. V. Daly, the Marconi Company's marine superintendent, arranged with the Beaver Line to install a set on board the *Lake Champlain*. The arrangements were made with 'a Mr. Jones', later to become Sir Alfred Jones, one of Liverpool's pioneer shipowners and a director of Elder Dempster and Company.

As there was no accommodation available in the *Lake Champlain* for wireless apparatus, a special cabin had to be built, and it may be of interest to compare this with the specially designed and equipped cabins of to-day. It consisted of little more than a cupboard 4 ft. 6 in. in length and 3 ft. 6 in. in width, one side being formed by the iron bulkhead. It was made of match boarding, without any windows, and when natural light was required the door had to be opened. The total cost of this structure was five pounds.

The apparatus itself was mounted on a table covered with green baize, the accumulators being placed on the floor and the lamp resistance for charging the cells screwed on to the wall. Two induction coils were supplied, one of which was kept as a spare. The two coil boxes, one on top of the other, served as a seat, the empty coil boxes providing a convenient cupboard for spares and sundries.

In an article in the *Wireless World* in June 1917, Stacey recalled some of the incidents of that first voyage of the first British ship to be fitted with wireless telegraphy. She sailed on May 21, 1901, with about 1200 people on board. Soon after clearing, communication was established with the station at Holyhead, and later with Rosslare. Numerous messages were sent and received to and from the owners, and private messages were also sent by members of the crew. The busy time soon ceased, however, for there were no other stations with which to communicate in Great Britain, and none had yet been erected on the American side. The new wireless installation naturally aroused tremendous interest among the passengers and crew, who crowded about the tiny cabin from morning until evening.

When the ship arrived at Halifax, special articles appeared in the newspapers and were cabled to America and England. On arrival at Montreal representatives of several scientific societies and technical colleges visited the ship, and Mr. Keeley, at that time Government Inspector of Telegraphs, travelled from Ottawa to examine the apparatus.

Communication between Ships at Sea

The return voyage was without incident until, on calling Crookhaven, which station had not been erected at the time of the outward voyage but which was by then working, Stacey was considerably surprised to receive a call from the S.S. *Lucania*, which was outward bound on her first voyage with wireless. Stacey exchanged several messages with the operator (J. St. Vincent Pletts) and as soon as communication was finished Crookhaven was picked up. Telegrams were sent to the owners and to Queenstown, and received some hours before they would have been if the old method of signalling by means of flags had been used. After leaving Queenstown, communication was established with Rosslare and Holyhead, and in due course the *Lake Champlain* arrived at Liverpool.

The first Cunard liner which sailed with Marconi apparatus on board was the *Lucania* on June 15, 1901. The Cunard Company made a long trial of the installation, and their second ship was not fitted with wireless telegraphy until September 21, when the *Campania* sailed. There was a rather significant exchange of messages between the *Lucania* and *Campania*, when the two vessels met some time later in mid-Atlantic. Here it is:

Campania: Are you there?
Lucania: Yes, here—*Lucania*.
Campania: Have you anything for us?
Lucania: Yes; *Lucania* sends best wishes for a pleasant voyage. All well.

Campania: All right. Thanks. Message for Captain McKay. Captain Walker sends his respects to Captain McKay. We have experienced very bad weather since leaving Liverpool. All well.

Lucania: Message received all right. Thanks.

Campania: Have you seen any ice, or have you experienced any fog, please?

Lucania: No; have seen no ice or experienced any fog. We have had fine weather up to the present. What is your position now, please?

Campania: Let us have your position; we will get ours.

Lucania: Our position—latitude 48.15 N., longitude 38.29 W.

Campania: Thanks; our position is latitude 48.50 N., longitude 38.29 W.

Lucania: 2.45 a.m. Goodbye. Pleasant voyage.

Campania: 2.50 a.m. Return the compliment.

The two vessels talked for a distance of 140 miles. The *Lucania*, which was on voyage from New York to England, had maintained communication with the Nantucket lightship at the entrance to New York for 287 miles.

Ice Warnings

It will be noted that one of the questions asked by the *Campania* was whether the *Lucania* had met much ice. The significance of this conversation was not lost, for the proposition was put by an eminent authority a few days afterwards that 'supposing some day when two vessels meet like that in the middle of the Atlantic, one states that something has gone wrong, that she has broken her shaft, lost part of her propeller, or something of that kind, and if the ship is saved by reason of the Marconi wireless apparatus being on board, we could then say, I take it, that every first-class liner would feel constrained to put this system on board their vessels, and it would not be surprising if we saw underwriters in the course of time reducing their premiums for insurance on Marconi-fitted ships'. Another advantage which did not receive mention at the time was the fact that such warnings regarding ice conditions might mean the avoidance of disaster to a liner and her precious living freight.

The *Lucania*, by the way, had been concerned, together with the *Campania* but a short time before, with the establishing of what might be called a wireless banking system at sea. A first cabin passenger on the latter steamer realised that he had not brought enough money to meet the amount of Customs dues likely to be levied in New York on the presents he had purchased in Europe. He knew his mother had sailed in the *Lucania* from New York on the same day that he sailed from Liverpool and he prepared the following message for the operator of the *Campania* to despatch as soon as communication could be established with the *Lucania*.

> 'Mrs. J. L. Robertson passenger *Lucania*. Pay purser *Lucania* £10, asking him advise purser *Campania* to pay me. Henry.'

Communication with the *Lucania* was made shortly after midnight one Tuesday when the steamers were nearly one hundred miles apart, and shortly before two o'clock on the Wednesday morning the purser of the *Campania* was awakened by the steward with this message from the *Lucania:*

> 'Graham purser *Campania*. Pay Henry Robertson £10. Have collected amount from his mother aboard *Lucania*. Milliken.'

And as soon as Mr. Robertson awoke he was informed by the purser that he was fifty dollars wealthier than when he went to sleep.

The Cunard Company, as befitted one of the oldest and at the same time most enterprising shipping companies, was among the first to adopt the system in their largest Atlantic liners.

The equipping of the *Lucania* and *Campania* was followed on September 28, 1901, by that of the *Umbria* and on October 12 by the installation of Marconi wireless apparatus in the *Etruria*.

First Transatlantic Signals

The chief event of the year, however, so far as the development of the invention itself was concerned, occurred in December 1901 when Marconi, at St. John's in Newfoundland, received wireless signals from the Company's station at Poldhu in Cornwall—a distance of over 2170 miles across the ocean. This was achieved in spite of adverse circumstances, the masts which had been erected for the permanent station having suffered severely from the winter gales.

This achievement of transmitting signals by wireless telegraphy from Poldhu to St. John's, Newfoundland, a distance of over 2000 miles, may fairly be said to have startled the world, for it marked an enormous stride forward in the development of the Marconi system. Its advantages to merchant shipping were becoming increasingly obvious. Marconi's own record of that historic occasion reads as follows:

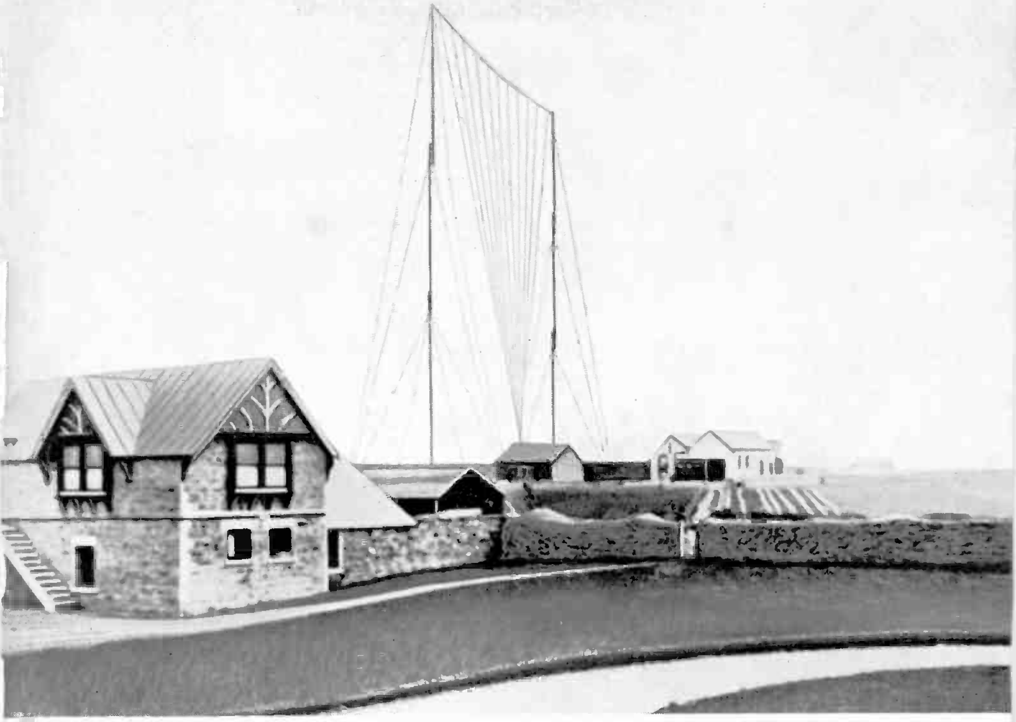
'On November 26, 1901, I sailed from Liverpool in the liner *Sardinian* accompanied by two assistants, Messrs. Kemp and Paget. As it was clearly impossible at that time of the year, owing to the inclement weather and especially in view of the shortness of the time at our disposal to erect high poles to support the aerial, I had arranged to have the necessary aerial supported in the air by a small captive balloon, and so we took with us two balloons as well as six kites.

SIGNAL HILL, NEWFOUNDLAND, DECEMBER 12, 1901

A drawing of the kite-suspended aerial by means of which the first Transatlantic wireless signals were received by Marconi at Signal Hill, Newfoundland, on December 12, 1901. The receiving instruments were in the room in the hospital attached to the Military Barracks, through the window of which the aerial and earth wires can be seen to enter. The aerial wire suspended by the kite was 500 feet in length.

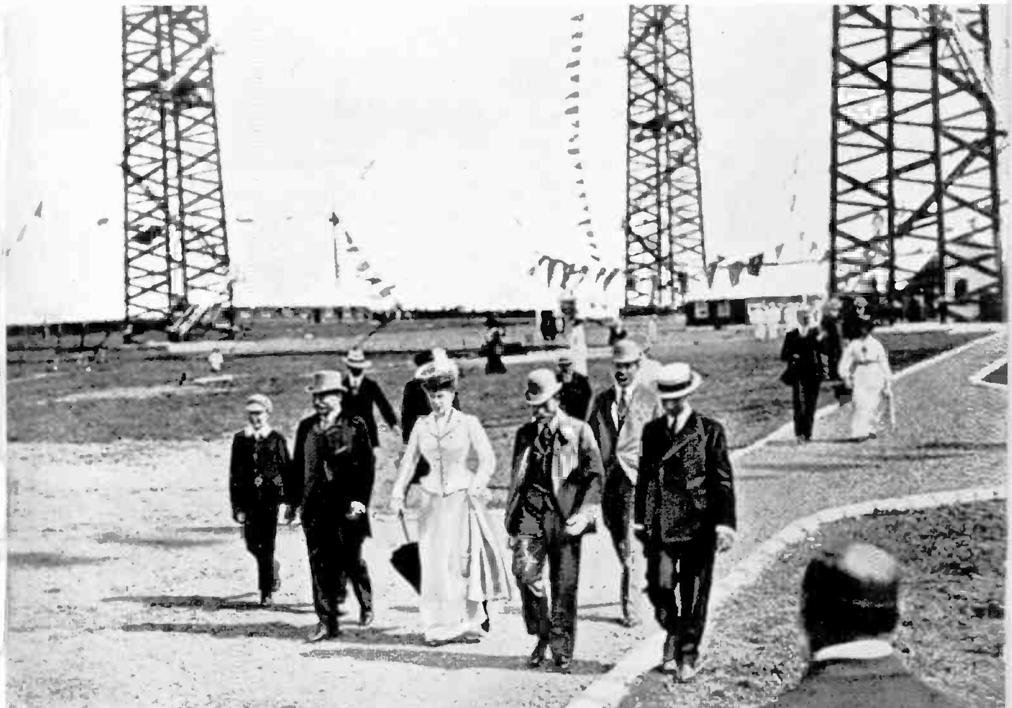
Marconi at Signal Hill with instruments used to receive the first Transatlantic signals, December 1901

Marconi with G. S. Kemp and P. W. Paget at Signal Hill, Newfoundland, December 1901



The two masts and fan aerial used in the actual transmission from Poldhu in December 1901

Their Majesties King George V and Queen Mary visit Poldhu Station, June 18, 1903 when they were Prince and Princess of Wales



The granite column which marks the site of the Marconi wireless station at Poldhu, used in the first Transatlantic experiments, 1901

'We landed at St. John's on Friday, December 6, and the following day, before beginning operations, I visited the Governor, Sir Cavendish Boyle, the Premier, Sir Robert Bond, and other members of the Ministry who promised me their heartiest co-operation and placed the resources of every department of the Government at my disposal in order to facilitate my work. They also offered me the temporary use of such lands as I might require for the erection of depots at Cape Race, or elsewhere, if I should eventually determine to erect the wireless stations which they understood were then being contemplated.

'After taking a look at the various sites which might prove suitable, I considered that the best one was to be found on Signal Hill, a lofty eminence overlooking the port and forming the natural bulwark which protects it from the fury of the Atlantic gales. On top of this hill there is a small plateau of some two acres in area which I thought very suitable for the manipulation of either the balloons or the kites. On a crag on this plateau rose the new Cabot Memorial Tower which was designed as a signal station, and close to it there was an old military barracks which was then used as a hospital. It was in a room in this building that I set up my apparatus and made preparations for the great experiment.

'On Monday, December 9, barely three days after my arrival, I began work on Signal Hill together with my assistants. I had decided to try one of the balloons first as a means of elevating the aerial and by the Wednesday we had inflated it and it made its first ascent during the morning. Its diameter was about fourteen feet and it contained some 1000 cubic feet of hydrogen gas, quite sufficient to hold up the aerial which consisted of a wire weighing about ten pounds. Owing, however, to the heavy wind that was blowing at the time, after a short while the balloon broke away and disappeared to parts unknown. I came to the conclusion that perhaps the kites would answer better, and on Thursday morning, in spite of the furious gale that was blowing, we managed to elevate one of the kites to a height of abour four hundred feet.

'It was a bluff, raw day; at the base of the cliff, three hundred feet below us, thundered a cold sea. Oceanward, through the mist I could discern dimly the outlines of Cape Spear, the easternmost reach of the North American continent, while beyond that rolled the unbroken ocean, nearly two thousand miles of which stretched between me and the British coast. Across the harbour the city of St. John's lay on its hillside, wrapped in fog.

'The critical moment had come for which the way had been prepared by six years of hard and unremitting work in the face of all kinds of criticisms and of numerous attempts to discourage me and turn me aside from my ultimate purpose. I was about to test the truth of my theories, to prove that the three hundred patents that the Marconi companies and myself had taken and the tens of thousands of pounds which had been spent in experimenting and in the construction of the great station at Poldhu, had not been in vain.

'In view of the importance of all that was at stake I had decided not to trust to the usual arrangement of having the coherer signals recorded automatically through a relay and a Morse instrument on a paper tape, but to use instead a telephone connected to a self-acting coherer, the human ear being far more sensitive than the recorder. Suddenly, about half past twelve there sounded the sharp click of the "tapper" as it struck the coherer, showing me that something was coming and I listened intently.

'Unmistakably, the three sharp little clicks corresponding to three dots, sounded several times in my ear; but I would not be satisfied without corroboration. "Can you hear anything, Mr. Kemp?", I said, handing the telephone to my assistant. Kemp heard the same thing as I, and I knew then that I had been absolutely right in my calculations. The electric waves which were being sent out from Poldhu had traversed the Atlantic, serenely ignoring the curvature of the earth which so many doubters considered would be a fatal obstacle, and they were now affecting my receiver in Newfoundland. I knew that the day on which I should be able to send full messages without wires or cables across the Atlantic was not far-distant and, as Dr. Pupin, the celebrated Serbo-American electrician, very rightly said shortly afterwards, the faintness of the signals had nothing to do with it. The distance had been overcome and further development of the sending and receiving apparatus was all that was required.

'After a short while the signals stopped, evidently owing to changes in the capacity of the aerial wire which in turn were due to the varying height of the kite. But again at 1.10 and at 1.20 the three sharp little clicks were distinctly and unmistakably heard, about twenty-five times altogether. On the following day the signals were again heard though not quite so distinctly. On Saturday a further attempt was made to obtain a repetition of the signals but owing to difficulties with the kite we had to give up the attempt. However, there was no further doubt possible that the experiment had succeeded, and that afternoon, December 14, I sent a cablegram to Major Flood Page, one of the directors of the Marconi Company, informing him that the signals had been received but that the weather made continuous tests extremely difficult. That same night I also gave the news to the Press at St. John's whence it was telegraphed to all parts of the world.'

CHAPTER SEVEN

Cable Companies' Apprehensions

THE sequel to this successful experiment was an intimation from the Anglo-American Telegraph Company that the work upon which Marconi was engaged was a violation of their rights. They claimed that they had a monopoly for telegraph business in Newfoundland, but arrangements were made, with the aid of generous encouragement on the part of the Canadian Government and in the United States, to set up stations on the other side of the Atlantic.

The cable companies were showing some signs of nervousness that this newcomer in the world of overseas communications might eventually prove a serious competitor, and endeavours were made to allay the fears of shareholders in the cable companies.

Expert opinion quoted by Sir John Wolfe Barry, chairman of the Eastern Telegraph Company and Mr. Francis Bevan, of the Anglo-American Telegraph Company, at their annual meetings was as follows:

> 'Causes of disturbance, which may or may not be remedied in the future, are at present existent, and fatal to the establishment of a practical and reliable system of commercial (wireless) telegraphy. I am, therefore, very clearly of opinion that submarine cable enterprise has nothing to fear in a commercial sense from the competition of ætheric telegraphy.'

The second read thus:

> 'To the best of my belief submarine cables will for a long time be pre-eminent for the purpose of long-distance telegraphy. It is manifest that wireless or open methods cannot compete in point of secrecy or certainty with closed or cable methods, and could only compete with them in point of speed and accuracy by aid of great improvements and new inventions involving little less than discoveries.'

The first of these passages was from the pen of Sir William Preece, and the second represented the opinion of Sir Oliver Lodge. It is, however, only fair to say that at that time the only knowledge of Marconi's work which Sir William Preece possessed was at least three years old. The same statement also applied to Sir Oliver Lodge. And the Marconi Marine Company itself was in 1902 only two years old.

Even when the first public announcement of success was made, quite a few responsible people refused to believe it. For example in the *Daily Telegraph* of December 18, 1901, we find the following statement:

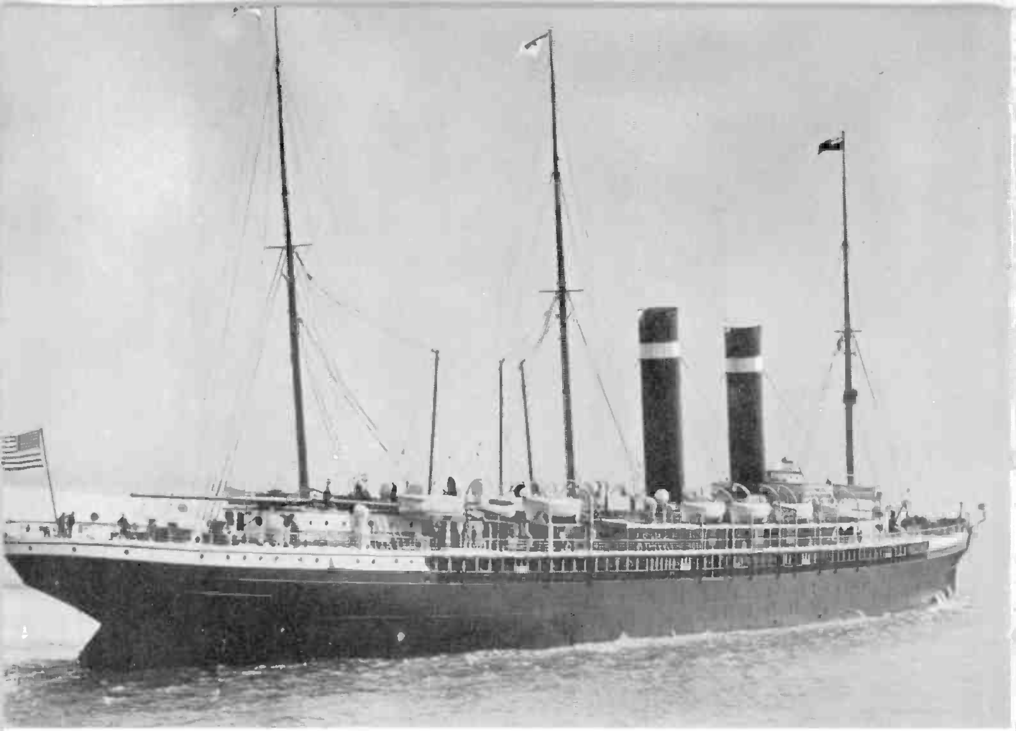
> 'Notwithstanding the detailed, signed statement by Signor Marconi, appearing in the *Daily Telegraph* yesterday, there was an indisposition . . . to accept as conclusive his evidence that the problem of wireless telegraphy across the Atlantic had been solved by the young inventor. Scepticism prevailed in the city. "One swallow does not make a summer", said one, "and a series of 'S' signals do not make the Morse code." The view generally held was that electric strays and not rays were responsible for actuating the delicate instruments recording the "S's" supposed to have been transmitted from near the Lizard to Newfoundland on Thursday or Friday. Some attributed these wandering currents to the old trouble—earth currents, others to the presence of a Cunarder fitted with Marconi apparatus, which was, or should have been, within two hundred miles of the receiving station at St. John's on the day of the experiment.'

In the same newspaper Sir William Preece was reported as having said that 'We shall want more information than we have at present . . . because the letters "S" and "R" are just the letters most frequently signalled as the result of disturbance in the earth or atmosphere'.

There is no doubt that wireless telegraphy was up against enormous vested interests in the cable industry which were reflected to some extent in a hostile attitude assumed by a portion of the electrical press.

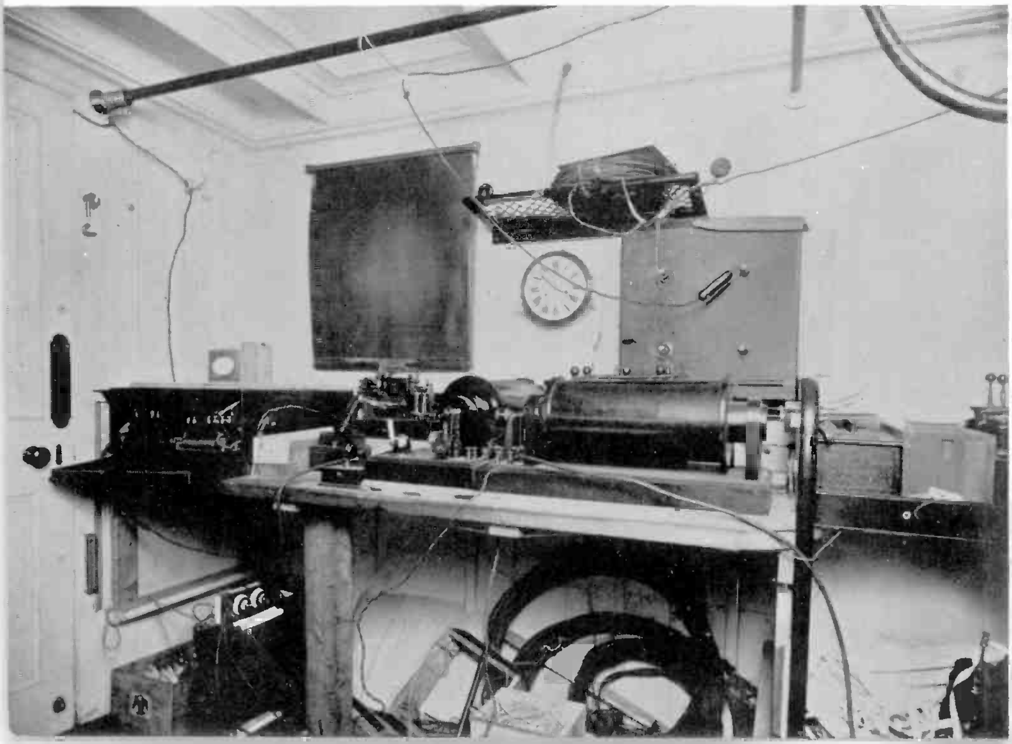
What Marconi thought about it all may be gathered from a letter he wrote to *The Times* on January 8, 1935, on the occasion of that paper's 150th anniversary. He was particularly glad to do this, he said, because he could 'never forget the inestimable assistance and support' which *The Times* gave him during the early days of his wireless experiments, particularly in 1901, after his successful attempt to send and receive wireless waves across the Atlantic. 'At that time and for long afterwards', he continued, 'certain important sections of the technical press in this country were against me, and spared no efforts in their determination to discredit both me and my work on long-distance wireless communication. From the first, however, *The Times* declared its belief in me, and was swift and forceful to rebuke those who persisted in a policy of disparagement. Radio has made very great strides since 1901, and yet I often look back on those early days and remember with deep gratitude what a wonderful encouragement and support it was to me to know that a great newspaper like *The Times* had faith in me even as

The S.S. 'Lucania', the first ship of the Cunard fleet to be fitted for transmitting and receiving wireless messages. She first sailed with the apparatus installed on June 15, 1901



The S.S. 'Philadelphia', in which, in October 1902, readable messages were received from Poldhu up to a distance of 1551 miles, and test letters as far as 2009 miles

Inside the cabin fitted as a Wireless room in the S.S. 'Philadelphia'



regards my work relating to the utilisation of electric waves for world-wide communication.'

Difficulties of the Inventor

Truly is the path of the pioneer and the inventor bestrewn with difficulties and obstacles! Even when he has succeeded in his self-appointed task he has prejudice and unbelief to overcome.

It was the same with the marine steam engine. It was in 1819 that the American steamship *Savannah*, of 300 tons, arrived at Liverpool from Savannah, Georgia, having made the passage in thirty-one days. She was fully rigged as a sailing vessel with auxiliary steam power, and her paddles were removable, but her crossing was only partly achieved by steaming, for the greater proportion of her voyage was made under sail. An historian of those times has suggested that it was due to the questionable success of the *Savannah*, combined with the fact that about this time and for some years afterwards, men of science were demonstrating—at least to their own satisfaction—that the navigation of the Atlantic by steam power alone was the dream of a visionary, that the renewal of this bold experiment of endeavouring to cross the Atlantic entirely by steam was postponed for several years. Not until 1838 was the practicability of profitably employing vessels propelled by steam on an Atlantic voyage fully tested when the *Sirius* and the *Great Western* both accomplished this feat. It was in that year that the British Admiralty issued advertisements for tenders for the conveyance of the North American mail by steamers. As all the world knows, the contract was eventually awarded to Samuel Cunard, George Burns, and David MacIver, and from this partnership sprang the vast maritime undertaking now known as the Cunard White Star Line.

The first sailing of a Cunard Company's vessel was that of the *Britannia*, in July 1840, but less than five years previously, Dr. Lardner had delivered a lecture at Liverpool emphasising the opinion which he had expressed on previous occasions that no steamship would ever be able to make so long a voyage as that of crossing the Atlantic without re-coaling. In the report of the lecture, which appeared in the *Liverpool Albion* of December 14, 1835, it was stated that, 'as to the project, which was announced in the newspapers, of making the voyage directly from New York to Liverpool, it was, Dr. Lardner had no hesitation in saying, perfectly chimerical, and they might as well talk of making a voyage from New York or Liverpool to the moon'.

And here is another curious, but interesting, instance of the miracle of to-morrow being pooh-poohed to-day:

Let us go back to the year 1869, when a select committee was appointed to consider the bill by which the inland telegraphs of the country were transferred to the State. In the minutes of evidence there are some references to the possibility of telegraphy without wires. The eminent electrician, Sir Charles Wheatstone, was asked, 'You have no faith whatever in telegraphy without wires?' He replied, 'Not in the least'.

Mr. R. S. Culley, chief engineer of one of the telegraph companies and afterwards chief engineer of the Post Office, expanded this answer:

'I take it from what you have said (he was asked) that it is your opinion that no system is likely to come into use within a comparatively short time which would dispense with the use of posts and wires.'

'I do not think it is possible', he answered; 'in fact I know it is impossible'.

And he proceeded to throw ridicule on suggestions which had been made in this direction by a Mr. Haworth as follows:

'He professes to have discovered a plan which amounted to this, I think; you had a galvanic battery placed in this room; you got the exact direction of New York; you placed this apparatus so as exactly to face New York; you had another apparatus in New York placed so as exactly to face this room, and the message would go from here to New York. It seemed to be almost equivalent to telling the message where to go; it was quite as absurd a plan as that.'

There was, however, no escaping the fact that in 1901 the Atlantic had been bridged by Marconi's wireless; but we find Dr. Fleming writing to *The Times* again after the transmission of wireless messages across the Atlantic, to disprove another suggestion. In connection with this long-distance work it was, of course, important to establish the fact that the powerful long-distance waves sent out from the power station at Poldhu would in no way interfere with the Marconi short-distance apparatus employed on ships to enable them to communicate with one another and with the shore. It had been suggested in certain technical journals that this would be the case. But Marconi proved the fallacy of such statements. Dr. Fleming fully satisfied himself that 'the operations of power stations such as Poldhu are absolutely without effect upon any communication between ship and shore, when carried out with the apparatus'.

The Poldhu Station

The Poldhu station played a very important part in the development of wireless. The site it occupied from 1900 to 1933 is now marked by a granite column, which was unveiled in 1937 by Mr. R. N. Vyvyan, formerly engineer-in-chief of the Marconi Company. A plaque on the monument reminds visitors that from this station, designed by John Ambrose Fleming and erected by the Marconi Company, were transmitted the first signals ever conveyed across the Atlantic by wireless telegraphy. Other plaques record that the Poldhu station was used by the Marconi Company for the first transoceanic service of wireless telegraphy which was opened with a second Marconi station at Glace Bay, in Canada, in 1902. When the Poldhu station was erected in 1900, wireless was in its infancy; when it was demolished in 1933, wireless was so firmly established as to have become almost indispensable for communication on land, at sea, and in the air, for direction finding, broadcasting, and television.

It was from the Poldhu station in 1923 and 1924 that Charles Samuel Franklin, inventor of the Franklin beam aerial, directed his short-wave wireless beam transmission to Marconi in his yacht *Elettra*, cruising in the South Atlantic. The epoch-making results of these experiments led to the foundation of modern high-speed radio telegraphic communication to and from all quarters of the globe.

The site of the column, together with some six acres of land on the edge of the cliffs, the cliffs and the foreshore beneath them, was given to the National Trust in 1937 by the Marconi Company to commemorate the pioneer work done between 1900 and 1933 by its research experts and radio engineers.

CHAPTER EIGHT

Further Tests in Atlantic Liners

TRANSATLANTIC communication by wireless having thus been achieved, although with imperfect apparatus, Marconi and his co-workers were sufficiently convinced that by means of permanent stations (that is, stations not dependent upon kites or balloons for sustaining the elevated aerial) and by the employment of more power in the transmitters it would be possible to send messages across the Atlantic Ocean with the same facility with which they were being sent over much shorter distances.

A short time later, in October 1902, further tests were carried out between Poldhu and a receiving station on board the American liner *Philadelphia* en route from Southampton to New York. The sending apparatus was the same as that used for the Newfoundland experiments. The receiving aerial on the ship was fixed to the mainmast, the top of which was sixty metres above sea level. As the elevated conductor was fixed and not floating about with a kite, as in the case of the Newfoundland experiments, good results were obtained on a syntonic receiver, and the signals were all recorded on tape by the ordinary Morse recorder.

On the *Philadelphia*, readable messages were received from Poldhu up to a distance of 1551 miles, and test letters as far as 2009 miles. The tape records of the signals were exhibited and the distances at which they were received were all verified and countersigned by the captain and chief officer of the ship who were present during the tests. Captain Mills of the *Philadelphia* had also marked on a chart the various positions of the ship between England and America at which the communications from Poldhu were received. The results obtained in the *Philadelphia* amply proved that the station at Poldhu was capable at that time of transmitting signals to a distance of at least 2000 miles.

Canadian Government's Support

Having been granted a subsidy of £16,000 by the Canadian Government to support his experiments, Marconi commenced the construction of another long-distance station at Glace Bay in Nova Scotia. In December 1902 messages were exchanged for the first time at night between the stations at Glace Bay and Poldhu, but it was found that communication was exceedingly difficult and unreliable from England to Canada, whilst it was good in the opposite direction. The reason for this was that the Glace Bay station was equipped with a more powerful and expensive installation—a condition rendered possible by the Canadian subsidy—whilst the Marconi Company was reluctant to expend large sums of money for the purpose of increasing the range of the Poldhu station owing to the uncertainty of what might or might not be the attitude of the British Government at that time towards the Poldhu project.

As, however, messages could then be sent for the first time by wireless telegraphy from Canada to England, inaugural messages were sent to the Kings of England and Italy, both of whom had previously given Marconi much assistance and encouragement in his work, and both of whom, by their replies, expressed their appreciation of the messages they had received. Other messages were also sent to England by the Canadian Government, during the transmission of which officers delegated by the Italian Government and a representative of *The Times* were present. Further tests were shortly afterwards carried out with the other long-distance station at Cape Cod in the United States, and a message from President Theodore Roosevelt was transmitted from that station to the King of England.

In the spring of 1903 the transmission of news messages from America to *The Times* was attempted in order to demonstrate that messages could be sent from America by means of the new method, and these messages were correctly received and published in that newspaper.

Experiments were continued with Poldhu and in October 1903 it became possible to supply the Cunard steamship *Lucania* with news transmitted direct from the shore during her entire crossing from New York to Liverpool.

Arrangement with Lloyd's

Meanwhile, Lloyd's had entered into an arrangement with the Marconi Company to install wireless equipment at specified Lloyd's signal stations both at home and abroad, and it was agreed that these wireless stations should be employed not only for reporting passing ships but also for commercial telegraphic traffic to and from ships.

Lloyd's were entitled to great credit for adopting wireless at this stage. Up to the advent of the Marconi system, communication between passing ships at sea, and between vessels and the signal stations operated by Lloyd's had been effected by means of a series of flags hoisted according to the International code. In order to signal to coast stations vessels were often compelled to make a considerable detour from the most direct course, thus losing time, and, in many parts of the world, being brought dangerously close to a treacherous coast. This crude method had been in vogue for centuries and science did not come forward with anything sufficiently practical to obviate the use of flags until the Marconi system was shown to be effective for signalling to and from a moving vessel.

More Land Stations Established

This was an eventful period in the Company's history and in the year commencing June 30, 1902 its operations were greatly extended. The following stations were then available for communication with vessels fitted with Marconi apparatus.

Crookhaven	Rosslare
Holyhead	Lizard
Niton	North Foreland
Caister	Withernsea
Malin Head	Innistrahull
Belle Isle (Gulf of St. Lawrence)	Chateau Bay (Gulf of St. Lawrence)
Borkum lightship (Germany)	Borkum lighthouse (Germany)
Babylon (United States)	Sagaponack (United States)

In addition orders had been received from Lloyd's to equip their signal stations at the following points: Scilly, Flannan Island, Gallon Head or Butt of Lewis, Cape Spartel, Port Said, Suez, Tor and Shadwan, Gulf of Suez. An agreement had also been entered into with the Canadian Government providing for the equipment and maintenance of wireless telegraph stations on the Canadian coast.

Contracts had been secured with the Belgian Government under which one land station and nine of the Belgian mail steamers plying between Ostend and Dover were being equipped with Marconi apparatus. An agreement had also been concluded with the Government of the Congo Free State in pursuance of which two Marconi stations, one at Banana, in the Congo Free State, and the other at Ambrizete in the Portuguese colony of Angola, were in course of erection.

By the adoption during the year of the Marconi system by the American, Allan, and Atlantic Transport Lines, the business of the Atlantic sea telegraph service was virtually assured to the Company, and it was confidently anticipated that so soon as arrangements could be made for the erection of land stations at suitable points those shipping companies owning vessels plying on other routes, would avail themselves of the advantages offered by the Marconi system which had already been proved on the Atlantic route.

During the visit of the Colonial Premiers to this country in 1902, a demonstration of the practicability and utility of the Marconi system of wireless telegraphy was arranged for them on board the steamer *Koh-i-noor*. Great satisfaction was expressed by those who were present on the occasion, and as a result inquiries were received from and proposals submitted to several Colonial Governments.

A successful demonstration of the Marconi system was also carried out in the presence of officials of the Dutch Government at Scheveningen in April 1902, and proposals for the installation of a number of Marconi stations available for ship signalling purposes in the Dutch East Indies had subsequently been made and the stations were under construction.

Experiments in long-distance communication carried out by Marconi had been attended by highly satisfactory results. In July 1902, he succeeded in receiving signals on board the *Carlo Alberto*, the warship placed at his disposal by the Italian Government, from Cornwall when the vessel was at Cronstadt, at a distance of 1600 miles, and two months later messages were received on the same vessel at Spezia from Cornwall, a distance of over 800 miles across the Continent and the intervening Alps.

Other arrangements were being completed for further shore stations commanding important shipping routes. A School and Depot was about to be opened at Liverpool to facilitate the large amount of business which the Company conducted with vessels running to and from that port.

Liner Installations

The following year the directors were able to report a further extension of the Company's operations, an extension connected principally with the equipment of further ships, the coast stations mentioned as available for communication in the previous year's report having helped to encourage a great part of this increased shipping traffic. Preparations had, however, been made for a wireless service on routes other than the Atlantic, and to this end nine new coast stations had already been equipped, and there were on order fourteen further coast stations. The opening of these stations would, it was thought, result in profitable contracts with lines of ships voyaging on these routes, and mention was made of a contract already practically concluded relating to the equipment of a whole fleet plying on the Mediterranean route.

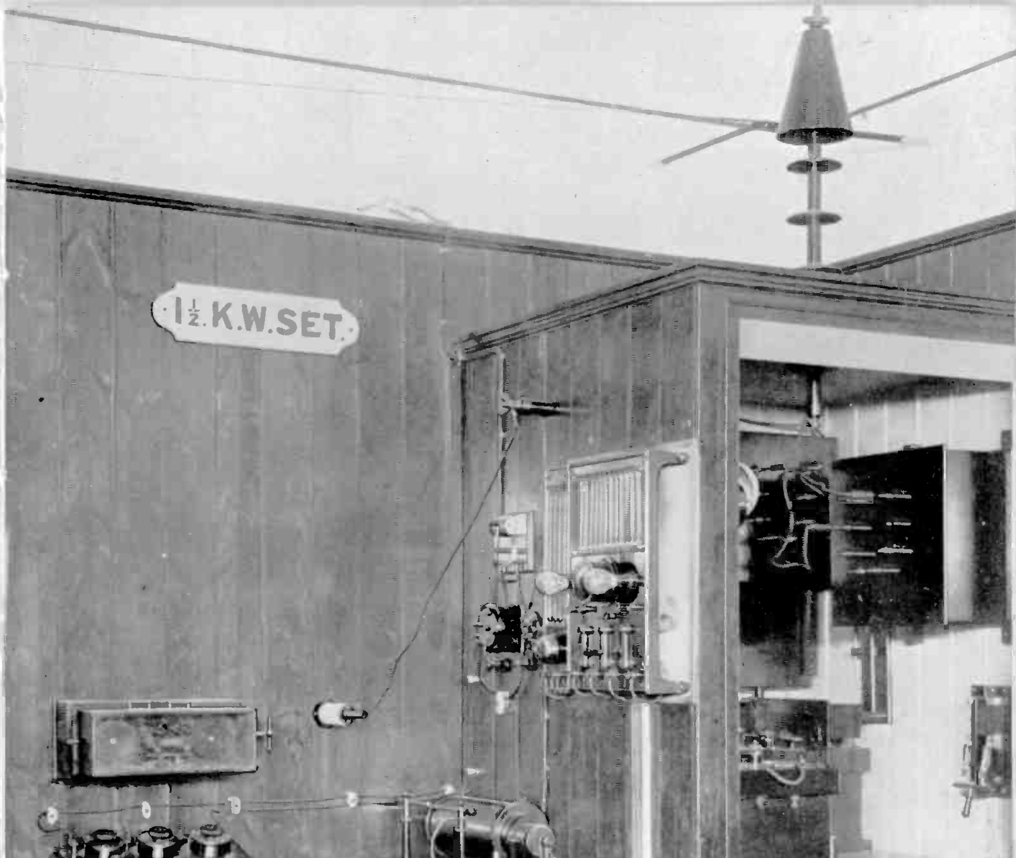
Of ships actually equipped at that time, particular mention was made of five of the Hamburg-Amerika Line, which discontinued the use of the German Slaby-Arco apparatus in order to avail itself of the Marconi system; two ships of the North German Lloyd, four of the Red Star Line, four of the Cunard Company (on the Boston Service), and four of the Compagnie Générale Transatlantique, making a total of nineteen. Other important shipping contracts were in negotiation.

The stations which had been erected or were in course of erection by the Marconi Company and its associated companies, including Lloyd's stations over which the Company were to have exclusive rights for wireless telegraph apparatus for fourteen years from September 26, 1901, now numbered fifty-four.

The Marconi system was now in regular and continuous use on the following ships.

Lines	*Vessels*		
Cunard Steam Ship Company	*Campania*	*Lucania*	*Aurania*
	Etruria	*Umbria*	*Carpathia*
	Ivernia	*Saxonia*	
Norddeutscher Lloyd	*Kaiser Wilhelm der Grosse*		
	Kronprinz Wilhelm		
	Kaiser Wilhelm II		
	Grosser Kurfurst		
	Kaiserin Maria Theresia		
Allan Line	*Parisian*	*Tunisian*	*Bavarian*
Atlantic Transport Line	*Minneapolis*	*Minnehaha*	*Minnetonka*
American Line	*Philadelphia*	*St. Louis*	*St. Paul*
	New York		
Compagnie Générale Transatlantique	*La Savoie*		*La Bretagne*
	La Lorraine		*La Champagne*
Belgian Mail Packet	*Princesse Clementine*		*Marie Henriette*
	La Flandre		*Prince Albert*
	Princesse Josephine		*La Rapide*
	Leopold II		*Ville de Douvres*
Red Star Line	*Zeeland*		*Finland*
	Vaderland		*Kroonland*
Hamburg-Amerika Line	*Deutschland*		*Moltke*
	Auguste Victoria		*Blucher*
Isle of Man Steam Packet Co.	*Empress Queen*		

In December 1903 the *Kroonland*, bound from Antwerp to New York, suffered a breakdown in her steering gear thirty miles from the Fastnet. The vessel was fitted with Marconi apparatus, and communication was immediately established with the station at Crookhaven, through which the Captain of the vessel sent messages to his owners in Antwerp, receiving instructions in return, and a large number of passengers sent reassuring messages to their friends in all parts of the world.



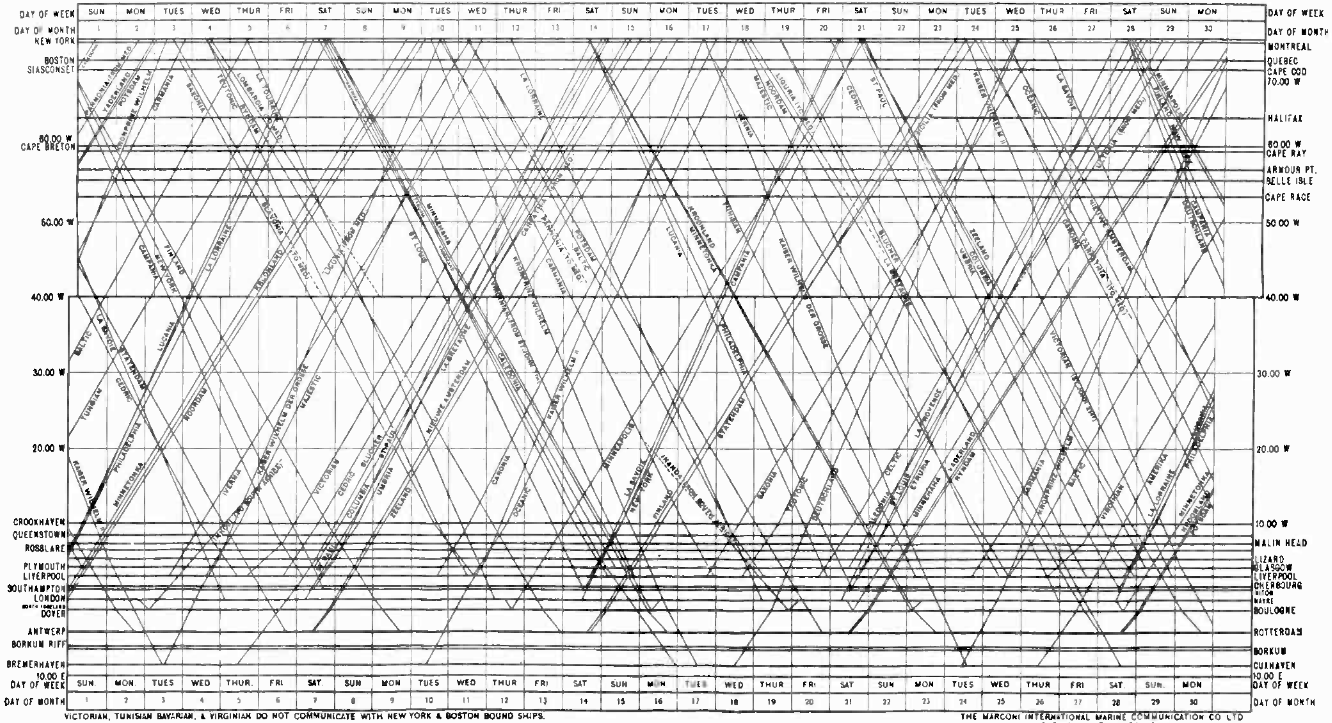
Early ship's wireless installation, 1½ kilowatt rotating spark gap and induction coil emergency transmitter, and Multiple Tuner with Magnetic detector for reception

MARCONI TELEGRAPH.

COMMUNICATION CHART.

APRIL 1906.

TIME TO BE USED WEST OF 40° LONGITUDE NEW YORK TIME, EAST OF 40° LONGITUDE GREENWICH TIME.
INTERSECTION OF LINES SHOWS EARLIEST TIME SHIPS CAN BE IN SAME LONGITUDE AT BEST AVERAGE SPEEDS.
COMMUNICATION SHOULD BE ESTABLISHED AT EVERY INTERSECTION EXCEPT AT CERTAIN POINTS OF THE ROUTE WHEN ONE VESSEL IS ON THE NORTHERN AND THE OTHER ON THE SOUTHERN TRACK.
EXAMINATION OF A NORTH ATLANTIC TRACK CHART WILL SHOW THE DISTANCE BETWEEN ROUTES OF DIFFERENT SHIPS DURING ANY VOYAGE.



An early Marconi Communication Chart covering the North Atlantic

CHAPTER NINE

Early Experiences of Radio Officers

ONE of the first operators in the *Philadelphia*, Mr. C. J. Weaver, has described how the wireless installation functioned. The sending apparatus consisted principally of a ten-inch induction coil with a few Leyden jars and a huge tuning coil. This had an effective range of seventy miles, but under favourable conditions communication was obtained up to one hundred miles. This limitation of range prohibited constant communication with land stations. The receiver employed was the old coherer and printer combination, which often became inoperative through loss of adjustment and required strong signals from nearby stations for good operation.

This apparatus would seem crude and ponderous in modern eyes, but it worked. The transmitter received its power from a bank of storage batteries and the crash of the spark in the open gap was a source of continual annoyance to those cabin passengers so unfortunate as to be quartered near the wireless room.

'I recall the old key which was used to break the heavy current for telegraphic signalling purposes', wrote Mr. Weaver. 'It was actually "pounded" and was equipped with giant platinum contacts. The maximum speed we could handle was about ten words a minute. And even at that slow rate of transmission operators would soon tire mostly of strain in the arm, as the key worked like a pump and required considerable expenditure of energy for operation. If we went faster the thing failed to function.

'Traffic was brisk even in the early days. Leaving England for America, we worked "NI" (Niton on the Isle of Wight), or "LD" (Lizard point, Cornwall). The first station we heard in America was the Nantucket lightship, "NS", which used to relay messages to the mainland. The first call sign of the *Philadelphia* was "PH". The rates were comparatively low even then, 20 cents a word, plus the land wire rates, being charged.

'I remember an occasion when the entire bank of Leyden jar condensers broke down. Not having any spares, I pasted tin foil on both sides of several jam jars. And it worked quite well!

The list of companies who had installed Marconi apparatus continued to grow and by 1906, we find amongst the newcomers the

Aberdeen Line with the *Inanda* and *Inkosi;* the Anchor Line with the *Columbia* and *Caledonia;* the Canadian Pacific Railway with the *Empress of Britain* and the *Empress of Ireland;* the Dominion Line with the *Canada* and the *Dominion;* the White Star Line with the *Baltic*, *Cedric*, *Celtic*, *Majestic*, *Oceanic*, *Republic*, *Teutonic*, *Arabic*, *Cymric*, and the *Adriatic*, then under construction.

Wireless Communication Chart

The ocean routes taken by the leading passenger lines were carefully adhered to, and as the dates of sailing of a number of ships were settled a considerable time in advance, it was possible to prepare a communication chart showing the position of the vessels on certain days on the Atlantic or other routes.

The communication chart, of which a copy is reproduced, showed for each day of the month in advance the approximate position of all the ships on Atlantic routes fitted with Marconi apparatus and enabled operators to know what ships were within range.

By the use of this chart a highly organised service of inter-communication between ships and shore was established by The Marconi International Marine Communication Company.

In 1906 only a few ships were equipped with Marconi long-distance receiving apparatus capable of receiving messages throughout the whole course of their voyage across the Atlantic. These were some half-dozen ships of the Cunard Line and five of the Hamburg-Amerika Line.

The chart reproduced here in respect of April 1906, indicates that the Cunard liner *Lucania*, due to leave America for the U.K. on Saturday, April 14, could expect to communicate with the *Minneapolis*, then 15 degrees W., bound for America, by relaying her messages through, say, the Marconi Service aboard the vessels *Carpathia*, *Zeeland*, *Baltic*, and *Carmania*.

Similarly, the *Lucania* might be expected to have reliable direct communication with the *Minneapolis* from the night of Monday the 16th until the early hours of Wednesday the 18th. Likewise a message from the coast station at Crookhaven, Ireland, could be routed for quick despatch to, say, the *Carmania*, south of Cape Race on April 12 by means of the Marconi installations on the steamships *Caronia*, *Caledonia*, and *Nieuw Amsterdam*.

For some years this tabulation of steamship movements continued not only in respect of the North Atlantic, but also for those other oceans on which Marconi wireless apparatus was increasingly being used.

Progress brought improved apparatus and the need for such charts lessened, for ships maintained direct intership communication for days and were no longer restricted to a few hours working.

Nevertheless, this chart will be of interest, not only to radio officers, but to all seafarers who may look back some forty years or more and see a record of the one-time famous Transatlantic steamships with their scheduled movements during the month of April 1906.

Many Ships Equipped

In 1907 the Anglo-American Oil Company, now known as the Esso Transportation Company, fitted the *Iroquois* and *Navahoe;* the Batavier Line the *Batavier II*, *Batavier III*, *Batavier IV*, and *Batavier V;* the Booth Line the *Antony*. The *Iroquis* and *Navahoe* were the first oil tankers to be fitted with Marconi's wireless telegraph equipment. To this oil company, therefore, goes the honour of being the first to fit wireless installation in commercial non-passenger ships. On June 30, 1907, there were 139 ships, British and foreign, fitted with Marconi's wireless telegraphy apparatus but, for the main part, they were all passenger carriers with the exception of a number of Trinity House lightships. In the following year the Anglo-American tankers *Narragansett* and *Tamarac* were so fitted, and by 1911 there were eleven ships of the Anglo-American Oil Company fitted with Marconi apparatus.

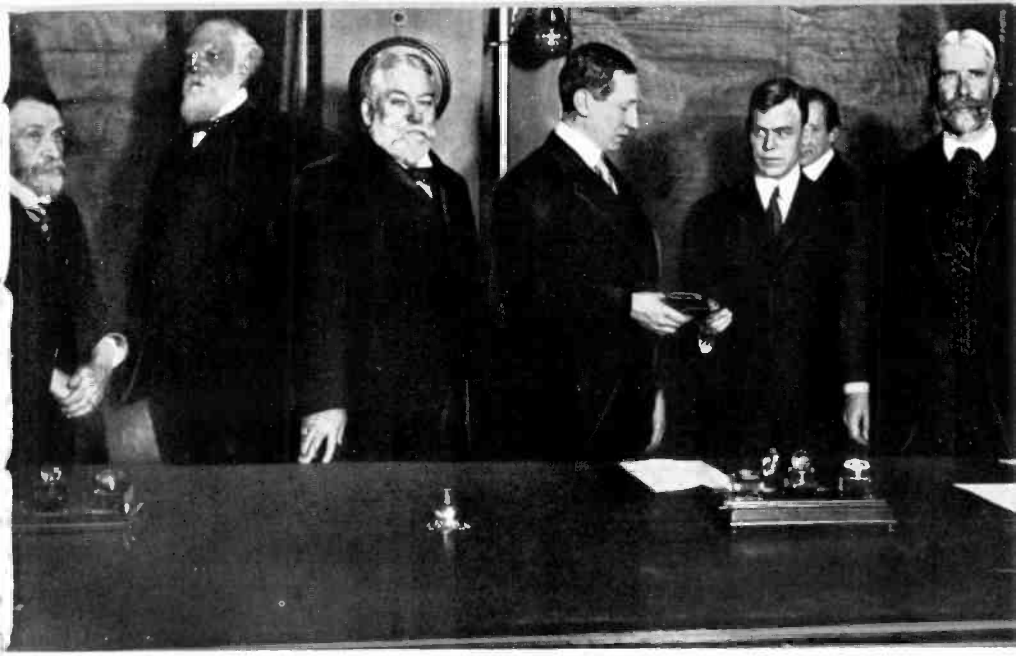
The first ships of the Royal Mail Steam Packet Company (now better known as Royal Mail Lines) to be fitted with Marconi's system of wireless telegraphy were the *Amazon*, *Araguaya*, *Aragon*, *Asturias*, and *Avon*. This was in 1908. The first P. and O. ships were the *Malwa* and *Mantua*, which were fitted in the same year.

The year 1909 saw many other shipping companies equipping their ships with wireless installations, among them being the Donaldson Line with the *Athenia*, *Cassandra*, and *Saturnia;* the Leyland Line's *Bohemian*, *Canadian*, *Cestrian*, *Devonian*, and *Winifredian;* the Orient Line's *Otranto;* the Union Castle Company's *Balmoral Castle;* the Wilson Line's *Aaro* and *Oslo;* and the Bibby Line's *Gloucestershire*. Alfred Holt began fitting three of their ships in 1910. These were the *Æneas*, *Anchises*, and *Ascanius;* the British India Steam Navigation Company fitted the *Rewa* and *Rohilla;* Elder Dempster eight of their ships; the New Zealand Shipping Company five of their largest vessels; and the Pacific Steam Navigation Company eight ships. Shaw Savill also fitted the *Arawa* and *Tainui;* Lamport and Holt the *Vauban* and *Vandyck*.

Other companies had extended their fleets, and in this year (1910) the Allan Line had sixteen ships fitted with Marconi apparatus, the

Anchor Line, eight; the Atlantic Transport Line, eight; the Booth Line, sixteen; the Canadian Pacific, twenty-two; the Cunard, fourteen, including the *Lusitania* and the first *Mauretania;* the Orient Line seven; the P. and O., twenty-four, including the second *Himalaya;* the Royal Mail, six; the Union-Castle, twenty-seven; and the White Star Line, twenty-five.

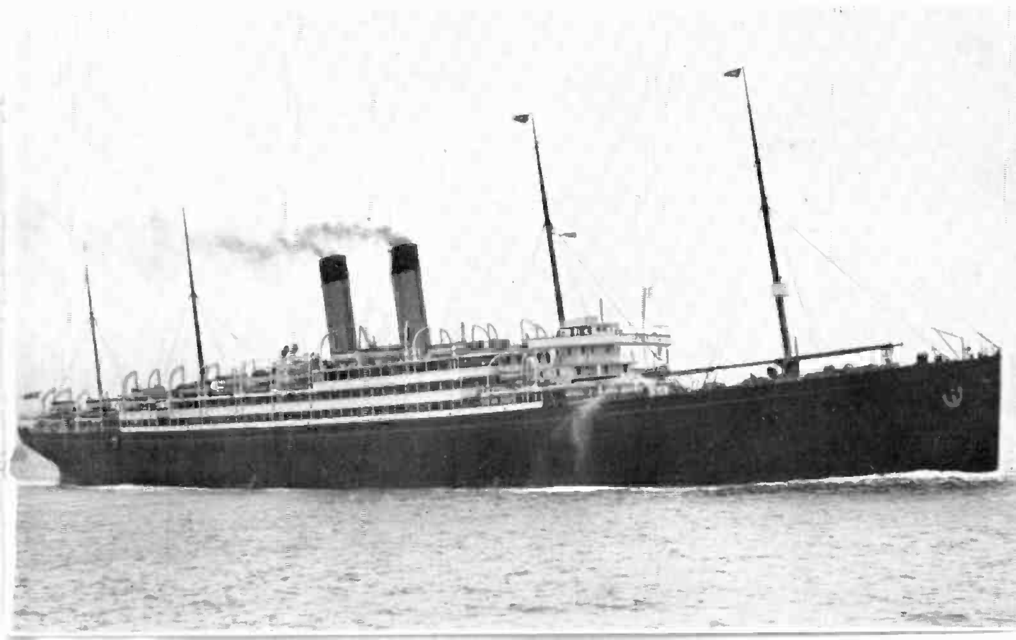
Lamport and Holt fitted nine of their ships during the year 1911; the London and South Western Railway Company fitted four of their cross-Channel ships, the *Cæsarea*, *Hantonia*, *Normannia*, and *Sarnia;* and Manchester Liners Limited, fitted the *Manchester City*.

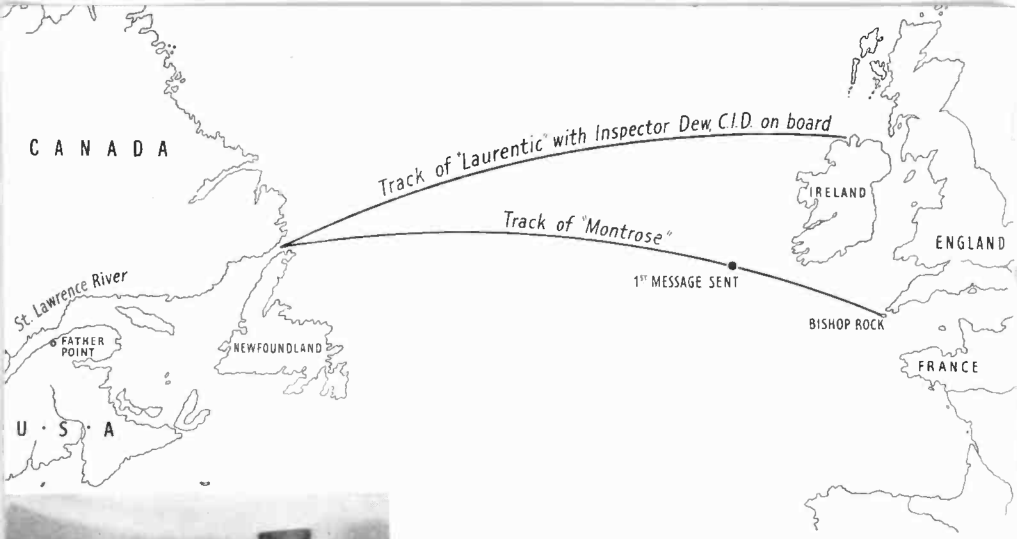


Presentation by Marchese Marconi on behalf of the Board of Directors of the Marconi Company in January 1909 to Jack Binns, Radio Officer of the White Star liner 'Republic'. Members of the Board present, reading from left to right: Major S. Flood-Page; Henry S. Saunders; Colonel Sir Charles Euan-Smith (chairman); Marchese G. Marconi; Jack Binns; W. W. Bradfield (behind); H. Jameson-Davies

The White Star liner 'Baltic' which rescued the passengers of the 'Republic' and the 'Florida'

Photograph by courtesy of Cunard White Star Ltd.





'Dr.' Crippen and Ethel le Neve on board the 'Montrose'

Photograph by courtesy of Captain Kendall

The C.P.S. liner 'Montrose' from which the wireless message was sent which led to the arrest of Crippen

Photograph by Nautical Photographic Agency

CHAPTER TEN

Loss of the *Republic*

IT was in 1909 that the enormous value of wireless in saving life at sea was first demonstrated, when the *Republic*, a ship of some 15,000 tons, was in collision with an Italian steamer, the *Florida*. The *Republic* was owned by the Oceanic Steam Navigation Company of Liverpool (the White Star Line). She had on board 250 first-class passengers, 211 steerage and a crew of 300. She had left New York on January 22, 1909, and, when about 175 miles west of the Ambrose light, ran into a thick fog, but although speed had been reduced and all the usual precautions taken for safe navigation, the accident occurred at 5.30 in the morning of the following day. The *Republic* was cut down to the waterline, and Jack Binns, the radio officer, whose name has now become famous in the annals of the sea, sent out the distress signal and got into touch with the wireless station at Siasconcet, on the American coast. That station thereupon sent out news of the disaster to such ships as were within reach, giving the *Republic's* position, and in a short time the whole world was aware of what had happened. But for wireless nothing might ever have been heard.

When the *Republic* was struck, the wireless cabin had been seriously damaged, but the apparatus and the aerial were safe, and though the dynamos had stopped, plunging the ship into darkness, the accumulators were undamaged and wireless messages could be sent. Meanwhile, in the *Florida* panic had broken out. She was carrying 800 emigrants, mostly refugees from a great earthquake which had recently occurred in Italy, their nerves already badly shaken by their experiences. Her officers were, however, able to reassure them, and the master, Captain Ruspini, got into touch with the master of the *Republic*, Captain Sealby, and it was decided, in view of the state of the latter vessel, that the *Republic's* passengers should be transferred to the *Florida*. While the transfer was being effected—no easy matter in fog with a high sea running—Binns was still at his post, keeping in touch with Siasconcet. His signals were too weak to reach other vessels, but he was able to overhear them communicating with one another and to report to Captain Sealby that the *New York*, the *Lorraine*, the *Furnessia*, the *Lucania*, and the *Baltic* were all coming to their assistance.

The *Baltic* was the first to arrive. She had picked up the message from Siasconcet at six o'clock in the morning, within half an hour of the collision, and although she had passed Nantucket inward bound, her master, Captain Ransome, turned his ship and steamed back towards the scene of the disaster. The distance was not great, but owing to the fog, he was not at first able to locate the *Republic*.

Story of the Rescue

The story of the rescue has been graphically described in R. L. Hadfield's 'Sea Toll of our Time':

'The *Republic's* spark was too weak to reach the *Baltic* direct, but Binns could hear that vessel talking with the shore, and it was undoubtedly a nerve-racking experience to witness, as it were, the groping in the fog of the would-be rescuer, whilst hours passed and the ship sank slowly beneath his feet. However, Binns presently began to get the *Baltic's* signals direct, and he was kept busy notifying her of his position and exchanging signals. In the afternoon he got in touch with the *Lorraine*, but she could not find him, and it was the *Baltic* that, between six and seven in the evening, eventually arrived on the scene.

'Binns, who had been busy at the key without a break since the collision—he sent out in all two hundred messages—now had the task of directing the course of the *Baltic* as she manœuvred for position. Whilst the lights of this vessel could be seen from the *Republic*, the latter, since her electric plant had failed, was more or less enshrouded in darkness, her oil lamps barely penetrating the fog more than a few yards. "Now you are on the port bow"—"Now you are dead ahead"—"You are coming too close"—"Back away or you will ram us", these were the vital messages which the wireless conveyed from one ship's master to the other.

'Eventually, the officers of the *Republic* saw a green light showing through the fog. The *Baltic* had safely arrived; her great search was over. The sea had risen, but it was decided that the best course would be to take off the passengers of both vessels from the *Florida*. The transfer went on all night until eight o'clock in the morning, this difficult and hazardous undertaking being carried out without accident or the loss of a single life. The *Baltic* then resumed her voyage to New York.

'The *Republic* was still afloat, and Captain Sealby decided to make an effort to save his vessel. Calling for volunteers, he obtained a crew, which included Binns, and he returned to the bridge of the *Republic* where his first order was to his wireless operator to call for tugs. News of the disaster had already been picked up along the coast, and a great race had started on the part of tugs and other vessels to be first to reach the sinking ship. The *Republic* was taken in tow, being convoyed by the *Furnessia*. But when south of Martha's Vineyard Island, it was seen that she was sinking rapidly. Boats from the towing vessels were immediately got out, but the *Republic* suddenly plunged down stern first, and the greater part of the crew had to throw themselves into the water to avoid being sucked down in the vortex. Captain Sealby, however, remained with his ship. Searchlights from the other vessels revealed him swarming up the foremast, and to this he clung until the topmast disappeared beneath the water. Happily, he and all the members of the crew were picked up without loss.'

Meanwhile the *Baltic* had docked in New York at noon on the 25th, a great crowd witnessing the arrival of the passengers. This most noteworthy rescue, whereby nearly two thousand lives had been snatched from the jaws of death, had thrilled the world, and had proved the practical value of the Marconi wireless system. A number of vessels had participated but it was the *Baltic's* lot to effect the rescue of the passengers of the two ships.

Passengers of the *Republic* were unanimous in unstinted praise of the courage and efficiency of the captain, officers, and crew. Said one: 'The discipline was perfect, and inspired the confidence of passengers, who, as a rule, acted calmly'.

Mr. James B. Connolly, a novelist and writer of sea stories, who was on board the *Republic*, said, 'It was good to have that wireless on hand; otherwise it would have been a terrible calamity'.

Tribute to Wireless

During the run in to New York from Nantucket, the passengers on board the *Baltic* collected a fund and then decided to strike medals from the proceeds. Among the passengers in the *Baltic* was a Mr. Ingersoll of the Ingersoll Watch Company, and he undertook to strike the medals and attend to the distribution. All the members of the crews of the *Baltic*, *Republic*, and *Florida* received a medal. Four of the medals were struck in gold and one each was presented to the three captains and to Jack Binns. The medal bore on one side the letters 'C Q D' at the top, a picture of the ship in the centre, and underneath the name 'S.S. *Republic*'.

On the other side:

'From the saloon passengers of the R.M.S. *Baltic* and R.M.S. *Republic* to the officers and crews of the S.S. *Republic*, *Baltic*, and *Florida* for gallantry, commemorating the rescue of over 1700 souls, January 24, 1909.'

Mr. H. G. Tattersall, the wireless operator of the *Baltic*, had stuck to his instrument constantly without sleep for fifty-two hours. Similarly, Binns of the *Republic*, with the wall of his cabin splintered and shattered by the bow of the *Florida*, stayed at his key all through the weary day sending out his distress cry CQD. Upon this signal and the correct working of his instrument depended the safety of all on board.

There was an exciting scene on the White Star Pier, New York, when Captain Sealby, of the *Republic*, and Jack Binns, the radio officer, landed on January 26. Both were caught up by a number of enthusiastic seamen and stewards of the White Star Line, who carried them on their shoulders. The crowd was delirious with joy at the sight of these brave men. They marched out to the street blowing trumpets and, after exhibiting their heroes to a large throng of people assembled outside, headed about, returned to the pier, and deposited their by-this-time thoroughly embarrassed burdens in the offices of the company. Much the same thing happened to Captain Ruspini, of the *Florida*, who succeeded in bringing his ship safely into dock.

Captain Sealby and Jack Binns returned to Liverpool in the *Baltic*. When the ship arrived at the Mersey port on February 8 a large crowd of relatives and friends gathered on the landing stage and the men were warmly greeted on stepping ashore. Particular attention was concentrated on Jack Binns. He was met by his sweetheart and several relatives from Peterborough, his home town, and many strangers in the crowd insisted upon shaking hands with him. Binns, who again repeated that he had simply done his duty, said he was going to London at once to report fully to the Marconi directors.

He had an enthusiastic reception at Peterborough. Thousands of people assembled to greet him and he drove with the Mayor to the Guildhall where a number of prominent citizens met to do him honour. The Mayor presented him with an address of welcome from the Corporation expressing the pride the citizens felt in his heroism and their admiration of the coolness and promptitude with which he used the wireless apparatus.

Presentation to Jack Binns

The directors of Marconi's Wireless Telegraph Company held a reception at their offices at Watergate House, Adelphi, London, on February 10, 1909, at which Binns was presented with a gold watch. Among those present were Sir Charles Euan-Smith, Mr. Marconi, Mr. H. Jameson Davis, Major Flood Page, and Mr. Henry Saunders. Mr. Marconi, who made the presentation, congratulated Binns upon having been the first to show what wireless telegraphy could do to save life at sea. Binns, in thanking the directors, said that he hoped he would always be able to do his duty in a similar way should the necessity unhappily recur.

Later on in the year, on Wednesday, June 9, 1909, a wireless signal was received on board the *Princess Irene* saying that the *Slavonia* (a vessel of 10,606 tons gross) was ashore and requesting assistance. The *Princess Irene* was at the time 280 miles from the *Slavonia*, but she at once changed her course and steamed at full speed to the scene of the wreck. This was found to be two miles to the southward of Flores Island. The *Princess Irene* arrived alongside the *Slavonia* on Thursday afternoon, June 10, and immediately began taking off her cabin passengers, which took all night to accomplish. At daybreak on Friday, the 110 cabin passengers on board had been transferred without a single accident, and shortly afterwards the *Princess Irene* left for Gibraltar.

The call for help transmitted by the *Slavonia* was also received by the Hamburg-Amerika liner *Batavia*, which also hastened to the scene. The intermediate and steerage passengers were safely transferred to her and only the crew remained on board the *Slavonia*. On Friday morning the entire crew left the wreck and went ashore at Velos on Flores Island, by which time the *Slavonia* was full of water and a total wreck.

The *Princess Irene* left New York on June 5 with a full passenger list, but while the extra 110 passengers (men, women, and children) put rather a strain upon her accommodation, the discomfort did not last long as she reached Gibraltar on Monday, June 14. The *Batavia* had better accommodation for steerage passengers than the *Princess Irene*, and this was probably the reason why she took on board the second and third class passengers.

CHAPTER ELEVEN

Wireless Proves its Value

THESE disasters had thoroughly demonstrated the enormous value of wireless, but such installations on ships were soon rendering good service in the case of minor difficulties. For example, in 1911, there was an extraordinary incident just after the *Olympic* had left New York on the return half of her maiden voyage across the Atlantic. Mr. Tom Sopwith, the English airman, hovered over the vessel in his aeroplane and dropped a pair of spectacles carefully wrapped and addressed to Mr. W. A. Burpee, a prominent Philadelphia merchant. Mr. Burpee had broken his spectacles shortly before sailing, and sent them to Wanamaker's store for repairs. Just before the *Olympic* sailed Mr. Burpee sent a wireless message to Wanamaker's, who had a wireless installation, requesting that the spectacles be sent to him in London. Taking advantage of Sopwith's ascent, Wanamaker's sent a wireless message to Mr. Burpee that the spectacles would be delivered by aeroplane. Mr. Sopwith was then engaged to make the delivery, which was safely accomplished.

Another sphere in which wireless was to prove its value increasingly as the years went on was indicated when a fireman aboard a Canadian Pacific liner became seriously ill. As the ship carried no surgeon, the master instructed his wireless operator to get in touch with a ship which did carry a doctor. Soon the Allan liner *Hesperian* responded, whereupon details of the sufferer's symptoms were telegraphed to the doctor, and a prescription received in return. This was repeated daily while the two vessels were in touch. Later, another ship, the *Montezuma*, was picked up and the 'absent' treatment continued by the surgeon aboard her. The patient probably owed his life to the medical service thus given and obtained by wireless, as many another seafarer was to do in the future.

In these more modern times ships at sea needing medical advice can obtain it from any Post Office coastal wireless station in the British Isles. Many vessels, when at sea, even though engaged on long voyages, do not carry doctors. Illnesses and ailments among the ship's company are generally dealt with by the master so far as he is able to do so with the aid of the ship's medical chest. In serious cases or where the master feels that a doctor's opinion is desirable, he may forward particulars to a coast station in a telegram asking for advice. These telegrams are sent in plain language or in a special code which has been devised to overcome the language difficulty. By this means a telegram coded in one of several languages may be decoded into a correct translation in any of the other languages, and the difficulty which might otherwise arise with foreign ships is thus overcome. During 1947, 323 medical messages were handled by Post Office coast stations under the service known as 'Medical Advice to Ships at Sea'; in 1948 the number was 252.

Details of the facilities available to ships at sea for obtaining medical advice through the medium of wireless services of other countries are given in the International List of Stations Performing Special Services, which is published by the Bureau of the International Telecommunication Union, Berne, and carried by British ships compulsorily equipped with wireless telegraphy.

In those early days of wireless at sea many other incidents occurred which showed how wireless telegraphy could come to the aid of the ordinary citizen in an emergency. One such case concerned a young lady who had arranged to leave Parkeston Quay, Harwich, for the Continent and was accompanied to the steamer by her father. At the ringing of the 'all visitors ashore' bell, this gentleman hurried off the ship when he found, to his consternation, that he had left his daughter without any money in her possession. Inquiries at the telegraph office elicited the fact that the steamer (it was the S.S. *Dresden*) had a wireless installation on board, and three-quarters of an hour later he sent a message to the captain of the steamer asking him to furnish the lady passenger with a sum of money. Upon arrival of the ship at Antwerp the lady wrote home saying that the captain had informed her of the receipt of a wireless message from her father, in accordance with whose desire he offered her sufficient funds to complete her journey.

Evil-doers brought to Justice

But it was in the cause of justice, as distinct from the main objective of Marconi to make the seas more safe for ships' crews and passengers, that wireless was to receive world-wide publicity. It was an ill day for evil-doers when wireless was invented. Previously many a criminal had been able to escape the punishment that was his due by a speedy voyage across the sea. Had he stayed on land telegraphy and the whole machinery of the law would, in all probability, have forced him to disclose his secret, but in a Transatlantic voyage (and that was the usual route taken) the only dangers to be guarded against were, one, recognition, and the other a report of the crime reaching the ship in which the criminal had chosen to escape. It was easy enough to evade the former possibility, and, as for the latter, when once the ship had left the landing stage it was ten chances to one that nothing more would be heard of the criminal.

But with the advent of wireless a passenger ship was as much in communication with the affairs of man on the high seas as when lying in harbour, and the arm of the law could use this invisible power to bring the wrongdoer to justice.

One such case in which a fugitive was brought to justice was when, in 1911, the municipality of Mantua, in Italy, had been defrauded by one of its officials to the extent of 300,000 lire. Upon the defalcation being discovered, the delinquent absconded and took passage on board the *Principe Umberto* at Genoa for Buenos Aires. His whereabouts for some time remained a mystery, but the Genoa detectives were consulted just in time to enable them to have him arrested as he was leaving the Italian steamship at Buenos Aires. Wireless telegraphy played an important part in the capture, for the Uruguayan authorities were able to make inquiries on board the vessel as she neared their coast, advise Genoa of the result, and so enable the arrest to be made when the steamer reached her destination.

Another case was the arrest of a Belgian millionaire who, after living a life of affluence and good repute and making a name for himself on the racecourse as the owner of a magnificent stud, was suddenly seen no more either amongst his wide circle of friends or in his accustomed resorts. His disappearance caused inquiries to be made with the result that he was alleged to have forged share certificates to the tune of over two million pounds which he had deposited at various banks as securities for substantial loans. Detectives searched for him, but in vain. Paris and London were vigorously scoured, but all to no purpose until one evening a wireless message was received by the judicial authorities at Brussels from the master of the *Etoile Belge*, a steamer belonging to the General Atlantic Company, then on her way to New York, stating that the gentleman in question was on board. A wireless message was immediately transmitted to the ship, and at the same time an order for his arrest was sent to the authorities at New York.

Arrest of 'Dr.' Crippen

The most spectacular case of this kind, however, was the arrest of the notorious 'Dr' Crippen on board the Canadian Pacific liner *Montrose* in 1910 just as that ship was approaching Father Point. There is no need to recall here the sordid incidents of the crime. We are more interested in the part which the new science of wireless played in the arrest. Suffice it to say that Crippen had lost his nerve after interrogation by detectives and had fled the country. A day or two later, in searching the house where he had lived, parts of a woman's body were found buried below the floor of the coal cellar. At once a warrant was issued for the arrest of Crippen and his typist, who was also missing, and their descriptions were circularised and published in the Press. Meanwhile, the two had reached Holland and sailed in the *Montrose* from Antwerp. The girl had cut her hair short, and was dressed as a boy. On the passenger list the pair were given as Mr. Robinson and son. But it was not long before the master, Captain Kendall, realised that they bore a striking resemblance to the missing pair; and, his suspicions aroused, he noticed them more particularly. He saw that the boy's clothes were somewhat ill-fitting and that 'he' seemed unusually awkward in them, also that the father occasionally squeezed the boy's hands rather tenderly and affectionately.

And so, in the evening of July 22, 1910, the Canadian Pacific Railway offices in Liverpool received a message from Captain Kendall, that Crippen and Miss Le Neve were on board that vessel. The Canadian Pacific Company at once informed Scotland Yard of Captain Kendall's message, and Scotland Yard communicated directly with the captain of the *Montrose* by wireless and procured further details which convinced the police that the clue was one which ought to be followed up without delay.

Race across the Atlantic

From that moment until the time of the arrest of the couple wireless telegraphy kept the police in touch with the ship. And on Saturday, July 23, Chief Inspector Dew set sail for Canada in the *Laurentic*, which was due to reach the Canadian shore in advance of the *Montrose*. So began a race across the Atlantic upon which the eyes of the world were fastened, and its interest lost nothing by reason of the fact that the progress of the contest between the fast liner and the slow one could only be traced from such charts and diagrams as the newspapers provided. There was no diminution of its fascination in the fact that the pursuer was bound to win. Day by day the certainty that the *Laurentic* would overhaul the *Montrose* was the one topic of conversation.

It was at this stage in the history of the chase that the powerful agency of wireless came to be realised. The first message had already indicated that if the fugitives were on board the *Montrose* this modern accomplishment of science would track them down. How completely it had defeated the hope of escape, for the first time in its application to criminal investigation, was very quickly proved. There was something intensely thrilling, almost weird, in the thought of these two passengers travelling across the Atlantic in the belief that their identity and their whereabouts were unknown, while news of both was being flashed with certainty to all quarters of the civilised world.

Three police officers, including Inspector Dew—all three disguised as pilots with blue suits and white caps—went off to the *Montrose* in a small boat rowed by three sailors. Dr. Crippen was promenading the deck with Dr. Stuart, the surgeon of the *Montrose*. The supposed pilots went on board and walked along until they passed the spot where Crippen was standing. Then, as Inspector Dew was able to get a good quick look at Crippen, he gave the preconcerted signal and the arrest was made.

Great credit was due to Captain Kendall for his prompt appreciation of the part which wireless could play in such an emergency. This, perhaps, was not surprising for Captain Kendall was second officer in the *Lake Champlain* at the time that vessel—the first British ocean-going ship to be fitted with Marconi's apparatus—was equipped for wireless telegraphy. He no doubt remembered the first wireless message which that vessel received off the South of Ireland. It was from Marconi himself, wishing Captain W. Stewart, the master of the *Lake Champlain*, every success with the wireless system.

The British Government recognised that the capture of Crippen was due in great part to Captain Kendall's initiative and resource, for they presented him with a cheque for £250 for the service he had rendered in bringing a criminal to justice. This, I believe, is only the second occasion on which such an award has been made, the first being for the capture of Lefroy, who murdered a bank manager in a railway train in 1881.

Captain Kendall was, some four years later, to receive further personal evidence of the value of wireless when the *Empress of Ireland*, of which ship he was master, was rammed in the St. Lawrence by a Norwegian collier and sank with great loss of life. Captain Kendall went down with his ship and was picked up from floating wreckage some half-hour afterwards by rescue ships which had been called to the scene by wireless.

First Wireless Court Circular

Another landmark in the history of wireless marine communication was the visit of King George V and Queen Mary to India at the end of 1911. It was the first time in the nation's history that a British sovereign had left the Motherland to visit the Empire across the sea. Throughout practically the whole of the long journey to India, the King was enabled, by means of wireless telegraphy, to be kept in as close touch with all that was happening at home as if he had retired to Balmoral, while a loyal public were kept informed daily of the Royal progress. One event which is of historical importance was that, for the first time, the *Court Circular* was despatched by wireless telegraphy.

Here is the exact copy of this historical despatch:

COURT CIRCULAR
H.M.S. *Medina*, Gibraltar
November 15, 1911
By Wireless

> The King and Queen arrived at Gibraltar last night. This morning Their Majesties received the Governor General, Sir Archibald Hunter, the Governor of Algeciras, the Governor of Cadiz, the Captain of the Spanish Cruiser *Reina Regente*, the Captain of the Portuguese Cruiser *Adamaster*, Vice-Admiral Sir John Jellicoe, Commanding the Atlantic Fleet, the Captains of the ships of the Atlantic Fleet, Rear-Admiral Frederick Pelham, Admiral Superintendent and in charge of all Naval Establishments at Gibraltar. H.M.S. *Medina* sailed at 10.30 a.m. for Port Said.

It will be noted that the issue was carefully described as 'By Wireless'—another example of the utility of Marconi's great invention.

Another incident which may be of interest in connection with this visit to India is that on November 21, 1911, British newspapers contained the announcement that 'the King had been graciously pleased to offer a peerage to Sir Arthur Wilson'. At the time the announcement was made the *Medina* was somewhere between Aden and Bombay. What means other than wireless could His Majesty adopt to make known his gracious wish! This was probably the first occasion on which a peerage had been offered by wireless telegraphy.

The King and Queen were very deeply interested in the working of the wireless installation on board the *Medina*, and His Majesty tried his skill at sending a message, which was duly received at the Admiralty headquarters in Whitehall.

CHAPTER TWELVE

The *Titanic* Disaster

THERE is no doubt that wireless telegraphy was rapidly advancing in popular appreciation; but a far greater event was soon to emphasise the value of this comparatively new science, when the greatest sea disaster of all time, the sinking of the *Titanic*, on her maiden voyage, shocked the world. The *Titanic* was the latest and greatest product of British shipbuilding. She was the largest ship in the world and on this, her maiden voyage, was carrying 1348 passengers and a crew of 860. The story has been told so often that it is not necessary again to go into the harrowing details of the disaster. It suffices to say that of those on board the *Titanic*, a total of 1503 were lost; 504 passengers and 201 of the crew survived, and were picked up by the Cunard liner *Carpathia*. One tragic feature of the disaster was that possibly many hundreds of other lives might have been saved had it occurred an hour or so earlier; for it was later established that another ship, with one radio officer, was only twenty miles away. Her radio officer, however, had gone off duty after a long day's work and so did not get the *Titanic's* message.

At the time of the collision with the iceberg, the Senior Radio Officer, John Phillips, was on watch; and within a few minutes of the accident he was joined in the cabin by the Junior Radio Officer, Harold Bride. Almost immediately Captain Smith, the commander of the *Titanic*, entered the room and said: 'We have run against an iceberg; the men are looking round to see what damage has been done, and perhaps it would be as well if you got ready for a call; however, don't send it until I tell you to do so'.

About ten minutes later the captain was back again looking very serious, but his voice was steady as he said, 'Call help at once', and Phillips, using the main transmitter, radiated both the CQD and SOS distress signals calling for help.

The first ship to reply was the German steamer *Frankfurt*, which was 153 miles south-west of the *Titanic's* position. While the operator of the *Frankfurt* was reporting the news to the bridge, Cottam, the Radio Officer of the *Carpathia*, established communication with the *Titanic*, as a result of which the *Carpathia* immediately altered course to the scene of the accident.

On board the sinking liner Phillips spent the last hours of his life in anxious activity, disturbed in his intent listening by the noise of escaping steam, the engines having been stopped for fear of an explosion. As there were no amplifiers of any sort, signals were very weak and could hardly be heard. After Captain Smith had informed both Radio Officers that the ship was not likely to remain afloat more than another half-hour, they began to get their things ready, putting on lifebelts and warm clothes. Then Phillips returned to the transmitter and sent another SOS. At that moment Captain Smith reappeared and said: 'You have done everything that can possibly be done; now leave your post and think of yourself'. Phillips, however, worked on for another ten to fifteen minutes. He replied to the *Olympic* which had just sent the message, 'Hastening as fast as we can', 'Come at once; engine room already flooded'. It was two o'clock.

Wireless Officer's Bravery

Phillips died at his post—as many a radio officer has done since that date. An eye-witness has told how, with the fore well-deck awash—when the women and children had been placed in the boats and cleared—the captain told the Radio Officers to 'shift for themselves', as the ship was sinking. Instead 'Mr. Phillips took the telephones up again when the captain had left and restarted work. Mr. Phillips tried to call once or twice more, but the power was failing and there were no replies'. Phillips was last seen standing on the deck house.

The news of the loss of J. G. Phillips was a source of great sorrow among his colleagues, but his splendid example of self sacrifice gave them a feeling of pride in his bravery and cool demeanour in time of danger. Those who knew him personally knew that such conduct was characteristic of him. Phillips was a native of Godalming, and was educated at the local grammar school. He started his career as a telegraph learner in the Godalming Post Office, and in March 1906 he joined the Marconi school at Liverpool. In August of that year he was appointed to the operating staff, and sailed on various ships, including the *Teutonic*, *Pretorian*, and *Oceanic*. He had also served on the operating staff of the high-power Transatlantic wireless station at Clifden for three years until July 1911. His example is one of the noble instances of devotion to duty which brighten the annals of wireless telegraphy.

There is, at Godalming, a memorial to John Phillips. It is in the form of a cloister near Godalming Parish Church. It has three cloistered sides and an arcaded wall, from the arches of which charming views are obtained. Around the memorial is a garden planted with shrubs and plants. On a memorial tablet is the inscription:

S.O.S.—This cloister is built in memory of John George Phillips, a native of this town, chief wireless telegraphist of the ill-fated S.S. *Titanic*. He died at his post when the vessel foundered in mid-Atlantic on the 15th day of April, 1912.

The memorial was opened on April 15, 1914.

'*Carpathia's*' *Wireless Log*

Here is the wireless log of the *Carpathia*, the rescuing ship, from 5.10 p.m. April 14, 1912, at which time she first established communication with the *Titanic*. It has its place in this history.

Sunday, April 14, 1912.

N.Y.T.

5.10 p.m. TR's. with S.S. *Titanic* bound west. One 'S' message received.

5.30 p.m. Signals exchanged with *Titanic* at frequent intervals until 9.45 p.m.

11.20 p.m. Heard *Titanic* calling 'SOS' and 'CQD'. Answer him immediately. *Titanic* says: 'Struck iceberg, come to our assistance at once. Position: lat. 41.46 N; long. 50.14'. Informed bridge at once.

11.30 p.m. Course altered; proceeding to the scene of the disaster.

11.45 p.m. *Olympic* working *Titanic*. *Titanic* says weather is clear and calm. Engine-room getting flooded.

Monday, April 15, 1912.

12.10 a.m. *Titanic* calling CQD. His power appears to be greatly reduced.

12.20 a.m. *Titanic* apparently adjusting spark gap. He is sending 'V's'. Signals very broken.

12.25 a.m. Calling *Titanic*. No response.

12.28 a.m. *Titanic* calls CQD; his signals blurred and end abruptly.

12.30 a.m. Calling *Titanic* at frequent intervals, keeping close watch for him, but nothing further heard.

1.25 a.m. Called *Titanic* and told him we are firing rockets. No signs of any response.

1.30 a.m. Continue to call *Titanic* at frequent intervals but without success.

At daybreak, the *Carpathia* arrives on the scene of the disaster.

Monday, April 15, 1912 (continued).

5.5 a.m. Signals with *Baltic* but unable to read him owing to continual atmospheric disturbances, etc.

6.45 a.m. Signals with *Mount Temple*. Informing him we are now rescuing *Titanic's* passengers.

7.7 a.m. Received following message from *Baltic* to Captain, *Carpathia*—'Can I be of any assistance to you as regards taking some of the passengers from you? Will be in the position about four-thirty. Let me know if you alter your position. Commander, *Baltic*'.

7.10 a.m. Sent following reply to *Baltic*: 'Am proceeding for Halifax or New York at full speed. You had better proceed to Liverpool. Have about 800 passengers aboard'.

7.40 a.m. Advised *Mount Temple* to return to his course, as there was no further need for him to stand by; nothing more could be done. We have rescued twenty boat-loads of the *Titanic's* passengers.

8.00 a.m. Advised *Virginian*: 'We are leaving here with all on board—about 800 passengers—please return to your northern course'.

10.00 a.m. Signals with the *Californian.*

2.00 p.m. TR's. with *Olympic.*

2.10 p.m. Sent news of the disaster to the *Olympic* saying we had rescued about 670 passengers.

2.35 p.m. Following message received from *Olympic*: '7.12 p.m. G.M.T. position 41.17 N, 53.53 W. Shall I meet you and where? Steering east true. Haddock'.

3.15 p.m. Replied to *Olympic*: 7.30 p.m. G.M.T. *Carpathia* 41.15 N, 51.45 W. 'Am steering south 87 west true. Returning to New York with *Titanic's* passengers. Rostron'.

At 9.45 p.m. on Thursday, April 18, 1912, the *Carpathia* docked at New York.

When Bride was picked up and reached the *Carpathia*, though injured, he took a short rest, and then pluckily set to work to help the the *Carpathia's* Radio Officer, Thomas Cottam, who was worn out, and Bride stayed at work practically continuously.

Harold Bride was later presented by the Marconi Marine Company with a gold watch 'in recognition of having done his duty, and done it bravely'. And Cottam, the Radio Officer of the *Carpathia*, was presented by the Liverpool Shipwreck and Humane Society with a silver medal and illuminated address 'for praiseworthy and humane service to the survivors of the *Titanic*'.

What might have happened had the *Titanic* not been fitted with a wireless installation is too terrible to contemplate. Collisions with icebergs in the past had been fatal to many good ships. The loss of the *President* and the *Pacific* in the earlier days of Atlantic navigation was ascribed to this cause, though no one survived to tell the tale. But in the case of the *Titanic* the wireless installation which she carried enabled her instantly to call up help.

The Nation's Gratitude

The nation's gratitude to those who had supplied the means by which this was carried out was adequately expressed in *The Times:*

> 'We owe it to patient research in a delicate and difficult branch of science that the *Titanic* was able with wonderful promptitude to make known her distress and to summon assistance. But for wireless telegraphy the disaster might have assumed proportions which at present we cannot measure, and we should have known nothing of its occurrence for an indefinite period. Many a well-found ship has in fact disappeared in those berg-haunted waters without leaving a sign to indicate her fate. Thanks to Marconi's apparatus, it is now hardly possible for any vessel equipped with even moderately powerful instruments to be lost on any frequented route without being able to communicate information and to summon help. The *Titanic* had the call upon a circle of at least 300 miles radius even in daylight, while at night the range of her instruments would be doubled or trebled. She could speak to the shore and to every vessel over that enormous area of ocean, and she could be spoken to and assured that help was on the way. Not only so, but the ships appealed to could communicate with one another, act in concert, and transmit the news to indefinite distances. The advantages conferred by this abridgement of space are enormous. No vessel need be alone, none need vanish without a sign from human ken, and in none but crushing and instant disasters need any despair of help. This is surely one of the greatest of many boons conferred upon humanity by patient, persistent, and often very discouraging inquiry into natural laws, carried on, at all events in its initial stages, by students animated only by love of knowledge.'

The present Lord Samuel was Postmaster-General at the time and, in a reference to the rescue, said that 'those who had been saved had been saved through one man, Mr. Marconi, whose wonderful invention was proving not only of infinite social and commercial value, but of the highest humanitarian value as well'.

Auto-alarms First Suggested

The Board of Trade inquiry into the circumstances attending the loss of the *Titanic* was presided over by Lord Mersey, as Wreck Commissioner, assisted by Rear Admiral S. A. Gough Calthorpe, Captain A. W. Clarke, Commander F. C. A. Lyon, Professor J. H. Biles, and

Radio Officer John George ('Jack') Phillips, senior wireless operator in S.S. 'Titanic', who lost his life when that ship sank after collision with an iceberg on Sunday, April 14, 1912

"S. O. S."

PUNCH (*to Mr. Marconi*). "MANY HEARTS BLESS YOU TO-DAY, SIR. THE WORLD'S DEBT TO YOU GROWS FAST."

The illustration here reproduced appeared in 'Punch' on October 22, 1913, just after the 'Volturno' disaster and is reproduced by permission of the proprietors of that publication

Mr. E. C. Chaston, and Marconi was called to give evidence before the Court. He was asked by the Attorney General if he had considered the possibility, on a ship with only one operator, of a person who was not an expert in wireless telegraphy receiving a simple signal which might be devised so that he could call the operator. Marconi replied that he had considered that, and thought that if the International Regulations allowed it a member of the crew could be instructed to stand by the instrument, to be in attendance at certain hours when the operator was off duty, and give the alarm and inform the captain in the event of a danger signal being sent. He thought that might be done. At the same time, he had a feeling that it might not, in many cases, be reliable. Another way that had suggested itself to him, and to which he had given a great deal of attention since the *Titanic* disaster, was of making the wireless apparatus ring a bell, and thereby give a warning that a ship in danger needed assistance.

In order to make the system effective, given that the apparatus was all right, Marconi said it would be necessary to alter the regulations of the International Convention so as to enable the danger signal to consist of, or be accompanied by, a long dash, as it was called, an impulse or sequence of waves which would last over a period of fifteen, twenty, or thirty seconds. This would cause a bell to give a prolonged ring, like that which was given on shore by a fire alarm, and that would be a signal to denote that a ship required assistance. Of course, following that signal, particulars might be given of the position of the ship and everything else. Some tests had been made with an apparatus such as he had referred to, and he had considerable confidence that it could be employed, although so far it had not been tested in actual practice. At all events, it was more feasible than the first suggestion. At that time the only reliable plan was to have a man on watch.

Even at that early date, it will be observed that the idea of the Auto Alarm was germinating in Marconi's brain, but some little time was to pass before it became a reality.

Following this disaster the principal maritime nations made concerted plans to prevent a repetition. From the efforts of the interested Governments there resulted the establishment of the International Service of Ice Observations and Ice Patrol, under provisions of the International Convention for the Safety of Life at Sea, signed in London on January 20, 1914. Each year since then, with the exception of some of the war years, a patrol of the North Atlantic area, for the protection of shipping against the iceberg peril has been maintained by the United States Coast Guard. Not a single loss of life due to collisions of ships with icebergs has occurred since this international duty was assumed by the Coast Guard.

It may be remembered that when the Merchant Shipping (Safety Convention) Bill was read a third time in the House of Lords in July 1949 Lord Shepherd referred to the Ice Patrol in the North Atlantic established after the sinking of the *Titanic*. This Ice Patrol, he said, had since been the responsibility of contracting Governments, and was to continue under the Convention which the Bill sought to implement. All the contracting parties, Lord Shepherd continued, were responsible for the upkeep of the activities of the Ice Patrol and, under the new conditions, each of the Governments would make a contribution according to the tonnage passing through the danger areas. Lord Shepherd said that from the beginning, the managerial responsibility for the Ice Patrol had been one for the United States, who, with their men and their ships, through summer and winter, had kept up the Patrol. It seemed fitting to His Majesty's Government that they should give a meed of praise to the American nation for the service they were rendering to the merchant shipping of the various countries who were parties to the Convention.

CHAPTER THIRTEEN

Safety at Sea

THOSE two or three years before the war of 1914–1918 were a tragic period in the history of merchant shipping. The disaster to the *Titanic*, which occurred in 1912, was followed in 1913 by the burning of the *Volturno* and the sinking in 1914 of the *Empress of Ireland.* On no occasion since then, with the exception of the war years when enemy action was responsible for the loss of many a fine ship, has British shipping suffered a major disaster with heavy loss of life.

Marconi himself had said many times that the aspect of wireless which gave him, personally, the greatest gratification was its use in saving life and property at sea. The first application of wireless was to ensure the safety of those who go down to the sea in ships and of the ships in which they sailed. Apart from the means whereby ships could communicate with other ships or with the shore, subsequent applications of the principles of wireless telegraphy have provided additional safety factors, such as the broadcasting of weather reports, time signals, warnings of dangers which might lie ahead, as well as checks on a ship's position by wireless direction-finding and the depth of water under her keel by echometer sounding device. In the sphere of safety at sea wireless has proved its greatest value, not only in the number of lives saved after disaster may have occurred, but in the prevention of accidents and avoidance of danger as a result of which the number of lives which have been saved is incalculable.

From the beginning of time the sea has proved hard and cruel to those who sail upon it. In these days when we who stay at home read of the regularity of the sailings of the big liners and even the much smaller ocean-going ships, it is difficult to appreciate the dread which, in pre-wireless days, the sea instilled in the hearts of mariners. Man, however, has in the end triumphed over most of his difficulties and, since the days of wooden hulls and canvas sails, ships of increasing size and strength proceed across the wide bosom of the Atlantic and other oceans on their lawful occasions.

The science of naval architecture, the skill of the British shipbuilders, and the promptitude with which the modern British shipowner embraces any new idea which will make for the greater safety of the passengers and crews, as well as for the efficiency of the ships, have produced vessels which are as near perfection as human ingenuity can make them.

Thanks to Marconi the silence which brooded over the waters has long disappeared; but the sea still claims its victims, as can be seen by examining the casualty columns in *Lloyd's List*. Even to-day the power and anger of the oceans are not to be despised. As recently as 1947 the master of the *Queen Mary* had to divert that 80,000 ton vessel several miles off her course when, about seven hundred miles east of New York, she ran into a sixty-five mile an hour 'near hurricane'. There were waves forty feet high but, of course, the vessel came through absolutely undamaged.

The 'Volturno' Rescue

To return to the *Volturno*, while in mid-Atlantic this British steamship, fully laden and carrying over 600 emigrants from Rotterdam to New York, took fire. The flames spread throughout the hold, and soon the forward part of the vessel was enveloped in flames. This was about seven o'clock on the morning of Thursday, October 9, 1913. The master ordered the radio officer to transmit a call for help. The first to receive the intelligence was the Cunard liner, *Carmania*, whose captain immediately altered course to proceed to her rescue. A stiff gale was blowing, but in spite of this the *Carmania* covered the seventy-eight miles which lay between her and the *Volturno* in a little more than four hours. Immediately Captain Barr, of the *Carmania*, received the call he used the wireless telegraph installation on his vessel to repeat the appeal for aid over a wider range, with the result that shortly after the *Carmania* arrived at the burning ship other vessels steamed up.

First among these were the Norddeutscher Lloyd steamships *Grosser Kurfurst* and *Seydlitz*. Later arrived the Atlantic Transport liner *Minneapolis*, Furness, Withy & Company's *Rappahannock*, the Russian Steam Navigation Company's *Tzar*, the Leyland Company's *Devonian*, the International Mercantile Marine Company's *Kroonland*, and the French steamer *La Touraine*, of the Compagnie Générale Transatlantique. They found the forward end of the *Volturno* burning fiercely and the ship rolling heavily. Already they had learned from the captain, by wireless, that six boats had been launched, but only two had got safely away. The other four had been smashed to pieces by being dashed against the ship's sides and the occupants had been either killed or drowned, while the *Volturno's* screws had been fouled and rendered useless by the tackles used in lowering the boats.

But the worst feature of the situation lay in the fact that the onlookers could render no effective aid. The seas ran so high under a north-westerly gale that no boat could approach the burning vessel and live. One crew from the *Carmania*, after labouring for two hours and losing most of their oars, were forced to return. Then Captain Barr made a daring attempt to manœuvre his own ship close to the *Volturno*. He got within a hundred feet of her, but in the storm it was impossible to pass a line. As a matter of fact, even if this feat had been accomplished, it would have been to little purpose, for with the ships rolling as they were in the turbulent sea, the strongest cable would have snapped like thread, and as for working a cradle, that was impossible. Towards nightfall the gale moderated slightly and the rescue vessels were able to lower boats, but it was still impossible to get alongside, and all they could do was to look for struggling swimmers in the water. They were aided in their work by the searchlights of the *Carmania*.

About nine o'clock that night the flames burst through amidships from the engine room and bunkers. Then came an explosion, and a flight of rockets from the doomed ship was the signal that hope had been abandoned and that the vessel herself was in the last extremity. How terrible the scene was, the words of one of the onlookers in the *Carmania* afford some indication.

'The spectacle', he said, 'of the *Volturno* burning with over six hundred souls on board, surrounded by the huge hulls of this Transatlantic fleet, crowded with thousands of spectators, all eagerly anxious but unable to help, beggared description'.

At 9.20 the Radio Officer of the *Volturno* had to change over to the emergency batteries, as the fire, reaching the boilers and the engine room, put the pumps and dynamos out of commission. Then he sent the last despairing message, poignant with agony, which must have burned into the hearts of all who received it: 'For God's sake, help us, or we perish'.

But there was little to be done until Captain Barr, who throughout had been organising the relief with wonderful skill and energy, realising that the only chance of effecting a rescue lay in the abatement of the storm or by the calming of the waves by pouring oil upon them, ordered his Radio Officer to ask by wireless far and wide: 'Is there any oil tanker in the neighbourhood?' A reply, which will long be remembered in the annals of ocean disasters, came from the master of the *Narragansett:* 'Yes, will come with the milk in the morning'.

She was seventeen hours' steaming from the spot where the *Carmania* was standing by the burning ship. 'Can't you make it an hour earlier?' interrogated the wireless. 'Yes', came the reply. 'I will be with you by five o'clock.' And she was. At daybreak on Friday morning she took up a position a little to windward of the *Volturno* and, opening her oil tanks, poured two large streams of lubricating oil on the water and thus enabled the flotilla of ships to gather at the stern of the *Volturno*, and rescue work was carried on apace.

By nine o'clock the remaining 521 passengers and crew had been taken safely off, and a feat of rescue work was accomplished which will stand high in the records of heroism and life-saving, and must be a lasting tribute to the efficacy of wireless telegraphy.

Value of Emergency Gear

This story of rescue emphasised in a particular way the value of the emergency gear fitted in the *Volturno*. This gear consisted of a set of accumulators capable of providing power for transmitting messages over a distance of a hundred miles. Had it not been for these accumulators the *Volturno's* apparatus would not have been able to work as long as it did, as the ship's dynamo was out of action. As it was, the operators were enabled to send messages up to the very last; that is to say, until the cabin became too hot for further occupation. This gave the vessels coming to the assistance of the *Volturno* the advantage of arranging the course they were to pursue long before they reached the disabled ship, so that not a moment was wasted in effecting rescue work. The Marconi Company had inaugurated the system of emergency sets many years previously, and the advantages of the practice were later recognised by several States who made the equipment of passenger vessels with this emergency gear compulsory.

The reports of the radio officers on board the various ships which went to the relief of the *Volturno* make vivid reading; but the general report of the *Carmania's* radio officer, Mr. Maltby, gives some idea of the amount of work entailed in the reception and despatch of messages at such a crisis. It may be stated that ninety-five messages passed through the hands of the radio officer on board the *Narragansett*, and many of these were a hundred words in length. The heaviest work fell to the radio officers of the *Carmania*, as this vessel was in touch with all the other vessels at one time or another. The working of all stations was excellent, and that of the *Volturno* especially so. The radio officer worked the main transmitter until the dynamo ceased running, and then on the emergency gear until he was forced by heat to leave the cabin. This speaks volumes for the Marconi apparatus.

Here is Mr. Maltby's report:

'On Thursday, October 9, 1913, at ten a.m. G.M.T., I received an SOS call from the S.S. *Volturno* giving her position as 49.12 N., 34.51 W., and saying: "Nos. one and two holds blazing furiously. Please come at once." I immediately replied, and then informed the captain who told me to say we were coming at once. The watch in stokehold and engine room was immediately double-banked and instead of fifteen and a half knots as previously we started on our journey at about twenty knots, as can be seen when we covered the seventy-eight miles which separated us in four hours. A tremendous north-westerly gale was blowing, and a very high sea. Arriving there at a little before two p.m. G.M.T., the *Volturno* was smoking heavily forward of the funnel, and all the time seemed to be lying in a trough, never rising on the waves. I told all ships in the vicinity to stand by, as the *Volturno* was in distress.

'Immediately we got to her we went as close as possible and lowered a boat, but it was impossible to reach her and after a dangerous and strenuous two hours returned unsuccessfully. The *Volturno's* aerial was now earthing badly, of which fact I informed the operator, and according to later reports it was repaired by the second officer who during this work fell from a height of twenty feet to the deck. After being asked by the *Volturno* to look for two missing boats we had only gone about five miles when we were asked to return, with the message "Come as quickly as possible, she may go down any minute, plates buckling". We returned and went dangerously close to the *Volturno* and lowered six rafts, to no avail. Nothing could be done so we stood by.

'Gradually one by one the other ships arrived, until at midnight eight were around her, our captain having kept all well advised as to the position, which was constantly changing. In the twenty-five hours that we were there, she drifted over forty miles.

'It was one of the most heartrending sights I have ever seen. To us, the *Volturno* presented one mass of flames from funnel to forecastle, surrounded by all these ships incapable of doing anything. Men and women on our ship were seen in tears, and if the captain had thought it advisable and called for volunteers the whole ship would undoubtedly have volunteered.

'At 10.15 the *Volturno's* main electric supply failed and the operator changed to the battery-operated emergency set. The operator of the *Volturno* deserves all praise, for he stuck splendidly to his post, even when the flames were as high as the funnel, and all the time worked with steady head and a coolness which, in the circumstances, was remarkable.

'Almost his last message ran: "We cannot last much longer, cannot anything be done to help us?" One felt like going out and getting a boat and attempting to get to him by one's self. Before daybreak the seas subsided somewhat, and the ships began to lower their boats, one of the first, I believe, being the *Devonian*. The *Carmania* now lay a little further away, and gave way to smaller and more navigable vessels. By nine a.m. all had been taken off and after the ships had cruised around on a fruitless lookout for the missing boats, they proceeded on their divers journeys. It was certainly one of the most nerve-racking experiences I have ever had, and all who saw it will certainly agree with me.' (*Signed*) P. B. Maltby, S.S. *Carmania.*

Some of the radio officers who took part in this thrilling tragedy of the sea were:

P. B. Maltby and J. A. Bell, *Carmania;* W. Seddon and C. J. Pennington, *Volturno;* R. B. Norwood and J. E. Woodward, *Devonian;* H. P. Hunt and K. Macrael, *Minneapolis;* D. O'Sullivan, *Rappahannock;* J. Neelemans and J. H. Jeppesen, *Kroonland;* M. Quévillon and M. Pierre, *La Touraine;* F. Gericke, *Grosser Kurfurst;* and H. Reich, *Seydlitz.*

On November 12, 1913 the two operators of the *Volturno*, Messrs. Seddon and Pennington, were presented with gold watches by Marconi in commemoration of the splendid work they had performed.

Mr. C. F. Hart, mechanical manager of the *Daily Mail*, was on board the *Carmania.* That over 650 lives were not lost and a sea tragedy second only to that of the *Titanic* was averted was due, according to Mr. Hart:

First, to wireless telegraphy; secondly, to the speedy arrival and organisation of Captain Barr, of the *Carmania;* thirdly, to the splendid seamanship of the international rescue squadron; fourthly, to the staunch bulkheads of the *Volturno;* and fifthly, and most of all, to the providential moderating of the gale during the night.

'The Magic of Wireless'

'The magic of wireless' had been further emphasised by the burning of the *Volturno.* The thought of ten great ships converging on the scene of disaster summoned there by the SOS appeal raised a thrill of gratitude to the great man whose genius had made such a thing possible. For there can be no doubt that but for wireless telegraphy the lives of every one of those 675 persons on board the *Volturno* would have been lost.

The thanks of the world were well expressed in *The Punch* cartoon which appeared in that paper of October 22, 1913, and is here reproduced.

The tragedy of the *Empress of Ireland* on May 29, 1914, will not soon be forgotten. Of the 1467 souls aboard 1023 were lost. It is not necessary to give here all the details of this disaster. The incident has its place in this history because had it not been for wireless which sent out the warning which brought rescuers to the scene, even the 444 saved might have perished. There was a thick fog at the time. The *Empress of Ireland* was in the vicinity of Father Point, in the St. Lawrence River. Before the fog had descended she had sighted a vessel about three miles away, approaching her. Suddenly, without a moment's warning, the bows of the on-coming ship (which eventually turned out to be the Norwegian collier *Storstad*) loomed out of the fog. A collision was unavoidable, the bows of the *Storstad* striking the *Empress of Ireland* amidships. The unfortunate vessel was ripped up aft and it was plain that she was doomed.

Immediately a wireless call for help was sent out. It was picked up by the Marconi Station at Father Point, and without delay the Government steamers *Eureka* at Father Point Wharf and the *Lady Evelyn* at the Rimouski Wharf were notified of what had occurred. The two ships made all haste to the relief of the survivors. These were in terrible plight, for the temperature was only about four degrees above freezing point. But everything was done for their comfort that was possible, and in a short time they were taken to Rimouski.

The first account of the accident was received in London by the Marconi Transatlantic Wireless Telegraph Service from the rescued senior wireless officer working the apparatus of one of the rescue ships. Later a fuller report from Mr. W. J. Whiteside, the officer in charge at Father Point, stated that he was awakened at 1.45 a.m. by Operator Russell, who reported that the *Empress* had been struck by another ship. Whiteside rushed to the instruments and asked for the vessel's position so that he could send the *Eureka* and *Lady Evelyn* to her assistance. The *Empress* replied: 'Am about twenty miles past Rimouski'. Then her signals trailed right off. Whiteside immediately got the captains of the *Lady Evelyn* and the *Eureka* on the telephone, told them of the circumstances, and asked them to leave at once.

Marconi Officer's Vivid Report

The chief Marconi officer on board the *Empress*, Ronald Ferguson, was later able to give a more detailed report:

'The first intimation of anything having happened', he said, 'was when the whistle commenced blowing at approximately 1.45 a.m. (American time). Mr. Bamford, the junior operator, had relieved me ten minutes previously and when the vessel struck I came into the operating room and took over the 'phones from him, instructing him to ask the bridge if we were to send out a distress signal. Between the time of the collision and the time the dynamos went out of commission we had only eight minutes. My cabin was on the top deck. Immediately after the shock I saw lights passing as I ran to the wireless room where I called all stations with the message: "Stand by for distress signal; have struck something". The chief officer later said: "Call SOS", so I sent out the message, "SOS, have struck something, sinking fast, send help".

'The station at Father Point, which had previously answered my preliminary call, replied immediately, asking where we were. I replied: "Twenty miles past Rimouski". I was trying to confirm the answer at the request of Father Point when the power failed. Water had got into the stokehold, cut off the steam and put the dynamos out of commission. Before taking off the headphones I got from Father Point the message: "O.K. Sending *Eureka*, *Lady Evelyn* your assistance". Mr. Bamford, my junior, had in the meantime brought me some clothes, and when I had put them on I ran out along the deck from which many people were jumping into the icy water, shouting: "Plenty of assistance is coming, and a ship will be here in less than an hour". I then returned to my cabin and was preparing to work on the emergency gear when the ship gave a fearful lurch, causing the accumulators to burst open the doors of the cupboard and scatter their contents over the floor of the cabin. As it was impossible to do more, I went out on deck and picked up a deck chair, and just as I had put my arm through it I was thrown into the water as the ship turned on her side and sank. When Mr. Bamford was thrown out of the ship he landed safely in a floating boat.

'After swimming for about a quarter of an hour I managed to scramble into a lifeboat, from which I was able to reach the *Storstad*. When the *Lady Evelyn* came alongside I jumped aboard her and gained entry into her wireless cabin by means of the window. As she had no wireless man I used her gear to establish communication with Father Point station, through which I communicated all the details of the disaster of which I had knowledge in a message to the Marconi Company in London after having asked for clothes and supplies and a train to be sent to Rimouski Wharf. When Mr. Bamford reached the *Storstad* he took out one of her boats and rendered what assistance he could. He then boarded the *Eureka* with those whom he had rescued and these were landed at Rimouski. The bows of the *Storstad* are terribly torn, and are striking evidence of the force with which she struck the *Empress of Ireland*.'

Most interesting also was Mr. Ferguson's summing up of the part played by wireless telegraphy in the work of rescue for, coming as it did from an eye-witness and at the same time one who was more particularly acquainted with the ship's management, it could be taken as authoritative:

'I do not think it has been realised what part wireless played in the affair. I was only able to work for eight minutes, but without that the only boats which would have been available for the passengers would have been those that could have been launched in the time available from the starboard side of the *Empress of*

Ireland, and it is not likely that more than forty or fifty would have been saved.'

Tribute to Marconi Operators

The Marconi operators in the *Empress of Ireland* gave evidence before the Commission of Inquiry held in Canada. Perhaps one sentence spoken by Lord Mersey is worth recording as testimony to their work: 'You spoke well, you young gentlemen', he said. 'You are a credit to the service you are in.'

The chief operator at Father Point, Mr. Whiteside, was also serving at that station when he picked up the *Titanic's* messages on April 12, 1912. He also handled the messages which came from the captain of the liner *Montrose*, in which Dr. Crippen was making his escape from England—the first time wireless was used in tracking down a murderer. At the nine-day inquiry which followed the sinking of the *Empress of Ireland*, Mr. Whiteside was warmly complimented upon the prompt and effective measures which he took to rush assistance to the doomed liner. The chairman expressed the opinion that but for his devotion to duty and his presence of mind, not one of those on board the *Empress of Ireland* would have been alive to tell the tale.

The *Empress of Ireland* was one of the most popular of the ships making the passage between England and Canada. Her construction was thoroughly modern. She carried boats for all, and all the latest devices for ensuring the safety and comfort of passengers had been introduced.

Among those who lost their lives were Laurence Irving, the actor, and his wife Mabel Hackney, and some 120 of the delegates on their way to the International Congress of the Salvation Army.

The master, Captain Kendall, was picked up from floating wreckage some half-hour after his ship had sunk.

Just two weeks after the *Empress of Ireland* sank in the St. Lawrence River, the House of Commons was debating the Mercantile Shipping (Convention) Bill—a measure designed to minimise the dangers of the sea. The compulsory wireless clauses provided that every British ship which carried fifty or more persons should have a wireless installation and should maintain a wireless telegraph service sufficient to comply with the rules made for the purpose under the Act, and should provide certified operators and watchers.

Ships engaged on voyages which did not take them more than 150 miles away from the coast, and sailing ships were exempt.

Power was given to the Board of Trade to withold a safety certificate unless they were satisfied that the provisions relating to wireless telegraphy had been complied with.

CHAPTER FOURTEEN

Competition in International Shipping

THE first ten years of the Marconi Marine Company, that is, from the date of its incorporation in 1900 until 1910, were, of course, spent in developing and improving the apparatus and the organisation for providing an efficient and reliable wireless communication service between ship and shore and ship and ship, and in convincing shipping companies of the value of the service in increasing the efficiency of their passenger liners. The capacity of the Marconi apparatus to justify the claims made for it had also to be demonstrated by all possible means. What we now call 'sales resistance' had to be broken down.

Sea carriage has always been a highly competitive industry in which only those shipping companies who provide the most economical and efficient service survive, although frequently other factors are responsible for certain foreign companies being kept in being by their respective Governments, and for subsidies being paid out of public funds to cover any losses which they may incur. British shipping, except for short periods in special circumstances, has generally had to fight such competition unaided, and it has been necessary to watch carefully every penny of expenditure in order to quote rates which would attract freight and passengers.

In those early days of wireless, competition was most fierce in the North Atlantic passenger-carrying trade, and it is to the credit of the companies engaged on that route that they were the first to recognise and appreciate the possibilities of wireless telegraphy not only in increasing the efficiency of their services but as a means of providing additional safety for the passengers they carried and the crews who manned their ships.

One prominent shipowner engaged in the passenger and cargo trade from Britain to India and Australia was reported to have said that 'shipowners considered wireless expensive and rather a nuisance.' It was not long, however, before wireless had proved its value to such an extent that in 1909 the particular company with which this owner was associated fitted eight of its largest ships with Marconi apparatus.

In the establishment of this wireless communication service and in 'selling' it to the shipping industry, much money had to be expended by the Company. It was estimated that the cost of creating and popularising the service was something in the neighbourhood of a quarter of a million pounds before the Company was able to earn any profits; and it was not until 1910—ten years after its incorporation—that, as a result of the hard work of every member of the Company, it was possible for a dividend (five per cent.) to be paid to the shareholders.

The year 1909 had seen the turning of the tide in the Company's affairs. For the first time the business had reached a stage where the revenue exceeded the somewhat heavy standing expenditure necessary in a business of this nature. There was a feeling of confidence that business would continue to improve and that the increasing facilities for communicating with the shore, the continually-growing number of ships installed, together with the growth of the custom of communicating with and from ships at sea, would show steadily increasing profits. The Board of Directors had been strengthened by the election of Mr. Godfrey Isaacs, and there was reason for believing that the patience of the shareholders and the hard work of the staff would continue to produce considerable expansion. At the end of 1909 the Company possessed and worked 143 telegraph stations on board ships on the high seas. By December 31, 1910, this number had increased to 250 and by June 20, 1911, there were 303 such stations at work.

An Economical and Efficient Service

'Service' has always been the chief aim of the Marconi companies. The parent Marconi company began by simply manufacturing wireless apparatus and selling it outright to those who wanted to use it. This was done, for instance, in the case of the installation supplied to the *Kaiser Wilhelm der Grosse* and to the Dover-Ostend packet boats. It soon became clear to the Marconi Marine Company, however, that no satisfactory or extensive business could be done by asking shipowners to purchase apparatus outright and to organise a public telegraph service. The Company accordingly decided to adopt the bold policy of organising the service on its own account. Three things were necessary to the efficiency of the service. First, the provision of land stations adjacent to the chief trade routes; second, the equipment of vessels with wireless apparatus; and third, but no means least, the working of both ship and shore stations by operators trained to observe the same rules and regulations. These were the lines upon which the Marconi Company began to build up a most useful and successful marine service. In each case the apparatus installed in the ships remained the property of the Company and was worked by the Company's own operators. With uniform control, confusion was prevented and the service brought to the highest pitch of usefulness.

The development of regular communication between the increasing number of ship stations had necessitated not only a carefully-designed organisation but a uniform method of working. This, in turn, necessitated a practical standardisation of apparatus. At the same time, the demand for absolute reliability in the hands of ordinary operators had led to the evolution of a type of apparatus which was free from complications and was constructed to work continuously without derangement.

The accident to the *Republic* had strikingly demonstrated the utility of wireless in the case of ships in distress; it had illustrated the excellent working of the Marconi ship-to-ship and ship-to-shore telegraph organisation and its value to all Transatlantic travellers. The large and increasing demand for the installation of wireless telegraph stations on board ships meant that additional capital would be required. Debentures amounting to £40,000, upon which interest at the rate of seven per cent. per annum had to be paid were paid off and first mortgage debentures to the sum of £125,000 at a lower rate of interest were created.

By December 31, 1912, the number of ships equipped had increased to 580, and by June 1913 to 686, and a considerable number of further orders were in hand. Largely owing to the establishment by the Marconi Company of shore stations in Great Britain, Canada, and the United States, wireless telegraphy had seen its greatest development on the North Atlantic routes. On other routes, however, the number of ships fitted was increasing. In Eastern waters, particularly in typhoon areas, wireless was voted a 'boon and a blessing' by merchants and shipowners.

The Company was by now performing a most vital and valuable service to the Mercantile Marine, and it could definitely be stated that it was playing a most important part in world commerce and trade. It could also be claimed that had it not been for wireless telegraphy many ships would have sailed from their home ports and never have been heard of again.

The Company now had so many large orders in hand that much further additional working capital became necessary. The authorised capital was £350,000 in £1 shares, of which 204,056 had been issued. In order to provide the additional funds required the directors offered in July 1913 to the Company's shareholders 102,028 shares in proportion, so far as was practicable, one new share for every two existing shares, at the price of 25*s*. each. Marconi's Wireless Telegraph Company, by virtue of its holding in the Marconi Marine Company, was entitled to an allotment of 94,395 shares in the issue. The whole of the shares were duly subscribed and allotted, and before the year was out an interim dividend of five per cent. was declared upon all the capital issued.

Advantages to Shipping Industry

Although it was as a life-saver that wireless telegraphy captured the public imagination there were many other advantages to the shipping industry in having the apparatus installed. It destroyed the isolation of ships at sea, but apart from the anxieties thus relieved and the risks of loss and delay thus diminished, there were many economies in connection with embarkation and disembarkation which could be arranged now that it was possible to send messages to ships at almost any point on their course.

In the event of a breakdown a wireless message would not only counteract a rise in re-insurance by allaying uneasiness ashore but also, by the diversity of the help it brought, succeed in reducing what might otherwise be a high salvage charge, or even lead to escape from salvage liability altogether if the distress summons brought alongside a vessel of the same Company.

The master could readily ascertain well in advance the weather conditions on his course—a matter of the first importance in Eastern waters, where hurricanes and typhoons commonly prevailed during certain seasons; he could also be advised of the state of tides and harbour bars when approaching from the sea—a matter for his earnest attention, especially on the west coast of Africa. In foggy weather, again, a vessel's position could easily be ascertained by wireless; a ship was always in a position to receive advice of the presence of floating derelicts, ice, or other dangers to navigation. Safe and rapid navigation could materially be assisted by the checking of the ship's chronometer by wireless time signals.

The manifold advantages of wireless telegraphy to shipping were not confined to the saving of life and property and the safety of navigation. Owners of cargo ships were becoming increasingly conscious of the manner in which Marconi's invention could be applied in other ways. For instance, in 1912 owing to a dockers' strike at Liverpool there seemed possibility of vessels being very much delayed in discharging. Some of the cargoes were of a perishable nature which might have had a chance of being discharged in some other port if they could have been diverted in time. It would have been an advantage and also a saving of money if such vessels could have been communicated with by wireless on their approaching the port and instructions given to the masters to proceed elsewhere.

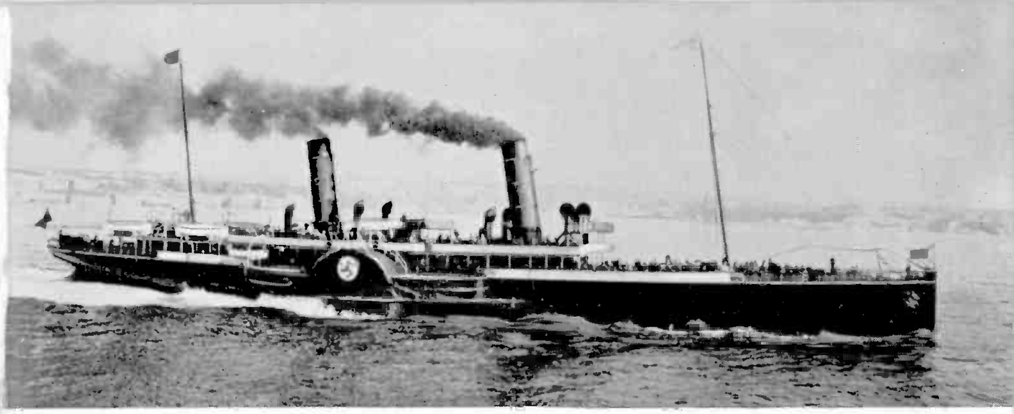
Again, a vessel might be carrying a cargo of wheat and this cargo might change hands several times between the departure of the vessel from the other side of the Atlantic and its arrival at the port of destination in this country. It might eventually be found better for a vessel to put in, say, at Cardiff instead of at Hull, or *vice versa;* but an alteration in the course while the vessel was at sea would only be possible if the owners were able to communicate with the master by means of wireless telegraphy. These were but two of the advantages quite apart from the human considerations.

Wireless for Cargo Ships

No doubt one of the reasons why few cargo ships at this time had been equipped with wireless telegraph apparatus was the absence of a sufficiently small, compact and efficient set which would be suitable in cases where the standard ship equipment was too large. To solve this problem the Marconi engineers evolved a ½-kW set, specially adapted to the requirements of cargo vessels in view of the possibility that the Governments of the world might insist upon the vessels sailing under their flags or entering their ports being equipped with wireless telegraphy.

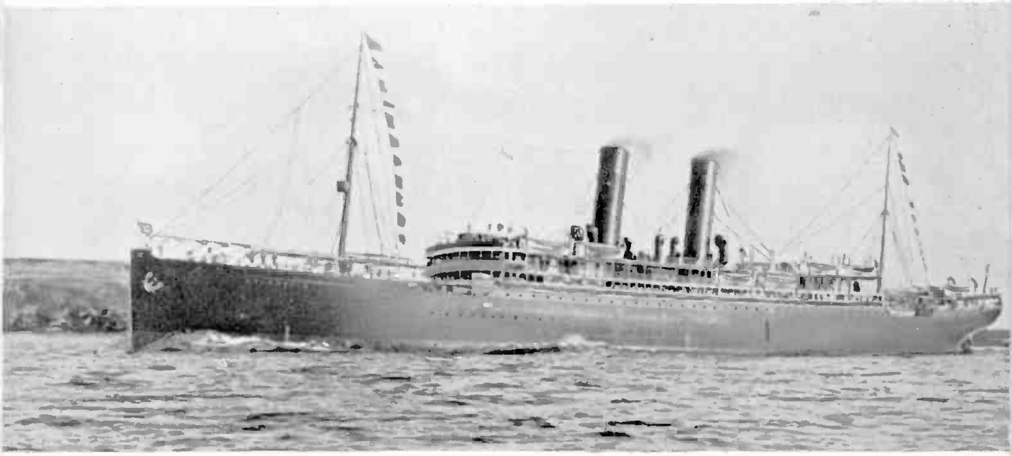
An illustration of what wireless telegraphy could do in the case of cargo ships was given in *Fairplay*, the weekly shipping newspaper, in September 1912 when there was a strike at 'the Islands' and coal prices were uncertain. A tramp steamer had been instructed, on leaving Bahia Blanca, to coal at Teneriffe. The owners, therefore, cabled to St. Vincent a code word ordering the ship to Las Palmas. The code word was so mutilated that the master could not make it out and he did not think it worth while to await its repetition. The owners were consequently surprised to receive his sailing cable saying he was bound to Teneriffe after they had taken the trouble to order him to Las Palmas. But the steamer happened to be fitted with a wireless installation suitable for a tramp which, as the ship had no electric light, was worked by a paraffin oil engine on top of the engineer's house, being thus independent of a possibly flooded stokehold. Consequently, when the owners received the ship's noon position through one of the Canary Island wireless stations, showing the ship was in touch with this station, they sent her a wireless message to go to Las Palmas instead of to Teneriffe. This was immediately acknowledged, the ship duly went to Las Palmas and the owners were thereby saved some £150 on the cost of the bunker coals. Thus in this case the wireless message actually corrected the mistake in the cabled order.

Wireless was proving that valuable time and bunkers could be saved by the facility with which owners of a vessel could get into touch with her for the purpose of changing her course when once she was cleared, and profits could be enhanced by the ability to order a ship home at top speed to take a special cargo on a sudden rise in freights for a prompt steamer. Time, pilotage, and port dues could also be saved by informing vessels that bunker coal was not available at a port for which she was making.



Photograph by courtesy of the Isle of Man Steam Packet Company

The Isle of Man Steam Packet Company's ship 'Empress Queen', fitted with Marconi wireless in 1906

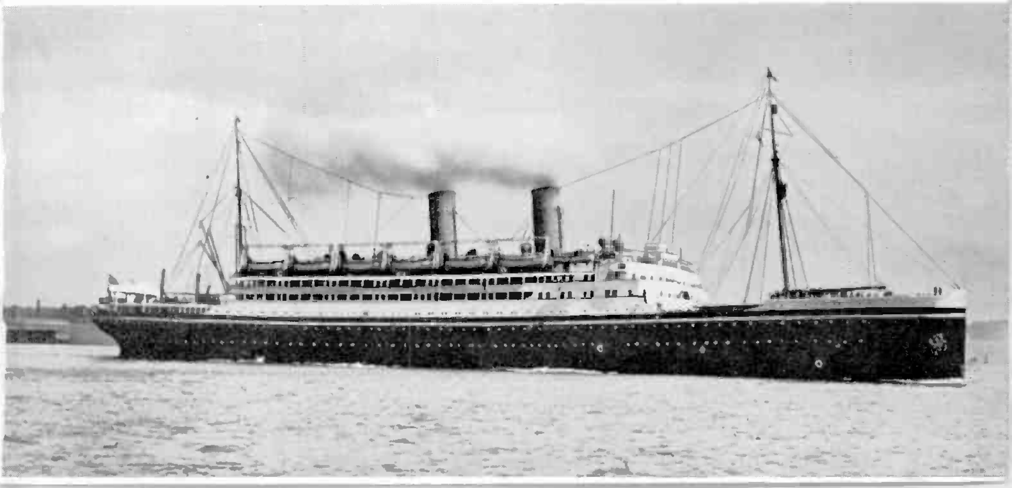


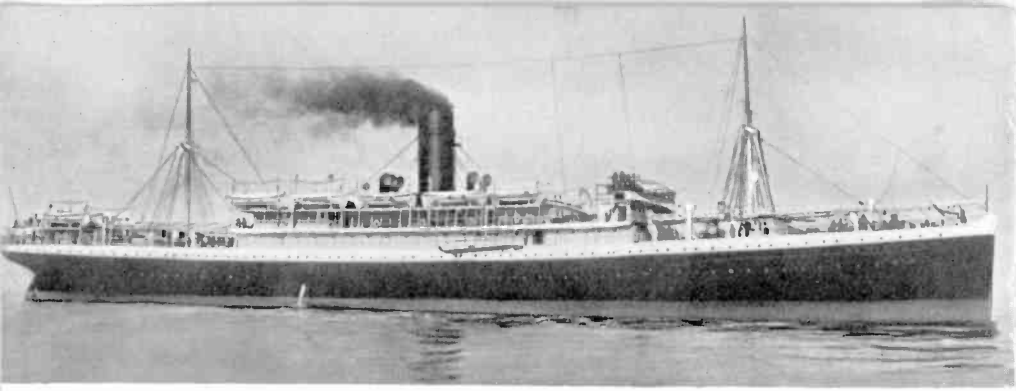
Photograph by courtesy of the Anchor Line

The Anchor liner 'Caledonia', fitted with Marconi wireless in 1906

The Canadian Pacific Company's liner 'Empress of Britain', fitted with Marconi wireless in 1906

Photograph by courtesy of the Canadian Pacific Railway





Photograph by courtesy of the Booth Line

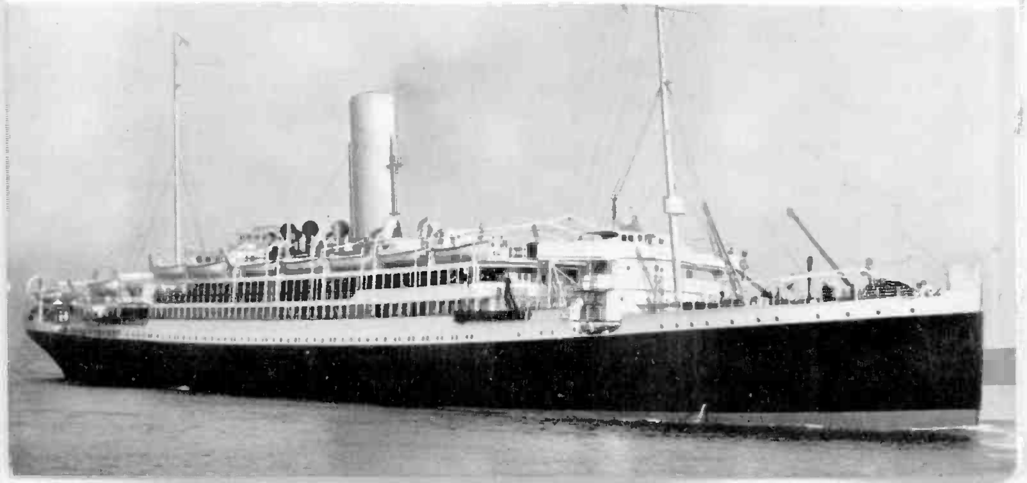
The Booth liner 'Antony', fitted with Marconi wireless in 1907

Photograph by courtesy of Harland Wolff Ltd.

The first oil tanker to be fitted, in 1907, *with Marconi wireless telegraph apparatus, the 'Iroquois', owned by the Anglo-American Oil Co.*

The Royal Mail liner 'Araguaya', one of the five ships of this company to be fitted with Marconi wireless in 1908

Photograph by courtesy of Royal Mail Lines, Ltd.



Docking, berthing, amount of coal for bunkers, extra stores, space available for cargo, medical officer's attendance, hospital accommodation for accidents, ambulances, package, train accommodation, meals, time of arrival—all could now be arranged for in advance by wireless with immense saving of money and time.

There were many other instances of the utility of wireless telegraphy, and the lower rates of insurance on ships equipped with wireless apparatus had assured it an impregnable position in the estimation of shipowners, underwriters, and the travelling public.

CHAPTER FIFTEEN

The First World War

THEN came the first world war which broke out in August 1914. Well it was for the British people and the world that wireless telegraphy had been brought to its then state of perfection! At no time before, perhaps, had the value of Marconi's invention and the usefulnes of the Company's organisation been so pronounced and emphasised. The nation had good cause for rejoicing that such an organisation existed and that it was the organisation of a British company. The country had been slow to appreciate the value of the work which the Company had taken in hand, or how dangerously near the whole business had been to falling into foreign hands. A far different state of things might have existed had the Company shown less enterprise and determination.

A few weeks before war broke out Marconi had said in a public speech: 'The value of wireless telegraphy may one day be put to a great practical and critical test; then perhaps there will be a true appreciation of the magnitude of our work'. Now the great practical and critical test had come.

At five a.m. on July 30, 1914 the great naval review at Spithead over, the First Fleet, which had just left Portland, was recalled by wireless telegraphy, and instructed not to disperse for manœuvre leave as had previously been arranged. Five days before the actual declaration of war, therefore, wireless telegraphy had performed its first great national service.

On August 1, 1914 the British Postal Authorities advised Berne that wireless telegraphy, except on British ships of war, would be suspended on board all vessels in territorial waters round the British Isles. On August 2, a Sunday, the *London Gazette* published the following notice:

'In pursuance of Regulation 5 of the Wireless Telegraphy (Foreign Ships) Regulations 1908, the Right Honourable Charles Edward Henry Hobhouse, His Majesty's Postmaster-General, gave notice that "in the opinion of the Right Honourable Reginald McKenna, one of His Majesty's Secretaries of State, an emergency has arisen in which it is expedient for the public service that His Majesty's Government should have control over the transmission of messages by wireless telegraphy, and that the use of wireless telegraphy on board foreign ships whilst in the territorial waters of the British Isles will be subject to such rules as may be made by the Admiralty".'

This was followed on Tuesday, August 3, by the following Admiralty notice:

'With reference to the notification published by the Postmaster-General on the 2nd inst. the following regulations have been made by the Lords Commissioners of the Admiralty, prohibiting the use of wireless telegraphy by merchant vessels in the territorial waters of the United Kingdom and the Channel Islands:

1. The use of wireless telegraphy is prohibited in the harbours and territorial waters of the United Kingdom and the Channel Islands.
2. On entering any port or harbour, or on directions being given to that effect by any naval, military, examination service, Customs, or police officer, the aerial wire or antenna is to be at once lowered, disconnected from its halliards and from the operating room and is not to be re-hoisted while the ship remains in British territorial waters.
3. Any breach of these regulations renders the masters of offending ships liable to penalties and to the confiscation of the wireless apparatus of their ships.

Note: These regulations do not apply to ships owned (not chartered) by the Admiralty, whether they fly the Blue or the Red Ensign.'

A further notice was issued the same evening:

'The Postmaster General has issued instructions for the closing of all experimental wireless telegraph stations in this country.'

Wireless Saves British Liners

The value of wireless was soon evident in rescuing British liners from the clutches of German prowlers. One of the most dramatic incidents was in connection with the *Mauretania*. She was bound for New York, but at 11.30 on Thursday night, August 8, she was warned by a wireless message from the British cruiser *Essex* to change her course without delay. She did so immediately and with such suddenness that the passengers, unaware of the order, believed that the vessel was turning turtle! Then, at the highest possible speed she set off for Halifax, her portholes blanketed and her lights extinguished. A similar experience was undergone by the White Star liner *Cedric*, which also received timely warning from the *Essex*. Another vessel to be warned by wireless was the *Calgarian*.

In the case of the Norddeutscher Lloyd steamer *Kronprinzessin Cecilie*, the boot was on the other foot, for the British were this time the pursuers and the liner the fugitive. There were two million pounds of specie on board and she was anxious to reach Germany. For this purpose her entire appearance was changed by blanketing her prow and stern with a shroud of canvas and her four funnels were tipped with black paint in order to conceal her identity. Furthermore, wireless silence was enforced for fear of betraying her whereabouts. But all her efforts or subterfuge were unavailing. She was forced to return to America before she had gone far from the coast.

It may, perhaps, be of interest to consider the position of wireless telegraphy at the time war broke out in 1914. The Marconi patents had been imitated in Germany and an important wireless company had been created by the German Government. This German company not only had the great financial aid of some of the principal German banks, but it also received a very large subsidy from the German Government. The German company, no doubt under the direction, to a large extent, of the German Government, had created powerful agencies in many countries, and had obtained a preponderating position in many parts of the world. The German Government had built a chain of wireless stations in all the German colonies at a cost three times as high as the Marconi Company had asked of the British Government when they proposed that high-power stations should be built in all the British possessions.

Those stations cost the German Government something in the neighbourhood of two million pounds, but when war came they soon proved the value of the investment, for at five o'clock in the afternoon of August 4, 1914, some seven hours before Britain declared war, Germany sent out a message to all its wireless stations which passed that message on from one to another, and each station sent it out to sea, covering a radius of something like 2000 miles or more, to this effect: 'War declared upon England; make as quickly as you can for a neutral port'. By means of that message, which occupied but a few minutes, Germany contrived to save the greater part of its Mercantile Marine.

Germany had spent money lavishly in laying German cables only to see them cut by the British within forty-eight hours of the declaration of war. The next move in the British assault upon German communications consisted of the destruction, one by one, of many of their high-power wireless stations. The detrimental effect upon Germany of the British successes in this respect cannot be better demonstrated than by the following extract from an official communique issued at the beginning of 1915 by the German Colonial Office. It read as follows:

'Soon after the outbreak of war all communication with the colonies by sea was broken, and all German submarine cables were cut by the British, so that even telegraphic communication with the whole of our colonies was rendered impossible. The only remaining means of communication was wireless telegraphy, but the first warlike measures of the British were directed to depriving us of this means also. On August 12 the Wireless Station Yap and soon afterwards the station Nauru were destroyed. Tasigata (Samoa) fell on August 29, and Bitapaka, in New Pomerania, on September 12. During the night of August 24 the great station at Kamina, in Togoland, had to be destroyed by us in order to prevent its capture. So vanished all possibility of further direct communication with the African protectorates, which hitherto had been able to communicate via Kamina.'

Nevertheless, although the stations were soon destroyed they had already saved Germany their cost a hundredfold, besides the immense assistance they rendered in other respects.

Enemy Attacks on Shipping

In August 1914 Germany had in all a dozen armed vessels on the high seas prepared to attack British shipping. It was the *Emden* which had the longest and merriest run. Her captain was Commander von Muller, who was aware from the first of the advantages of wireless and made great use of it for tracking down ships during the three months he managed to keep out of sight of our searching warships.

Two outstanding naval engagements in which British wireless played an important part in destroying these marauders were those of the Falkland Islands and the sinking of the *Emden*. The first of these engagements came about in this way. After the destruction of Admiral Craddock's squadron at Coronel, the German Admiral von Spee cruised about in the Eastern Pacific and, apparently deciding to make his way round the Horn to South Africa, thought he would first pay a visit to the Falkland Islands to destroy the wireless station on those islands. His fear of wireless, which was well-founded—for, of course, he was receiving a great number of British messages showing how the Royal Navy was watching in every sea for his destruction—led to his doom.

It is important to consider that Admiral von Spee's immunity from destruction hitherto had lain very largely in the motherly protection he received from German wireless stations in South America. He had been, until this moment, operating in a zone of friendly wireless and had, therefore, known all the movements of the British Fleet so far as those movements were likely to affect him. But now, in making an attack upon a British wireless station, he not only lost the protection of his own wireless, but was exposing himself to a weapon of the most deadly potency. His action was one of panic—a wild effort to prevent the British Admiralty receiving valuable information from the British land station at Port Stanley.

It was perhaps a stroke of luck that Admiral Sturdee should have reached the Falklands only a day before the enemy ships were sighted. He had steamed half-way round the world at a speed which had astonished everybody and, arriving off the Falklands, had decided to bunker. He was there with the battle cruisers *Invincible* and *Inflexible*, and three cruisers of the 'County' class. So swift and so secret had been his journey that his arrival off the Falklands on December 7 took everybody by surprise. At 8 a.m. on the following day, a Tuesday, a message was received stating that enemy ships had been sighted approaching Port Stanley.

At 9.20 a.m. the German warships *Gneisenau* and *Nurnburg*, with guns trained on the wireless station, came within range of the old British battleship, *Canopus*, which was obscured by the hills and opened fire with her main armament. The enemy at once hoisted their colours and turned away. A few minutes later they altered course to port, as though to close the *Kent* at the entrance to the harbour, but about this time the tripod masts of the *Invincible* and *Inflexible* were sighted. The enemy at once altered course to evade action, but was pursued by the British squadron and, with the exception of the *Dresden*, was destroyed before nightfall. The *Dresden* was later destroyed in the Pacific.

Exploits of the 'Emden'

The story of the *Emden* and her eventual destruction by H.M.A.S. *Sydney* will stand for all time as one of the most thrilling exploits in naval history. The *Emden* had disguised herself to look like an English cruiser; she carried a fourth funnel which was made of wooden frames covered with canvas. In this way she was able to deceive many French and British vessels and to avoid destruction for some weeks.

If the loss of wireless was serious for the Germans on land it was trebly serious for the German sailor out on the high seas. It is, therefore, not surprising that the German sea raiders did what they could to destroy the stations of their enemy, and we find von Muller, in command of the *Emden*, explaining why his ship made what was destined to be her last journey.

'On November 9 we lay off Keeling Island, our object being to destroy the cable and wireless telegraph stations. A landing corps of two officers and forty-nine men were disembarked under my orders. The *Emden* lay some 1500 metres from the shore. I had reckoned on armed resistance, and taken four machine guns with me. On landing we took possession of the station and proceeded to destroy, burn, and blow up everything.

'The destruction of the station and the fishing up of the cable occupied about two and a half hours. Then unexpectedly the *Emden* blew her siren. This was the signal to hasten back with all speed. I was able to do so at once, as we were just getting into the boats; the work was finished. As I pushed off I saw the *Emden* had already weighed and was leaving harbour . . . Suddenly she opened fire. I could not see the enemy, he was behind the island; but I saw his shots striking. As the *Emden* was engaging at a speed of about twenty knots, it was impossible for me to follow.'

At six o'clock that morning an Australian convoy off Colombo had received a wireless message from Cocos reporting that a foreign warship was approaching. That message decided the fate of the *Emden*. In less than one and a half hours the flagship received from H.M.A.S. *Sydney* the wireless message: 'Have engaged the *Emden* and finished her'.

CHAPTER SIXTEEN

The Call for Wireless Operators

IMMEDIATELY on the outbreak of war the Admiralty took steps to secure the services of Marconi operators for all branches of the Service. In answer to the Government's call there came an army of lads and young men from all classes who had gone from school to the Marconi Marine Company, in whose offices they had been trained in Morse and the operation and maintenance of wireless apparatus. These at once volunteered their services to the Admiralty and the War Office—their places being taken by other lads clamouring to be trained as wireless operators. In due course the Company provided not merely an army of operators, but also technical experts whose knowledge was unrivalled and to whose service to the country many tributes were paid.

The Company kept its offices open day and night for the purpose of examining lads who came from all parts of the country to offer themselves as operators. So great was the demand, that some of the pupils and enrolled scholars were as young as sixteen years. The staff at Marconi House worked to the limits of their power and to the last ounce of their energy to meet the great emergency. Every ship which arrived at a British port with a wireless operator on board brought a volunteer to the Admiralty. These men were taken in their hundreds from the Merchant Navy and distributed as quickly as possible among ships of war of all types from the battleship to the armed trawler.

But although the Navy's problem was being solved another was being created in the Merchant Fleet. Not only were the big liners deprived of their Marconi operators but ships which hitherto had not been fitted with wireless—vessels of 1600 to 3000 tons—found that wireless was a necessity. In addition, whereas before the war it was sufficient for one operator to be carried, now it was essential that there should be at least two operators to keep a continual vigil.

How the difficulty was met was told in the pages of the *Wireless World:*

A conference was held at the Admiralty for the purpose of considering the practicability of fitting all ships of 1600 tons and over with wireless telegraphy. The desirability of carrying two operators for maintaining continuous watch was also emphasised. The authorities thereupon approached the Marconi Company with the view of ascertaining whether they could possibly cope with so huge a task. Few ships under 3000 tons had up to that date been fitted, and it was quite evident that not only would a tremendously increased volume of wireless apparatus have to be made and supplied, but that the operating staff would need to be practically trebled. It was estimated, in other words, that the trained personnel, already increased in three years from 1000 to nearly 3000 men, would have to be further expanded to a total of about 4000 to 4500 in a few months. With full knowledge of this gigantic task, Mr. Godfrey Isaacs, on behalf of the Company, undertook definitely to provide both apparatus and men.

Arrangements were made for a course of free tuition, and the accommodation of Marconi House being filled to overflowing, arrangements were made with King's College and the Birkbeck Institute for the reception of additional volunteers. Similar schemes were set afoot in several provincial centres. At the same time, pressure of a severe nature was put upon the Marconi Works at Chelmsford. The delicate mechanism employed in wireless telegraphy, with the Company's research and development and constant improvements being introduced by experts at headquarters, had to be manufactured at a speed and in such quantity as never before had been contemplated. And, in addition, there was a constant demand for those simpler instruments—keys, buzzers, telephones, etc.—which are necessary for the instruction of pupils. The manner in which this problem was handled is beyond praise.

Wireless in War

'They also serve' who, while not in the actual fighting line, are asked to devote their special talents and skill in other ways in the nation's interest. It is no exaggeration to say that wireless saved the world in that great struggle of 1914-1918. At the lowest estimate, wireless played an important part in compassing the enemy's defeat. We are an island nation dependent upon sources outside the United Kingdom for a large proportion of our food supplies, and if our life-line across the seas had been cut, all the courage of our fighting men on land, on sea and in the air would not have saved us. But wireless telegraphy placed in the hands of the British Navy and the Mercantile Marine an instrument which enabled them, albeit at great sacrifice, to maintain our supremacy at sea. All honour then to those Marconi technicians and instructors who, working day and night, supplied the Navy of Defence and the Navy of Supply with the apparatus and the gallant young men to operate it.

As a result of the Marconi training scheme, not only were large numbers of candidates secured but the service was opened to many keen and intelligent young fellows who, residing many miles distant from a training centre, might have been prevented from entering upon a wireless career. The training was in all cases at least as efficient as in peacetime. The needs of the time were so great that each operator sent to sea had to be fully proficient in order to maintain the high reputation of the Company and to do justice to the Company's apparatus.

In those perilous days these young men acting as wireless operators were almost continuously upon the high seas. They were engaged in a serious occupation and great responsibility rested upon their shoulders, but in no single instance was one of them found wanting in the moment of peril. The Company had, of course, always been at some pains in selecting men for this service, in enquiring thoroughly into their records, both of school and subsequently of their parentage and of their home life, and it was significant and an indication of the inherent qualities of British youth that all bore themselves admirably in all circumstances.

Courage of Radio Officers

It would require a separate volume to chronicle the many thrilling episodes in which lives were saved through the instrumentality of wireless telegraphy when ships were attacked by enemy submarines, and to detail the many examples of courage displayed by Radio Officers. But perhaps a few instances may be recorded. The first episode is concerned with the escape of the *Anglo-Californian* from submarine attack.

When this ship was being chased by a U-boat the Radio Officer in charge, I. F. Rea, sent out calls for help which were answered by various warships entirely out of sight and, according to the Admiralty record, the wireless conversation which ensued was one of the most extraordinary that had ever been chronicled. To the requests of one of our warships for indications of his ship's course, speed and appearance, Rea replied swiftly and added: 'Hurry up for God's sake! Submarine firing like blazes'. The naval ship gave him instructions as to the best course to steer. Meanwhile the submarine bombardment became heavier and heavier, and Rea, with his instruments already damaged, sent another message: 'Cannot hear you. Concussion. Am lying on floor. Broken glass all around me'. The warship replied: 'Keep your pecker up, old man. Am firing to scare him. Can you report result?' Rea carried out his instructions and finally sent the following agonised message: 'Hurry, Hurry, submarine getting abeam to torpedo us'. And then, as the faint trail of smoke on the horizon resolved itself into a fast approaching ship, the U-boat got frightened and dived, and the Radio Officer's final message was characteristic of his coolness all along: 'I hope she stops down. It was getting hot here. Don't worry about us. Destroyers now alongside.' Rea was afterwards presented with a gold watch by the Lords Commissioners of the Admiralty for his devotion to duty in remaining at his post in the wireless cabin during the time the ship was heavily engaged and shelled by a German submarine. The junior Radio Officer, Mr. W. G. Williams, was highly commended for splendid conduct in going down into the stokehold and assisting the engineers in keeping up steam when the stokers had refused to go below.

In another instance the unlucky Radio Officer involved paid with his life for his courage and devotion. During the latter part of 1917 the S.S. *Benledi* was some 140 miles from land when she was attacked by a submarine which launched a torpedo at her. Fortunately the torpedo passed under the ship without doing any damage. Very soon afterwards the submarine appeared on the surface at a distance of about four miles and began to shell the ship.

The shelling continued for about an hour during which period E. W. Gardiner, the Radio Officer, remained in his cabin and got into communication with a land station from which he was promised the immediate assistance of a destroyer. During the whole hour the ship was being shelled the Radio Officer remained at his post in the hope of getting into touch with a ship which would be able to give him help. The master then sent a message by the first mate to the Radio Officer to the effect that, having communicated with the coast and obtained a promise of assistance, it was advisable that he should leave his post and take shelter. But Gardiner refused to go. He was getting into touch with an American light cruiser which he believed was nearer than the British destroyer and was, therefore, likely to give earlier assistance. As soon as he was able to get through the message to the American cruiser and get a satisfactory reply, he would take cover.

Within a few minutes the submarine abandoned solid shell for shrapnel and fired a shot which passed directly through the cabin, decapitating the Radio Officer. When the master and officers went later to the wireless cabin they found the headless body sitting in the chair with the completed message from the American cruiser written out in front of him. Only the timely arrival of this American vessel had prevented the ship from being sunk. Had the Radio Officer left his cabin, as he was authorised to do by the master, the ship would probably have been sunk, and it is more than likely that many, if not all, on board would have been lost.

Devotion to Duty

It is always invidious to make any selection where many are meritorious; it is especially so when one attempts to make selections amongst those who have 'acquitted themselves like men' in the dark hours of danger and distress. In presenting these few examples of Radio Officers who won official recognition for extreme gallantry during the period covered by this volume, the fact must be emphasised that they are typical of, and not exceptions to, their numerous comrades of the Marconi service at sea. The brief summary which follows indicates the nature of their respective claims to a place in our pages. As far as the order is concerned, that which follows is alphabetical.

Arthur John Broughton was Radio Officer in the liner *Zent*. As this vessel was, on April 5, 1916, making her way down the Channel, suddenly, without the slightest warning, two torpedoes struck her on the starboard side. The *Zent* foundered and disappeared completely in about two minutes. Immediately on the first explosion Mr. Broughton sent out the distress call, using the emergency set as the ship's dynamo was destroyed. This gallant young man was never seen again; but his call was instrumental in assuring the safety of eleven survivors out of a crew of sixty. Such was the indignation of the master and mates of the *Zent* at the dastardly outrage of which they were the victims that they caused to be drawn up by a notary public, in legal form, a 'Public Instrument of Protest' wherein they spoke of the way in which 'this brave gentleman's life was sacrificed to his duty'. This document was lodged with Messrs. Elders and Fyffes, the owners of the vessel. Of Mr. Broughton, the master of the *Zent* wrote: 'But for his gallantry and devotion to duty not a single life would have been saved. He remained to the last in his wireless cabin.' But he had succeeded in bringing help to the others.

Owen Chick was twenty-four years of age when he sailed in the oil tanker *San Melito*, in August 1916 *en route* to Mexico. When steaming down Channel the *San Melito* found herself under fire from a German submarine at about 250 yards range. Flying splinters struck the captain down and Mr. Piper, the chief officer, took the helm. For forty minutes the gallant Radio Officer and his comrades stuck to their exposed posts on the upper deck, attending to their duties, whilst sending out the SOS signal continuously. The vessel was saved, and Mr. Chick, in common with his comrades, received not only a cheque for his services, but a silver model of a German submarine as a memento of the occasion.

Ernest Alexander Corothie was serving in the S.S. *Ohio* when the vessel was torpedoed and sunk on March 7, 1917. The young Radio Officer (he was only twenty-two when he died) with calm deliberation gave up his life in order to save the lives of his fellows. The *Ohio* went down four minutes after she had been struck by the enemy torpedo, and Mr. Corothie, with full knowledge of his fate, stuck at his post, transmitting signals of distress all the time that his comrades were abandoning the doomed ship.

William Douglas Crookes was serving at sea on July 6, 1917, when his ship experienced an example of U-boat frightfulness. On this occasion, thanks to the intrepidity and alertness of the Radio Officer and the zeal of the rescuers, the vessel was ultimately able to make port. Her master marked his gratitude for Mr. Crooke's zealous performance of his duties by writing a letter to the Marconi Company, eulogising his conduct in the following terms:

'I wish to state that I received great assistance from my Radio Officer, who although badly shaken through shock due to the explosion, remained at his post and was the means of my being able to obtain the early assistance which enabled me to save the ship. I therefore wish to compliment Mr. Crookes on his pluck in remaining by his post at the most critical time.'

John Cunningham was serving in a British ship when she was attacked by an enemy submarine. On this occasion the U-boat used her guns and subjected the vessel to so fierce a fire that the master and chief officer (besides other members of the ship's personnel) fell victims to the bombardment. Mr. Cunningham worked manfully, despite the fact that the wireless cabin formed a special target for the submarine gunners. The shell which struck down the captain and chief officer as they stood upon the bridge above his head disordered the wireless gear in such a way as to render it temporarily useless. Undeterred by the shock and the rain of projectiles which followed, Mr. Cunningham put the apparatus straight, and finally succeeded in getting into communication with Malta.

Edward Walter Dyer was one of the Radio Officers in the British transport *Royal Edward* when, on August 13, 1915, she was torpedoed by an enemy submarine whilst bound for Gallipoli. Although but twenty-one years of age, Mr. Dyer had, since he joined the Marconi service in 1914, served in five other vessels before he joined the *Royal Edward*. He stuck to his post to the last and, whilst struggling in the water after the vessel sunk, received injuries so severe that he was obliged to have one of his legs amputated. Mr. John Keir, the other Radio Officer, escaped with contused ribs, having been crushed between two collapsible lifeboats.

The Story of the 'Floandi'

Douglas M. Harris, Radio Officer on board H.M. trawler *Floandi*, won an enduring place in Britain's roll of honour. His vessel was one of a line of drifters watching anti-submarine nets in the Straits of Otranto. On May 15, 1917, three Austrian cruisers turned upon them from

Pola. The little British craft, utterly helpless against the powerful enemy ships, refused nevertheless to surrender, and put up a stout fight. Some of them were sunk and others badly damaged before assistance could arrive. The *Floandi* was one of the trawlers equipped with wireless and thus received the enemy's particular attention. She was badly damaged in the encounter and came out of the engagement with four men killed and three wounded out of a total of ten. Radio Officer Harris was found in his cabin lying across the wireless log, which it was his duty to keep, and upon which he was engaged in writing at the moment when the shell struck him down. The log showed the marks where it was perforated by the enemy's missiles and bore a line traced by Mr. Harris's pencil as he fell forward in his death agony. The gallantry of the young hero caused him to be 'mentioned' in the Admiral's despatch, and his deed remains as a bright example to future generations of his young countrymen.

John McMillan had served the Marconi Company since June 1913 on four ships before receiving his appointment to the S.S. *Wayfarer* in March 1915. The safety of this Harrison liner, which was attacked by German underwater craft in the earlier part of 1915, was due to the promptness with which wireless enabled her to summon assistance, and the British Admiralty gave practical testimony to their sense of Mr. McMillan's gallantry in carrying out his duty in circumstances of an exceptionally trying character by presenting him with an inscribed watch.

Ronald Charles Older was one of the younger members of the Marconi staff at the time when he was serving in the S.S. *Goldmouth* on the occasion of her being torpedoed by an enemy submarine. He transferred from the *Geika* to the *Goldmouth* little less than a year before the destruction of the latter, and his gallantry on the occasion of the sinking of his ship caused him to be commended for his services. Mr. Older was seriously injured in his foot by a shell in the execution of his duty on that occasion and had the misfortune to suffer amputation.

Frank Reid was serving in a British merchant ship when she was shelled by an enemy submarine for upwards of eight hours on July 30, 1917. The nerve-wracking experience of carrying on duty through a lengthy period like this, when the decks were being subjected to an almost continuous shell fire, can hardly be estimated by those who have not experienced it. On this occasion the aerials were shot down so that Mr. Reid and his gallant comrades were obliged to go aloft and execute repairs under conditions which might well have tried the nerves of seasoned professional fighting men. Fortune favoured the brave; the enemy was eluded and Mr. Reid came home to receive the well-merited thanks of the shipowners.

Robert Stanley Smith was serving in a ship when a submarine, after firing two torpedoes which missed their mark, shelled the vessel for three and a half hours on July 12, 1917. Mr. Smith sent out the SOS and received answers from two land stations. The aerials and spreaders were shot away. The roof of the wireless cabin was pierced by fragments of shell, missiles were falling and bursting all round. Mr. Smith stuck bravely to his post, and under this fierce gunfire rigged up new aerials, improvised temporary spreaders and transmitted his messages. It took two and a half hours of strenuous labour under heavy fire to accomplish this. He was awarded Lloyd's silver medal and a cheque for £25, the former for meritorious service, the latter as an honorary acknowledgment of his gallant conduct.

CHAPTER SEVENTEEN

The Price of Admiralty

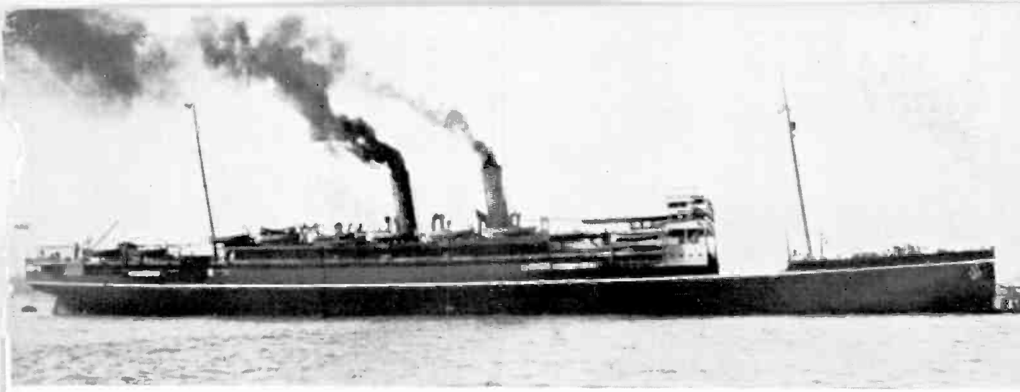
In the course of the war of 1914–1918, 183 Marconi Radio Officers met their death on the high seas whilst cheerfully performing the exacting duties which fell to their lot. During the war the Marconi Company trained no fewer than 3300 operators for the Mercantile Marine. Many an enemy submarine met an early end as a consequence of wireless warnings transmitted by these keen young men, and still more ships, with thousands of precious lives and valuable cargoes, were saved from destruction through their activities.

It sometimes happened that Radio Officers were left aboard ship after the other members of the crew had abandoned ship; so often did this occur that it became necessary for the Ministry of Shipping to issue a Notice M182 as follows:

'Warning to ship's crew. Special arrangements should be made for warning all members of the crew that a ship is due to be abandoned. This is particularly important in the case of engine-room staff and wireless operators who may have to remain on duty until the last moment.'

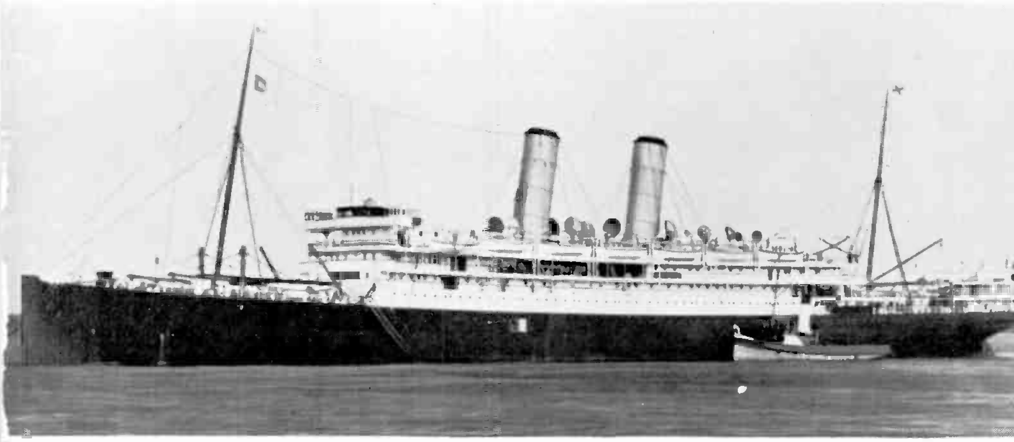
Before the days of wireless it was a tradition for the master to remain on the bridge and go down with his ship when it sank. Things are a little different to-day. True, the master is generally the last to leave the vessel when disaster occurs; but such a privilege is also shared by the Radio Officer who, as a matter of duty, will remain at his instruments and continue, as long as necessary or until the power fails, to send out the SOS in the hope that the last signal of all may reach another ship in time for help to come to those who need it. Should emergency arise every Radio Officer in the service would automatically do the same. The youngest of the sea services, the wireless service, has already built for itself a glorious tradition.

One of the outstanding lessons learned by the British people during the 1914–1918 war was the supreme national importance to these islands and to the Empire of all shipping, not only naval but mercantile. As stated in the *Wireless World:* 'Modern warfare had done away with the old division in wartime between civilians and belligerents. Nations threw the whole force of their being into the struggle; and those energies which in peacetime were devoted to carrying the flag of commerce to every sea focused themselves on beating the arrogant enemy, who not only challenged but affected to despise them. The struggle brought



Photograph by courtesy of the P. and O. Steam Navigation Company

The P. and O. liner 'Malwa', fitted with Marconi wireless in 1908

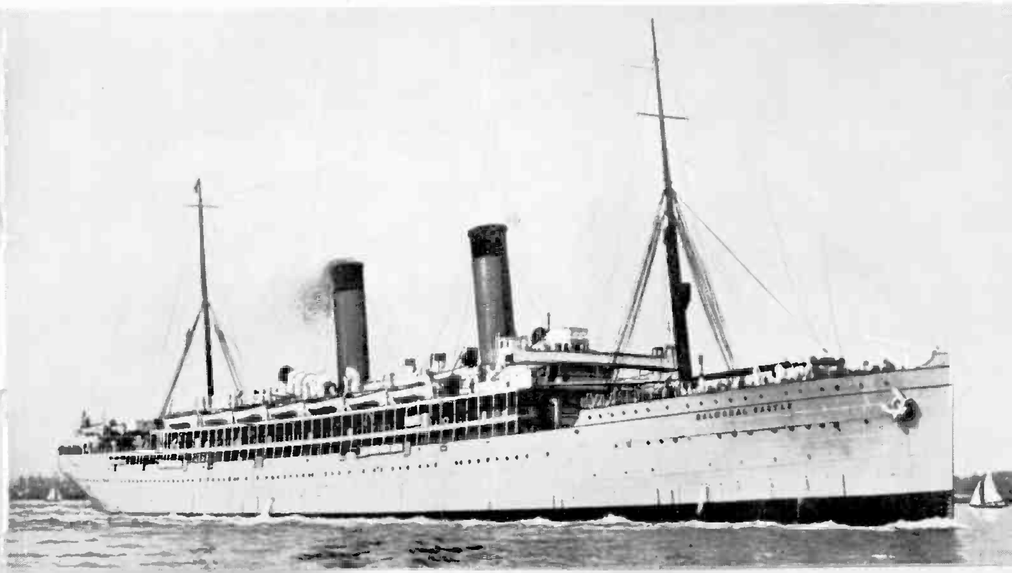


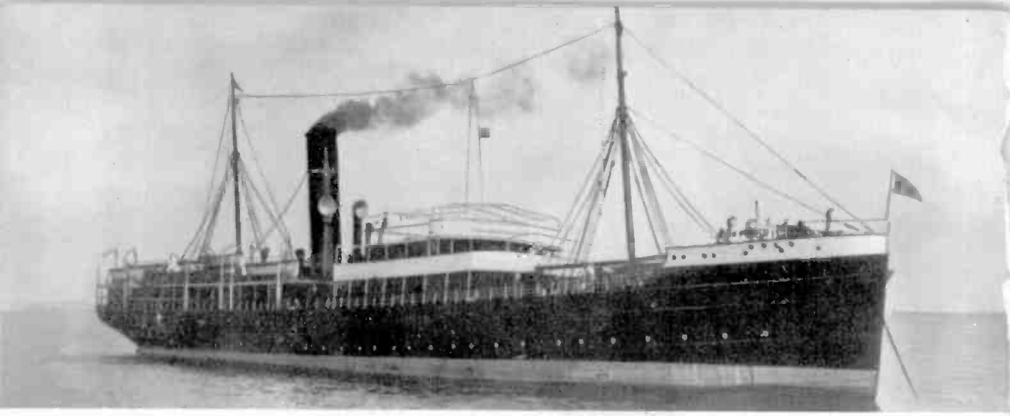
Photograph by courtesy of the Orient Line

The Orient liner 'Otranto', fitted with Marconi wireless in 1909

The Union-Castle liner 'Balmoral Castle', fitted with wireless in 1909

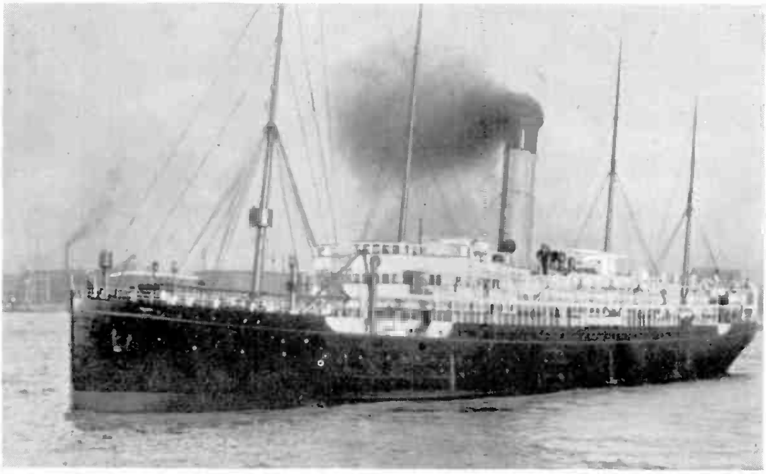
Photograph by courtesy of the Union-Castle Mail Steamship Company Ltd.





Photograph by courtesy of Ellerman s Wilson Line

The S.S. 'Oslo', fitted with Marconi wireless in 1909. She was then owned by T. Wilson and Company, now Ellerman's Wilson Line

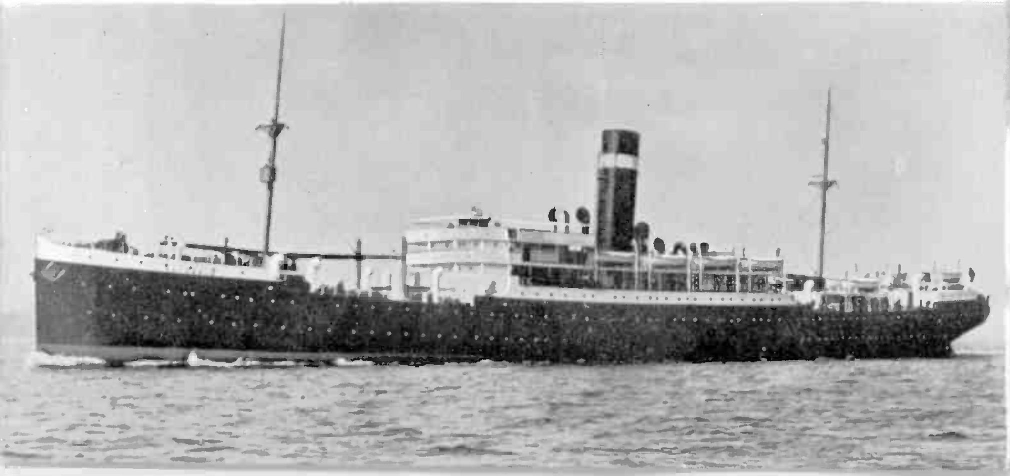


Photograph by courtesy of the Bibby Line

The Bibby Line's 'Gloucestershire', fitted with Marconi wireless in 1909

The Donaldson Line's 'Saturnia', fitted with Marconi wireless in 1909

Photograph by courtesy of the Donaldson Line, Ltd.



out in a dramatic fashion the greatness of Britain's shipping organisations and the gallantry of the men engaged therein. Common danger and common effort had drawn the two great services more closely together and had proved to "landlubbers" that courage and devotion were the characteristics of both.

'The duties of a wireless operator on a merchant ship in times of peril are of paramount importance to all on board. It is no small matter of pride to reflect that in no single instance have ships' Radio Officers failed to rise to the occasion. The submarine menace did but intensify their courage and devotion, as it intensified their danger. Many of them were lads under military age, and it may not be inopportune to record the fact that during the last year of warfare no fewer than seventy wireless operators under the age of eighteen made the supreme sacrifice in discharge of their duty.'

Lord Maclay's Tribute

Sir Joseph Maclay (now Lord Maclay), the Shipping Controller, sent a message of praise for the way in which they discharged their duty. This message constituted an official acknowledgment of the work done for Britain by the Radio Officers who were working in the Mercantile Marine during the 1914–1918 war:

'The wireless telegraph', said Sir Joseph, 'has played a crucial part in the conduct of the war at sea as on land and in the air, and I am glad to have the opportunity of expressing my warmest admiration for the manner in which the wireless operators on board our merchant ships have throughout discharged their trying and often most dangerous duties. The safety of officers and passengers and crews has time and again been in their hands and they have ever maintained the highest traditions of our sea service.'

And so, when on July 19, 1919, a representative body of the Empire's forces marched through London in celebration of peace and victory, twelve Radio Officers of the Merchant Navy took a well-merited part in the procession. These men and their colleagues shared equally with other seafarers the risks of keeping the seas, and in many cases paid with life or limb the price of duty faithfully done. Even after repeated torpedoings they did not hesitate to go yet again into the danger zones strewn with mines or infested with German submarines, and what the nation owed to them can never be calculated nor paid for. Radio Officers were also represented in the Victory March which took place after the Second World War.

When the Mercantile Marine War Memorial was unveiled on December 12, 1928, Radio Officers who served during the war, numbering some six thousand, were represented by twenty Radio Officers from the Marconi International Marine Communication Company Ltd. One of these, Mr. Robert Leith, who was senior operator in the *Lusitania* when she was sunk on May 17, 1915, was presented to H.M. Queen Mary.

The sinking of the *Lusitania* was but one example of German 'frightfulness' at sea, but the inhuman manner in which it was arranged and carried out aroused so great a wave of indignation throughout the world that it was one of the greatest factors which helped to bring the United States into the war. The *Lusitania* was torpedoed and sunk by a German submarine off the Old Head of Kinsale. In the sinking 1198 persons lost their lives, many being helpless women and still more helpless children. Among those who perished were 124 citizens of the United States.

When the *Lusitania* was torpedoed Mr. Leith was at luncheon, the second wireless officer being on duty. Mr. Leith immediately returned to the wireless cabin to send out the SOS and remained on duty until the ship was on the point of sinking, when he managed to jump into a partially submerged lifeboat which had previously been lowered. After many hours in this boat he was subsequently taken to Queenstown in a vessel which had been sent out to pick up the survivors.

Roll of Honour

In addition to the 183 Marconi Radio Officers who lost their lives at sea, some 165 other members of the staffs of the Marconi Companies were killed in the course of their duty. Their memory is kept green by the Roll of Honour which can now be seen in the Entrance Hall of Marconi House at Chelmsford. A reproduction of this Roll of Honour appears in this book. It is headed

'In proud and grateful memory
of our colleagues
who laid down their lives during
the Great War 1914–1918
They dying, so live'.

It was an impressive ceremony which took place on June 21, 1922, when Mr. Godfrey Isaacs unveiled the Roll of Honour. Departmental heads of the Marconi Companies, together with many of their staffs, attended to do homage. Representatives of the Association of Wireless and Cable Telegraphists (now the Radio Officers' Union) were also present. The ceremony was broadcast and Mr. Isaacs' address was heard by Radio Officers in ships all round the coasts of the United Kingdom.

In the course of his address, Mr. Isaacs said:

'We have met here to-day to unveil and to dedicate a Roll of Honour which will perpetuate the memory of those members of the Marconi staffs who gave their lives in the service of their country during the Great War. Within a few minutes when the Union Jack is drawn aside, it will be seen that no fewer than 348 persons, members of the Head Office, Chelmsford Works and Depot staffs, of the sea-going telegraphists drawn from Headquarters and the Italian Agency, also members of the Relay Automatic Telephone Company made the supreme sacrifice; and whilst we to-day salute with reverence the roll of those who gave their lives in the performance of their duty it is not inappropriate to recall the fact that, of nearly 6000 sea-going operators under the control of this Company when the Armistice was declared, no fewer than 1202 have been the subject of enemy attack, and were rescued from vessels sunk by enemy submarines. Some of these were torpedoed on three or four different occasions.

'There were numerous instances where Marconi Radio Officers upheld the high traditions of British seamanship, and there were cases where Marconi men refused to leave their ships when the legitimate moment had arrived for abandonment. We are proud of their bravery and the deeds of valour performed by Marconi men acting upon their own initiative in the face of death; and we are certain that no records of the war show deeds which reflect greater credit upon the nation or any individual organisation. This Roll of Honour, as already indicated, contains the names of a number of persons who, as members of the head office, works and other administrative staffs, were well known to many present here to-day. The majority of these, together with their surviving colleagues, served in the Army and endured the hardships inseparable from a long campaign in land warfare. They too upheld British traditions.'

It was not in the Mercantile Marine alone that wireless proved its worth in the 1914–1918 war. The Army, the Navy, and the Air Force all had good reason for later expressing their very real appreciation of the valuable services which wireless had rendered.

Direction Finding

One of the uses of wireless, of course, in addition to providing a means of communication, is to obtain accurate bearings of fixed and mobile transmitting stations. It was in 1905 that Marconi had made the important invention of the bent or directive antenna both for reception and transmission. He found experimentally that if a wire were laid horizontally above the earth and a receiving instrument connected between one end of the wire and an earth plate that he could receive electric wave signals most clearly and strongly when they were arriving from a station situated in the opposite direction to that in which the free or insulated end of the antenna was pointed. Also, he showed that if the receiving instrument were replaced by a transmitter, then such a horizontal antenna sent out waves most vigorously in a direction opposite to that in which the free end pointed.

Proceeding still further, he found that if a pair of such horizontal antennæ, each with one end free and one end joined to the earth through a receiving instrument and transmitting instrument respectively, were placed back to back—that is, with the free ends of the antennæ pointing away from each other, these two antennæ so placed possessed remarkable powers of sending and receiving more vigorously and therefore over greater distances than plain vertical antennæ. They had also the good quality that the radiation was concentrated in the direction in which it was required.

Hence, such a bent transmitting antenna having a short length vertical and the greater part of its length horizontal, the transmitting or oscillation-making apparatus being placed at the lower part of the vertical portion has the peculiar power of sending out most of its radiation in the direction opposite to that in which the free or insulated end points. It is, therefore, something like a lighthouse having a reflecting mirror behind, or a Fresnel lens in front of its light, to project the greater part of the light in one direction.

In his paper read before the Liverpool Chamber of Commerce in 1908, Marconi had referred to the adoption at the Transatlantic stations of a directional aerial. The ordinary wireless telegraph transmitter sent out its electrical radiation equally in all directions. That was in many cases a disadvantage. In some of Marconi's experiments in 1896 he used copper reflectors, by the aid of which it was possible to project a beam of electric radiation in a certain direction, but he soon found that this method would only work over short distances. In 1905, Marconi again took up the subject and was able to determine that, by means of transmitters and receivers constructed in a particular manner, it was possible to confine the effect of electric waves mainly to certain directions as desired. True, Marconi said, the limitation of transmission to one direction was not very sharply defined, but it was nevertheless exceedingly useful.

The practical result of this method which was applied at the Transatlantic stations had been, so far, that messages could be sent over con-considerable distances in selected directions, 'and that, with aerials of moderate height, greater efficiency in a specified direction could be obtained than could be obtained all round by means of ordinary aerials'.

'By means of the same system applied to the receiver', Marconi said, 'it is possible to find out the bearing of a sending station, and in conjunction with evolutions carried out by H.M.S. *Furious*, some conclusive tests proving this point were conducted by me on behalf of the Admiralty'.

Early in 1907 E. Bellini and A. Tosi began their experiments—each on different lines, but with a common aim—designed to attain directivity in wireless signalling. In February 1912 the Marconi Marine Company secured the patents of Bellini and Tosi, including those for the wireless direction finder.

British Army's Direction-finding Stations

During the 1914–1918 war direction finding was brought to a fine art by Captain H. J. Round, one of the many brilliant young engineers on the staff of the Marconi Company which, immediately war was declared, devoted the whole of its energies to the assistance of the naval, military, and air forces. It was this officer who, having revolutionised wireless direction finding by adapting valve reception to this particular purpose, embarked on December 14, 1914, for France with the first set of military instruments of this character. By means of the two direction-finding stations set up for the use of the British Army, the exact position of an enemy station from which wireless messages were being transmitted could be located. Thanks to the inventiveness of Captain Round, who went to the Army from the Marconi Company, it became possible for a wireless operator, sitting in a little hut within sound of the guns, not only to know what the enemy was saying, but to put a pin's point on a map and say, 'He is speaking from this place'.

These direction finders opened the eyes of our military authorities and it was not long before their use was widely adopted.

How many German units were destroyed and British lives saved through these silent and mysterious instruments cannot be ascertained, but there is definite evidence of their wonderful assistance to the Allied cause, not only on land but at sea.

Much information of great value to the British headquarters staff was obtained by these two stations. Later on, in 1915, after the first Zeppelin raid on this country the War Office realised the advantage which would accrue from locating every movement of Zeppelins and naval ships. Suitable stations were erected in England, as a result of which the movements of Zeppelins and enemy warships could be ascertained with great exactitude. But for the work of these direction-finding stations English cities and towns would have been visited far more frequently by these German airships.

Some of these direction-finding stations were used to maintain watch on German fleet movements and others for locating enemy submarines and aeroplanes. So accurate were the recordings that the movements of the German ships in the harbours could be ascertained and thus the Grand Fleet was able to stay in harbour knowing full well that any indication that the German ships were about to put to sea would be recorded.

It was directly due to the work of Captain Round and other Marconi technicians that the Battle of Jutland was fought and that the German fleet, instead of carrying out a hit-or-miss attack on British coastal towns and coastal shipping or getting a certain number of their ships away to sea to act as commerce raiders, were forced to scuttle back to their home bases, there to remain until the great surrender.

The Battle of Jutland

Captain Round was in charge of a group of wireless direction-finding stations on the East coast, where for some time he and his skilled assistants had been keeping observation on German wireless stations. Just before the Battle of Jutland they noticed unusual signals from the principal wireless ship in the German fleet, which was then at Wilhelmshaven. Exact readings were taken of the direction from which those signals were coming, and later in the day it was noticed that the ship, the *Bayern*, and those answering her had moved 1½ degrees—in other words, they had taken up a position in the Jade River, nearer the open sea.

This movement was reported to the Admiralty and on the strength of this information Admiral of the Fleet Sir Henry Jackson, then First Sea Lord, was able to give anticipatory orders to the British Grand Fleet. Speaking later at the Institution of Electrical Engineers and referring to a paper read by Captain Round on direction finding, Admiral Jackson said:

'The difficulties experienced in classifying errors in direction finding and the means of eliminating them and correcting the observed bearing are not the least interesting items in this paper. The author states that "the extent to which direction finding was trusted by the authorities was really remarkable" and he instances a most important event in the history of the British Navy brought about by an observed motion of less than 1½ degrees in the daytime. I think I may say we trusted him and his methods, because we soon found them to be reliable. The efforts and intelligence of his staff reduced the errors to a minimum and where strategical movements were under consideration, a few miles of error in the North Sea were of secondary importance. I think it may be of interest if I give a few particulars about the case quoted in his paper, as it is really known to very few. We have heard much about the use of direction finding for minor tactical movements of all arms, but this is a case of a major strategical operation which brought about the historical meeting of the British and German Fleets at the Battle of Jutland on May 31, 1916.

'I was First Sea Lord at the time, and so was responsible for the disposition of the Grand Fleet. I may incidentally mention that, in spite of other statements of which I have heard, its Commander-in-Chief (Lord Jellicoe) and I lived, so to speak, with the object of bringing off such a meeting. Our wireless direction-finding stations, under Captain Round, kept careful and very intelligent watch on the positions of German ships using wireless, and on May 30, 1916, heard an unusual amount of wireless signalling from one of the enemy ships which they located at Wilhelmshaven. This was reported to me; the time was a critical and anxious one in the war, and I had also some reasons for expecting that the German Fleet might put out to sea during the week.

'Our Fleet was ready at short notice, and had arranged, unless otherwise prevented, to put to sea on the following day for a sweep of the North Sea. But if the German Fleet got to sea first, the chance of a meeting in water not unfavourable to us was remote; our object was to try to get to sea before, or shortly after the Germans, and hitherto we had not succeeded in doing so. Later on in the afternoon it was reported to me that the German ship conducting the wireless had changed her position a few miles to the northward. Evidently she and her consorts had left the basins at Wilhelmshaven and had taken up a position in the Jade River ready to put to sea.

'This movement decided me to send our Grand Fleet to sea, and move towards the German Bight at once and try to meet the German Fleet and bring it to action. This they did with their usual promptitude, and the result was the famous Battle of Jutland, which was indirectly brought about by the careful and accurate work of Captain Round and his staff, for which I hope they will now accept my belated thanks and appreciation. Their work is not ended. Direction finding has come to stay and for more general use in peace. Errors are being eliminated and there should be a great future before it, especially on the lines indicated in the Press to-day by the Admiralty for assisting navigation at sea as well as in the air.'

The direction-finding apparatus, said *World Radio*, was extremely accurate and the movements and bearing of each of the German ships were known to our operators. In order to determine the actual geographical position of a station transmitting a signal, several suitably-placed receiving stations were necessary. Each line of signal direction indicated by the direction-finding apparatus was marked on a special map, and the point of intersection of the lines denoted the required position. The three Admiralty stations mentioned were situated at Lowestoft, Flamborough, and Aberdeen. It will be seen that, so placed, their simultaneous observations provided the best possible position-finding combination for Germany and a certain part of the North Sea. The apparatus used was, perhaps, crude in some respect when compared with modern equipment but, by virtue of continuous research and extreme care, direction-readings correct to half a degree were obtained during daylight. This was phenomenal at that time.

The direction-finding system employed two fixed loops or frame aerials erected at right angles to each other and both were connected to a receiver comprising one stage of high-frequency amplification, balanced carborundum crystals as the detector, and two stages of low-frequency amplification. The valves were of the early 'soft' type, and were not nearly so reliable as present-day valves. Head telephones were used and strong signals were necessary in order to provide accurate readings.

Each aerial formed a separately-tuned circuit; consequently, the tuning and balancing adjustments were most critical in order to ensure reliability. But latterly the whole operation was revolutionised and simplified by the introduction of aperiodic aerials and multi-valve amplifiers, using new type high-vacuum valves.

CHAPTER EIGHTEEN

Compulsory Wireless Regulations

DURING the period of the 1914-1918 war the Company was meeting an absolute national need, and the years of war were giving proof of the extreme utility, if not the absolute necessity of a wireless telegraph installation on board every sea-going merchant ship. It might also be suggested that not only was it essential in wartime that every ship should be equipped with wireless telegraphy apparatus but that overwhelming evidence was being afforded of the importance of a world-wide service organisation such as the Marconi Marine Company had built up. And perhaps it would not be too much to say that such an organisation could never have been developed efficiently except under one management. The importance of these services, which the Marconi Company was able to provide became more evident as the war proceeded.

On July 28, 1916, the *London Gazette* printed the text of a new official regulation requiring the owner of every vessel of 3000 tons and over registered at a British port in the United Kingdom to fit a wireless installation before August 21, 1916, irrespective of whether his ship carried passengers or not. The greatly increased demand for wireless telegraph installations which followed this regulation soon began to place a great strain upon the Company's resources in material and manpower, but which they were able to sustain because of the organisation they had built up in time of peace. This increased work was also reflected in the Company's accounts, but although the excellent progress of the Company was gratifying, there is no doubt that far greater satisfaction was derived from the contemplation of the immense benefits which had accrued to the nation in its hour of need and the tens of thousands of lives, as well as ships and cargoes, which wireless telegraphy had been instrumental in saving.

During 1916 over 460 additional ships were fitted by the Company. In consequence, a considerable expenditure on capital account was necessary, and so it was decided to offer the remainder of the authorised capital of the Company to the shareholders at a premium of 15*s*. per share. The issue was largely over-subscribed.

But the business was increasing even more rapidly, and orders in hand were so large that additional funds became essential, and it was decided to increase the Company's capital from £350,000 to £600,000. Two hundred and fifty thousand new £1 shares were offered to the shareholders at a premium of 15*s*. per share. The issue was over-applied for and allotments were made *pro rata* to the holdings of the applicants. The issue was necessary in consequence of the Government's decision in 1917 to make the provision of wireless telegraph apparatus compulsory on all merchant ships of 1600 tons gross and over and to require two operators to be carried on all vessels fitted.

Losses of installations were, of course, being incurred as a result of the submarine campaign. An interesting point in this connection was that although it had been the custom of the directors to insure these installations against the risk of loss at sea, the premiums had become so high owing to the submarine campaign that, after consideration, the Company decided to take the risk itself. In the year 1917, notwithstanding the severity of the submarine warfare, the sum saved under War Risk Insurance amounted to £1174, and in Marine Risk to £451, or a total of £1625.

The staff were working continuously day after day for very long hours with hardly a day's holiday. Every member of the staff was giving of his best, and although it was not their privilege to take part in the defence of the country in the field, the services which they rendered to the nation were not surpassed by those who could be spared to join the Armed Forces.

In 1917, the Company had some 3347 operators at sea. They, like the rest of the Merchant Navy, were in the front line. Notwithstanding the great increase of risk and danger in the services which they performed, all that was heard from the men if their ship had met with disaster, was, 'ship torpedoed, all effects lost, awaiting instructions'.

Even then, the directors were looking ahead, and it was recognised that obsolescent plant would have to be replaced by instruments of new design. It was impossible for this to be done during the war; the urgent need for equipping ships with wireless installations was so great that the Company simply had to continue to manufacture as fast as they could installations of a standard design which could most quickly be produced.

In 1918 it was again necessary to increase the capital of the Company by the creation of 900,000 new shares of £1 each, and 600,000 were offered to the shareholders at par.

Radio Officers' Wages

At the conclusion of hostilities there was considerable dissatisfaction among Radio Officers with regard to their rate of pay. It should perhaps be explained that the contracts which the Company entered into with shipowners provided for the most part for a certain annual payment to be made to the Company in respect of operator's wages so long as the scale of pay continued as at the time of the contract, which, generally, was for a period of ten years. If an increase became necessary it had to be added to the sum paid to the Company by the shipowners to cover the further cost arising from such increased pay to the operators.

The Company was, therefore, unable to deal with any question of increased pay without the agreement of shipowners, unless they chose to accept responsibility themselves and for the Company's account. This had not been contemplated under the terms of the Company's agreements with the shipowners. Nevertheless, as a result of the great increase in the volume of the Company's business and the consequent spreading of standing charges, it was decided to make an all-round increase in wages. This imposed a fairly substantial burden upon the Company. Even so, it was realised that in view of the increased wages which had been granted to officers and men of the Merchant Navy under the direction of the Ministry of Shipping, the wages of Radio Officers still seemed inadequate, and application was made to the Ministry to agree to the increase demanded by the Association of Wireless Telegraphists, as the Radio Officers' Union was then known.

Inasmuch as the Ministry of Shipping was occupied fully with other questions, this matter was deferred longer than the operators felt it should have been and they became dissatisfied. The Company, however, conferred with the representatives of the Association, and in so far as all matters touching the conditions of employment by the Company were concerned, a complete agreement was arrived at. A new scale of pay was also considered, and the Company recommended its acceptance to the Shipping Federation and the Ministry of Shipping. The Shipping Federation regarded the recommendation as reasonable and the new terms were accepted by the Ministry. The directors stated that they were 'glad to recommend the improved terms of employment of operators for their conduct as a body had been magnificent during those very perilous times'. A further increase in salaries was made in 1920.

For a little while after the war, shipping enjoyed a short-lived boom; but before world trade could recover, the industry was to experience a period of depression unparallelled in its history. The nature of the business of shipping is such that the industry is extremely sensitive to changes in world economics and world trade, and is the first to feel the effect of a falling-off in the exchange of goods and commodities between nations. Shipping depends upon the carriage of goods and passengers by sea, and a decline in the volume of cargoes to be carried inevitably brings a decline in freight rates. At the expiration of the short-lived 'boom' after the war there were more ships in the world than the world needed, and large numbers had to be laid up, while some shipping companies which had not accumulated sufficient reserves in the good times to tide them over the slump years, were forced to go into liquidation.

Early in March 1921, the London and District Association of Engineering Employers, representing The Marconi International Marine Communication Company and Siemens Brothers and Company, Ltd., received an intimation from the Shipping Federation that negotiations were in hand by that body for a general reduction of wages for seafarers, and in this connection it would be necessary to put the machinery in motion for dealings with sea-going wireless operators on similar lines. Various conferences took place between the representatives of the Employers' Association and the Association of Wireless Telegraphists until on May 5, 1921, the employers were informed that as a result of a settlement arrived at by the National Maritime Board it was provided that a general reduction of £2 10*s.* per month should be made in the wages of all classes of seafarers except the catering departments and certain sections of the coastal service.

An offer of a reduction of £2 per month was made to the Association of Wireless Telegraphists. This was declined and the matter was referred to arbitration. Summarised briefly the award gave a reduction of £1 to each operator in the first two years of service; £1 10*s.* in the third, fourth, and fifth, and £2 in the sixth to ninth years. On the whole the Radio Officers' Association had reason to congratulate themselves on the result, especially as the award stated that the Court were satisfied that, having regard to the position of responsibility and education required of the wireless telegraphist and the development of wireless telegraphy during the war, the pre-war rate was not, in itself, a safe guide as to the appropriate remuneration of wireless telegraphists, and it, therefore, did not feel that what was a proper reduction, in the case of seafarers generally, was a proper one in the case of the wireless telegraphists.

CHAPTER NINETEEN

New Designs in Wireless Equipment

VERY considerable improvements had been made in wireless telegraphy during the war period. New installations embracing these improvements would have been introduced by the Company during the war but for the fact that it was imperative to turn out sets and install them in ships as fast as possible. With these new designs the range of a ship's station was increased under normal conditions to two and three thousand miles, and thus a ship crossing the Atlantic was able to keep in direct communication with one or other of the two coasts during the whole voyage.

Wireless telephony, for use by ships, was also making considerable strides. As far back as 1914, Marconi had demonstrated the possibility of maintaining wireless telephonic communication between two ships of the Italian Navy over a distance of forty-five miles.

In 1919 the wartime ban on experimental wireless was partly removed, and during this year further improvements in valve transmitting apparatus for radiotelephony enabled the Marconi Marine Company to carry out tests across the Atlantic. Good results were obtained, using a 2-kW valve transmitter. In the early part of 1920, wireless telephonic transmissions were carried out from the Chelmsford works on a number of occasions and these transmissions were received at Newfoundland and on ships at sea one thousand miles distant from this country.

The first large-scale experiment in this direction was in July 1920 when the S.S. *Victorian* was carrying the delegates of the Empire Press Union to Canada for the Imperial Press Conference, when wireless telephone conversations took place through the medium of Marconi installations between the delegates in the *Victorian* and Poldhu and Chelmsford in England and St. Johns, Newfoundland, over distances exceeding one thousand miles.

Records were made, not only for the distance over which the signals were received, but also in newspaper publishing for, for the first time in history, both a morning and an evening newspaper were published at sea. The paper was called the *North Atlantic Times*.

But however interesting the newspaper may have been, the big thing of the voyage was the wireless telephone broadcasting equipment. The idea of having a special set in the ship originated with the late Arthur Burrows ('Uncle Arthur' of early broadcasting fame), who discussed his ideas with Captain Pearson, who was then publicity agent of the Canadian Pacific Ocean Services. The late Sir Thomas Fisher, who was then general manager of the C.P.O.S., gave every support to the experiment, and agreed to have a special cabin built in the steamer to accommodate the set which the Marconi Marine Company installed. The actual arrangements of the installation were in the hands of Captain Forster, assistant manager of the steamship company, and the Marconi engineers, Messrs. Tremellen and Allnut.

Mr. Burrows had the unique experience of editing this Atlantic newspaper at sea for the benefit of the distinguished journalists on board. Some of this news, conveying the results of sporting events, such as the contests for the America Cup and the racing at Liverpool and Hurst Park, was received in the ship in mid-Atlantic within five minutes of the events being decided. Other news was received by wireless telephone.

The 'Victorian's' Experiments

The *Victorian* was, in 1904, the first Transatlantic passenger vessel to be propelled by steam turbines, and so, in 1920, this same vessel introduced something new to life on the ocean by including amongst her equipment not only the latest long-distance Marconi apparatus for ship to ship and shore to shore telegraphic communication, but also a wireless telephone which made possible conversation with the land over several hundreds of miles. In conjunction with this telephone there had been installed a loud-speaking receiver enabling passengers sitting in the public rooms to hear and enjoy a concert transmitted from a distant station.

Here are some extracts from the official account of the work carried out:

'On July 21, 1920, telephone messages were being put through at noon from the *Victorian* to the Marconi station at Chelmsford in Essex. The *Victorian* at the time was twenty-six miles north-west of Tory Island, or a distance of nearly six hundred miles from the Essex station. The demonstration was not as advertised in the morning edition of the *North Atlantic Times*, but incidentally gave the ship's telephone a much more exacting test than was originally intended. When the *Victorian* called up Poldhu in Cornwall in the morning, that station replied, but a few minutes later Chelmsford broke in with a statement that as she could hear the *Victorian* distinctly and Poldhu wished to be silent owing to the immediate proximity of a ship in distress, she would accept a limited number of messages. These were sent and received correctly, despite the report of a thunderstorm over England, by communicating direct by telephone with Chelmsford. The *Victorian* had established an easy record for a ship at sea. That same morning the Press Association experiments in the wireless circulation of news were heard distinctly in the loud-speaking device in the first-class lounge.

'On July 22, the Chelmsford concert was clearly audible on the telephones when the ship was nine hundred miles distant, but was accompanied by extraneous noises when heard on a loudspeaker. The noises were apparently due to a bad electrical storm over England.

'On July 23, at breakfast time, the Press Association trials in news distribution by the Marconi telephone at Chelmsford were easily audible to all in the lounge. So distinct was the speech that it was generally agreed that an unnecessary amount of spelling was taking place. During the morning short wireless concerts with gramophone records were given to a number of ships. The *Corsican*, *Olympic*, *Saturnia*, and *Canada* reported hearing the selections with great clearness. This afternoon a surprise message was received by telegraphy from the special Marconi station at Signal Hill, Newfoundland, stating that the gramophone selections were clearly heard there. Later on Chelmsford again gave a concert, the various items being heard even more clearly than on the previous day.

'At the conclusion of the concert there was an amusing diversion. A loud voice was heard anxiously inquiring for Mr. Pemberton of the *Daily Mail*, who was wanted at the office, and whose whereabouts were unknown to his wife.

'At noon, Lord Burnham, as President of the Empire Press Union, was invited to speak by telephone to Sir Bertram Hayes, then commander of the *Olympic*, which was steaming for New York on a course 480 miles south of the *Victorian*. Lord Burnham's message was:

' "I should like to speak from the *Victorian* to Sir Bertram Hayes on behalf of the delegates of the Empire Press Union going to attend the Imperial Press Conference. We send our greetings and good wishes to you and to all your ship's company. We are having a very pleasant voyage, and we are looking forward to a fine tour of Canada. We are all good Canadians in the sense that we rejoice in her progress and well being. We hope to know more of the part she is bound to play in the future of the Empire by our visit."

'The *Olympic* was not fitted for wireless telephony, and Sir Bertram Hayes replied by wireless telegraphy as follows:

' "Your message was received by me with much pleasure and great distinctness. Please accept the best wishes of the *Olympic*, familiarly known throughout Canada as the 'Old Reliable', for the success of the visit of the British Press delegates to the Imperial Press Conference at Ottawa, and the hope that their deliberations will have a soothing effect on the peace of the world. Bertram Hayes."

'July 25. Yesterday a new sea record was established for the reception of Chelmsford telephony. The daily concert was audible to all, the *Victorian* being then 1530 sea miles distant. The various selections were less clear, however, than on the previous day owing to slight local electrical interference. Newfoundland reports that the *Victorian's* gramophone pieces were clearly heard at St. Johns, both Friday and yesterday.

'July 26. Although the *Victorian* was enveloped in fog at midday yesterday, passengers in the ship were sufficiently in touch with the world to be able to hear clearly the National Anthem sung by male voices at Chelmsford over 2,100 land miles distant. This easily eclipses all previous records in long-distance telephonic reception on a passenger liner. At 10.15 p.m. yesterday wireless telephonic intercommunication was established with Signal Hill, Newfoundland, which was then over 300 miles distant. Lord Burnham, in exchanging greetings with the Premier of Newfoundland, expressed great regret that for reason of time the delegation was not able to visit the Dominion. The Premier, in reply, spoke of Newfoundland as a stepping stone between the Old World and the New. He pointed to the part that Newfoundland had taken in establishing cable communication between Europe and America, and in aerial navigation, and expressed his pleasure that she was now taking part in the development of wireless telephony. Other messages were exchanged between the ocean voyagers and those on shore.

'July 26. From early morning until the time of going to press the *Victorian* has been in telephonic communication with St. Johns, Newfoundland. There has been a constant interchange of greetings between the ship and ministers and officials of Newfoundland and representatives of the Press on the island.

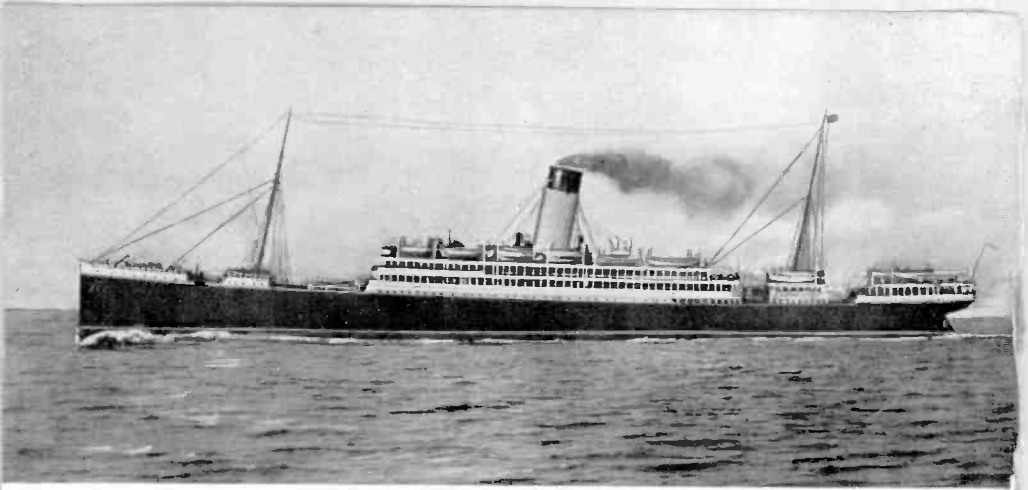
'One interesting fact was gained during the course of the conversations. The wireless speech from the *Victorian* had provided Newfoundland with an opportunity for telephony over a greater distance than was then possible on the wired telephone installed on the island. Everyone appeared to have been greatly impressed by the clearness of the speech transmitted by this new medium.'

On July 27, 1920, the *Victorian* arrived at Sydney, C.B., so the entry for July 26 was the last dealing with the new wireless experiments.

Telephonic Communication with Shore

It was whilst in charge of the demonstration in the *Victorian* that there happened what Mr. Arthur Burrows regarded as his most dramatic wireless experience. On the second day of the voyage the *Victorian*

The Marconi Roll of Honour, 1914-1918



The Allan liner 'Victorian', in which, in 1920, passengers at sea heard a concert broadcast from a land station for the first time

Receiving a concert broadcast from Poldhu in the lounge of the S.S. 'Victorian', 1920

called up Poldhu and obtained the usual acknowledgment. Being satisfied that all was well, the newspaper proprietors and editors on board were invited to hand in, if they so wished, some messages to be despatched to their papers. No restrictions were placed on the number of the messages or their length. The editors took Burrows at his word.

Late in the afternoon, when he was 'resting', owing to some 'discomfort' caused by a light ship facing a strong head wind, news arrived that some twenty-three persons were anxious to send messages to their offices in England. So up Burrows went to the special telephone cabin and started to call Poldhu. But a 'death-like' silence prevailed and for twenty minutes he tried to coax Poldhu into a reply. His temperature rose, his heart sank, and in a state of perspiration he began to wish that wireless telephony had remained unthought of for another century. Feeling less than the dust and about to abandon the effort, he gave one more shout: 'Hallo Poldhu!' To his great astonishment a loud voice replied through the headphones he was wearing: 'Hallo, Burrows! I hear you are in difficulties'.

The voice certainly was not that of Poldhu, so Burrows immediately replied: 'Yes, this is Burrows, but who are you?'

Back across hundreds of miles of land and ocean came the answer. 'I am Round, speaking at Chelmsford. I heard you calling and, gathering that you are having difficulty with Poldhu, we are prepared to help you.'

To cut short a long story, Captain Round, despite 'fierce atmospherics', took the whole of the *Victorian's* messages without error and forwarded them safely to their destinations. Captain Round told Burrows later that it was a pure accident that he happened to have tuned in on the *Victorian's* wavelength at the time he was calling. The explanation of Poldhu's silence was that she had been requested not to transmit as a French barque had gone ashore on the French coast, and it was essential that there should be no interference with the wireless traffic concerning the rescue.

During the voyage the *Victorian* gave broadcast concerts of gramophone records at intervals throughout the day and night. The audience consisted of ships dotted about the North Atlantic over a radius of nearly 800 miles, and it was a common thing, after such items, for the regular wireless operators in the wireless telegraph cabin to come in to the *Victorian* with Morse code requests for encores from several points of the compass. The records which appeared to give the greatest pleasure to the North Atlantic audience were: Harry Lauder's 'I love a lassie', Kreisler's 'Caprice Viennois', Alma Gluck's rendering of 'O sleep why dost thou leave me?', and Cobb's 'On the road to Mandalay'.

These experiments in the *Victorian* with wireless telephony were, of course, some of the earliest demonstrations of broadcasting. This volume has nothing to do with the phenomenal development of broadcast entertainment and instruction, but one story told by Burrows of the early days at Savoy Hill may be new to many, and is certainly worth recalling.

It was in the spring of 1923 when a well-known bishop was giving a religious address. His peroration concluded as follows: '. . . And if we obey these laws, etc., etc., we shall all meet in Heaven'. Then, while the microphone was still 'live', he turned to Burrows and said: 'I don't think I spoke too long, did I, Mr. Burrows?' And it was asserted by listeners that Burrows switched off the microphone at the end of the words: 'I don't think'.

The most important problem in the question of wireless telephonic communication with ships at sea was the technical one of linking the wireless telephone installation to the land line exchanges, but this was satisfactorily solved by British wireless engineers. During 1920 a successful linking up of wireless telephone apparatus with the land line telephone system was accomplished and connection was successfully established between a subscriber's instrument in London and an aeroplane in flight on its way to Paris.

Extension of Wireless Telephone Service

In 1921, the Marconi Company gave demonstrations of duplex wireless telephony between London and Amsterdam. For the purpose of these demonstrations, Marconi House in the Strand was linked by means of the ordinary trunk line with the Marconi Station at Southwold, and similar arrangements were made in Holland between the Wireless Station at Zandevoort and the Amsterdam Stock Exchange. Successful communication was also established between Southwold and Oslo. For these demonstrations the unusually short wavelength for that time of 100 metres was employed, which, in addition to other advantages, gave immunity from interference from other stations.

In May 1923, a Marconi wireless telephone transmitter was installed on the S.S. *Olympic* of the White Star Line and good clear speech from the *Olympic* at sea was received on the *Celtic* which was then in New York Harbour.

In August 1923, the Marconi Marine Company fitted a wireless telephone installation on the S.S. *Lorina*, belonging to the Southern Railway Company. Good clear speech was maintained both ways between Marconi House and the *Lorina* whilst the latter was crossing the Channel. This was the first direct conversation between a passenger in a ship at sea and an ordinary telephone subscriber in England, as distinct from a telephone conversation between a wireless station on board a ship and a wireless station on land or between two ships at sea.

In 1925 the Marconi Marine Company installed duplex wireless telephone apparatus in the S.S. *Princess Ena*, belonging to the Southern Railway Company, and good speech was maintained between the *Princess Ena* when crossing the Channel and telephone subscribers in London, Glasgow, Leeds, Cardiff, Bristol, Portsmouth, Southampton, and Bournemouth.

Wireless telephone installations were first fitted by the Marconi Marine Company on board ship for commercial purposes in the summer of 1922, since when ships of all classes and types from the great passenger liners down to harbour tugs have been fitted with radio-telephone installations.

To-day it is common practice for a passenger in an ocean liner to pick up the telephone receiver in his cabin and be connected with a telephone subscriber ashore as easily and promptly as if he were on land putting through an ordinary trunk call.

CHAPTER TWENTY

The *Mauretania's* Direction-finding Equipment

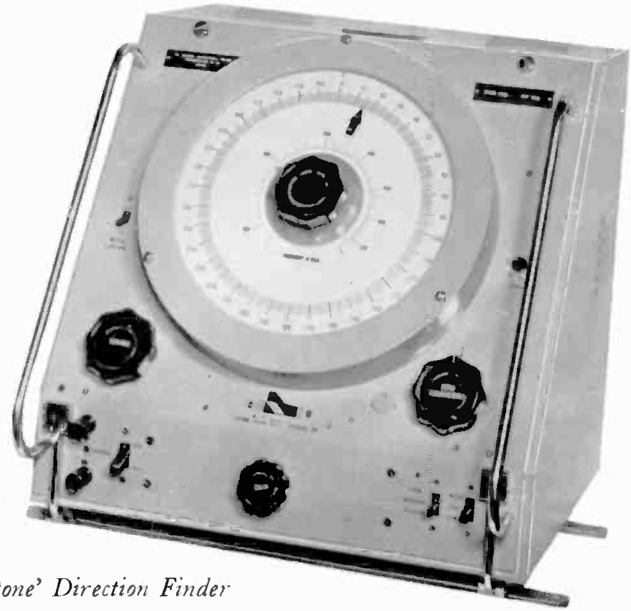
ANOTHER wireless 'wonder' in the *Victorian* during her historic voyage to Canada in 1920 was the new Marconi direction finder, an instrument capable of providing the captain with all the essential bearings for safe navigation when, owing to fog, cloud or other reasons, he was unable to make the usual astronomical observations. Demonstrations of the capabilities of this instrument were given at intervals on the voyage. As Admiral of the Fleet Sir Henry Jackson said in 1920: 'direction finding had come to stay and for more general use in peace'.

It was not until after the Armistice of 1918 that the general public became aware for the first time of the enormous part played in winning the war by the group of directional wireless stations set up on the east coast. Submarines, surface ships, and aircraft had been repeatedly and accurately located over great distances by means of these stations.

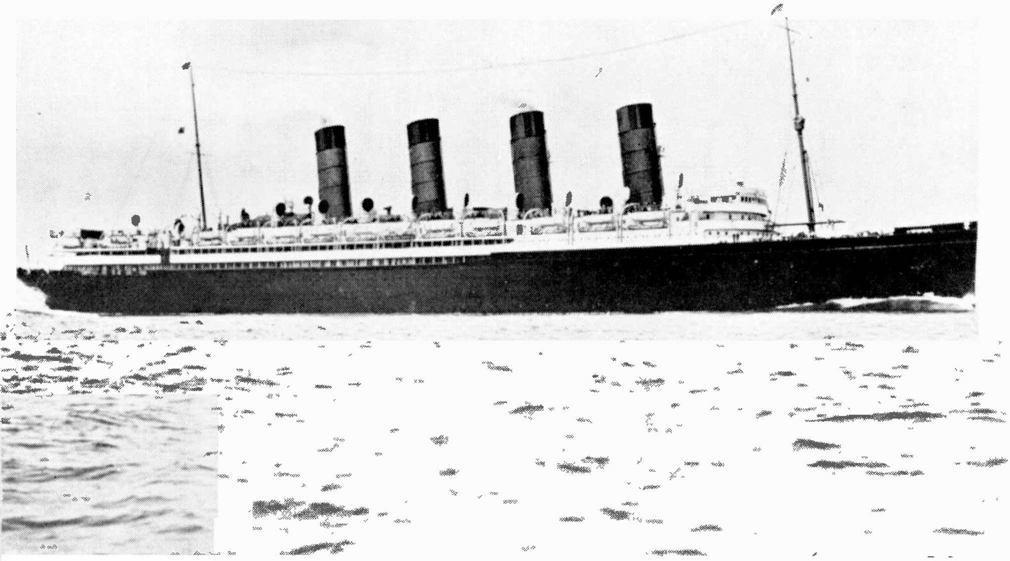
The first *Mauretania* was the first merchant ship in which wireless was used for direction and position finding, the Marconi-Bellini-Tosi system being installed experimentally in 1912, when tests were made by Marconi engineers during Atlantic crossings. In those days signal detection was achieved by means of a crystal which, compared with the valve receivers of later years, was most insensitive. A direction-finding range of about fifteen miles was then considered quite good, although in a few instances bearings were taken at over ninety miles distance from the transmitting stations. A number of interesting and important discoveries with regard to wireless direction finding at sea were made during these early voyages and much light was thrown on the effect of the metalwork of the ship on the accuracy of bearings.

Some shipowners at first were inclined to regard the direction finder as an expensive fad, but it soon proved to be a great economiser of time and money; so much so that, in 1927, the Chamber of Shipping, on its own initiative, recommended to its members the installation of direction finders on all classes of ships—a remarkable example of the public spirit and far-sightedness with which British shipowners then, as now, carried on their business.

Marconi Direction Finding Aerial



Marconi 'Lodestone' Direction Finder



R.M.S. 'MAURETANIA': 1907-1935

This famous Cunard liner will always be remembered with affection by the thousands of persons who travelled and served in her during her long and honoured career. Her maiden voyage was on November 16th 1907, from Liverpool to New York. Her last Atlantic voyage from New York to Southampton commenced on September 26, 1934, a date which coincided with the launching of the 'Queen Mary' at Clydebank. For over twenty-two years she reigned undisputed Queen of the North Atlantic, a longer period than any other Atlantic liner. Not only did she bring back to this country the Blue Riband of the Atlantic, but she maintained such regularity in service that it was said of her that she was the most reliable time-keeper on the Atlantic. At one time this amazing ship averaged 25½ knots for twenty-seven consecutive runs. In all she made some 350 voyages across the Atlantic, a total steaming distance of nearly 2,500,000 miles; this apart from her service as a troopship and a hospital ship in the first world war. Like all other Cunard liners of her day she was fitted with wireless—that on her maiden voyage being a Marconi 1½ kW fixed gap transmitter. She was also the first merchant ship to be fitted with direction-finding equipment. That was in 1912; and it was during tests and experiments with this apparatus that many interesting and important discoveries with regard to wireless were made

The late Mr. J. Herbert Scrutton, the well-known shipowner, and one-time Vice-President of the Chamber of Shipping, said, when taking part in an important discussion at the Royal Society of Arts in 1924:

'The direction finder strikes me as the most extraordinary advance in navigation that one has ever heard of. I am all out for putting these things on board a ship. There is no question whatever about their usefulness.'

Early in 1921, although very few vessels were fitted with direction finders, the new apparatus was instrumental in rescuing the personnel of the Norwegian steamer *Ontaneda* in the North Atlantic off Newfoundland. All hands would have been lost but for the use of this new apparatus. The rescue of the crew of the *Ontaneda* was a thrilling episode and a triumph for a new development of wireless science. A heavy gale had left the *Ontaneda* drifting helplessly with broken-down engines and a list of fifty degrees in a heavy sea.

Her master sent out SOS signals but, in the thick weather, he could get no observations of sun or stars, and had to estimate his position by dead reckoning. His calculations later proved to be ninety miles out. Whilst several vessels which went to his assistance were steaming about near the position given without finding a trace of the *Ontaneda*, the *Fanad Head*, by means of bearings taken with her Marconi Direction Finder, discovered the true position of the doomed vessel. She was nearer to the *Fanad Head* than to the ships which had originally steamed to her assistance, and the master of the *Fanad Head*, Captain Finlay, altered course towards the spot where he calculated the *Ontaneda* to be. The wireless bearing proved to be correct, and the distressed crew were rescued just in time.

Locating Disabled Ships

In course of time many instances have been provided and are still being provided of the value of the direction finder as a life-saver. Perhaps one of the most striking examples is the story of the British steamer *Antinoe*.

The S.S. *Antinoe* sent out an SOS signal at three o'clock on Sunday morning, January 24, 1926, and the message which followed stated that it was only possible to give the previous day's noon position, the weather having been too bad to obtain reliable observations since that time. In the circumstances the captain of the *President Roosevelt*, which intercepted the SOS signals, decided that the best thing to do was to obtain wireless bearings of the *Antinoe* and these were taken at fifteen-minute intervals until nearing the *Antinoe*, when they were taken continuously. Both the captains of the *Antinoe* and the *President Roosevelt* afterwards agreed that had it not been for the direction finder there was very little doubt that the *President Roosevelt* would not have found the *Antinoe* in time to effect a rescue. The rescue ship, in this case, was American, and the direction finder was not a Marconi instrument, but the lesson of the value of the direction finder was the same.

The Radio Officer of the *Antinoe* was in the employ of the Marconi Company and his conduct was in accordance with the high traditions which Radio Officers have always maintained.

As an indication of this it may be put on record that Captain Fried, of the *President Roosevelt*, presented a silver signalling torch to Mr. Arthur Evans, the Radio Officer of the lost ship. When the *Antinoe* was sinking, Mr. Evans continued to transmit SOS signals until the wireless cabin was wrecked by heavy seas. He then signalled with a hand torch.

About the same time that the *Antinoe* foundered another British ship, the *Laristan*, was in need of assistance and, in this case, it was the Marconi Direction Finder on board the Canadian Pacific passenger ship *Montnairn* that was instrumental in guiding the rescuing ship, the German liner S.S. *Bremen*, to the distressed vessel which proved to be twenty-six miles from the position calculated by dead reckoning.

A more recent illustration of the value of the direction-finding apparatus in locating a disabled ship at sea resulted in a world record tow by a merchant vessel. It was on September 19, 1948, that the P. and O. motorship *Palana*, four days out of Lyttelton, New Zealand, with a cargo of frozen meat for London, picked up a radio message from the 4972-ton motor vessel *Fernmoor*, en route from Sydney to London with a cargo of grain, asking for assistance in the form of a tow to port, her engines having been disabled due to the collapse of the water cooling system, a portion of which had jammed the crank webs.

Captain Spurr, the master of the *Palana*, altered course towards the position given—some 500 miles north-east of the P. and O. liner—and advised Captain Lamb, master of the *Fernmoor*, accordingly. Owing to bad weather, the *Fernmoor* had been unable to obtain a 'sight' for three days, and Captain Lamb advised that his position was approximate only. Direction-finding bearings of the crippled vessel were taken and the *Palana's* course amended. During the next thirty-six hours frequent wireless bearings were taken until, in the early hours of September 21, the *Fernmoor* was sighted right ahead, several miles from her radioed position.

Weather conditions were unfavourable, so the *Palana* was manœuvred into position and a rocket fired across to the *Fernmoor*. Attached to the rocket line was a three-inch manilla rope, then a five-inch manilla rope, and finally the six-inch steel towing hawser. All were successfully hauled aboard the *Fernmoor*, and two hours later the 2300-mile journey to Auckland commenced.

But weather conditions gradually worsened, and the *Fernmoor* pitched and rolled violently. Impromptu sails, made from tarpaulins (which were subsequently blown away in a heavy squall) were rigged on the *Fernmoor's* fore deck in an attempt to steady and handle her better but, following an extra violent lurch by the *Fernmoor*, her anchor chain parted just forward of the windlass.

Fearing that the released hawser and cable might foul the *Palana's* propellers during the operation of hauling in it was necessary to continue steaming ahead; until after many hazardous and strenuous hours by all hands the hawser was at last hauled aboard.

In the meantime the two vessels had become separated by some seventy miles. The *Palana* turned back on her course, and once again with the aid of the wireless direction-finding apparatus, the *Fernmoor* was sighted. Again the towing hawser was passed with the aid of the life-saving rocket apparatus, and the two vessels were once again on the way to Auckland. Throughout the passage the unfavourable weather persisted and on four occasions it was necessary for both vessels to heave to for several hours. Finally, however, on the twenty-third day of towing, the two vessels, despite several minor incidents, anchored safely in Waitemata harbour, thus completing the longest tow ever undertaken by a merchant vessel.

Progress of the Direction Finder

By 1923 it was reported that many shipping companies, such as the Cunard, Canadian Pacific Ocean Services, Elders and Fyffes, the P. and O., Royal Mail, Red Star, and White Star Lines, had adopted the direction finder. There had already been several examples of the saving of life, ship and valuable cargo, but the apparatus was increasingly proving a good investment since it enabled shipowners to effect economies in time, money, and material which far outweighed its cost. The saving of only one tide in some cases saved the entire cost of the apparatus for the year. The direction finder was the means of saving considerable time when ships had encountered dense fogs and navigation had been rendered difficult or impossible but for the assistance given by the apparatus. The Canadian Pacific mail steamer *Metagama*, while on her first voyage with the direction finder on board, ran into dense fog off Belle Isle, and was navigated by means of bearings obtained with the apparatus.

Shipmasters also were full of praise regarding the direction finder as a reliable navigational aid. During 1925 a considerable number of reports were received from masters speaking in the highest possible terms of the service which the Marconi direction finder had rendered.

The master of one ship referred specially to the assistance of the direction finder during foggy weather. The owners said that but for the direction finder the vessel would certainly have lost one tide in making her first discharge port. To a non-technical person the fact that the vessel avoided losing a tide does not mean very much, but, to put it in a form which an ordinary person can understand, it means that the ship, by saving that tide and thus arriving in port twelve hours earlier than she would otherwise have done, saved the entire cost of the apparatus.

The master of another ship found himself in the midst of a sandstorm when his course lay between two small, steep islands. Another vessel had preceded him through in clear weather. By means of bearings taken with the Marconi direction finder on the ship ahead of her, the vessel in the sandstorm was able to make her course with confidence.

The master of a third ship, in writing to his owners, said that after navigating entirely on dead reckoning for 1500 miles in thick, rainy weather and with two days' poor observations previous to this, they made their objective on time, due to good wireless bearings. Approaching the Irish coast they were able to assist three other vessels by advising them of their positions.

Another master reported that, coming up Channel 'after a glimpse of St. Catherine's Point lighthouse, it shut down dense fog between there and the Maas light vessel. During all this time, *viz.*, twenty-four hours and a distance of 220 miles, I was never in doubt of my position. As the figures show, I was able to maintain an average speed of nine knots, including various stops for traffic.' It needs no knowledge of navigation to understand what the position of a vessel in these circumstances would have been but for the direction finder.

The value of wireless telegraphy and wireless direction-finding apparatus in safeguarding the lives of travellers using passenger ships has, of course, long been recognised. The security brought to the men who 'follow the sea' as an occupation is perhaps not so frequently stressed. Yet a census of the lives of seamen saved by wireless would probably show that seafarers owe as much to this means of summoning assistance as do occasional ocean travellers, and are certainly no less appreciative of what is owed to Marconi's genius. Numerous instances had occurred of seamen, stricken with serious illness or disabled by accident, being treated by doctors on distant ships through wireless instructions, and for men being transferred from one ship to another for treatment. In these cases an exchange of wireless messages had brought assistance, and the wireless direction finder had saved valuable time in directing one vessel to the other when it was necessary for them to meet, particularly when fog or storm made it difficult to determine the actual position of either ship.

Both these advantages of wireless figured in a report which was received in July 1923 from the Prince Line steamship *Saxon Prince.*

During the voyage of that vessel from Newport News to Rio de Janeiro one of the seamen was taken seriously ill, and instructions were given by the master to the Radio Officer to ascertain if there were a ship in the vicinity carrying a doctor. A reply to the wireless call was received from the Spanish steamship *Manuel Arnas*, bound from Teneriffe to San Juan (Porto Rico), and the vessels altered their courses in order to meet. As they were approaching each other, instructions as to treatment were wirelessed from the Spanish ship.

The *Manuel Arnas* was equipped with a Marconi wireless direction finder, and, as the result of bearings taken with this instrument, the vessels were able to meet with a minimum of delay.

The Spanish surgeon boarded the *Saxon Prince*, and on examining the patient, found the case so serious that he decided to move the man to his own ship. The transfer was accomplished without mishap, and the vessels resumed their interrupted voyages.

Direction-finding Coast Stations

Although in 1926 there were over 200 ships of the British Merchant Service fitted with direction-finding apparatus of the Bellini-Tosi or similar type by means of which they could determine the bearing of any coast station or ship, we find the secretary of the Mercantile Marine Service Association, writing to *The Times*, deploring the comparatively small number of regular direction-finding stations along the coast of Great Britain. And in 1927, when the number of British ships fitted with the direction finder totalled more than 300, the *Shipbuilding and Shipping Record* 'again' called attention to the need for an extension of the number of stations round the British coast from which ships could obtain their bearings by wireless.

'We observe', said the *Record*, 'from a reply given by the President of the Board of Trade in the House of Commons that the Post Office have in hand the fitting of certain stations with direction-finding apparatus, and that if they prove to be satisfactory, they will be put into use. The matter is one for energetic action, and we hope that from time to time steps will be taken in Parliament to obtain information on the progress of the departmental action. At present there are four direction-finding stations in operation in this country. There is ample need for their extension . . . This country, with its great mercantile marine and its geographical situation in the route of world shipping, ought to be a leader in all that pertains to the safety and convenience of navigation.'

The late Sir Bertram Hayes, K.C.M.G., D.S.O., who was Commodore of the White Star Line when he retired from the sea some twenty-five years ago, wrote in his book of reminiscences published in 1925 that, at that time, Great Britain was limping behind the world in providing wireless aids to navigation—'we who had the greatest Navy and the greatest merchant fleet, we who more than any other country had to use the sea for business upon which we depended for the very food which kept us alive', to quote Sir Bertram.

Sir Bertram said he felt very strongly on this point.'When I see other countries, especially the United States and France, utilising the latest discoveries of science to provide the greatest possible security for their ships in bad weather, I cannot avoid feeling in regard to whoever is responsible that Lord Fisher's phrase—"sack the lot"—should apply. Even our colonies are ahead of us. Ports there, as well as in France and the United States, are covered by wireless direction-finding stations which give ships reliable positions in thick or doubtful weather.

'The excuse—I can call it nothing else—offered by our authorities when approached on this subject, is that wireless direction finding is still in the experimental stage. They refer to the two or three stations that are established around our coasts, and mention an experimental one at Niton, on the Isle of Wight, presumably to show that they have the matter under consideration. They say that it is undesirable, from motives of economy, to add more until the usefulness of those established is assured.

'Isolated stations will never establish their usefulness to the full extent, though they serve to keep ships clear of the particular point they are on, and of others in its immediate vicinity. What is wanted is two, or preferably three, stations covering the entrance to each port, as is the case in Canada and the United States, with France following closely in their wake. Their existence proves that wireless direction finding passed the experimental stage years ago, and has come into general use in other countries. Surely it ought to have done so in ours by now!'

As Sir Bertram said, it was not as though the instruments were very costly. The value of one ship saved from going on shore by the use of them would cover their cost for years. Sir Bertram seemed to think that there was some influence working against the adoption of wireless direction-finding land stations. He had been told that the Navy was against them in case they would be of assistance to enemy ships in time of war. On the other hand, high-ranking Naval officers assured him that the Navy was in favour of them and blamed the Post Office authorities. But whoever was to blame, Sir Bertram thought that the Post Office should have pressed for their establishment in sufficient numbers to be of real use, for they would have been the first to benefit through the acceleration of the landing of the foreign mails. 'If we had had the assistance of such stations in making port during doubtful weather, many hours would often be saved', he said.

'As a matter of national pride', Sir Bertram continued, 'we ought to have them, if for no other reason. I mentioned, in one of the letters I wrote, asking for a wireless beacon to be established on the Nab Tower, that it was only through the courtesy of France that I was enabled to get a position to make the tower during a fog without losing a considerable amount of time. I thought that might stir the official mind up a bit but it only brought forth the stereotyped reply to which I have already referred.

'On that occasion, the Cherbourg station had given me a bearing, which, used in conjunction with the one I obtained from the "experimental" station at Niton, gave me a good position, which I, of course, verified by the use of the lead before proceeding. I may mention that all bearings are given free of cost to the ship asking for them by the Canadian and United States stations, which is not the case with the few we have.

'Wireless beacons which send out a special signal at short intervals, denoting what light vessel is sending it, are established on all the United States light vessels we pass on our way into New York, and ships that are fitted with wireless direction-finding instruments pick their signals up, and so are guided past them with absolute accuracy.

'Great Britain has two such beacons. One is on Inchkeith Island in the Firth of Forth, and is "experimental", like the Niton Station. Very few merchant ships pass that way. The other is on the Bar Light Vessel, at the entrance to the River Mersey, and was presented to the Mersey Docks and Harbour Board by the Marconi Company. This must be of great assistance to the ships fitted with wireless direction finders that frequent the port of Liverpool, though I have had no experience of it myself, not having entered the port since it was established.

'Those beacons cost even less than the stations I have previously mentioned, and, as they are automatic, no extra staff is required to run them, and the cost of upkeep is negligible. Now, at the moment of retirement, I make an especial plea for the establishment in considerable numbers of these stations. They are essential, and if words of mine should hasten their provision, I know of no greater boon I would crave to be granted for my shipmates of the Service.'

Well, this country is now, at all events, well supplied with 'beacon' transmitters, and there is no doubt that many vessels have been saved from delay, as well as from mishap, by getting their correct positions by wireless direction and position finding.

These radio beacons are in many ways equivalent to the lights which are provided round the coast to assist the navigation of ships, but instead of lights they are provided with small wireless transmitters capable of operating automatically. These transmitters send out at regular intervals signals from which ships with direction finders can obtain their bearings. Generally, these signals are sent out every half hour, but in foggy weather, which, of course, does not obscure a wireless signal as it does a light, they operate every six minutes. These beacon stations are operated for the most part by the Trinity House, the Northern Lighthouse Board, and the Irish Lights Commissioners.

Advantages of the Direction Finder

The advantages of the direction finder as an aid to navigation are considerable. It gives the relative bearing to the ship's head of any wireless station within range, whether mobile or fixed. By taking two or more bearings of fixed stations the position of the ship can be determined with a high degree of accuracy.

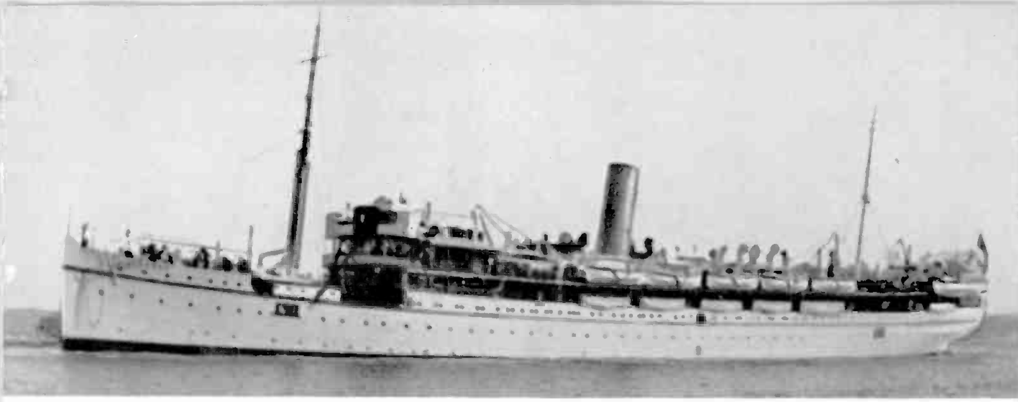
Wireless direction finders were first made compulsory in British ships as a result of the Safety of Life at Sea Conference of 1929. Eighteen nations signed a Convention; and among the provisions relating to wireless was a clause making the fitting of direction-finding apparatus compulsory on all passenger ships of 5000 tons gross and upwards. British ships, some of even smaller tonnage than this limit, had been using the direction finder for a considerable time previously, for shipmasters had proved the enormous navigational value of the device, and shipowners had found that the saving in time which followed the installation more than paid its cost in a single year.

When effect is given to the International Convention for the Safety of Life at Sea, which was signed in June 1948, all ships of 1600 tons gross and upwards will, when engaged on international voyages, be fitted with direction-finding apparatus. This Convention is to come into force on January 1, 1951, provided that at least twelve months before that date, no fewer than fifteen acceptances, including seven by countries each with not less than 1,000,000 tons of shipping, have been deposited.

According to the regulations laid down in the Convention:

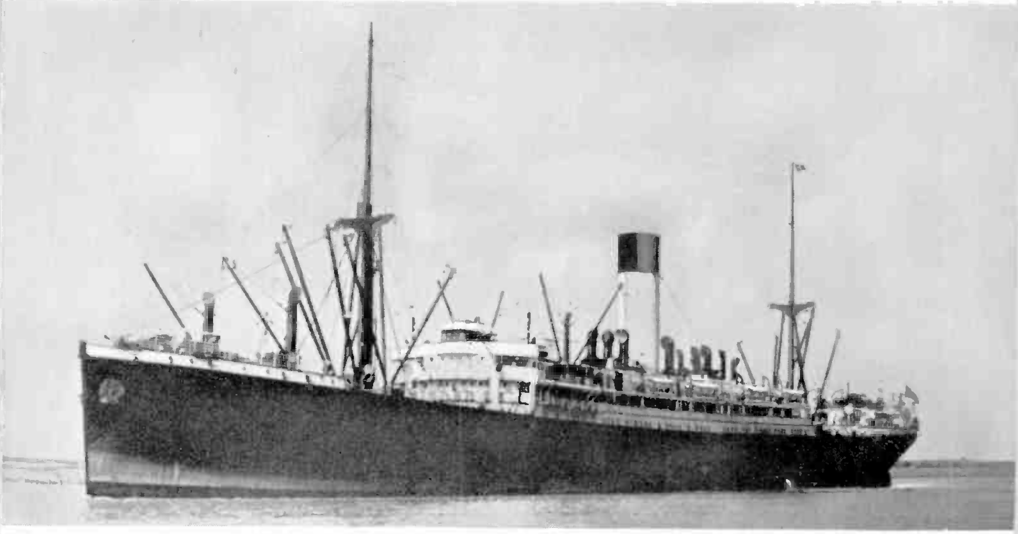
(*a*) The direction-finding apparatus required shall be efficient and capable of receiving signals with the minimum of receiver noise and of taking bearings from which the true bearing and direction may be determined.

(*b*) It shall be capable of receiving signals on the medium frequencies assigned by the Radio Regulations for the purpose of distress and direction finding and for maritime radio beacons.



Photograph by Nautical Photographic Agency

The British India Steam Navigation Company's liner 'Rewa', fitted with Marconi wireless in 1910

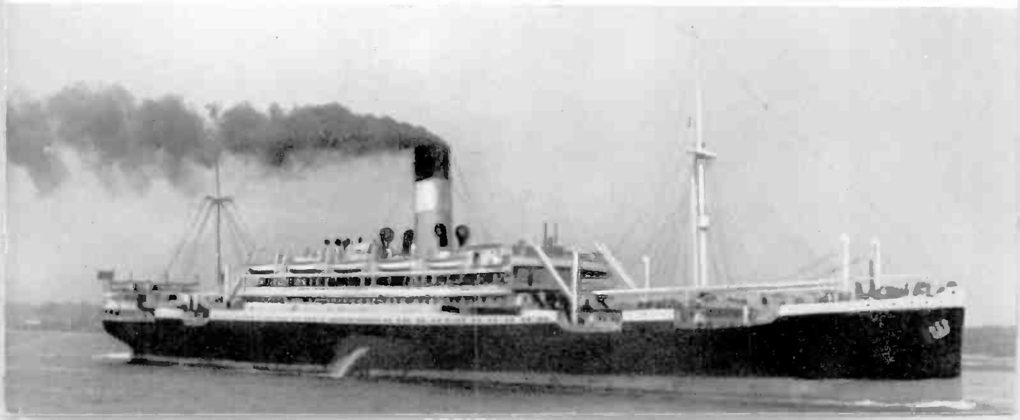


Photograph by Nautical Photographic Agency

The Blue Funnel liner 'Aeneas', fitted with Marconi wireless in 1910

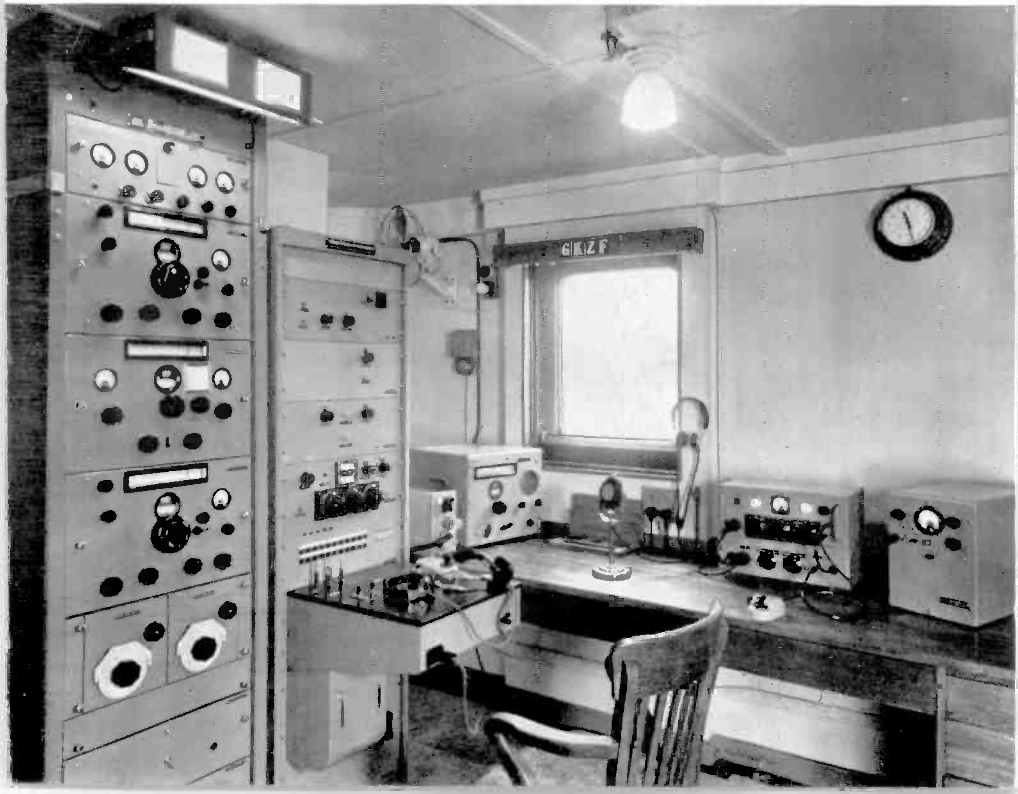
The Lamport and Holt liner 'Vandyck', fitted with Marconi wireless in 1910

Photograph by Nautical Photographic Agency



The Main Wireless Telegraph Office of the Royal Mail Liner 'Andes'

CRD 150/20 Triple Diversity radio telephone receiving equipment, telephone terminal and inverter equipment, 'Yeoman' receiver and radio telephone transmitter control unit, on R.M.S. 'Queen of Bermuda'.



(*c*) In the absence of interference the apparatus shall have a sensitivity sufficient to permit of accurate bearings being taken on a signal having a field strength as low as 50 microvolts per metre.

(*d*) Efficient communication shall be provided between the direction-finding apparatus and the bridge.

(*e*) All direction finders shall be calibrated to the satisfaction of the Administration on first installation and the calibration shall be verified whenever any changes are made in the position of any aerials or of any structures on deck which might affect appreciably the accuracy of the direction finder. The calibration particulars shall be checked at yearly intervals, or as near thereto as possible. A record shall be kept of the calibrations and of any checks made of their accuracy.

CHAPTER TWENTY-ONE

The 'Auto-Alarm'

ANOTHER invention which was greatly developed after the 1914–1918 war and eventually became a compulsory fitting in seagoing ships was the auto-alarm—an automatic receiver which operates a system of alarm bells when a special signal is intercepted. We have seen in a previous chapter how, just after the loss of the *Titanic*, Marconi had conceived the idea of inventing a means whereby a message from a ship in distress could be received by other ships even when the Radio Officer was not on duty in his wireless cabin. It will be remembered that a ship, which was only a few miles away from the scene of the disaster and could perhaps have saved many lives, failed to receive the *Titanic's* SOS call because the Radio Officer had turned in.

As already pointed out, during the war all the energies of the Marconi Companies were concentrated on war work, but immediately after the Armistice the problems connected with the production of an automatic transmitter which would send out a special signal with mathematical accuracy and an equally reliable receiver which would respond to this signal only were again taken in hand with satisfactory results. Early in 1920 Marconi's new 'calling up' system or auto-alarm, was demonstrated at Chelmsford.

For the purpose of the demonstration an out-station, fitted with both the new wireless calling device and wireless telephony, was put up thirty miles from Chelmsford, at Shalford, close to Cambridge. According to Press reports from those present, communications were first exchanged between Chelmsford by the Company's wireless telephony 'with as much speed and accuracy as with an ordinary telephone'. Then the special messages were sent from Shalford, which not only set bells at Chelmsford going, but also exploded a charge of gunpowder and flash lights.

'Without entering into a technical description of the system', said one report, 'it is sufficient to say that when the emergency arises the automatic key will be pressed and, in a fraction of a minute, all the alarm bells on ships fitted with the receiver and within range—any distance up to eighty miles—will be set ringing, after which the transmitting operator can send particulars as to the ship and its position. Another result, which the system makes possible, is a reduction of the wireless staff on board ships which are not obliged by regulations to maintain a continuous wireless watch.'

It should be explained that under the Merchant Shipping (Wireless Telegraphy) Act of 1919 any seagoing ship carrying 200 persons or more had to carry three Radio Officers if the voyage exceeded forty-eight hours from port to port and two Radio Officers if the voyage exceeded eight hours but was less than forty-eight hours. In each case one of the operators was not required to hold the Postmaster General's certificate. His duty was to stand by in the wireless room as a 'watcher' in case a distress signal should be received during the time one of the certificated operators was off duty. Ships carrying fifty but fewer than 200 persons had to carry one operator and two watchers if the voyage exceeded forty-eight hours from port to port and one operator and one watcher if the voyage exceeded eight hours but not forty-eight from port to port.

The general attitude of shipowners towards the auto-alarm was perhaps expressed by Sir Alan Anderson in an article in *Lloyd's List* of December 21, 1923. Sir Alan said: 'One new device which the Radio Telegraph Convention (of 1919) mentions is distinctly a life-saver and ought to be brought into use at once. At present great expense is thrown on trade without a gain in efficiency by the regulation that a man is to watch for distress calls at sea. An automatic alarm device which rings an alarm bell in every ship within range when a ship is in distress, is absolutely essential to gain the life-saving use from wireless.'

The 'Continuous Watch' System

At that time, the shipping industry was beginning to suffer from the aftermath of the war. It is true that, for a short while after the Armistice, tonnage was in short supply and freight rates ruled high. But the industry was now saddled with a large number of ships which had been built at exceedingly high prices when there was a scramble for new tonnage, as well as reparation tonnage for which the industry had paid the British Government prices which were considerably in excess of its real value. Economies in operation had to be effected wherever possible. The obligation to carry 'watchers' in order that a continuous watch should be kept in case a distress call might be missed when the regular Radio Officer was off duty meant not only that extra wages had to be paid for the watchers but extra accommodation must be provided for them.

In a very short time thereafter trials were carried out by the Government with a view to studying the possibilities of an instrument which would respond to a special signal used as the forerunner of the distress call, the object being to make it unnecessary for ships to maintain a constant human watch. Since investigations along these lines had been carried out by the Marconi Marine Company for several years, the Company was able to lend the Government apparatus for carrying out its trials. The results of the experiments and trials were embodied in a report laid on the table of the House of Commons, and which included a specification of the requirements which such an instrument should fulfil. The Marconi four-second alarm device was designed in accordance with the requirements. It was found at the trials that the most suitable form of signal consisted of a series of four-second dashes, and the instrument had been designed in accordance with this recommendation.

Then, in 1927, the Government decided to make the fitting of an auto-alarm device compulsory in all ships carrying more than forty-nine and fewer than 200 persons. This meant that shipowners were no longer required to carry the two wireless watchers. The Marconi Companies had spent many years and large sums of money in perfecting the device, and, in July 1927, Board of Trade approval of the Marconi Auto-Alarm was received. The device had this strong appeal to shipowners, that unlike many devices required by wireless regulation which involved them in additional cost it enabled them to dispense with two wireless watchers.

The regulations, which came into force on October 1, 1927, were as follows:

If not fitted with an approved automatic apparatus for registering the alarm signal, a ship of Class I (*i.e.*, carrying 200 persons or more and not engaged in the coasting trade) shall carry operators in accordance with the following table, and while at sea an operator shall be always on watch.

Nature of Voyage	*Number and Grade of Operators*
(*a*) Voyage exceeding forty-eight hours from port to port.	Three operators, of whom one shall be an operator of the First Grade and not more than one an operator of the Third Grade.
(*b*) Voyage exceeding eight hours but not exceeding forty-eight hours from port to port.	Two operators, of whom one shall be of the First or Second Grade.
(*c*) Voyage not exceeding eight hours from port to port.	One operator, who shall be of the First or Second Grade.

A ship of Class II (*i.e.*, not engaged in the coasting trade carrying fifty but less than 200 persons) and ships engaged in the coasting trade carrying fifty persons or more.

The Radio room of R.M.S. 'Orion' showing, left to right, two Marconi 'Yeoman' receivers, 'Worldspan' transmitter, 'Lodestone' direction finder, and Marconi broadcast receiver

Radio room of Union Castle R.M.S. 'Pretoria Castle' fitted with 'Worldspan' transmitter and 'Yeoman' receivers

Photograph by courtesy of Union Castle Mail Steamship. Co. Ltd.

Photograph by courtesy of the Postmaster General

The General Post Office Wireless Station at Burnham, which maintains communication with British ships all over the world. This station was reopened, with new equipment, in November 1948

In the ships' bureau at Burnham, track is kept of all British ships equipped with high-frequency radio. Steel wall maps show the shipping lanes of the world, the position of larger ships being recorded with magnetic markers. A quick-reference filing system keeps a last-known location of all ships. When the Burnham Station was opened, early in 1925, the installation consisted of one short-wave receiver, with a short-wave transmitter at its companion station at Portishead. In the first year traffic with ships totalled merely a few thousand words. To-day the traffic at the new Burnham Station is nearly ten million words per annum

Nature of Voyage	*Number and Grade of Operators and Watchers*
(*a*) Voyage exceeding forty-eight hours from port to port.	One operator, who shall be of the First or Second Grade, and two watchers.
(*b*) Voyage exceeding eight hours but not exceeding forty-eight hours from port to port.	One operator, who shall be of the First or Second Grade, and one watcher.
(*c*) Voyage not exceeding eight hours from port to port.	One operator, who shall be of the First or Second Grade.

A ship of Class III was to carry one operator, First or Second Grade, and while at sea should always be on watch at the times specified.

If a ship of Class I were fitted with approved automatic apparatus, she carried two Radio Officers, if engaged on Voyage (*a*), one of these had to be of the First Grade. While at sea a Radio Officer was always to be on watch at specified times, at other times the watch could be maintained either by a Radio Officer or by means of the auto-alarm; if on Voyage (*b*), one Radio Officer of the First or Second Grade. It will be seen, therefore, that the installation of the auto-alarm meant one Radio Officer fewer in such cases. For ships of Class II fitted with an auto-alarm only one Radio Officer of the First and Second Grade needed to be carried, thus saving two watchers on Voyage (*a*) and one watcher on Voyage (*b*).

Further Amendments to Regulations

These regulations were further amended after the Safety of Life at Sea Conference in 1929. From January 1, 1933, a wireless installation was compulsory on all passenger ships and on all cargo ships of 1600 tons gross and upwards, and the ships were classified as follows:

Class I	Passenger ships of 3000 g.r.t. or upwards and cargo ships of over 5500 g.r.t.
Class II	Passenger ships of under 3000 g.r.t. and cargo ships of 3000 to 3500 g.r.t.
Class III	Cargo ships of 1600 to 3000 g.r.t.
	Watches:
Class I	Ships must keep continuous watch.
Class II	Ships must keep eight hours watch per day.
Class III	Ships must keep six hours watch per day.

If a ship were provided with an automatic alarm device watch had to be kept by a Radio Officer for four periods of one half-hour each, namely, 0800–0830, 1200–1230, 1600–1630, 2000–2030. At all other times the automatic alarm device was to be in operation.

The Safety of Life at Sea Conference held in London in 1948 took another great step forward by providing that, in all passenger ships and in all cargo ships of 1600 tons gross and over, a continuous watch on the distress frequency of 500 kilocycles per second is to be kept either through human agency or by human agency assisted by an automatic listening device. Further, all cargo ships between 500 and 1600 tons gross will have to fit either a radiotelegraph or a radiotelephone installation, and carry a Radio Officer or a qualified radiotelephone operator. In such ships watch will be kept by the Radio Officer or the radiotelephone operator at fixed times during each day when safety messages are sent out by coast stations.

Since 1929 radio has established itself as one of the most important agencies for saving life at sea through the facilities it affords for summoning speedy help to vessels in difficulty or distress. Its efficiency for this purpose is increased in proportion as the number of vessels listening for distress calls is increased; and this new regulation, which will, it is expected, come into force on January 1, 1951, should bring about conditions under which distress calls will rarely or never be missed.

An SOS call sent out by a ship navigating in the seas round the British Isles invariably finds its first shore contact at one of the Post Office Wireless coast stations. All these coast stations maintain a continuous watch for distress calls from ships at sea, and when such a call is received the station immediately ceases all commercial transmitting and directs its attention to establishing communication with the ship concerned. The nature of her distress and the assistance needed is passed at once to the appropriate authorities, who provide all necessary measures for effective help. During 1948, Post Office coast stations dealt with 281 distress calls.

CHAPTER TWENTY-TWO

Wireless Equipment for Ships' Lifeboats

THE early 1920s saw great developments in wireless and the invention of new radio aids to navigation as well as appliances for increasing the safety of seafarers. Nor only were ships' wireless installations giving more efficient communication over greater distances but, as we have seen, the research work carried out by the Marconi staff had produced efficient wireless direction finders and auto-alarms. Another development which was to have great beneficial effect in the following years, especially during the period of the war of 1939-1945, was the compulsory equipment of ships' lifeboats with wireless telegraphy apparatus. The greater range at which the enemy's submarines were able to operate in the second world war resulted in ships being sunk many hundreds of miles away from the nearest land. Many ships' crews were cast adrift in lifeboats to suffer privation and exposure before being rescued, and many would never have come through had it not been for the lifeboats' wireless equipment which brought help and assistance far more speedily than might have been the case had the apparatus not been installed.

The Marconi Marine Company had for many years given serious consideration to the question of equipping lifeboats on liners with small wireless installations, it being realised that, in the event of a wreck, such lifeboats could not only remain in touch with one another, but keep rescuing vessels acquainted with their position. Early in 1914 a new departure in this direction was the equipping of the motor lifeboats of the Cunard liner *Aquitania* with wireless apparatus, the Marconi Marine Company having designed a special type of installation for such a purpose.

It was not until 1923, however, that the desirability of fitting ships' lifeboats with wireless was so strongly emphasised as to result in legislation being introduced making it compulsory for foreign-going vessels carrying more than ten lifeboats to have at least one equipped for wireless telegraphy. This was brought about by the case of the Hain Steamship Company's steamer *Trevessa*, which was lost while on a voyage from Australia to England, some 1500 to 1700 miles from land.

The Court of Inquiry into the circumstances attending the loss of the *Trevessa* found that the vessel sank through springing a leak which admitted water rapidly into the ship and filled No. 1 hold. There was no direct evidence to justify a positive finding as to the cause of that leak, but the Court was strongly of opinion that owing to the great weight of the cargo, which consisted of zinc concentrates, and the severe weather she experienced the ship was subjected to continuous excessive straining, which caused a seam or seams to open in the shell plating on one or both sides.

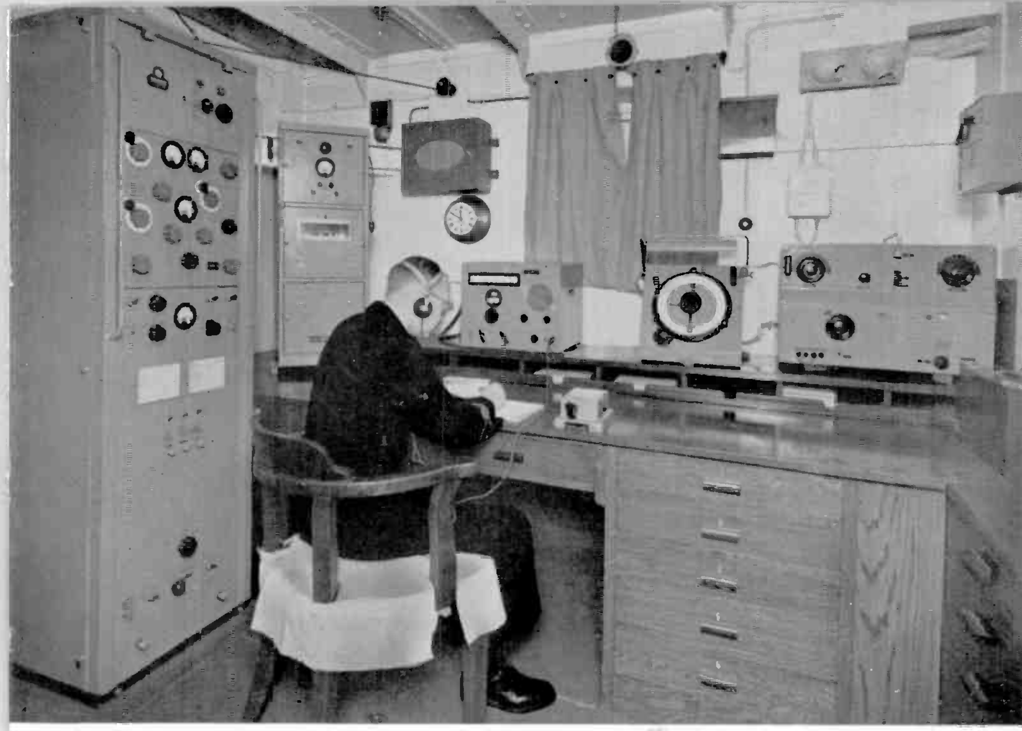
The vessel foundered in Lat. 28.45 S., Long. 85.42 E. The crew, numbering forty-four, got away in two lifeboats. The officers, petty officers, and A.Bs. were British; the others being Indians and Arabs. In No. 1 lifeboat there were twenty men in all, with the master, Captain Cecil Foster, in charge. There were twenty-four in the other lifeboat under the charge of the Chief Officer, Mr. J. C. Stewart Smith. The *Trevessa* was an ex-German ship taken over after the war by the British Government, who sold her to the Hain Steamship Company. Her wireless installation was German—a ½-kW Telefunken QG set, with galena crystal receiver. The Radio Officer was Donald Lamont, who is now serving on shore at the Aberdeen depot of the Marconi International Marine Communication Company.

When Captain Foster gave orders to abandon ship he instructed Lamont to send the SOS giving the ship's position. It was some time before a reply was received and then so faintly that it could hardly be heard. The SOS was answered by the S.S. *Runic* and two other steamers, names unknown, since their call signs were unreadable, but the crew were unable to wait a reply as to whether ships were coming to the assistance of the *Trevessa* or as to how far they were away.

In the boat, the master questioned Mr. Lamont as to the vessels with which he had been in touch during the few days previous to the foundering with the idea of finding out if any of them were approaching the *Trevessa's* position, and ascertaining approximately how far away they might be. From what Lamont told him the master gathered that they were all a long way off. To add to this, the boats were fast drifting away from the scene of the disaster, so that the probability of their being picked up soon was not great.

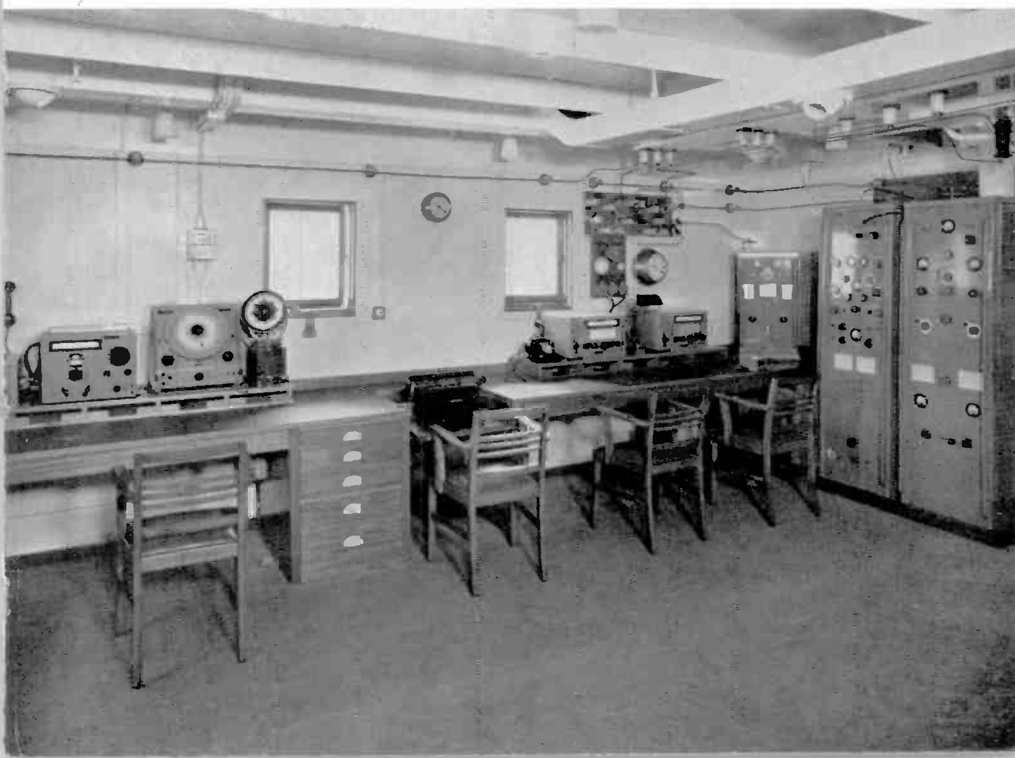
Lifeboat's 1700-*mile Voyage*

And so it was decided to make for land. There are not many spots in the world so far from land as that where the *Trevessa* was lost. She was abandoned and sank approximately 1600 miles from Fremantle and 1728 miles from the Mauritius group. In his book, *1700 miles in Open Boats*, Captain Foster stated that the reason for deciding to make for the Mauritius group was that it seemed to offer the best conditions for getting to land, though it involved covering a greater distance than the alternative routes.



The Wireless room of the C.P.S. liner 'Beaverdell'

Marconi transmitting-receiving-direction finding installation, P & O liner 'Himalaya'



The first lifeboat to be fitted with wireless. This motor lifeboat, stationed at Rosslare Harbour, was fitted with wireless in 1926

The winds on the course chosen would be favourable, and there was the hope that at that time of the year the boats would carry the prevailing westerly winds, encountered in the high latitudes, across the usual calm belt which lies between them and the trade winds nearer the equator. At this season, too, they were more likely to encounter rainy weather, which would help to augment the supply of water, which was scanty for the long trip to be made should they not be rescued by another vessel. Moreover, the temperatures they might experience on this route would be less trying than if they attempted to reach land by any other route.

After six days the two boats parted company, and after twenty-two days and nineteen hours the captain's boat reached Rodriguez Island, having covered a distance of 1556 miles. The chief officer's boat reached Mauritius, a distance of 1747 miles after twenty-four days and twenty hours at sea—two wonderful examples of seamanship and discipline which will long be remembered. Two lives were lost in the captain's boat and nine in the chief officer's boat. The two in the former died from exhaustion. When the captain's boat reached land the master said that every man was 'all out', both mentally and physically. And in a testimony to the behaviour of his crew, Captain Foster added: 'Those who were better equipped than the others in either or both ways never hinted that they might be doing more than their share when they were called upon to exert their powers to the utmost. If I had known that I was going to be called upon to make this boat voyage I could not have picked a better crew for the purpose . . . I could not have had more loyal support, and I am proud to count them all as my friends.'

Since this is a history of the Marconi Marine Company and its staff, let me give just one extract from the master's diary made four days before the boat landed: 'Lamont was by this time feeling the effects of exposure very much, being only a youngster and without as much physical strength as the others. To start with he took his full share in whatever there was to do, helping with the steering and so on. He was still keeping a watch, in fact continued to do so until we reached land, but he had to be helped to sit upright and to keep in a sitting position. In spite of his weakness, however, he never grumbled or uttered a protest.'

Lamont himself has since expressed the opinion that had lifeboats in those days been fitted with Marconi apparatus the crew would have been picked up in at least three or four days—in fact, probably sooner, assuming that the searching ships were also fitted with Marconi direction-finding apparatus, for they could have steered direct to the boats instead of to the ship's position from which the lifeboats had rapidly drifted.

It was only natural that the case of the *Trevessa* should give rise to much discussion as to whether if either of that ship's boats had been fitted with wireless it would have been able to establish communication with the vessels which responded to her call. It may be of interest to note in this connection that the late Mr. Havelock Wilson, chairman of the Seafarers' Joint Council, stated that, in his opinion, the installation of such apparatus was an absolute impossibility at that time, for there was no machinery invented that would make it possible to install wireless in a small boat. This sweeping assertion, however, was not in accordance with the facts, for several lifeboat sets had been in existence for some years, and a number of the lifeboats of the Cunard and White Star liners had already been equipped with small wireless installations.

The new Board of Trade regulations came into force on July 1, 1925, and to comply with the requirements laid down the Marconi Marine Company designed a compact receiver-transmitter apparatus by which signals could be sent or received by persons who had no technical knowledge of wireless. This, of course, was important, for there would never be any guarantee that a Radio Officer would find a place in the lifeboat so equipped if it had to be launched hurriedly. The installation was a $\frac{1}{4}$-kW quenched spark transmitter and a three-valve receiver set working on a fixed wavelength of 600 metres, power being supplied by a motor alternator. An easily-erected aerial was provided. The installation had a normal range of from fifty to sixty nautical miles.

By April 1926 this Marconi wireless installation had been fitted on 171 lifeboats. Quite remarkable ranges had been obtained with the apparatus. Signals from a lifeboat had been received by ships at a distance up to 175 miles, were reported to be steady and clear, and communication had been maintained for one hour in daylight with land stations 300 miles away.

First R.N.L.I. Lifeboat Fitted

Not long afterwards another type of lifeboat—one which did not come under the compulsory regulations for ships' lifeboats—was fitted with wireless. In the official history of the Royal National Lifeboat Institution published in 1923, under the title of *Britain's Lifeboats: The Story of a Century of Heroic Service*, it was suggested by the author that it would be unwise to attempt to predict what developments in motor lifeboat construction would be made at the beginning of the Institution's second century. 'It may, however', it was added, 'be said that once motor lifeboats which are large enough to keep the seas for long periods have been successfully established, the next step will be to add wireless telegraphy to their equipment'. It was some time in 1926 when the first lifeboat of the R.N.L.I. was fitted with wireless telegraphy, when the Rosslare harbour lifeboat had a wireless telegraph receiving and transmitting set installed. This was the $\frac{1}{4}$-kW installation designed by the Radio Communication Company (later taken over by the Marconi Marine Company) for ships' lifeboats. The whole of the apparatus was enclosed in a water-tight case, the operator working through a hole in the case fitted with a waterproof sleeve. In the front of the case there was a window, lighted by a small lamp, through which he could see the controls, receiving valves, and writing tablet.

On the trip from the building yard at Cowes to Ireland, the wireless was tested and communication was effected with Niton Wireless Station at a distance of eighty-five miles. Subsequently, the boat communicated with Port Patrick 185 miles away. That was the only wireless telegraphy station to be put into a lifeboat of the Royal National Lifeboat Institution, and it continued in use until June 1943. Wireless telegraphy was not used in other lifeboats because of the necessity of carrying a skilled operator.

The next experiment of the Institution was in 1929 when the motor lifeboats at Dover, Stornaway in the Island of Lewis, and St. Peter Port, Guernsey, were equipped, not with telegraphy, but with telephony apparatus, and a little later the motor lifeboats at New Brighton, on the Mersey, and Barra Island, in the Hebrides, were also similarly equipped. These five lifeboats had both receiving and transmitting sets with a range of fifty miles.

The six lifeboats which had by this time been fitted (one with wireless telegraphy and five with radiotelephony) were the only lifeboats which fulfilled the necessary conditions—that they were within fifty miles of a shore signal station, were lifeboats with cabins, and lay afloat. Those second two conditions were as necessary as the first. The lifeboats had to lie afloat so that the mast and aerial could be kept up for regular testing. This could not be done when the lifeboat was hauled up into a boathouse and the mast had to be lowered, and without this it was not at that time found possible to maintain the apparatus in workable condition. The boats had to have cabins to protect the delicate apparatus from the sea. Even with cabins the damp was a source of much trouble in the first three lifeboats in which radiotelephony was installed, and the sets had to be refitted and rebuilt. Such were the severe limits imposed on the first use of radiotelephony in lifeboats.

As other motor lifeboats were built which fulfilled the three necessary conditions they were equipped with radiotelephony. In 1936 experiments were carried out with a radiotelephony set in the Cromer boat to see if, with improved apparatus, it could be used in a cabin lifeboat which did not lie afloat. These experiments were made with a substitute aerial in the boathouse, with which the apparatus could be tested each week. The results of this experiment, though not entirely satisfactory, were sufficiently good to justify the Institution in deciding to fit with radiotelephony all cabin lifeboats which were kept in boat-houses, provided, that is, that they were based within fifty miles of shore wireless stations. That was the state of affairs at the beginning of the second world war, in September 1939. Immediately war was declared all transmitting sets, except in lifeboats on the coast of Eire, had to be put out of action and sealed. Lifeboats might listen but they must not speak. Nor would the Government allow any more boats to be fitted with wireless equipment.

This continued for four months. Then lifeboats were again allowed to send out messages, but they were warned that they must say nothing which could give information to listening German submarines. The Institution was also allowed to equip more boats, and during the war twelve were so equipped. The Admiralty also fitted seven of the Institution's boats, which had no wireless installations, with receivers as used on motor cars, so that the coxswains might be kept in touch with the Naval officers-in-charge on shore. The position at the end of the war was that out of the Institution's 151 motor lifeboats, seventy had radiotelephony; fifty-seven of the seventy had sending and receiving sets; thirteen had receiving sets only. In 1949 there were eighty-four lifeboats fitted with radiotelephony transmitting and receiving sets, and thirty-four of these had been supplied by the Marconi Marine Company.

Sound-reproducing Equipment

The year 1925 also saw the introduction of an apparatus first known as the Marconi band repeater. Although not strictly wireless apparatus, this band repeater made use of many appliances which had been developed for wireless purposes, more particularly for broadcasting. The band repeater comprised a microphone, amplifier, and a number of loud speakers which could be installed in various parts of a ship. The microphone was fitted near the orchestra and the music played could thus be repeated in any other part of the ship. Gramophone music could also be reproduced by means of a special gramophone attachment. The possibilities of entertainment aboard ship were thus greatly increased.

The latest development of apparatus of this nature to-day is the Marconi 'Oceanic' Sound Reproducing Equipment. This is a flexible system capable of providing installations from that of the receiver and five loud speakers for the average small cargo ship, to the complicated equipment of a large passenger liner. The Orient liner *Orion*, when she sailed on her first post-war voyage, in 1947, after reconversion, had seventy-eight loudspeakers fitted as part of her 'Oceanic' equipment.

The basic units are the receiver, amplifier, pre-amplifier, single turntable, double turntable, microphone, and, in the case of large fittings, rack mounted distribution panels.

One of the most elaborate sound-reproducing installations to be fitted in a modern liner is that in the Canadian Pacific liner *Empress of Canada*. Two separate systems are fitted. One is an entertainment system which will relay speech or music over an extensive loudspeaker system, and the second, an 'Order' system, was designed to assist in the efficient running of the ship by supplying immediate two-way communication between the bridge and certain key-points throughout the ship.

The entertainment system diffuses entertainment to specified parts of the ship over a network of thirty-two loudspeakers arranged in three main groups. This grouping makes it possible for three different types of programmes—broadcast reception, reproduction of gramophone records, and the relaying of speech and music through a microphone—to be passed simultaneously to any of the three main groups of loudspeakers fitted in different parts of the ship. This means that one group, for instance, may be playing broadcast programmes while a second group is relaying gramophone recordings, and a third a talk by one of the ship's officers or a programme by the ship's dance orchestra.

In case of emergency, the entertainment programme can be faded and announcements can be made from any one of three master microphones situated in the Chart Room, Purser's Room, and Gramophone Room, to selected or to all loudspeaker groups.

The 'Order' system enables the bridge to be in immediate communication with any one of ten points throughout the ship. For this purpose, loudspeakers and microphones have been installed at various points to give two-way communication between the bridge and these positions on the port and starboard side of the promenade deck.

CHAPTER TWENTY-THREE

Godfrey Isaacs and Marconi

ONE man to whom the Marconi Company owes much for the progress made during the second and third decades of its history is the late Godfrey Isaacs who, for fourteen years—from 1910 to 1924—was its managing director. He was a member of a distinguished family which included Lord Reading, one-time Viceroy of India. Those few years before the first world war, during the period of the war and the years of reconstruction which followed, were indeed critical years, and throughout his association with the Company, he worked assiduously and enthusiastically for its advancement. His period of service was one of great development in wireless on both the scientific and business sides; and it might perhaps not be too much to say that the Company owes almost as great a debt to him in his particular sphere as it does to Marconi for the position which wireless now occupies in marine affairs as well as in the general business life of the community.

He joined the Company at Marconi's personal invitation at a time when the cash resources were low and when it was exceedingly difficult to find money in this country for wireless telegraphy. Within a very few weeks of his joining—and while Marconi had gone to Canada on the Company's business—he had to draw a cheque on his own banking account to pay the salaries which were due on the Saturday morning for the preceding month.

Marconi was a good administrator and might, perhaps, have himself made a business success of his invention had he been able to concentrate his entire energies in that direction. But there would always have been the conflict between the man of business and the inventor at a time when Marconi's inventive mind was engaged in evolving and experimenting with his many ideas for improving and perfecting his apparatus. The development of this new means of communication would have been greatly retarded just at the moment when it should have been making its greatest progress.

Marconi himself once said that when Isaacs joined the Board it enabled him to give his best attention to the work for which he felt most adapted and in which capacity he could be of most value to the Marconi Companies. On another occasion he said, 'I should like to place on record my great appreciation of the whole-hearted manner in which he (Isaacs) has placed his whole energies and time at the disposal of the

Company, hardly ever allowing himself a single day away from work, and also of the wonderful results which he has achieved, and which have been so much due to his wonderful skill and untiring efforts'.

The association of Godfrey Isaacs with Marconi in the development of the fascinating science of wireless telegraphy for commercial purposes was a striking instance of the beneficial combination of financial and inventive genius and one which rarely occurs. As a result of this co-operation British wireless made the unparalleled strides which it did.

The team of Marconi, the scientist and genius, and Isaacs, the master of finance and man of affairs, was an ideal one. A complete confidence existed between them. With a united board of directors and the active support of its shareholders, together with a loyal and competent staff, the Company was bound to progress in its useful, beneficent work in saving life and property and in cheapening communication all over the world.

Godfrey Isaacs had begun life when very young in his father's business, where he started at the bottom of the ladder. He made the best use of his opportunities and at eighteen years of age he was manager of the great concern which he had entered as a lad. Young as he was, he not only mastered all the difficult questions connected with the foreign trade with which his father was chiefly concerned, but as manager he was able, as a result of his early training and travel, to carry on the important correspondence of the firm in the various languages of the leading customers.

At an early age, in the course of his extensive travel in all parts of Europe, he had exhibited marked ability in dealing with leading business men. His cosmopolitan education, his exceptional knowledge of the languages which he spoke, his great courage and resource in dealing with the delicate and difficult situations which continually arise in the conduct of all large businesses had well equipped him for his task. He possessed a charming manner, a most honourable character and a great sense of fairness alike to those with whom he had business dealings and those under his business control, and his honesty in all his dealings with others constituted him a model managing director. He was just the man to carry on the business of the Marconi Company in its natural development.

Death of Godfrey Isaacs

He died in 1924 at the early age of fifty-eight after a short illness. He resigned his managing directorship in November 1924 on the advice of his doctor. He then remarked that he had been working for forty-three years without a holiday. When his health broke down he told an interviewer: 'If I had allowed myself a proper amount of rest and recreation and had taken my golf regularly, I believe I could have gone on for a long time. It is a mistake to pursue work to the exclusion of everything else.'

Those who had the opportunity of serving with Godfrey Isaacs in those constructive years will always remember him as a man of remarkable talents and boundless enthusiasm for the science to which he gave the best years of his life. He had the gift of inspiring others to give of their best in the cause of wireless and in the interests of the Company, even to the point of personal sacrifice. He is remembered with affection by many of those who are still serving in the Marconi organisation. He was appreciative and proud of the services which Marconi Radio Officers were able to render during the first world war; and on one occasion in 1916, he invited twenty-two Marconi Radio Officers to dine with him at the Trocadero Restaurant. The twenty-two were all men who had operated their wireless installations under conditions of great peril, and in many respects the gathering was a unique one. Many of those who had performed their duty in perilous circumstances were still in service at sea carrying on in the tradition of the Merchant Navy; but all those who happened to be ashore at the time were able to attend, and made a brave array. The names of the guests, and those of the ships in which they had served, are worth recalling. They were:

Harold Bride (S.S. *Titanic*); Walter Condon (S.S. *Minnehaha*); Owen Chick (S.S. *San Melito*, which was bombarded by a German submarine and managed to escape); Percival Dennison (S.S. *Den of Crombie*, torpedoed by the Germans); Edward Dyer (H.M. Transport *Royal Edward*, which was torpedoed in the Mediterranean); F. L. Fenn (S.S. *Harmetris*); H. Jones (of the ill-fated *Hesperian*); R. Jones (of the same vessel, and later of the S.S. *Appam*); John Keir (H.M. Transport *Royal Edward*); R. A. C. Lee (the torpedoed *Vandyck*); R. Leith (*Lusitania*); D. McCormick (*Lusitania*); J. Maurice (S.S. *Dakir*, which caught fire and was abandoned); R. F. McLennan (S.S. *Flamenco*, sank by the German raider *Mowe*); P. Morris (*Ibernian*, torpedoed); H. H. Mills (*Anglo Columbian*, torpedoed); R. C. Older (*Goldmouth*, torpedoed); J. H. Oliver (*Norseman*, torpedoed); J. Rea (*Anglo Californian*, shelled by a German submarine); E. T. Shrimpton (the wrecked S.S. *Cobequid*, the S.S. *Kaipara*, and the torpedoed S.S. *Drumcree*); H. W. Taylor (*Marquette*, torpedoed); N. Varley (*Simla*, torpedoed).

Several of these men had been injured. Some had since been appointed to shore positions and others were still serving at sea.

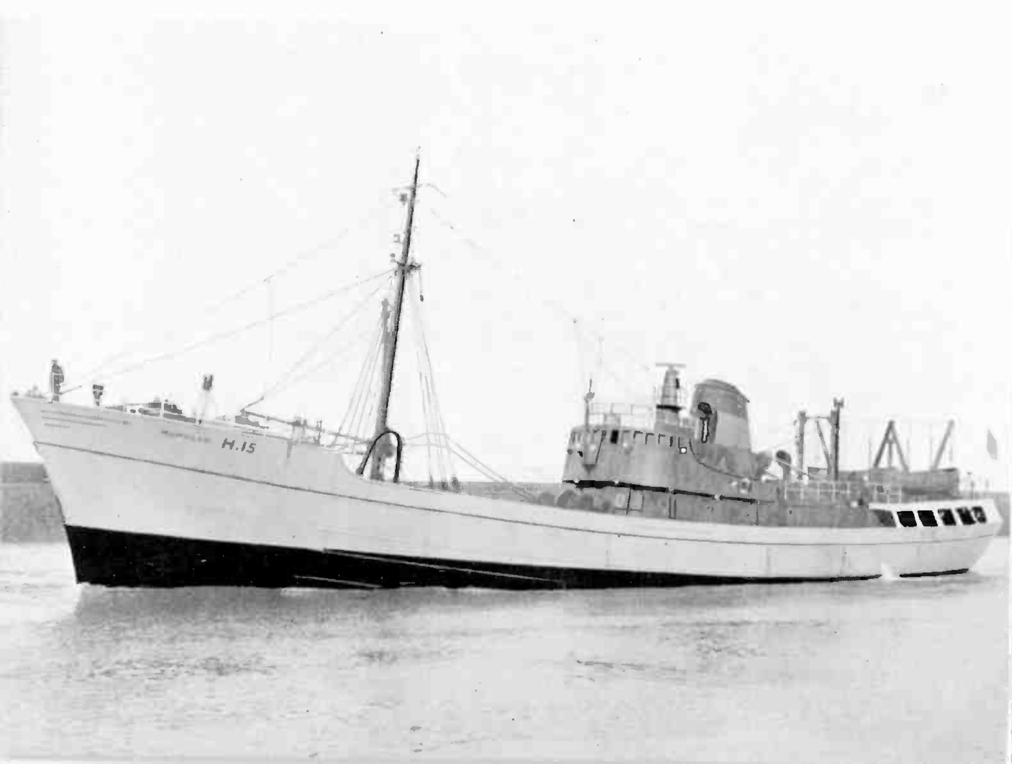
The late Godfrey Isaacs, for many years managing director of The Marconi International Marine Communication Company, with Marconi

Thirty years after the first message had been sent across the Atlantic. Marconi, with Mr. Kemp and Mr. Paget, photographed at Marconi House. Marconi is examining an ordinary coherer and a self-restoring mercury contact-coherer, both of which were used at Signal Hill

left: *The aerial scanner of the Marconi 'Radiolocator' installation on board the steam trawler 'Benella'. To provide a clear field of 'view', the scanner is mounted on a special tower*

Photos by courtesy of J. Marr and Sons

below: *The steam trawler 'Benella' owned by Messrs. J. Marr and Sons Ltd., Hull, the first unit of the British fishing fleet to be fitted with the Marconi 'Radiolocator'.*



CHAPTER TWENTY-FOUR

The Radio Officers' Union

THE year 1926 was one of considerable difficulty and, like those of other companies and industries, the Marconi International Marine Communication Company's operations suffered from the prolonged dispute in the coal trade and from the general strike. The shipping industry was still feeling the effects of the general trade depression. An even more directly injurious effect was felt from the strike of Radio Officers which began at the end of 1925 and lasted until February 1926. This strike was due to a decision of the Shipping Federation to ask for reductions in operators' wages proportionate to those which had been agreed to by other classes of men employed in the British Mercantile Marine. After a struggle lasting three months the strike terminated shortly before midnight on February 18, 1926. The men accepted provisionally the wage reduction of 22*s*. 6*d*. a month demanded by the employers on the understanding that further negotiations would take place regarding all matters in dispute and that if no agreement were reached their case would be submitted for arbitration.

The award of the Industrial Court brought the wages of Radio Officers into line with those of navigating officers. It is to the credit of the Radio Officers that, although they considered the findings of the Industrial Court somewhat unfair, it was felt that, in the best interests of the service, peaceful and friendly relations should be re-established between them and the employers and that complete harmony should prevail at home and abroad.

It was as long ago as 1918 that the Marconi Company first granted official recognition to the Radio Officers' Union, or the Association of Wireless Telegraphists as it was then, Mr. Godfrey Isaacs having agreed that an association for the collective expression of ideas from the Radio Officers' side was necessary and should be a means of providing amicable working between the Company and the Radio Officers in their employ. Since 1926 better relations between employers and employed have been established on a basis of mutual trust, goodwill and respect; as a result of which the atmosphere of their meetings has become one of the utmost frankness on both sides and both parties have obtained a better insight into the difficulties of the other.

The present general secretary of the Radio Officers' Union is Mr. H. O'Neill, who himself served for many years with the Marconi Company as a Radio Officer at sea. He succeeded Mr. H. J. Perkins, who retired in July 1949. Mr. Perkins was appointed to his position as general secretary of the Union in 1937, and a short time afterwards a new agreement was arrived at between the wireless companies and the Radio Officers as a result of which increases of salaries were granted to certain grades of Radio Officers. The most interesting point in that agreement was that the words 'wireless operator' were supplanted by the words 'Radio Officer', a title which the Union had long claimed on behalf of its members. There is little doubt that this alteration was more in keeping with the increased prestige and importance of those responsible for the operation of wireless and other radio aids in navigation. Some six months later the title of the organisation was changed to 'Radio Officers' Union'. Later the Union became affiliated to the Trades' Union Congress and became registered as a Trade Union under the Friendly Societies Act.

As Mr. Van de Velde, the present Deputy to the Managing Director of the Marconi Marine Company, said some thirteen years ago when the Radio Officers' Union celebrated its silver jubilee, 'the ultimate strength of the Union lies in the personal qualities of the men who comprise its rank and file. In that direction the Union is especially fortunate in deriving its membership, as it does, from a body of men of tested intelligence, integrity, and good character'. Mr. Van de Velde added that the Radio Officer, in the comparatively short time of his existence as a seafarer, had won for himself a unique place in the annals of the world's mercantile marine. He had absorbed the best traditions of the deep-sea sailor and had added a distinctive tradition of his own, of which the outstanding characteristics were devotion to duty and unfailing service—service to the shipowner, to the travelling public, and to the Company which he represented on his ship.

Mr. Van de Velde considered that one of the greatest benefits conferred by the Union upon its members had been its fostering of the corporate spirit among them. By stimulating co-operation it had strengthened the bonds of comradeship and the realisation of the common interests of Radio Officers as a body. Tribute must, therefore, be paid to those who had assumed the onerous task of guiding the destinies of the Union. No one realised more than the management of the Marconi Marine Company how difficult that task had been at times, but their work had been justified by its results. In its execution the representatives of the Union had frequently shown a statesmanship and discretion that had been recognised and admired when difficult issues had come up for discussion and settlement. On the other hand, the management of the Marconi Marine Company had always endeavoured to act equitably towards its employees and its efforts had been fairly recognised.

The Radio Officers' Union has, since 1941, been represented on the National Maritime Board and takes its place with the other seafarers' organisations in discussing and arriving at agreements on questions which affect wages and conditions of employment of all seafarers.

Provision Against Possible Foreign Control

Although The Marconi International Marine Communication Company, as the pioneer in wireless communication at sea, has fitted the majority of British ships with wireless transmitting and receiving sets it has never been without competitors both at home and abroad.

Throughout its existence it has always been a British Company. It was in 1926 that the parent company made alterations in its Articles of Association which were rendered necessary by the fact that the British Government in giving that company a licence for the conduct of wireless telegraph services made it a condition that the Company should remain predominantly British. Although there was no pressure from the Government upon the Marconi Marine Company to take similar action, the directors felt that it was desirable that the Company, which was responsible for the wireless equipment of over 90 per cent. of British shipping coming under the compulsory wireless law, should be British in both character and control.

The principal changes in the Articles of Association which were unanimously approved by the shareholders in December 1928 were the introduction of provisions to secure that not more than 25 per cent. of the total number of issued shares of the Company at any time outstanding should be under foreign control, and that the directors should be natural-born British subjects. This latter provision, however, was not to disqualify any of the directors at that time holding office—a provision made in deference to the distinguished founder of the Company.

In proposing the adoption of the special resolution required for the alterations in the Articles of Association, Marconi emphasised that these provisions provided for a continuance of British control of the Company. He did this because he thought it would be unfortunate if the impression got abroad that it was not then and had not always been under British control.

The presence of a much larger percentage of foreign capital in the shareholding of many businesses may, perhaps, not be open to criticism, but it was felt that companies which were concerned with vital national interests, such as communications, were in a different position. That this principle of maintaining the national character of communications companies was also held by the United States is shown by the history of the American Marconi Company. That company was established in the United States in 1899, but in the year 1919 the Company was informed that the development of its business must always be hampered unless it became purely American in character, since it would be unable to secure the support of the American Government. As a result of this it became necessary for the American Marconi Company to dispose of its American interests to an American Company, and the Radio Corporation of America then took over the whole of the American Marconi Company's interests in the United States.

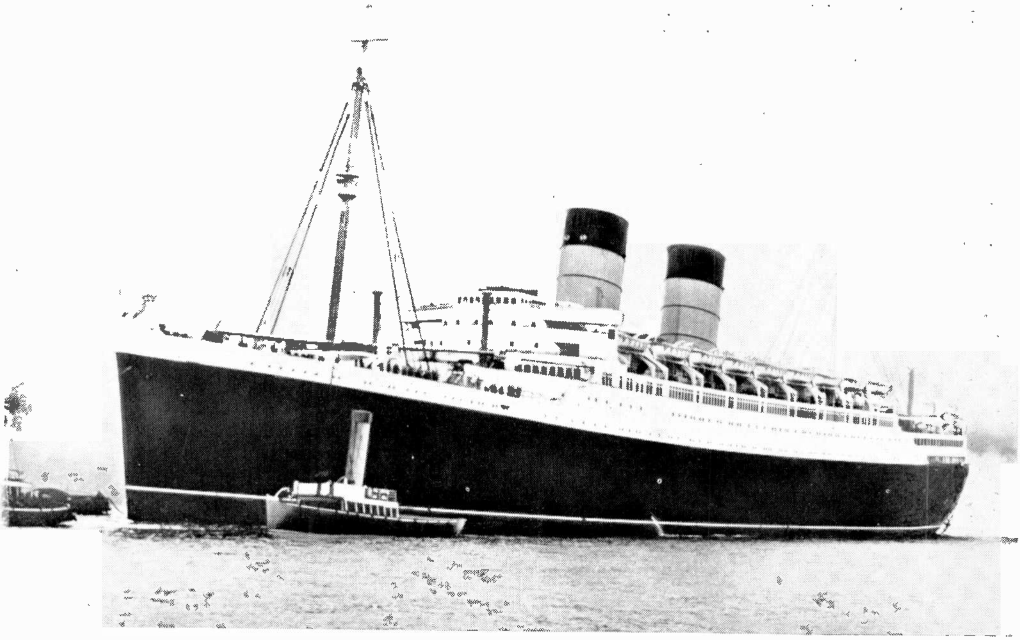
The change in the Marconi Marine Company's Articles of Association was welcomed by the British shipping industry, who approved the decision that the company which equipped its ships with wireless should be effectively protected against any danger of its policy coming under foreign influences.

As previously stated, the Company had anticipated that it would be necessary to expend large sums of money in modernising ships' wireless installations, and in 1927 the sum of £25,000 was appropriated as a special reserve for this purpose.

Objections to 'Spark' Transmitters

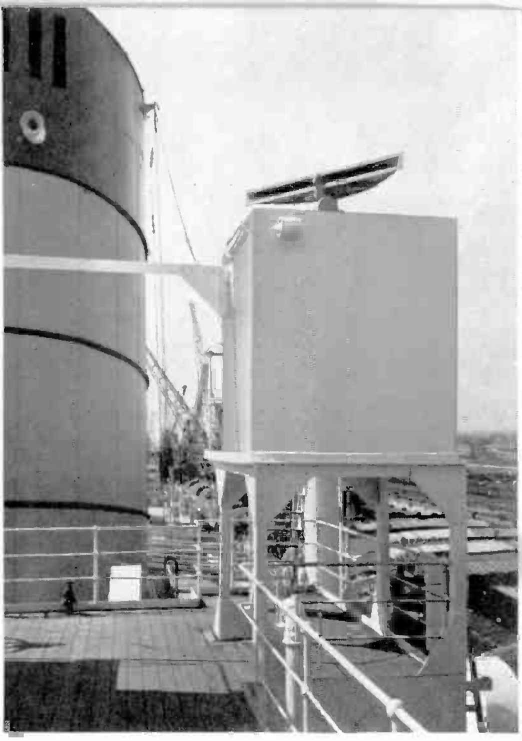
In the autumn of 1926, the Postmaster-General was asked in the House of Commons if he were aware of the annoyance experienced by broadcast listeners in coastal districts owing to the use of spark transmitters by ships, and whether any action would be taken with a view to abating this form of annoyance. The Postmaster-General said he was aware that wireless communication between ships and shore did at times interfere with broadcast reception, especially when unselective receiving apparatus was used. The abolition of spark transmission from ships would require international agreement, and he hoped that it might be possible to achieve this when financial conditions at home and abroad in the shipping industry improved. Meanwhile, however, improvement could be effected by making receiving apparatus more selective.

In the following year an International Radiotelegraph Conference was held at Washington, at which the Marconi Marine Company was represented by Mr. F. S. Hayburn, the General Manager at that time and afterwards for some years Managing Director, and Commander Slee, the Technical Manager. A very determined effort was made at that conference to secure the immediate abolition of all spark sets on ships. Had that attempt succeeded it would have cast a heavy financial burden on British shipowners and on the Company. However, thanks to the skill with which the British case was presented by the representatives of the Chamber of Shipping, Mr. Cleminson and Mr. W. A.



WIRELESS IN THE NEW 'MAURETANIA'

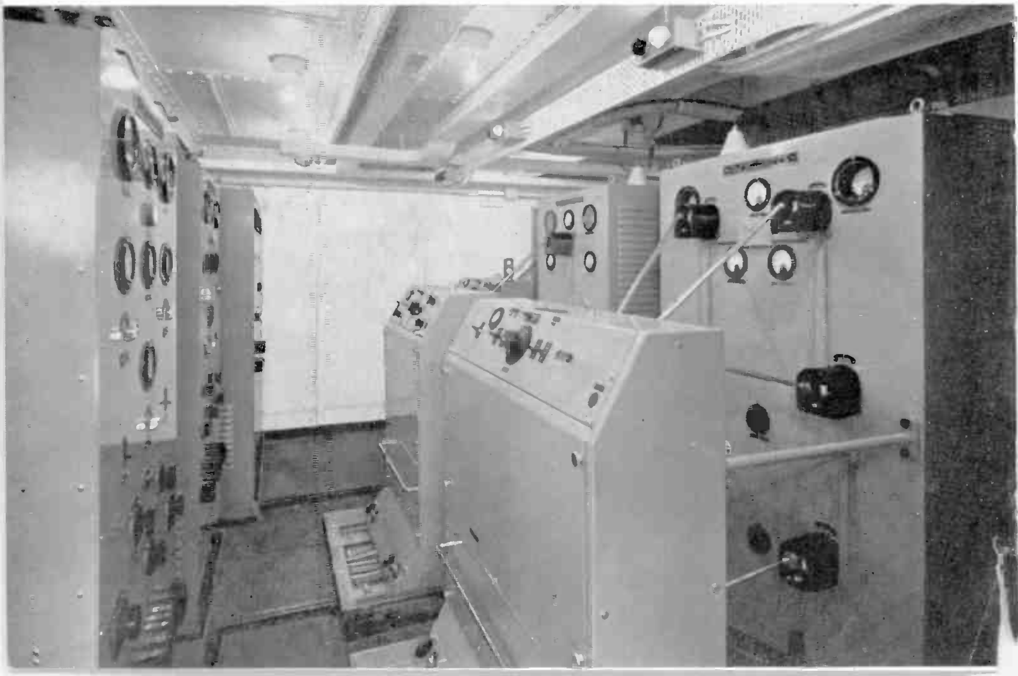
The Cunard White Star liner 'Mauretania' is equipped with one of the most comprehensive wireless installations ever installed in a modern ship. This was supplied by the Marconi Marine Company. Nine aerials and three separate transmitters are employed, one for each of the short, medium, and long wave channels. The medium and long wave transmitters are used for telegraphy only, but the short wave transmitter is suitable for both telegraphy and telephony. There are four separate telegraph receivers, one for short waves, one for medium waves, one for long waves, and one for Press reception. By means of the short wave transmitting apparatus the 'Mauretania's' passengers are able to make telephone calls from the ship to telephone subscribers ashore. Entertainment is provided by elaborate sound-reproducing equipment. The Marconi 'Radiolocator' will assist in the navigation of the ship under conditions of poor visibility. A special feature of the installation is the auto-alarm equipment which maintains a permanent automatic 600-metres watch. The bridge is also equipped with the Marconi Echometer sounding device to indicate the depth of water under the keel. In order to facilitate docking arrangements the 'Mauretania' has also been equipped with low-power bridge radio-telephone installation to enable the officers of the ship to speak to the shore and to tugs when docking is in progress



left: *One of the Radio Officers of R.M.S. 'Mauretania' operating the 'Radiolocator'*

right: *The 'Radiolocator' Scanner Unit mounted on deckhouse of R.M.S. 'Mauretania'*

below: *View of the transmitter room of the Cunard White Star liner 'Mauretania', showing the telegraph and telephone transmitters*



Souter, and by the representatives of the Marconi Marine Company, that attempt was defeated and a satisfactory compromise was arrived at by which the period for the elimination of spark sets was extended to the end of 1939. This applied to sets of a power of 300 watts and over. Spark sets under 300 watts were not affected.

In 1928, in response to representations made by the Chamber, the Marconi Marine Company agreed that when a British Government Regulation or Order came into effect compelling the shipowner to provide on the ship a station of the interrupted continuous wave type in lieu of the spark station, they would provide the substitution free of cost to the shipowner, and a clause to this effect was inserted in the approved form of agreement for hire and maintenance of the various types of installation provided.

CHAPTER TWENTY-FIVE

Competition in Wireless Industry

IN THE early days of The Marconi International Marine Communication Company, Ltd., every contract for the fitting of a ship had to be fought for against competition from the United Wireless, Telefunken, Anglo-German, Von Lepel, Poulsen, Helsby, Fessenden, Lodge-Muirhead, and a host of smaller fry, all of whom have long since disappeared. All through the fifty years of its existence the Marconi Marine Company has had to face competition from various quarters; but the service it has been able to provide, not only in the installation of radio instruments of various kinds, but in maintaining the equipment in full efficiency through its expert technicians and depots in all the important ports of the world, has fully merited the confidence of the shipping industry which it has thereby earned and which accounts for its pre-eminent position to-day.

It has always been the policy of the Company to give shipowners every possible improvement which science and research could produce in their wireless equipment with as substantial a reduction in charges as the circumstances justified. These results have been secured by what might be termed the essential principles of rationalisation in industry such as the elimination of wasteful competition, the concentration of production into the smallest number of profitable units, the scrapping of out-of-date machinery and equipment, and the removal of every form of waste or duplication in the management of the business.

On April 25, 1925, the Company had completed twenty-five years of most useful work, giving employment to thousands in a new career and contributing very considerably to the safety of life and property at sea. The Company depended for its existence on the goodwill of the shipowners of this country. Although independent in its constitution, it was very truly a department in the offices of every shipowner with which it did business; it acted as the shipowner's delegate for the conduct of the wireless service on board his ships, and perforce shared the fortunes of those for whom it worked. During the good years it prospered with the shipping industry; during the lean years it could not escape some share of the burden caused by the general trade depression with its consequent lack of freight and unremunerative rates.

During those years of acute depression a number of shipowners had to go into liquidation, voluntary or otherwise, and a proportion of the shipowners who succeeded in carrying on did not find it easy to meet their obligations with the same promptitude as in the past. Although the Company was compelled to grant long terms of credit to its clients, they had, in adopting this attitude, been prompted by what might be described as enlightened self interest. In the majority of the cases where the Company had accorded credit for long periods those obligations were faithfully met by the shipowners.

Throughout the period of the first world war, as that of the second, there was little or no opportunity to give attention to the more normal matters of business, and one of the results of this was that almost coincidental with the slump in shipping the Company found itself faced with the problem of modernising all wireless apparatus on hire on board ship. Depreciation in the ordinary sense had always been taken into account, but the rapid progress of wireless telegraphy demanded something more effective than mere depreciation if the Company were to continue to give the shipping industry that wireless service which could be acknowledged on all hands to be unrivalled at home and abroad.

Between 1920 and 1925 the Company expended over £100,000 in keeping up-to-date stations on hire to shipowners. With the more extensive use of wireless at sea for the transmission and reception of messages the need had arisen for the rapid handling of this traffic, and for this purpose valve receivers were being adopted in every vessel. The capital outlay in this connection was considerable, and, naturally, by the extended employment of such perishable articles as valves and batteries used in conjunction with them, the costs of maintenance were expected to increase. It was anticipated that for some years to come it might be necessary to expend some £20,000 annually in modernisation. This was one of the penalties of exploiting a new and progressive science.

Soon after the first world war had ended in 1918, the Company was faced with competition from a new wireless company; and this competition had met with a certain amount of success. Shipowners had been satisfied with the service which the Company had furnished; but there is little doubt that some of them were not loth to give support to a competing company, believing that competition was a healthy thing. In a general way that may be so, but there is something to be said for co-ordination of control. To carry out such a business as that upon which the Marconi Marine Company was and is engaged necessitates depots and responsible officials in every important port throughout the world. At each depot there must be maintained a considerable store of spare parts in order to provide replacements of any part which may be damaged or missing. Such an organisation would work out at a very high cost per ship unless spread over a large number of vessels. Finally, there is the all-important question of research and invention, both very costly, but without them there would be no progress.

The Company was conducting a very big business involving an immense amount of work, a very extensive and world-wide organisation, and carrying very considerable stocks; but if the management could be accused of laying itself open to criticism for working on a small margin of profit which was hardly commensurate with the work carried out, there is no doubt that a policy of maintaining terms as low as possible was sound. The Company could be proud of having maintained its pre-war rates to the shipping industry.

Radio Communication Company

It was not until some time later, in 1926, that the Company acquired the majority shareholding in the Radio Communication Company, Limited, which, for some years, had been its principal competitor. The action of the directors was justified from a financial point of view; but, what was more important, co-operation between the two companies made it possible to carry out economies in administration.

While the Radio Communication Company had never paid a dividend to its shareholders, its activities were reducing the Marconi Marine Company to a position where they might have had to join the ranks of non-dividend paying concerns, ending in an exhausting battle where the survivor would have suffered considerably, in the same way as countries which win wars receive little material benefit.

The amalgamation of the two companies—or, rather the absorption of one by the other—did not result in increased charges to the shipping industry. On the contrary the Company was able in some respects to reduce prices. They were able to give shipowners an improved service; to substitute more modern equipment without charge to the shipowners; and to reduce the duration of the shipowner's contract to a firm period of five years, which was equivalent to an appreciable reduction in prices, since previously the Company's charges were based on a contract period of longer duration. They were also able to give a reduction of 30 per cent. in rentals on direction finders. In fact, the Company could boast that there had been no increase in the cost to shipowners of the Company's equipment since pre-war (1914-1918) days. On the contrary, they had been able, in many cases, to make reductions on the standard terms which prevailed before the war.

This was a very remarkable achievement, for costs in other directions had increased—material, labour, rates, taxes, freight and fares, and all other items entering into the cost of production. Previously there had been two separate organisations, two separate research departments, two separate service organisations in many ports throughout the world. As a result of this arrangement all this duplication was cut out.

Among other causes which had enabled the Company to reduce its charges was the extent to which it had been able to standardise types. It is readily understandable that if it is possible to manufacture 500 or 600 sets of one type, it can be done more cheaply than if the same number of sets of half a dozen different types have to be produced.

Another contributory cause was the steady but discreet application of economy throughout every branch of the joint administration, so that the overheads the business had to carry were reduced to the lowest possible figure consistent with maintaining the efficiency of the organisation.

Combinations in Industry

A frequent criticism of combinations in industry is that they must necessarily be followed by an increase in prices to the consumer; but there is much to be said for the contrary view that it is only by wise combination in industry that prices can be brought down to the lowest economic level. Why maintain a number of industrial units when the work can be done more efficiently by one? If that principle is applied with a sole regard to the interests of the industry and of those who use its products, it can only make for the increased industrial strength of the country. As compared with a State monopoly, which the ordinary citizen has no alternative but to accept, an industrial combination dare not use its power oppressively since if it did so it would immediately create competition.

In the early years of the present century—long before large State monopolies existed—it was contended in certain political and economic schools of thought that competition was a curse for it encouraged great waste of effort and man-power inasmuch as two, three, or even more establishments or companies or associations would be engaged on the same work. On the other hand, it was argued by opponents of this theory that competition was the very life of industry for by fair and honest competition only the most efficient could survive and thus the consumer was assured of the very best and most efficient service.

This is not the place to enter into a discussion on the subject of whether large combines can or cannot give better service than a number of smaller concerns competing one with the other for the business which may be available; but it is perhaps of interest to take a glance back at what has happened not only in the shipping world but in the wireless world. In shipping, of course, there are such things as Conferences in the regular liner trades which fix rates for passengers and cargoes and (in theory, at all events) allocate the number of ships which may be needed to give the fullest and most efficient service. Shipping conferences are not in any way restraints to trade. Without them we should probably see two or three times as many ships on certain routes competing for the sea-carrying business available as were really required. Most of the ships would be sailing half empty, but operating costs, dock dues, pilotage and all the other charges would be the same as if they were full. Losses instead of profits would be made, and there would be no reserves to fall back upon to purchase new and more modern tonnage when it became necessary to replace old and obsolescent ships.

By arranging sailings and supplying a sufficient number of ships to meet the demands which may be made upon them, economies can be made and some of the savings passed on to the shipper. Shippers, in the main, are in favour of shipping conferences. They ensure stability in rates and regularity in service. If the conferences were to act as if they possessed monopolistic power and were to abuse that power it would be found, as has occasionally happened in the past, that new competition would be attracted and shippers would support it.

Depression in Shipping

In the years between the two great wars British shipping experienced two long periods of serious depression. When the year 1927 dawned it looked as if the first depression were coming to an end. There was certainly some improvement in the passenger-carrying trade, but general traders and tramps were finding it difficult to restore British shipping to its former proud position as the world's principal sea carrier. The Marconi Marine Company had, by reducing its charges for the rental and maintenance of its apparatus to a level below that ruling before the first war, endeavoured to assist the shipping industry in its hard struggle for existence. But the improvement noticeable in 1927 did not fulfil its promise.

The climax seemed to be reached in 1931, which was the worst year, up to that time, that British shipping had ever experienced. The average amount of British shipping laid up was no less than 21.67 per cent. In addition, the launchings of vessels of over 1600 tons—*i.e.*, those which were compelled by law to carry wireless installations—amounted to only one-fifth of the normal number. The year 1932 proved to be even worse from a shipping point of view; for during the twelve months the average lay-up of British ships had increased to 25 per cent., while at one time during the year a peak of 30 per cent. of the ships in which the Company was interested had been attained. Only twenty-one ships of 1600 tons and over were launched from British shipyards. Rebates in respect of operators and apparatus not in use were made to a greater extent than ever before. It was felt that it was the duty of the Company to aid the unsubsidised British shipowner to keep his ships afloat ready to take any advantage of any revival when it came, for the fortunes of the shipowner and of the Company were closely interwoven.

The year 1933 was little if any better than its immediate predecessors. In that year up to the end of June, only two vessels of 1600 tons and over were launched, while none at all was waterborne in the months of January, February, May, or June. In July, however, a barely appreciable improvement began, with the result that in the second half of 1933, twenty new ships of 1600 tons and over—one-fifth of the normal—were launched from British shipyards, more laid-up tonnage was recommissioned, and the lay-up of vessels on which the Company did business fell to an average of 22½ per cent. for 1933. In 1933 the sale of vessels to shipbreakers as well as to foreign shipowners continued and these dealings adversely affected the Company's business.

By the end of 1934 the figure of tonnage laid-up had been reduced to 12½ per cent., and fifty-four ships of 1600 tons gross and over were launched from British shipyards. In 1935, tonnage laid-up averaged 10·63 per cent., and sixty-two ships of 1600 tons gross and over were launched; in 1936 laid-up shipping averaged 7·22 per cent., and a large number of ships were either under construction or under contract. It was an indication, perhaps, that the Company's policy of providing the highest possible quality of service at reasonable prices to shipowners was the right one to pursue and one which was appreciated to the full by the shipping world, that, in spite of intensive competition, over 80 per cent. of the orders placed for wireless apparatus for new tonnage and over 88 per cent. of all the available marine wireless business was obtained by the Marconi Marine Company.

CHAPTER TWENTY-SIX

Introduction of the Echometer

For many years the research engineers of the Marconi Marine Company had been devoting much attention to the production of an electronic echo-sounding device, simple in operation and maintenance, which would be suitable for installation in merchant ships. In December 1930 the Marconi Sounding Device Company Ltd. was formed, with capital provided by the Marconi Marine Company, to market the newly-developed Marconi Echometer. This instrument gave to the mariner a continuous and reliable indication of the depth of water under a ship's keel. Previous to that time the depth of water underneath a ship in shallow water was generally ascertained by throwing a long length of cable, knotted in fathoms and weighted with lead, into the sea, and, as it sank gradually to the bottom, the 'lead swinger' would count the fathoms as the cable was swallowed up. In deep water the depth was ascertained by means of a deep-sea wire sounding device, both systems being very slow in operation. Both these methods for ascertaining the depth under the ship's keel were superseded when the Echometer became available.

The navigator likes to know the depth of water under his ship. The lack of such knowledge at a time when it was most needed was undoubtedly responsible for the loss, by stranding and kindred causes, of a considerable number of vessels, both large and small, before the supersonic sounding device was introduced; and even to-day quite a few such casualties could be avoided if the instrument were in more general use, as it provides immediate and continuous soundings at whatever speed a ship may be travelling.

Because of the depressed condition of the shipping industry and the necessity of designing and manufacturing an Echometer that would be thoroughly British and Marconi in character, it was not possible for the Marconi Sounding Device Company to get down to real business until April of 1931. It was in that month that the first supersonic Echometer was installed in a British merchant ship by the Marconi Sounding Device Company. The instrument gave, instantaneously and correctly, and irrespective of the speed of the vessel or sea conditions, all depths between two and 360 fathoms under the keel—no matter how quickly the ocean bed might vary. The apparatus was a separate unit, capable of being operated from a small battery and was secret and silent in operation. With this type of sounding device the nature of the sea bottom—

i.e., whether hard or soft—could also be ascertained. The navigator could obtain instantaneously something which navigators for the previous 2000 years were content to obtain in minutes, namely, the depth of water under his ship. He could obtain this in the comfort of the chart room, with his charts before him, and without the necessity of calling other members of the crew from their ordinary duties.

At the end of 1931, 110 British vessels had been fitted with the Echometer on full rental-maintenance or maintenance only; and by the end of 1932 the number of such vessels had increased to 328. Although the Sounding Device Company was formed during a period of unprecedented depression in the shipping industry in less than two years it had secured no fewer than 547 orders for its Echometer type of sounding device. Of these orders 350 were in respect of British trawlers.

It was inevitable that the development of this business should involve heavy development costs, and the Marconi Sounding Device Company reached the end of 1931 with an adverse balance of £15,734 in its profit and loss account. This, however, was provided for; and the financial progress made by the Company in 1932 was clearly shown by the fact that for that year the corresponding provision was only £1420. From that time onwards there was steady progress. At the end of 1933, no fewer than 514 British ships were fitted with the Echometer; at the end of 1934, there were 906 ships; at the end of 1935, 1188; at the end of 1936, 1378; at the end of 1937, 1541; at the end of 1938, 1717; and at the end of 1939, 1790. Then there was a slight decline in the numbers of British ships so fitted, mainly due to the diminished size of the British merchant fleet as a result of war losses; but in 1945 the figure was 1824; and by the end of 1949 over 2,500 British ships were fitted with the Echometer.

The value of the apparatus is perhaps indicated by the fact that at the International Conference on Safety of Life at Sea held in London in 1948, one of the recommendations was 'that Governments should encourage the development and use of reliable echo depth-sounding apparatus'.

Description of the Echometer

The Echometer is available with an optical indicator only, with a recorder which provides a permanent record of soundings on a roll of sensitised paper, or with combined optical indicator and recorder. It was announced by the Marconi Company in 1947 that they had designed a completely new series of Echometers, using a new type of magneto-striction projector. The recorder was named 'Seagraph' and the visual indicator 'Seavisa'; when combined they are called 'Visagraph'. Prototypes of both visual indicator and the recorder soon proved that the new type of Echometer gave very fine performances at sea. The 'Seagraph' equipment was designed to provide direct reading of the depth of water below the ship with the minimum manipulation of controls by the navigating staff, on all classes of vessels.

The equipment comprises three main items, namely, Recorder, Transceiver (consisting of transmitter, amplifier, and power unit in the one cabinet), and Projector. A novel method of recording was introduced in this instrument, whereby the stylus was attached to an endless belt and carried across the impregnated paper by pulleys situated at either end of the scale. This arrangement has the advantage that the recording stylus travels across the paper in a straight line, and not in the arc of a circle as is common with many other types of recorder. In this manner, depths can be read off a straight uniformly divided scale, and the contour of the sea bed is thus only compressed on the record, it is not distorted.

The 'Seavisa' is a direct reading depth indicator, designed to operate with the same Transceiver (consisting of transmitter, receiver, and power unit in the one cabinet), and Projectors as fitted with 'Seagraph' equipment. It may be installed either instead of, or in addition to, the 'Seagraph' recorder.

The depth indication is shown on a circular scale, which is evenly divided into fathom intervals, in the form of a brilliant flash of light, visible up to a distance of twenty feet.

'An Additional Sense'

It is not too much to say that the Marconi Sounding Device, or Echometer, literally endows the navigator with an additional sense. It displays before his eyes every variation in depth, nature, and contour of the sea bottom, so that when making a landfall in thick or misty weather, he is enabled to pick up the hundred-fathom line with ease and assurance. In pilotage waters it is likewise invaluable. In view of its simplicity, ease of operation, and the fact that soundings can be taken instantaneously, the fitting of this apparatus on board ship encourages navigators to take frequent soundings—a habit which undoubtedly proves of considerable value, not only to themselves but to others vitally interested in the safety of ships at sea.

It will have been noted that of the first 500 or so Echometers supplied to British vessels, substantially more than one-half were supplied to British trawlers; but for all classes of ships the Echometer provides a navigational instrument of the utmost value.

Big ship navigators are very interested in depths from a little over 100 fathoms downwards, for at about that level lies the continental shelf, that interesting submarine geological formation by sounding which navigators can tell they are nearing their European landfall. They are also particularly anxious to read from two to twenty fathoms of water under the keel so that they may avoid stranding. Trawlers, on the other hand, demand much greater depths, at least as great as 350 fathoms, because the majority of fish are bottom feeders—surface and mid-water feeders being rare. The staple food of the majority of fish consists of weeds of various kinds, or the small creatures that exist at, or very near, the bottom. The best depth for certain types of fish varies with the locality and the time of the year, the depth being fairly precise for a given locality. The fish are usually found on the slope of the sea bed, the trawl being dragged along a contour line. If the trawl is taken too far up the slope, or too far down, the quality and, usually, the quantity of the catch deteriorates. It is obvious, therefore, that any instrument that will keep a trawler skipper accurately informed as to the depth of water in which he is fishing is of immense value to him.

It is in fishing vessels, perhaps, that the Echometer has proved of the greatest utility not only in enabling trawler skippers to locate the banks and depressions where the best fish congregate, but also in locating fish where otherwise they might be overlooked. One systematic observer in the use of the Echometer, the owner and skipper of a steam drifter, kept careful records and wrote a detailed description of his experiences. Apart from the service of the device in informing him of the true depth of water from which he could make his own deductions in regard to his position, this skipper described how shoals of herrings could be definitely located.

'A shoal of herring moving at a depth of, say, fifteen fathoms', he said, 'will cause a peak to appear on the Echometer scale at fifteen fathoms; while the signals that get through the shoal continue to the bottom and return to give the ocean depth peak as usual'.

Writing of one particular trip, this observer said the extent of the indications on the Echometer corresponded roughly with the catch taken at the time, so that the amount of fish available could be calculated and a good idea obtained as to whether it was worth while to drop the nets—a matter of some moment when a futile trawl means loss of money. From his experiences this fisherman said it was quite reasonable to claim that the Echometer would record the presence of herring when swimming in shoals; give the exact depth at which the shoal was moving; and give some idea of the density and extent of the shoal.

It should, perhaps, be stated that the Marconi Company does not give any guarantee that the Echometer will do more than is claimed for it, namely, to indicate the depth of water between the keel of a ship and the sea bottom. Nevertheless, some two years ago, in co-operation with some of its clients and with the Ministry of Agriculture and Fisheries, the Company developed 'Seagraph' for the special purpose of providing pictures of shoals of fish beneath the hulls of fishing vessels. During the last herring fishing season of 1948, excellent results were obtained, so much so that the Lowestoft drifter *Dauntless Star*, using this equipment, won the much-coveted 'Prunier Trophy' for the largest single catch during a specified period. The pictures obtained during the prize-winning trip were most interesting, and showed the shoals which provided the heaviest catch to win the trophy since 1937. There is little doubt that this development greatly facilitates the netting of herring and other fish.

Wireless Telegraphy in Trawlers

Trawler owners and skippers have long been radio-minded. Even as far back as 1913 the application of wireless telegraphy in fishing trawlers was demonstrated when experiments were carried out in the North Sea on the trawler *Othello* and the carrier *Caesar*, owned by Messrs. Hellyers' Steam Fishing Company, of Hull. Two installations of ½ kW power, but of rather different designs, were installed in the trawler and two other installations, each of 3 kW, were placed in the carrier. An average of ninety miles was aimed at; but at a distance of 270 miles from Cullercoats the *Caesar* sent and received messages without difficulty. The *Othello*, which was equipped with a Marconi portable installation, was able to communicate with Cullercoats, 180 miles away; messages being freely exchanged at that distance, and also with the *Caesar*, a distance of 100 miles. As a result of these satisfactory trials, Messrs. Hellyer immediately placed an order with the Marconi Company for one installation of the type fitted on the carrier *Caesar*, and three installations of the class fitted on board the trawler *Othello*. The system by which the trawlers worked was, after a full catch, for each 'fleeter' to transfer her cargo to a swift 'carrier' which then travelled at high speed to port, where she discharged her cargo. One of the ships was also fitted with a direction finder.

It was not compulsory for a trawler to carry wireless, but the trawler owner and trawler skipper soon learned that wireless saved both lives and money. In 1928 there were 191 trawlers and drifters carrying the Company's apparatus. The possible market was about four times that figure. Reports received from trawler owners and trawler operators as to the use of wireless were sometimes of a sensational character as, for example, when trawlers in distress in bad weather were able to secure much-needed assistance. And there were many cases where wireless on trawlers had increased earnings considerably. One such case was that of four trawlers which were sheltering in bad weather off St. Kilda. When the weather improved and fishing became practicable again they separated on a wide search for fish. One of them found an exceptionally 'good living', as the trawler world terms it, and summoned the other three vessels to her position. In the normal course of fishing, the four trawlers might have averaged between £200 and £400 each for their catches, but, receiving the information of a 'good living' at a point some hundred miles distant—and they could only have received it by having wireless on board—they converged on it, and the total catch of the four trawlers concerned in this instance was £798 for one trawler, £1035 for the second, £879 for the third, and £563 for the fourth—an average of over £800 per trawler.

At the present time very many up-to-date trawlers are equipped with wireless telegraphy, radiotelephony, wireless direction finder, echo-sounding device, and some are being fitted with radar. These devices have proved a great boon to the trawlers and their personnel.

Advantages of the Radio Telephone

The advantages of the radio telephone are obvious. A trawler striking good fishing is able to call up the other vessels of the fleet to share in the catch. Trawler skippers use the radio telephone for keeping in touch with one another and for the exchange of information regarding the weather and the progress of the fishing as well as for the exchange of courtesies and opinions which, at times, make entertaining listening for those with short-wave sets; and some amateur wireless enthusiasts on shore have received much enjoyment as a result of being able on occasion to eavesdrop during such conversation. Radio telephone communication has done much to dispel loneliness in the fishing fleet especially during the long hours of darkness in Arctic waters.

It has been ruled by the Postmaster-General that it is illegal for the general public to listen to any signals from ships which they might be able to pick up on their receivers. The Broadcast Receiving Licence specifically states that it is granted for the purpose of receiving messages by telephony 'sent for general reception from authorised broadcasting stations and receiving by telephony or telegraphy messages sent from authorised amateur stations'. And the Postmaster-General has stated that members of the public holding such licences who improperly intercept communications which they were not entitled under the terms of their licences to receive are liable, on conviction, to the penalty prescribed by the Wireless Act of 1904.

There probably are, however, a few sets in the homes of trawler men which are fitted with 'trawler wave bands', and although the licensees or their families are not supposed to listen in to any but B.B.C. programmes, it is difficult to see how those who are tempted to listen in on the 'trawler wave band' can be prevented from so doing, or the skipper for sending a message over the air in such manner as is understood by the person for whom it is intended who, in turn, can pass it on to any relatives of the crew who may be concerned. By listening in to the trawlermen's conversations the relations on shore get some idea as to when their men may be expected home.

In the eyes of the law this is all very wrong, but it sometimes has its humorous side. It has been said, and the truth of the story can be vouched for, that a certain trawler skipper instructed his wife in the art of tuning the domestic wireless receiver to the wavelength of the Marconi telephone transmitter on his trawler, then, having got well out to sea, he proceeded to give her a piece of his mind, finishing up with the illuminating phrase, 'For years I have had to listen to your tarradidles, my lady, without having a chance to answer back. Now for once you've had to listen to me without being able to interrupt.'

The value of the radiotelephone in times of danger is self-evident; but only last year—in July 1949—Mr. Justice Willmer, in giving judgment in a claim for salvage award for services rendered to the fishing vessel *Perfective*, whose engines had broken down in the North Sea, said that the vessel carried a radiotelephone 'which enabled her, as long as her batteries were in good order, to converse with other vessels in the North Sea to a range of 200 miles, so that she was in touch with other vessels who were similarly equipped. This in itself limited the element of danger to her, and in future cases this advantage could not be lost sight of. The vessel which carried the equipment when she met with a casualty could get in touch with other vessels and communicate her need and her information to them.'

It may, perhaps, be rather surprising to learn that about one-third of the Marconi Marine Company's total rental/maintenance revenue is derived from the trawler industry. With the exception of the latest 'Worldspan' W/T transmitter used by the large passenger liners and the 'Vigilant' auto-alarm, all the Company's post-war designs were made to meet the hard conditions of trawler working; and this, of course, means that the requirements of the deep-sea vessels are easily met. The Marconi latest trawler telephone set, the 'Seamew', was specially designed for skipper control. This set has six crystal controlled transmitter frequencies in the intermediate band with a similar number of spot selection points on the receiver. The receiver control may be fixed to wander over the whole frequency range, but in compliance with regulations, the transmitter is tied to its spot frequencies. The instrument has a range of approximately 200 miles. The equipment is extremely compact, easily handled and maintained. A remote control unit is available providing for operation up to fifty yards away from the set.

For larger trawlers carrying operators, there is the 'Transarctic', a combined telegraph and telephone set covering medium, intermediate, and short wave bands. This set is also extensively used by coastal craft, yachts, and certain deep sea ships.

CHAPTER TWENTY-SEVEN

Death of Marconi

Marconi died on July 20, 1937, and the whole world mourned the passing of one of the great figures in history. From the very beginning his discoveries had attracted universal attention and stirred the imagination, and each and every improvement and new achievement left men wondering to what unconsidered and unbelievable extent they would develop further in the interest of humanity. Almost at one stroke the invention of wireless telegraphy halved the perils of the sea. As *The Times* said when he died: 'What other men had been content to prove impossible, he accomplished; and this is surely greatness'.

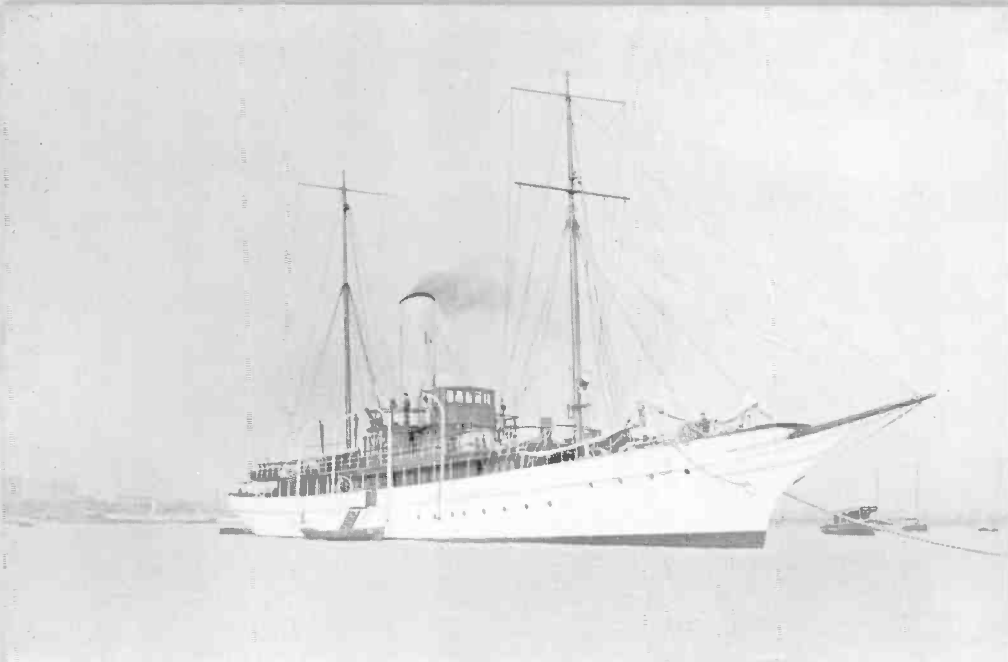
When his funeral took place on July 21, 1937, thousands of the citizens of Rome walked behind the mounted police who closed the official procession, and many more thousands lined in reverent silence the route which lay across the city to the Church of Santa Maria degli Angeli, where the funeral service was held.

All Post Office wireless telegraph and wireless telephone stations in the British Isles were silent for two minutes from 6 p.m., the hour of the funeral. At the central radio office of the G.P.O., the operators stopped work at 6 p.m. and stood silently to attention beside the transmitters.

At the international telephone exchange the girls operating the Empire radio telephone services also stood to attention by their switchboards; and at every Post Office wireless station throughout the United Kingdom the transmission and reception of radio messages ceased for two minutes. The silence was also observed by all broadcasting stations under the control of the B.B.C.

A memorial service was held at Chelmsford Cathedral on the evening of July 21, 1937. The Provost of Chelmsford officiated. Among those present were Mr. H. A. White, Managing Director of the Marconi Wireless Telegraph Company; Mr. Edward Wilshaw, Chairman of Cables and Wireless, Ltd.; Mr. H. R. C. Van de Velde, then Managing Director of the Marconi International Marine Communication Company, Ltd.; Mr. C. J. Strother, Works Manager at Chelmsford; Mr. C. C. Howe, Hon. Secretary of the Marconi Veterans; Sir Noel Ashbridge, Chief Engineer of the B.B.C.; Mr. H. I. Kirke, Head of the Research Department, B.B.C.; and employees at the Marconi Works, Chelmsford.

Marchese Marconi, G.C.V.O., LL.D., D.Sc.



Marconi's famous yacht 'Elettra'

Marconi in the wireless room of the 'Elettra'. Marconi is standing alongside a high-powered short-wave equipment capable of world-wide range

On the following day, July 22, a memorial service was held in London at St. Peter's (Roman Catholic) Church, Clerkenwell Road. The Prime Minister was represented and the Postmaster-General (Major G. C. Tryon, M.P.) was present, together with a very large number of prominent personalities in the diplomatic, scientific, technical, commercial, political, and social world.

To appreciate the benefits which Marconi brought to mankind one has only to consider the results of his life work. He banished silence and isolation on the great waters. The dangers and perils of the sea have been greatly reduced and safety in large measure has been brought to all those who go down to the sea in ships. As Sir Westcott Abell, one-time Chief Ship Surveyor to Lloyd's Register of Shipping, wrote in his book *The Safe Sea*:

'Safety at sea has been increased in the last generation by four times what it was when that generation was born—the risk of to-day is only one-half of what it was when the Armistice was signed in 1918 and is now at such a low figure that travel at sea is almost safer than staying at home—very nearly as safe.

'This last reduction of risk brought about in so short a time suggests that the ship is becoming nearly as safe as she is ever likely to be, and the question arises as to what it is that has caused so great an increase in safety in a service that was already almost as free from risk as seemed possible.

'The answer to this question must be that the great forward strides made in the science of wireless communication, and the great use to which the seafarer has put it, have made it possible not only to warn the captain of the ship of danger long before he reaches it, not only to enable him to report "All's Well" twice a day from the loneliest part of the ocean, but also to summon help if he should happen to need it.'

Wireless has become an integral part of the administration of the Merchant Marine Services. In addition to the wireless instruments passenger-carrying ships and ships over a certain tonnage are compelled to carry by law, there are available for ship services transmitters and receivers capable of keeping ships in communication by telegraph with shore stations wherever they may be on the high seas, wireless telephone apparatus by which travellers by sea can carry on conversations with their friends ashore, apparatus for direction finding which forms a very valuable aid to navigation, small sets for life-boats, auto-alarm apparatus by means of which attention can be called to a ship needing assistance even though there is no operator on watch in neighbouring ships, and automatic beacon transmitting stations which send out signals in foggy weather from which ships may obtain their bearings.

Practically all ships of importance are now fitted with wireless for commercial and navigational purposes and many small ships such as coasters, trawlers, whaling vessels, and private yachts are finding wireless of the greatest value for the purpose of communication and navigation even though they are not required by law to carry this apparatus. The introduction of simple wireless telephone apparatus which can be operated without the need of a skilled wireless operator is bringing the advantages of wireless to many ships which previously had been unable to avail themselves of its use owing to economic reasons, and wireless is becoming regarded as of almost as great importance to every ship as the chronometer and compass.

'My Happiest Thought'

'That my discovery has been the means of saving so many lives at sea is one of my happiest thoughts.' To his intimate friends Marconi constantly stressed this point. When asked about the more spectacular side of wireless, such as radio and television, he would shrug his shoulders slightly and reply: 'Can you compare entertainment value with the saving of men's lives?' His own inborn love of the sea probably accounted for the great interest he took in all seafarers.

When in the mood for recalling the past, which was on very rare occasions, he would tell stories of his boyhood days at Leghorn. He shared, with his elder brother, a small rowing boat in which auxiliary sails could be rigged. That was when he was little more than eight years old. 'Was your mother not nervous about you?' he was once asked. 'She would have been—very—had she seen all we did', he remarked with a chuckle. 'We were nearly drowned more than once.'

Furthermore, it is interesting to recall how much greater was his anxiety to send the earliest messages across the sea rather than to continue land experiments. In later years, aboard his yacht *Elettra*, he looked the popular idea of a seafaring man—brusque, blue-eyed, with an expression which seemed not only as if he were solving problems but looking into great distances.

'The utter helplessness of a ship's crew caught in the teeth of a raging gale, with no means whatever of calling for help always appeared to me as a terrible picture', he said.

Marconi's achievements brought him many honours. In Italy he was a Grand Officer of the Order of St. Maurice and St. Lazarus and a Chevalier of the Civil Order of Savoy, and he held the Grand Cross of the Order of the Crown of Italy. He was also a Senator of the Kingdom of Italy (1914) and he received the hereditary title of Marchese in 1929. In the same year he was appointed President of the National Research Council. In Russia the Tsar conferred the Order of

St. Anne upon him in 1902; in Spain he was a Grand Officer of the Order of Alfonso XII. On July 24, 1914, King George V conferred upon him the Honorary Knighthood of the Grand Cross of the Victorian Order. Not only was the distinction one of the highest tributes that His Majesty had it in his power to confer on a foreign subject, but the manner of the bestowal was such as to make the honour doubly acceptable. Marconi was summoned by telegram to Buckingham Palace where he was received by the King, who spent half an hour chatting to him and himself pinned the decoration of the Order on the great inventor. In the course of conversation the King showed an intimate knowledge of wireless telegraphy, especially as applied to naval purposes, and was deeply interested in all that Marconi had to tell him of his latest discoveries and of the application to naval purposes.

His academic distinctions included honorary degrees from Oxford, Cambridge, Aberdeen, Glasgow, and Liverpool, the Rectorship of St. Andrews, the Nobel Prize for Physics, the Albert Medal of the Royal Society of Arts, the John Fritz Medal (America) and the Kelvin Medal.

Of the man himself only those who were in close personal contact with him or enjoyed his friendship can testify; for he was of retiring disposition. He never sought the limelight, and was extremely modest regarding his great achievements. There are many examples of this; but the one I like best is that which is told of his visit to the Chicago World Fair in 1933. Marconi heard that there was an amateur station in the Fair. He paid it a surprise visit. The two operators on duty failed to recognise their distinguished visitor; but he at once introduced himself. After inspecting the equipment carefully, he remarked that it was a very fine piece of workmanship. The proud builder deprecated his efforts, saying: 'But it was built by only an amateur'. 'Ah!' said Marconi, 'I am only an amateur myself'.

Perhaps his most intimate friend and the one who knew him best was the Marchese Solari. In an appreciation of the great inventor, Solari wrote that he had a very keen imagination, dominated by an iron will and sustained by an excellent memory. He had exceptional sensitivity but also an exceptional resistance to physical pain by will power, as Solari was able to observe during the operation he underwent for the removal of his right eye after the car collision which took place on the Bracco ascent near Spezia in 1913.

'Marconi was a man of great affections. He especially loved his country. He voluntarily placed himself in her service during the two wars in which Italy was involved during his lifetime; the war with Turkey and the first world war. He also greatly liked Great Britain. His mother was Irish of the Jameson Davis family of Dublin. He spoke calmly and in rather a low tone of voice, which was not very strong. His accent revealed slightly his habit of speaking English, which he knew as well as his own language. He spoke French but little and with an English accent. He was neither a speaker nor a writer. When he spoke and when he wrote he used brief and condensed phrases.

'When approached by persons with whom he was not well acquainted, he took no trouble to converse. This coldness of his always caused disappointment among those who approached him for the first time. He had generally a very serious and pensive expression; his habit of meditation and of leading an often solitary life gave to his face the strong imprint of a reflective man, and of sadness. This imprint produced a great impression when he was still young, since it was in contrast with his age. In intimate circles and with trusted friends, he displayed a simple and youthful joy, which was very surprising to people who had only met him at official meetings. Even with his intimates he detested too many words and long speeches; he loved to touch upon serious subjects such as politics and history, but without long dissertations.

'Marconi, when he found himself in complex and difficult situations, owing to the successive difficulties he encountered in the development of the great organisations he directed, slept with the greatest tranquillity, and he even slept more calmly the more special were the positions in which he so often found himself and which would have destroyed the sleep of many other persons. He was a man of few words, orderly, precise, methodical. He followed each day the progress of science. He read each morning many electrotechnical reviews. When his attention was called to a subject which inspired him with a new idea, he assumed an absent-minded appearance, but his mind was firmly fixed on what struck his acute sense of observation. He belonged to that class of men who have been described as a "natural force" (una forza della natura). When he decided to embark on a new line in the technical field, or in a channel wholly unexplored he pursued it with firmness until he attained the final result of which he felt certain.

'He had periods during which one would have said that he was always tired, a tiredness which was not physical, but spiritual. Then it appeared that this gifted manipulator of hidden energies refused any development of his own energy; but when some new fact stimulated him to work his production was at once original and grandiose. In the period when he was developing in his brain some new invention, he was extremely silent and of a persistent concentration. He had vast culture not only in the technical field, but also in the historic, political, and economic domain; a culture acquired not only by study but also by his long and frequent journeys in the various countries of Europe and America, with which countries he was perfectly acquainted. In hours of sadness and solitude he often read the Gospel and the Bible, and in that reading he always found some maxims which led him to make comparisons and parallels of striking originality.'

The Marconi Inquiry

Men of genius are frequently believed to be somewhat temperamental. Marconi did not object to criticism of his work, but he was extremely sensitive if the honour and integrity of his companies or of his colleagues associated with him in the development of his inventions were assailed; and there were occasions when he found it difficult to hide his feelings in that respect. One particular occasion which I have in mind was early in 1913 some time after an agreement had been signed between the Postmaster-General and the Marconi parent company. The story does not really belong to this history of the Marine Company, but it has its place in the history of the man. Owing to scurrilous rumours to which certain periodicals gave currency and also to certain political undercurrents, an inquiry into the circumstances leading up to the agreement and into the agreement itself was ordered to be made by a Select Committee of the House of Commons. Their report resulted in the agreement being completely ratified by Parliament in August 1913, after the lapse of one year.

These rumours reflected on the conduct of certain Ministers of the Crown and implied that members of the Government, acting in the interests of the Marconi Company and in disregard of public interests, had exercised undue influence to procure for the Company a Government contract, also that such members of the Government, with a knowledge acquired in their official capacity of the nature of the negotiations and of the probability that an agreement would be completed of great value to the Company, had during the progress of the negotiations purchased shares in the Company with a view to selling them at a profit on the announcement of a favourable result of the negotiations. The Committee's report stated that 'no evidence of any kind has been submitted to the Committee to justify any of these charges'. One of those responsible for the suggestions stated above 'admitted that he was never able to verify any of the rumours or to discover any definite ground for them. All the other witnesses responsible for their publication who appeared before us also failed to specify any ground on which they could be justified or to produce any evidence in support of them.'

In his evidence before the Committee, Marconi expressed his 'resentment at the reflections which have been made upon my Company and upon me for having innocently entered into a contract with His Majesty's Government. I resent the inquiry into and publication given to the affairs of my Company which have no relation whatsoever to the contract entered into with His Majesty's Government, and in this respect I would particularly refer to the business carried out by Mr. Isaacs and me in America, as related by Mr. Isaacs in his evidence, which I fully endorse and confirm, and I regret that the services which my Company and I have, for so many years, rendered to the Post Office, the Admiralty, the Mercantile Marine, and, in fact, the whole nation, should not have been deemed worthy of higher consideration.'

'I wish to state', he added, 'that I have never, at any time, speculated in any of the shares of my Companies. I have always supported them whenever money has been required frequently to very large sums. I have occasionally sold shares, not in consequence of markets or circumstances connected with the Company's business, but only when I have required monies for business in which I am interested other than that of the Marconi Companies. During the whole period of the boom in shares in the parent company or the American company, or any other of the companies with which I am associated, I have never bought or sold a share. I have never taken part in any syndicate, nor have I ever heard of any syndicate, nor do I believe that any syndicate ever existed in connection with any of the shares of any of the Marconi Companies. Neither I, nor my Company, have in any way been responsible for the fluctuations of the prices in the market, but I believe that these prices have varied entirely according to the natural supply and demand, in the same way as prices of any security upon the Stock Exchange will fluctuate.'

A Floating Laboratory

Marconi was very faithful to his friends, although he proffered his friendship but rarely. It was necessary for him to give lectures and to speak at public functions, but it generally required a great effort on his part. Even at the annual meetings of the companies which bore his name, he seldom presided; and there were times when his nature demanded solitude and freedom from the cares of the world. He was probably never more happy than when at sea in his yacht, *Elettra*, endeavouring to give practical effect to his theories and to the ideas which filled his mind.

It was here that Marconi was really at home. He always liked the sea. 'I was born to be a sailor', he once said. 'I never feel as well as when I am sea. I like the sea not only because it takes me away from all troubles on land, but because at sea I can meditate, study, and experiment at my will.'

Marconi bought the *Elettra* in 1920. This steam yacht had been designed by Messrs. Cox and King of London, and built by Messrs. Ramage and Ferguson, at Leith, Scotland, being completed in May

1904. She was originally the property of the Archduchess Maria Theresa of Austria, being then called *Rovenska*, and was used by the British Admiralty for naval purposes during the war. Her principal dimensions were, length overall 220 feet, beam 27½ feet, and depth 16½ feet.

The yacht was beautifully furnished and equipped, and its principal interest lay in the fact that for about eighteen years she was used by Marconi for experimental purposes and played an important part in practically all his investigations and discoveries during this time. There was no ship like it in the world, for Marconi not only made his home on board but it also contained his great floating laboratory where some of his most important work was done.

Marconi was a skilled navigator. He held the rank of Captain in the Royal Naval Reserve of Italy. 'The yacht not only makes me independent', he said, 'but it takes me away from curious eyes and distractions. I can work there at all hours of the day and the night, finding without delay suitable ground for all kinds of experiments which would be difficult and complicated to carry out on land.' The possibility of quickly moving from one point to another and reaching any given distance appealed to him.

In 1920, soon after he had purchased the yacht, Marconi sailed with a party to carry out experiments on long-distance reception. In the Bay of Biscay his guests danced to the music of the Savoy Orpheans, and in mid-Atlantic they not only heard the beautiful voice of Melba from Covent Garden, but re-broadcast it to other stations in Europe. To-day this may not appear to be very wonderful but it was a great achievement in 1920; for the guests on that cruise were the first people who had ever danced in a ship in the Atlantic to music played in a London hotel.

In 1922 Marconi made his first Atlantic crossing in the *Elettra*. After leaving the Azores the wireless instruments of the yacht showed a storm ahead. The *Elettra* was able to avoid it and took refuge at Bermuda. 'I am longing to get on board *Elettra* again', said Marconi, 'I travel a lot, but I am never happy when I am away from my yacht for long. Let somebody else have greater and more ambitious dreams. I am quite satisfied with my floating home. Nothing can replace the charm and freedom of the sea.'

In addition to the cabins used by the Marchese and Marchesa, there were three guest cabins and four bathrooms, while Marconi used a study, tastefully furnished in oak. The visitors' book was of great interest, containing the names of hundreds of famous men and women, including kings and queens of many countries. Autographed portraits given by famous visitors adorned the study.

'Elettra's' Wireless Equipment

The focus of interest on board the *Elettra* was, of course, the wireless cabin. This room and its equipment were naturally subject to continual change and modification as experimental work proceeded or as new investigations were begun. The standard wireless equipment apart from the experimental apparatus, was, as might be expected, very complete and included several transmitters and receivers, all designed for special services.

It was in the *Elettra*, with a short-wave telephone transmitter with a power of 2 kW, that Marconi carried out his important series of experiments demonstrating the possibilities of ships at sea making direct connection by wireless with the land line telephone networks of the world so that passengers and marine officials could speak from their ships directly to their homes and offices ashore. To-day, it is a commonplace for those on board ship to exchange conversations over many thousands of miles of land and sea. It was, however, a startling innovation when Marconi spoke from the *Elettra* in the Mediterranean with telephone subscribers in Sydney, New South Wales, London, Montreal, Bombay, Cape Town, New York, Buenos Aires, and Rio de Janeiro.

From his yacht *Elettra*, off Genoa, on March 26, 1930, he opened an Electric and Radio Exhibition at Sydney, over 9000 miles away. Pressing a telegraph key in the wireless room of his yacht, he thus caused wireless waves to close a circuit in Sydney, with the result that 3000 electric lamps were lit at the exhibition, and afterwards the Marchese spoke to the Sydney gathering which, in turn, congratulated him on his successful experiment. The pressure of the telegraph key caused the transmission of signals which were picked up at Dorchester, flashed by beam from Grimsby to Australia, picked up at Victoria and conveyed by land line to Sydney Town Hall, where they operated a switch, thus turning on the lights.

It was in the *Elettra* also that Marconi carried out his investigations into the properties and behaviour of electric waves of less than one metre in length.

The *Elettra* was very largely used in the experiments which led to the development of the Marconi short-wave beam system as a means of long-distance wireless communication. By its speed and efficiency this system revolutionised world communication and brought into commercial use the short-wave lengths of 20 to 100 metres which were previously considered too erratic in their behaviour for practical purposes. In the course of these researches the *Elettra* travelled many thousands of miles including the crossing of the Atlantic.

On Marconi's death the *Elettra* was purchased by the Italian Government. Marconi's executors had refused an offer of £200,000 from Mr. David Davies, an American. The apparatus on board, which included high-powered shortwave radiotelegraphic and radiotelephonic gear, as well as echo-sounding equipment, was partly the property of the Italian Marconi Company and partly the property of the Marconi Company of London. The two companies concerned presented the apparatus (valued at about £5000) to the Italian Government in memory of their president.

CHAPTER TWENTY-EIGHT

The Second World War

THE outbreak of the second world war in September 1939 threw a great weight on the Marconi Company as the main reserve not only for the provision of wireless installations and Radio Officers to the British Merchant Navy, but also as a source of supply for the equipment of much of the shipping of our Continental allies.

Owing to the necessity of wartime conditions, the Board of Trade found it necessary, early in October 1939, to make certain modifications in the normal peacetime complement of wireless telegraph operators carried on compulsory-fitted United Kingdom ships. The object was to meet the actual and prospective shortage of Radio Officers caused by the fact that considerable numbers of Radio Officers formerly serving on merchant ships had taken up other employment. The shortage was accentuated by the increase in the number of Radio Officers needed for service in those ships which were required by the Admiralty, when on specified voyages, to maintain continuous watch at sea by means of at least two wireless telegraph operators, irrespective of whether an auto-alarm were fitted or not.

This situation dictated the employment of operators not holding the Postmaster-General's first or second certificate of proficiency and operators without previous sea service to supplement the services of those possessing these qualifications, so far as such employment was compatible with maintaining the efficiency of the wireless telegraph service on United Kingdom ships to meet war conditions.

In the case of vessels carrying only one Radio Officer this did not admit of any modification of the normal peacetime arrangements requiring the vessel to carry a Radio Officer holding the Postmaster-General's certificate of proficiency in radiotelegraphy of the first or second class and having had at least three months' previous sea experience as a Radio Officer. It was essential under war conditions that where only one Radio Officer was carried his operating qualifications should be beyond doubt.

For vessels carrying two Radio Officers the normal arrangements were adhered to as regards the Chief Radio Officer who was required to possess the qualifications referred to in the previous paragraph, but the Junior Radio Officer might be either a holder of the Postmaster-General's certificate of proficiency of the first or second class, whether with or without previous or recent sea experience, or a holder of the special certificate granted by the Postmaster-General (which was normally issued for use only in voluntarily-fitted vessels), whether with or without previous or recent sea service.

For vessels carrying three Radio Officers the normal arrangements were adhered to as regards both the Chief and the Second Radio Officer, *i.e.*, that they should both be holders of the Postmaster-General's first- or second-class certificate, and the Chief Radio Officer should possess the qualifications indicated in the paragraph referring to vessels carrying only one operator. The Third Radio Officer might be qualified in the same respects as the junior operator in a two-operator vessel.

It was obvious that the extension of the twenty-four hour watch to ships not previously manned for such service, the call for fresh apparatus, and the rapid training of a reserve pool of Radio Officers would make a demand on the wireless service far beyond peacetime requirements. A temporary shortage of Radio Officers had to be made good, and a large number of new servicing depots had to be established in Great Britain and in other parts of the world which were open to Allied shipping.

Nevertheless, as a writer in *Fairplay* pointed out, 'so responsive has the wireless service been to the demands made upon it that, wherever a convoy or a single ship puts into port, masters and Radio Officers are assured that they can, if need be, speedily get into touch with someone who is fully qualified and equipped to provide any help that may be required.

'The world-wide dispersal which such a service dictates increases its strength and its invulnerability, and the accumulation of equipment, spare parts and a variety of stores in Marconi Marine Depots in numerous and widely separated centres throughout the world is a practical guarantee of an uninterrupted continuance of the wireless service, no matter what damage may be inflicted by the enemy, proof of which has been given again and again during recent years. Many new demands have been made on this service as the war has developed and has changed its character and direction, and every effort has been made to meet each requirement as it has arisen.'

Heroism of Radio Officers

The great traditions of the wireless service which were first exemplified by Binns of the *Republic* and Phillips of the *Titanic* and by Radio Officers in the war of 1914–1918, were worthily upheld by those who served during the war of 1939–1945. Their devotion to duty, their gallantry and courage, filled their colleagues in other branches of the

Marconi Company's activities with pride, and won not only their appreciation and admiration but also more tangible recognition in the awards which were bestowed upon them by the King. A list of these awards will be found on another page.

Side by side with the officers and men of the Mercantile Marine, Radio Officers in the Company's service showed wonderful endurance and continuous heroism in carrying on their duties under the strenuous conditions of sea warfare for six long and weary years.

In the first world war, Radio Officers had only the submarine to contend with. Certainly, that was a great ordeal for young men who knew nothing of war, for our country had been at peace for many years. Some of them, no doubt, fathered the men who were to fight in the second world war, and they had no illusions respecting the sacrifices which would be entailed. They had experienced all the horrors of war, and were fully aware that the immensity of the task which would devolve upon all connected with the Navies of Defence and Supply in keeping open the sea lanes along which flowed the weapons, food, and other goods and commodities which meant life to our island people would be greater than in 1914-1918.

They knew of the barbarity and utter ruthlessness with which the enemy had carried on submarine warfare; but whereas in 1914–1918, the U-boats were denied the use of French, Dutch, Danish, and Norwegian bases and, with a much shorter range than the German submarines of 1939–1945, had to make the long and hazardous journey round the north of Scotland to get on to Britain's sea routes, during the last war they were able to use bases in western France, right on the doorstep of the Atlantic, which enabled them to operate at much greater distances, even as far as the eastern seaboard of the United States.

The enemy also had a new weapon in their aircraft, which not only operated in the North Sea and the English Channel but could act in concert with the submarines far out in the North Atlantic and the western approaches to our coast. The task of the Royal and Merchant Navies was immeasurably greater than in the first world war; but they carried these additional burdens willingly and cheerfully with conspicuous efficiency. Great sacrifices had to be made; and it is a measure of the intensity with which the war at sea was waged that, in the discharge of their duties, no fewer than 960 brave Marconi Radio Officers laid down their lives in that great struggle, and some 110 were made prisoners of war.

The war upon British shipping began almost immediately war was declared, the first casualty being the Donaldson liner *Athenia;* and the officers in the marine wireless service soon had the opportunity of showing that the traditions which had been laid down by their predecessors in the first world war and the principles of devotion to duty would be worthily upheld. In a letter to *The Signal*, the official organ of the Radio Officers' Union, the three Radio Officers in one of H.M. transports in the vicinity of the *Athenia* when she was torpedoed on September 5, 1939, paid high tribute to the radio staff of that ill-fated ship.

They wrote: 'We would like to record a note of appreciation to the *Athenia's* Radio Officers on the cool and decisive manner in which the "call for help" procedure was carried out. Our ship was at anchor off a certain port at the time, so we could only take a semi-active part by passing on the urgent message to another quarter. The *Athenia's* Radio Officer had the good sense to screw down the emergency transmitting key, leaving the motor running, before, as he said, "Abandoning Ship", this enabling ships in the vicinity to take direction-finding bearings for a prolonged period. From the position of our ship the continuous emergency spark was heard for almost one hour, presumably until the radio room became submerged.'

Attacks on Coastal Shipping

From the very beginning the Merchant Navy was in the front line of battle. It was no 'phoney' war so far as they were concerned. Other new weapons adopted by the enemy were magnetic and acoustic mines which were laid by aircraft in the coastal waters and estuaries along the east coast. This not only resulted in many casualties to our ships but ultimately made it necessary for a great proportion of London's sea traffic to be transferred to the western ports. New ports and docks fully equipped for dealing with ocean-going ships were constructed on the Clyde, where their cargoes could be discharged into smaller craft for distribution to London and east-coast ports. Ships engaged in the coasting and short sea trades still had to face bitter attack not only from aircraft but from E-boats (another new weapon as compared with 1914–1918) which were based in Western European ports and could raid the coastal convoys.

One such ship was the S.S. *Keynes*, owned by Messrs. Stephenson Clark and Associated Companies. The *Keynes* was armed with one Lewis gun. She was attacked by enemy aircraft twice in one day. One fine clear morning, a single aircraft was observed coming from the east, flying low. It was recognised as a Heinkel III. As soon as it was within range the Lewis gun opened fire. The enemy dropped one bomb, circling the ship and came in again from the starboard quarter, flying at about 100 feet. It dropped three bombs, which missed, circled to port, attacked again from the starboard quarter with the sun behind it and dropped another three bombs, this time using its front and rear machine guns before and after passing over the ship. It circled again across the ship, but dropped no bombs. Its fore machine gun had, it seems, been put out of action by the Lewis gun, but the rear gun scored hits.

Three Spitfires now appeared and drove away the Heinkel, which dropped some forty more bombs into the sea and retired with its tail smoking. The attack lasted some ten minutes, during which the master swung his ship so that the Lewis gun could be trained on the aircraft. The gunner took all his chances, and the master reckoned that some 300 to 380 tracer bullets fired hit the enemy at close range. In the middle of the afternoon, the day being still fine and clear, another aircraft swept down from the south-east a mile and a half on *Keynes'* beam, flew round about a mile to the northward, fifty feet above the water, turned sharply, and came in from ahead. At about 300 yards, the master, realising that it was an enemy aircraft, opened fire. The enemy climbed steeply to avoid the *Keynes'* masts. He dropped three bombs, one of which hit and put the steering gear out of action so that the master could no longer use his helm. Three more bombs were dropped, one hitting in much the same place as the first. The ship caught fire, her engines stopped and she was out of control. Her port side had been blown clean away and she took on a list. Her whole deck was aflame, and as there was no way of quenching the fire, the order was given to abandon ship. The crew were picked up by one of H.M. ships.

The gunner, on an exposed and open bridge in most trying conditions, showed great courage. Of the Radio Officer, Charles Augustus Coleman, the citation said: 'though severely wounded, he tried again and again to send out signals'. With blood flowing from his hands and face as he operated the wireless, Radio Officer Coleman continued to send out the SOS under a barrage of bombs and bullets. 'He must have had a hell of a time', said the gunner. 'One bomb dropped almost on his cabin, blowing him into the air.' Coleman was taken to hospital with wounds in the chest, hands, and shoulder. He was later appointed a Member of the Order of the British Empire and also awarded Lloyd's War Medal for his gallant service.

CHAPTER TWENTY-NINE

Victims of the Surface Raiders

UNTIL they were eventually rounded up, enemy surface vessels were able to take fairly heavy toll of our merchant shipping. The brave fight of the *Jervis Bay* against the German pocket-battleship, *Admiral Scheer*, will long live in our memory. Her gallant action undoubtedly saved thirty-three of the thirty-seven ships which she was convoying.

Another pocket-battleship, the *Admiral Graf Spee*, had a short life before meeting an inglorious end after the Battle of the River Plate. Among her victims were the S.S. *Tairoa*, owned by the Shaw, Savill, and Albion Company. When war broke out the *Tairoa* was outward bound to Australia, but on her return voyage she was sunk by the *Admiral Graf Spee* on December 2, 1939.

The *Tairoa* was armed with one 4-inch gun. Her crew numbered eighty-one, three of whom were injured by shrapnel. Before daybreak a vessel was sighted about two points on *Tairoa's* beam some five miles away. When within two miles the enemy ship signalled with flags, 'I am coming to board you', and made two other flag signals which were not read.

The Radio Officer, Patrick Joseph Cummins, commenced to transmit the alarm signal and at once the enemy ship fired several shots, which damaged the steering gear, smashed the wing of the bridge and dislodged the sandbags round the wireless room. Three times the Radio Officer tried to send out the alarm signal and each time the enemy opened fire, but ceased as soon as the wireless stopped.

After the third attempt to transmit, the enemy fired two shells which put the wireless out of commission. Soon afterwards the ship was boarded and the crew were transferred to the German battleship. Her commander, Captain Langedorf, later explained that he did not wish to take life, but only fired when the *Tairoa* disobeyed a notice in English telling her not to use her wireless. This notice was not read. He complimented the Radio Officer 'on his courage and devotion to duty'.

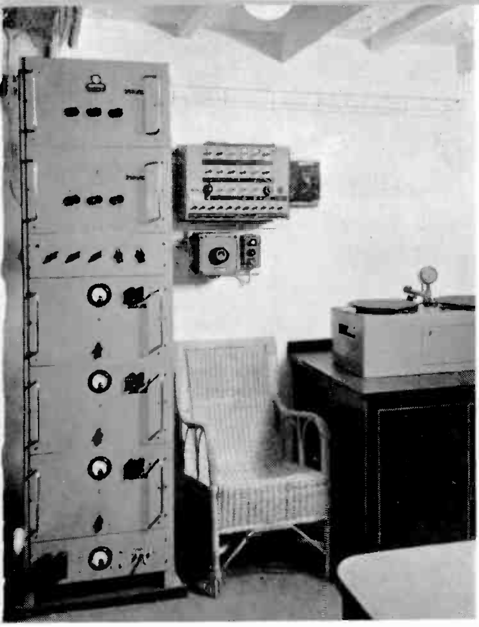
Another vessel which had the misfortune to encounter the *Admiral Graf Spee* was the S.S. *Trevanion*, owned by the Hain Steamship Company. In the early afternoon she sighted a battleship on her port beam some seven miles away flying a large French ensign. When four points on *Trevanion's* bow, she put her helm hard astarboard and headed for her. At two miles she hoisted two signals—'Do not use your wireless', and 'I am sending a boat'. She then came up at full speed on *Trevanion's* port side. Not until she was close abeam could her German flag be seen. On the master's orders the Radio Officer, Noel Charles Martinson, sent out the Raider Signal and ship's position. The enemy at once opened fire with a machine gun and swept *Trevanion's* upper deck from a range of about 100 yards. The master then mustered the crew on deck. The Radio Officer stopped sending the message for a time and the machine-gun fire ceased. Then the master went to the wireless room and stood by while the whole message was sent out again and then returned to the bridge and found that no one had been hurt. The enemy vessel was now nearly alongside. The master rushed for his secret papers, threw them over the side and watched them sink. The *Trevanion's* crew were taken aboard the German ship which proved to be the *Admiral Graf Spee*.

Among other ships in which Marconi Radio Officers were serving and which were intercepted and sunk by enemy surface raiders were the Port Lines' *Port Brisbane*, the Anglo-Saxon Petroleum Company's motorship *Patella*, the Shakespeare Shipping Company's *Chaucer*, the motorship *King John*, owned by Dodd, Thomson and Company Ltd., and the Newcastle steamer *Haxby*. In all these encounters the Radio Officers showed great devotion to duty while under heavy fire.

Wireless Room First Target

When the *Port Brisbane* was attacked the first salvo missed, but the second hit the bridge and the wireless room, causing fires to break out. Another salvo penetrated to the engine room, putting the steering gear out of action thus causing the ship to circle. The master gave orders to abandon ship, but himself remained on board with nine others to fight the fires. Shortly afterwards a boarding party from the raider came on board, placed bombs in the engine room and stokeholds, and took the remaining officers and men prisoners. 'Senior Radio Officer Magee showed conspicuous courage and outstanding devotion to duty. Although badly wounded and suffering from burns, he continued to send out signals in the face of persistent fire from the enemy. He died while a prisoner.' That is the statement which accompanied the announcement that he had been posthumously awarded Lloyd's War Medal.

The *Patella* was proceeding independently from Trinidad to Capetown, laden with fuel oil, when she was shelled by a German raider. Distress messages were sent out, but the third shell hit the bridge, wounding the master and the First Radio Officer, Francis George Andrews. The latter, however, continued transmitting until the wireless cabin was

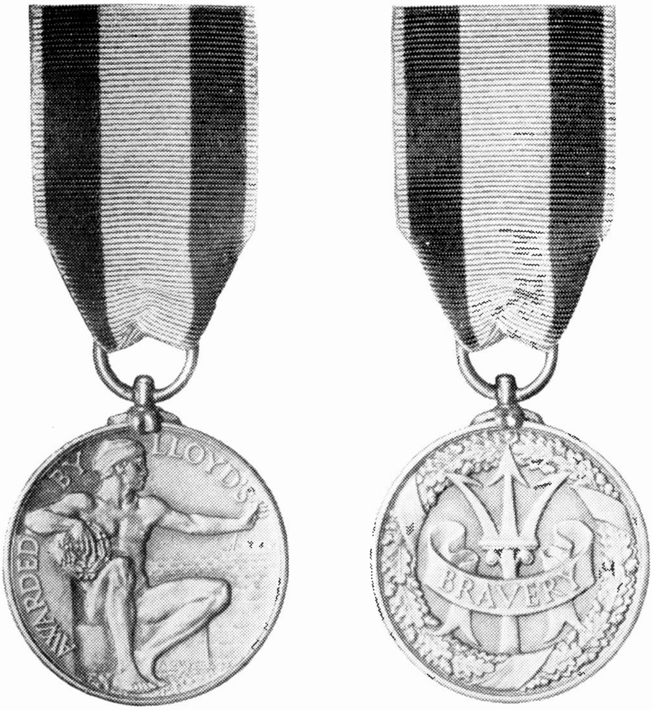


left: *The Marconi 'Oceanic' sound reproducing equipment, fitted in a passenger ship. It can be used to provide music for dancing, orchestral music, talks, and ship's announcements*

right: *The Marconi Echo Sounder as fitted in a passenger liner. On left is the 'Seagraph' Echo Sounder, Depth Recorder and Transceiver Unit. On right the 'Seavisa' Echo Sounder and Visual Depth Indicator*

below: *Marconi 'Seamew' radio telephone set, combining transmitter and receiver*

Lloyd's War Medal for Bravery at Sea



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'Lloyd's War Medal for Bravery at Sea' was bestowed upon officers and men of the Merchant Navy and Fishing Fleets in cases of exceptional gallantry at sea in time of war. The medal, the two sides of which are illustrated on this page, was designed by Mr. Allan G. Wyon, *F.R.B.S.* The heroic figure symbolises courage and endurance and the trident sea power. The oak leaves and acorns fittingly suggest those qualities of sturdiness and endurance which are as present in our seamen who serve in ships of steel as ever they were in their predecessors who manned the 'Wooden Walls of Old England'. The ribbon of the medal is in blue and silver.

TWENTY-THREE OF THESE MEDALS

WERE AWARDED TO MARCONI RADIO OFFICERS

DURING THE WAR OF 1939-45

demolished. As there was no chance of escape the engineers were ordered to render the engines useless and to attempt to scuttle the ship. The boats were manned and lowered and the ship was finally abandoned a few minutes before the salvage party came on board. The survivors were taken on the raider and were later interned in Japan. The sabotage of the *Patella*, however, had been successful and she was eventually sunk by the enemy. 'The First Radio Officer', said the announcement of his award of the M.B.E. and Lloyd's War Medal, 'acted with coolness and disregard of personal safety throughout'.

When the *Chaucer* was attacked, all guns were immediately manned and the ship was zig-zagged in an attempt to evade the enemy. This proved to be in vain as the raider closed and registered many hits on the *Chaucer*. A running fight ensued and about half an hour later a direct hit put the ship's Bofors gun out of action and hits in the engine room caused loss of speed. The position was now hopeless and orders were given to abandon ship. In spite of considerable damage to the boats, all hands got away and attempted to evade the enemy in the dark but were eventually picked up by a launch from the raider and made prisoners. Later the *Chaucer* was sunk by shell fire from the raider. The Chief Radio Officer, Eric Campbell, remained at his post sending out distress messages in spite of hits from enemy shells in the compartment below the wireless room. He and three other officers were awarded the M.B.E.

The *King John* was on a voyage from the United Kingdom to Vancouver when she was attacked by a German raider. Evasive action was immediately taken and distress signals sent out, but the ship was hit by a salvo of shells which put the steering gear out of action. The engines were then stopped and the port lifeboat got away with about thirty men. The shelling continued and the remaining hands, with the exception of the master and the Radio Officers, boarded the starboard boat, which remained alongside. The master then made an inspection of the ship whilst the First Radio Officer, Dudley Haslam Golden, continued to send out signals until the aerial was brought down by shell fire.

'When the master and Radio Officers took to the boat, the *King John* was a mass of wreckage forward and amidships and the poop was on fire. The master displayed coolness and courage throughout. The First Radio Officer acted with outstanding devotion to duty in remaining at his post sending out distress messages until the aerial was brought down.' He received the M.B.E., while George Mercer Hindle, the Second Radio Officer, received the King's Commendation.

Mr. George Wall Hackston, was the Radio Officer in the *Haxby* when she was intercepted by an enemy raider. The ship was heavily attacked. Salvoes of shells did much damage; the engine room was flooded, all the boats were smashed, and the crew abandoned the sinking ship on barges and rafts made of logs. While the ship was under fire, Radio Officer Hackston showed great bravery. He sent out a message giving his ship's position, and remained at his post, in the wireless room, throughout the attack until the room was set on fire by a shell.

After boarding the raider Mr. Hackston was ordered to decode messages for the German commander. He valiantly refused. After a long period on the raider he, with others, was transferred to the Norwegian steamer, *Tropic Sea*, which had a German prize crew aboard, but that vessel was intercepted by H.M. Submarine *Truant*, whence British subjects were transferred to her and landed safely at a fortress. Mr. Hackston was awarded the M.B.E. and Lloyd's War Medal.

CHAPTER THIRTY

Awards to Radio Officers

As will be seen by the List of Awards to Marconi Radio Officers these numbered no fewer than 146. It is, therefore, impossible to do more than give a few examples of the outstanding courage which one and all displayed. Nor is complete information regarding all the incidents which received official recognition available for there were many which, if related in some detail, might disclose information which, in the event of a future war, might be of value to an enemy. In many instances the notification of an award in the *London Gazette* merely stated that it had been made 'for good service when their ships encountered enemy submarines, aircraft, or mines'. There were very many cases where the Radio Officers stuck to their posts until the very end in order to get their SOS calls through to another ship. Their devotion to duty cost them their lives, but their action generally resulted in the rescue of their shipmates. Here is a typical instance of self-sacrifice by a Radio Officer where 'a man laid down his life for his friends'.

The heroic action of Chief Radio Officer Duncan of the *Tilawa* was equal to the highest traditions of the radio service both in peace and in war. On the night when his ship was sunk by the enemy, and subsequent to the torpedo striking the vessel, Mr. Duncan arrived in the wireless cabin to find that the transmitter was out of action, due to the effects of the explosion. Eventually he was able to repair the installation and send a message for assistance which was picked up by four coast stations. Then, giving instructions to his juniors to attend to the lifeboat emergency equipment, he proceeded with the task of exchanging messages, and remained at his post to the last. It was due to his efforts in successfully clearing the fault and his clear and persistent signalling that the lives of over six hundred were saved. His action was described by the master as 'heroic'. Had the messages for assistance not gone out, there is little doubt that all would have been lost, as the ship was seven hundred miles from the nearest land. Thus, in the annals of the sea, another epic drama with courage of the highest order manifested by the Radio Officer added another chapter to the many brilliantly displayed since the inception of radio.

LIST OF AWARDS TO MARCONI RADIO OFFICERS FOR GALLANTRY AT SEA

as

announced in the *London Gazette* and *Lloyd's List*.

D.S.C.

Ambler, E. H.
Mason, C. P.
Walker, H. (R.N.V.R.)

GEORGE MEDAL

Dennis, D. W.

M.B.E.

*Andrews, F. G.
Arthurs, A. M.
*Bacon, N. J.
Campbell, E.
Cardwell, W. S.
Carlyle, T.
*Coleman, C. A.
*Coleman, N. M.
Cummins, P. J.
Dowling, R. J.
Edwards, D.
Evans, J. R.
Franklin, A. J.
Fryer, G. K.
*Garstin, G. K.
Glen, G. R.
Glendinning, J.
Golden, D. H.
*Hackston, G. W.
Hackworthy, W. H.
*Haines, S. D.
Hodgson, E.
Horn, H. S.
Hosking, L. G.
Huey, A.
Jenkins, T. M.
King, B.
*Marshall, C. S.
Murphy, E.
*Norcliffe, H. W. H.
Palmer, C.
Parkinson, W.
Powell, S.
Richardson, G.
Riordan, P. A.
*Simkins, T.
*Smith, B. H.
Taylor, S. J.
Thompson, J. J.
Walker, G.

* Indicates that the recipient was also awarded Lloyd's War Medal for bravery at sea.

COMMENDATIONS

Abbott, J. M.
Adamson, G.
Archer, G. J. M.
Baker, T. J. F.
*Barrett, M. W. K.
Barrett, R. F.
Bentley, E. M.
Bradshaw, E. H.
Broomfield, H. F. C.
Brown, W. M. A.
Child, E. C.
Clarke, J. W.
Cockburn, T.
Currie, R. W.
Darton, M. H.
Darwin, P. J.
Davies, J. I.
Dempster, J. D.
Dennis, A.
Everett, W. J.
Franks, P. A.
Gilpin, J. G.
Graham, W. R.
Hale, F. J.
Hardy, G. R. V.
Harrison, W.
Harvey, V. S.
Haworth, H.
Hill, L. D.
Hindle, G. M.
Hodgson, C. W.
Hodgson, E.
(Also awarded M.B.E. previously)
Hughes, R. W.
John, R. P. D.
Kemp, J. E.
Livingstone, A. M.
Lovie, J.

COMMENDATIONS

Low, C. S.
Lyons, D. I.
Major, E.
Martin, T. H.
Martinson, N. C.
Moore, J.
Murphy, J.
Murray, W. G.
McDonald, T.
McGregor, J.
O'Hanlon, M. S. A.
O'Keeffe, P. J.
Owen, E. A.
Parcell, S.
Perrin, A.
Proctor, R. L.
Raeburn, G. A.
Richmond, P. V.
Roberts, K. J.
Robinson, K. W.

Rogers, H. J.
Saunders, J. E.
Sharman, J. O.
Thompson, D. H.
Thompson, J. E.
Townsend, J. A. E.
Trewren, N. L.
Walsh, C.
Watson, E.
Whiting, W. Y.
Worrall, K. J. D.
Zeitlyn, O. D.

Posthumous

Alexander, T. F.
*Barker, G. T.
Bowden, J. N.
Butterworth, A. R. C.
Cannell, B. I.
Carpenter, S. G.
*Clark, F. R.
*Duncan, E. H.
Hare, J. E.
*Hay, J. W. E.
*Magee, J. H. A.
Murphy, M. J.
Newbold, R. A.
*O'Keefe, C. G.
Oldfield, W. F.
Reilly, W.
Shepherd, J.
Smith, A. A. E.
*Stewart, R.
*Sturdy, E.
Taylor, J.
Ward, G. W.
*Watson, J. V.
*Wilson, J. F.
Williamson, A. L.
Williamson, H.

LLOYD'S WAR MEDAL FOR BRAVERY AT SEA

Andrews, F. G.
Bacon, N. J.
Barrett, M. W. K.
Coleman, C. A.
Coleman, N. M.
Dennis, D. W.
Garstin, G. K.
Hackston, G. W.
Haines, S. D.

Marshall, C. S.
Norcliffe, H. W. H.
Simkins, T.
Smith, B. H.

Posthumous

Barker, G. T.
Clark, F. R.
Duncan, E. B.

Posthumous

Hay, J. W. E.
Magee, J. H.
O'Keefe, C. G.
Stewart, R.
Sturdy, E.
Watson, J. V.
Wilson, J. F.

SILVER MEDAL OF ROYAL HUMANE SOCIETY

Fairley, D. S. (Also awarded Stanhope Gold Medal for 1941 given by the Royal Humane Society for bravest deed of the year)
Pye, L. C.

MENTIONED IN DESPATCHES

Moody, J. T. W.
Newcombe, A. A.
Walker, H. (twice). (R.N.V.R.)

BRONZE MEDAL FOR SAVING LIFE AT SEA

Loughlin, C. M.
Thayne, A. C.

The Brotherhood of the Sea

Let me give a few more examples to indicate this great brotherhood of the sea; and in all humility and pride let us pause to reflect upon the sacrifice of self for the good of the greater number which was shown by Radio Officers in the last Great War. The words which follow are not mine, but are those used in the official records.

The ship in which Radio Officer James Falconer Wilson was serving was torpedoed while sailing alone in the darkness. Severe damage was sustained and the crew were ordered to abandon her. Radio Officer Wilson remained on board the sinking ship repairing the radio transmitter and sending out a distress message. 'He sacrificed his life by his gallant action in remaining at his post, as he was not seen again after a second torpedo hit the ship. The message was picked up by one of H.M. destroyers, and the crew were rescued the following day.'

Radio Officer Cyril George O'Keefe's ship was torpedoed by a submarine and sank. The crew took to the boats, but 'Radio Officer O'Keefe would not leave his post until he had sent out signals giving the position of the sinking ship. Through his courageous devotion to duty he gave his life to save his shipmates, for the signals were picked up and the crew were rescued.'

When the ship in which Radio Officer Geoffrey Tasman Barker was serving was shelled at point blank range by a submarine, a number of the crew, including the master, were killed or injured by splinters. 'The rest of the crew took to the boats, but Radio Officer Barker would not leave his post until he had sent out signals giving the position of the sinking ship. Through his courageous devotion to duty he gave his life to save his shipmates, for the signals were picked up and the crew was rescued.'

Radio Officer Max Reginald Gerard and Assistant Radio Officer Edward Russell Campbell were serving in a ship which was attacked by shell fire from an enemy submarine, and the crew were told to take to the boats. 'Although ordered by the master and the first mate to leave the ship, the Radio Officer and his assistant refused to do so and continued to send out the SOS. The boats were just clear when the submarine, which had now surfaced, fired a torpedo which sank the ship, and the two radio officers went down doing their duty. The others were saved.'

Radio Officer Michael Hennerty 'stayed by his post, sending out a distress message, and went down with his ship. Thus he gave his life to save his comrades.'

When the ship in which Radio Officer Ernest Sturdy was serving was torpedoed, he remained in his cabin to send out a distress message.

'The ship sank quickly and both he and the fourth engineer, who had stayed to shut off steam from the main engines, were drowned.'

Radio Officer James William Esmond Hay, was serving in a ship which was torpedoed and sank within seven minutes. The crew got away in three boats in pitch darkness and unfavourable weather conditions. 'In spite of the order to abandon ship, Chief Radio Officer Hay returned to the radio room and remained at his post to send out distress messages. His unselfish devotion to duty cost him his life.'

Radio Officer Joseph Victor Watson's ship was hit by two torpedoes and sank within ten minutes. Most of those on board got away in two boats and were picked up after five days. Radio Officer Watson 'showed great courage and devotion to duty without regard for his own safety. He remained at his post to send out a distress message, and sacrificed his life in an effort to save his shipmates.'

Radio Officer Cecil Palmer's ship was attacked by two submarines. She was torpedoed and, 'after a grim struggle', sunk by gunfire. 'The Chief Radio Officer, with great devotion to duty, remained at his post under heavy gunfire, sending out distress messages. The survivors were picked up the same day by a vessel despatched to search in response to the messages sent.'

The steamer *Kingsbury*, sailing in convoy, was torpedoed in darkness. She sustained serious damage and the engines were stopped. As the ship was sinking rapidly by the stern, abandonment was ordered, and this was carried out successfully in spite of adverse weather conditions. Chief Radio Officer Bertie King 'displayed outstanding courage and devotion to duty remaining on board until the end.'

The *Baron Cochrane* was torpedoed and sustained such severe damage that she had to be abandoned. The crew got away in one boat and two rafts. The Chief Radio Officer, Mr. Charles Scott Marshall, 'displayed great courage and devotion to duty in hazardous and difficult circumstances. He remained behind and made repeated efforts to get out a distress message using every method and improvisation at his disposal. He was among the last to leave the ship which sunk when a second explosion occurred. The survivors were picked up the following morning.'

The ship in which Senior Radio Officer Robert Stewart was serving, was torpedoed and damaged so extensively that she had to be abandoned. One lifeboat and some rafts got away. After the boat reached land eleven days later an unsuccessful search was made for the rafts . . . 'Senior Radio Officer Stewart remained at his post to send out distress messages, and his devotion to duty cost him his life. He was lost with the ship.'

The *Empire Zeal* sustained such severe damage after being torpedoed that abandonment was ordered. Chief Radio Officer Samuel Douglas Haines 'behaved with outstanding courage and devotion to duty. He remained on board to the last in an endeavour to repair the wireless and to send out a distress message. The survivors were rescued the following day.'

And here is one last example where the Senior Radio Officer lost his life by remaining at the post of duty to transmit the message which brought a ship to the rescue of his shipmates. The ship was the *British Resource*. As a precautionary measure, when she was torpedoed, one of the boats, with thirty members of the crew, was immediately lowered and pulled clear of the ship. Meanwhile, the master swung his ship stern on to the submarine and opened fire. Only one round, however, had been fired when a second torpedo hit the ship and set her on fire. With the ship burning fiercely the master and the remainder of the crew ran through the flames to the forecastle head and dived overboard. After being in the water for three hours a raft was sighted which the master and others managed to reach. It was badly damaged and had neither water nor provisions. The survivors clung to the raft for about twenty-six hours before they were picked up by a rescuing ship which had answered the distress calls sent out when the vessel was first torpedoed. First Radio Officer Frederick Ronald Clark 'sacrificed his life by his devotion to duty, remaining on board to transmit distress messages which brought a ship to the rescue of the survivors. He then ran through the flames and dived overboard, but was not seen again.' The Third Radio Officer, Mr. Neil Murray Coleman, 'showed great bravery and devotion to duty. He remained in the wireless room and held a broken wire in position while distress messages were transmitted. He would not leave until forced to do so by the enveloping flames.'

CHAPTER THIRTY-ONE

'Greater love hath no man . . .'

THE phrase 'the Radio Officer gave his life to save his shipmates' becomes awe-inspiring and almost frightening in its continuous reiteration as one reads through the various citations from the *London Gazette;* but the frequency with which it is employed is an indication of the splendid type of young men who comprise the Marine Wireless Service. Many were deservedly decorated, but there were hundreds who performed brave deeds who were content in the realisation that a good job of work had been done. The position of a Radio Officer on board a modern ship is one which requires not only considerable technical knowledge but, especially in times of stress, may call for the most exacting service which it is possible for a human being to perform. In the history of marine navigation both in time of peace and war, the Radio Officer has set an example at least as fine as has been recorded in any other calling in life.

One Radio Officer, Donald Wilfred Dennis, was awarded the George Medal, one of the highest decorations for gallantry which it is in the power of His Majesty to confer. Mr. Dennis was serving as Chief Radio Officer on board the motor vessel *San Emiliano* when she was sunk by enemy action on August 9, 1942. She was owned by the Eagle Oil and Shipping Company, Ltd. The official citation reads as follows:

'The Chief Radio Officer volunteered to release the only undamaged boat. Although he was badly burnt, he crawled through the flames on his hands and knees and released the falls. Throughout he displayed outstanding courage and fortitude, and but for his brave act the boat would not have got away and there would have been few, if any survivors.'

The report of the Chief Officer of the *San Emiliano*, Mr. T. D. Finch, to the owners of the vessel is a document which tells of tragedy and suffering, heroic endeavour and sacrifice unsurpassed in the long history of the British Merchant Navy.

The full story of the terrible experience of this tanker's crew when their ship was torpedoed and set ablaze, the heroism and fortitude they displayed (one, a young apprentice, was posthumously awarded the George Cross) does not, perhaps, belong to this history of marine wireless; so let us end with a quotation from the Chief Officer's report:

'To conclude this report, I especially wish to commend First Radio Officer Dennis; in spite of a badly burnt back it was he alone who lowered the port lifeboat away and enabled the rest of us to get away. In doing this he suffered bad rope burns, but this man was very reticent about it and in my estimation he showed great courage and fortitude throughout the whole ordeal.'

Three Marconi Radio Officers were awarded the D.S.C., one, Mr, H. Walker, R.N.V.R., while serving in the Royal Navy; the other two, Radio Officer Charles Powell Mason, of the Isle of Man Steam Packet Company's ship *Tynwald*, and Radio Officer Ernest Harry Ambler, of the same Company's *Mona's Queen*, for distinguished conduct during the evacuation of Dunkirk. Eight of this Company's ships were used in the evacuation, making numerous crossings of the Channel loaded with troops. Three of them were lost during this great operation —the *Mona's Queen*, *Fenella*, and the *King Orry*.

Radio Officer Ambler's ship was sent to Ostend on April 16, 1940, to evacuate refugees, the town at that time being frequently bombed. When the evacuation from Dunkirk commenced he made two trips, the ship bringing back 1312 troops before she was sunk by a mine at Dunkirk, when heavy casualties were sustained. Mr. Ambler, we are told, displayed great courage, coolness, and efficiency, and assisted his captain in every possible way in addition to his own specialised duties. He particularly distinguished himself at Dunkirk by making urgent visual signals regarding the movement and safety of the ship, although he was in an entirely exposed position and under heavy aircraft bombardment at the time.

Radio Officer Mason was awarded his D.S.C. 'for conspicuous devotion to duty and unflinching determination in the face of enemy action'. The *Tynwald* made five crossings during the Dunkirk evacuation and brought back 10,000 troops. She was eventually sunk in Bougie harbour after a great fight in the North African operations at the end of 1942 when she was acting as an A.A. ship.

Officers and men in the services of the Isle of Man Steam Packet Company earned many awards during the war, including six Distinguished Service Crosses, two of which went to Marconi Radio Officers.

Initiative of Radio Officers

And now let me give one or two examples showing, apart from their gallant bearing in the face of the enemy, the capacity for leadership and initiative displayed by Radio Officers of the Marconi Company when circumstances called for quick decisions and immediate action. Here is a story of a youngster, John Glendinning, Third Radio Officer of the

Larchbank, during a period of eighteen days on board a ship's raft. The ship was torpedoed and sank in about three minutes. Owing to the heavy swell and the rapid sinking only one boat and two rafts got clear. The boat was brought to safety by the chief engineer after a voyage of nineteen days. One of the other rafts was in charge of the fourth officer. This raft was almost without food and water. The fourth engineer caught fish by hand and collected rain water, and it was due to his efforts that he and his two companions were kept alive until they were rescued after twenty-three days. The Third Radio Officer we are told, 'also displayed great courage and high qualities of leadership. Although untrained for such responsibilities, he took charge of the second raft, supervised the issue of rations, and, by his organisation and example, greatly helped the other occupants of the raft through their ordeal of eighteen days adrift.'

Then there was Donald Edwards, Chief Radio Officer of the *Empire Mordred*, whose ship struck a mine in darkness. The explosion wrecked the whole machinery space and caused the boilers to blow up. Two of the boats were also destroyed. When it was seen that there was no chance of saving the vessel, abandonment was ordered and shortly afterwards the survivors were picked up by another ship. 'The Chief Radio Officer displayed outstanding qualities of skill and leadership in getting one of the boats away while the master was semi-conscious from blast and temporarily incapacitated. He then took charge of the boat, organised the men to pump out the water and generally assumed command.'

Radio Officer Bertram Hugh Smith's ship was sailing alone when she was torpedoed and had to be abandoned. Smith stayed in the wireless room and went on sending out distress signals until he heard that the last boat was leaving. His ribs were badly injured when he was thrown in the bottom of the lifeboat as he was helping to launch it. He took charge of the boat and improvised a mast and rudder from the floor boards and used the spray shield for a sail, as the gear was lost when the boat was swamped. On the seventh day they sighted a convoy and were taken on board a rescue vessel. 'It was mainly due to Radio Officer Smith's resource, determination, and fortitude that the boat's company were rescued.'

Is it, therefore, a matter for wonderment that the Marconi Marine Company draw very largely upon their seagoing staff for filling posts ashore and even the higher executive positions? But we shall have something to say about this later. Here is another story of a ship's raft. It concerns a ship called the *Arletta*. She was sailing alone when torpedoed 300 miles from the nearest land and sank within three minutes. The chief officer, seeing a number of the crew attempting to lower a

Royal Humane Society Awards

Two awards were also made by the Royal Humane Society to brave Marconi Radio Officers. Douglas S. Fairley was awarded the Silver Medal of the Society and also the Stanhope Gold Medal for 1941 given by the Royal Humane Society for the bravest deed of the year. When in convoy at sea in June 1941 his ship received a direct hit from a bomb and was set on fire. While making his way to his lifeboat he came across Seaman John Miller, whose right leg was almost severed, whose left leg was fractured, and who had severe burns on hands and face. Though suffering himself from a compound fracture, dislocation of the right ankle joint and severe burns on his face and hands, Fairley stopped to assist Miller, thus missing getting away in a lifeboat. Although so badly injured, Fairley succeeded in getting Miller into the water and, finding a lifebuoy, he held to it with one hand and supported Miller with the other for fifty minutes until they were picked up by a rescue ship. Four times in ten minutes Fairley was seen to pull Miller back to the lifebuoy while he encouraged him not to give up.

Second Radio Officer Leslie Clark Pye was on November 20, 1941, awarded the Liverpool Shipwreck and Humane Society's certificate for saving life. The presentation was made by the Lord Mayor of Liverpool, Sir Sydney Jones, who said it gave him very great pleasure in recognising officially the splendid courage shown by this young man. Mr. Pye was only seventeen years of age when he performed his heroic act. He was serving as Second Radio Officer in a Newcastle tanker which was torpedoed and set on fire in April 1941 and, although he had no life-jacket, jumped from a raft to rescue a man who was in danger of drowning. 'You were ready and prompt to take action when action was necessary', said the Lord Mayor. Mr. T. Harper, chairman of the Liverpool Shipwreck and Humane Society, said this was one of the finest acts recorded during the war.

CHAPTER THIRTY-TWO

Marconi 'Service' in War and Peace

DURING the second world war, as in the first world war, the urgent and vital need to counter every activity of the enemy and to jump one step ahead resulted in every available scientist and research engineer being enrolled in the country's service to improve every known method and process and to invent new techniques. In no branch was this so evident as in the expansion and improvement of all communications services, and in particular, those of the Marconi Marine Company, where every new scientific achievement was immediately applied to afford seafarers some additional safeguard against the enemy's malevolent schemes.

The Marconi Marine Company, like many other organisations, has served through two world wars; but there are few industries that can show a finer record of service than the wireless industry whose resources were strained to the utmost and who were called upon to make great sacrifices in order that all arms of the fighting services and the Merchant Navy should receive the greatest benefit from the radio aids which could be placed at their disposal. The Marconi Marine Company undertook heavy responsibilities for the Admiralty and carried them through successfully. The service depots moved along with the line of battle so that wherever transports and munition ships touched port, there they would find efficient Marconi service awaiting them. The Company were fortunate, too, in being able to extend a helping hand to some of their sister companies during their wartime exile.

Notwithstanding these wartime exertions, a certain amount of development work was still carried on, so that the Company entered the peacetime field with a series of post-war designs almost completed. It naturally took some little time to get together the teams needed to translate these designs into production drawings and to gather the material and manpower together for actual manufacture. This meant a wide gap in deliveries at a time of heavy demand that proved most embarrassing, not only to the Company itself but also to the associated Companies that had habitually relied upon Chelmsford for their equipment.

The difficulties generally encountered in this country and throughout the world in the supply of materials and in obtaining the necessary technical and productive manpower, coupled with the anxieties occasioned by the troubles of a world uneasily at peace did not, however, hold up progress in the design, development and production of the modern radio apparatus required for marine communication services and of electronic aids to navigation.

During the post-war years much has been accomplished both by Governments and industries to ensure that all types of mercantile vessels, whatever their vocation, shall have available the best possible radio apparatus that human ingenuity can devise, coupled with economical cost.

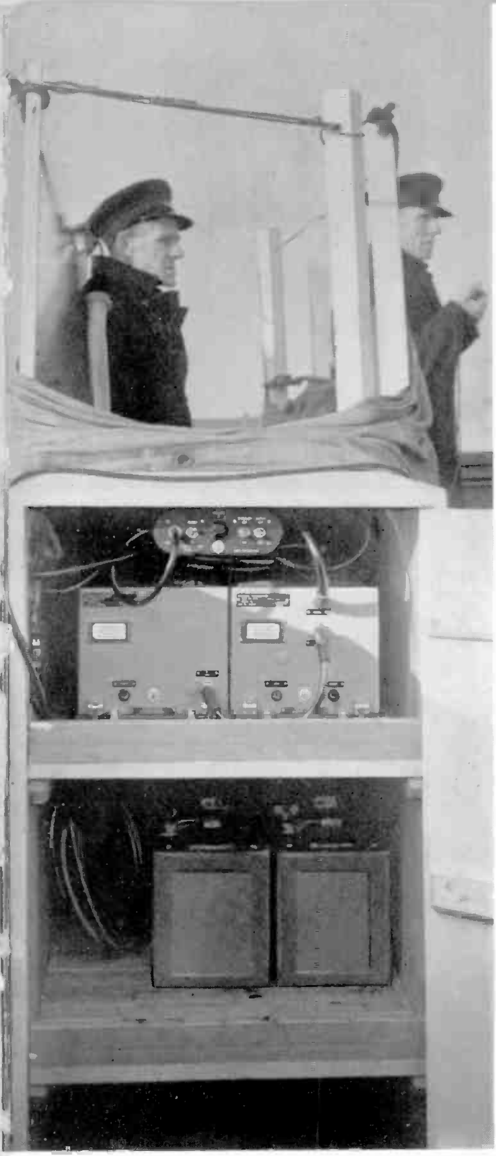
International and national radio conferences have been held in various countries. The Safety of Life at Sea Convention in London and several regional conferences have all concentrated the attention of the world's experts on the problems of securing for seafarers an equitable share of the spectrum for their radio and navigational aids requirements and to ensure that the frequencies are allocated in the most efficient manner to provide the best possible service for the greatest number of users.

The British Ministry of Transport has been very active in these conferences and, with the advice and assistance of the Ships' Wireless Working Party, has been able to secure for the mariner a place in the sun. The British Post Office has also been in the van in issuing well-considered specifications for all types of marine radio equipment with which all future sets must comply; and, in the construction of the Burnham radio shore station, inaugurated in 1948, they placed at the disposition of seafarers facilities second to none for efficient communication with all ships sailing the seven seas.

The radio industry has been equally alive to the need for keeping every vessel, wherever it may be, in touch with any part of the world. The Marconi Marine Company, with the huge resources of the English Electric Company and Marconi's Wireless Telegraph Co., Ltd., behind it, has introduced a new series of modern equipment which, both in radio design and production methods, embodies all the technical refinements which have resulted from a half-century of experience, development and operational research. This new apparatus has all been evolved since the termination of the war, and is now being produced in quantity to meet modern marine needs. For communication purposes, transmitters, receivers, and telephone sets have been designed using modern technique and relatively low power, and this range ensures a first-class communication service between a ship and every efficient coast station throughout the world.

New Navigational Aids

In the navigational aid field, the new productions include 'Radiolocators', Direction Finders, and Echometers, all of which provide for the



left: *Marconi V.H.F. radio-telephone equipment used on the Tilbury-Gravesend Ferry Service*

The Tilbury-Gravesend ferry boats are now fitted with Marconi H. 16 V.H.F. By means of this Marconi equipment and the shore-based radar equipment the service can operate in dense fog

right: *V.H.F. Aerial fitted on Gravesend Ferry Service*

left: *The first Marconi Service Depot. It was established on Seaforth Sands in* 1903

below: *The School Room at the Marconi Depot on Seaforth Sands*, 1903

ship's navigator a measure of safety and security undreamt of a few years ago. The equipment is constructed to withstand mechanically the heaviest vibration and movement likely to be encountered on any ship in the worst possible sea conditions. All the electrical circuits are also specially designed to withstand extreme heat and cold and conditions of salt-laden high humidity. All this new material is available to the shipowner at very little additional cost when compared with pre-war equipment.

As a result of all the work that has been done since the war, both by the British Government and the radio industry, it is safe to say that, in common with many other fields, in marine radio communications and radio navigational aids, Britain leads the world.

Let us examine very briefly some of the new equipments which have been developed and put into operation since the war. The new telegraph transmitters are named 'Trader', 'Oceanspan', and 'Worldspan'. The basic unit is the 'Trader', a medium wave C.W., I.C.W. transmitter with an output of 100 watts to the aerial. All controls, emergency equipment, and power packs for receiver, D.F. and auto-alarm are included in the basic unit. A special set of pre-fabricated leads is provided to link up with the receiver, D.F. and auto-alarm fitted on the operating table alongside. Once placed in position on the ship it is then only necessary to run aerial, earth, and battery leads to the set. These sets have a normal daylight range of 600 to 800 miles and have done well over 1000 miles.

By exchanging the oscillatory circuit panel of the 'Trader' with another panel of the same size which includes both medium and short-wave circuits, the set is converted to an 'Oceanspan'. The sets are otherwise identical. The 'Oceanspan' provides an easy world coverage with a characteristic note that facilitates traffic clearance, and large numbers of these sets have been installed.

For the largest type of passenger liners, with heavy traffic loads to clear at extreme ranges, a high power amplifier is added to the 'Oceanspan' which converts it to a 'Worldspan'.

Wireless Communication over 10,000 *miles*

The first installation of the 'Oceanspan' was completed in January 1946, in the Canadian Pacific ship *Beaverdell*. During her trials in the Clyde area, the *Beaverdell* made contact without difficulty with three continents. Two American coast stations at Chatham (Massachusetts), and Amagansett (Long Island) (2000 miles), were contacted first, both stations reporting the signals to be loud and clear. This was followed with excellent communication with Halifax, Nova Scotia. Next Simonstown, South Africa (6000 miles), was worked, and finally excellent two-way communication with Sydney, Australia, was established over a distance of about 10,000 miles. The Radio Officer's report on this latter communication is interesting and illustrates the ease with which contact was made. He says: 'I had not thought it possible to communicate with Sydney on this frequency (12 mc/s) and at this time of day (12·18), but Sydney was coming in at full strength on my "Yeoman" receiver, and so I tried. I made a fairly long call asking Sydney to break through. He did so and good communication ensued. Sydney seemed surprised when informed of our location.'

Since that initial test more reports containing evidence of the efficiency and reliability of the equipment have been received by the Marconi Company. The Port Line ship *Port Dunedin*, for instance, reported that she established communication with a New Zealand station whilst lying in the Mersey—a distance of 10,280 miles.

The importance of an accurate direction finder as a contribution to the safety of ships at sea has been recognised for many years. The new 'Lodestone' direction finder has been designed to conform with the high quality of all Marconi apparatus. Based on the well-known Marconi-Bellini-Tosi system, the position of the indicating scale is independent of the position of the frame aerial, and the latter may be installed in a convenient position in the ship—an advantage which many shipowners have been quick to recognise. The performance of this new equipment in range and accuracy is even better than the high-class instruments hitherto manufactured by the Marconi Company.

A new series of Echometers—'Seagraph', 'Seavisa' and 'Visagraph'—have already been fully described in Chapter Twenty-six, as have the new trawler radiotelephone set, the 'Seamew', and the larger instrument, the 'Transarctic', which is a combined telegraph and telephone set for use in the largest trawlers and other vessels. The 'Seamew' is a battery-operated set in which both transmitter and receiver have been built into one small cabinet. It is a sturdy, compact equipment with a minimum of controls, and although designed primarily for trawlers and small craft generally, it is of course equally suitable for any service where a short-distance telephone link is required.

The performance of the Marconi 'Vigilant' auto-alarm is so far in excess of statutory requirements that it is unlikely to be superseded for very many years.

To sum up, the new range of Marconi marine equipment is the result of fifty years' experience of marine wireless, culminating in the great technical advances of the last few years, which have produced wireless sets unsurpassed in performance for service on ocean liners, cargo vessels, or small craft.

But perhaps the most notable progress has been made in the production of the 'Radiolocator'.

CHAPTER THIRTY-THREE

Developments in Ship-borne Radar

WHEN the International Conference on Safety of Life at Sea met in London in 1948 everyone was agreed that radar was one of the most important navigational aids which had ever been discovered, and the Conference passed a recommendation setting out certain minimum performance standards for ship-borne radar (such as range and bearing discrimination), and urging Governments to encourage the fitting of radar with these standards in mind.

In the field of radar the Marconi Marine Company has been most active. Many types of radar were developed during the war under conditions of great urgency and where expense and man-power were of little or no consequence. The only thing that mattered was to have something done, and done quickly, irrespective of cost.

The Marconi Company contributed greatly to the development of radar equipment during the war, and played a major part in the production of high-power radar installations for Naval use. In addition, the Company manufactured very large numbers of magnetrons and other special valves used in the generation of centimetric waves.

At the conclusion of the war, after careful consideration, the management of the Marconi Marine Company decided that equipment designed under wartime conditions and for wartime purposes was not the answer to peacetime needs and that all Marconi knowledge and experience should be directed towards the design of a completely new equipment that would give peacetime shipping the highly efficient service that is expected from all Marconi equipment.

The shipping press took a similar view. Here is what the *Syren and Shipping* had to say on July 3, 1946:

'Before marine radar can become a satisfactory commercial proposition it will be necessary to develop not only a first-class servicing organisation, but also to redesign and simplify much of the existing equipment to make it suitable for handling by deck officers instead of skilled radio personnel. There are other qualities which for commercial radar apparatus are of supreme importance—reliability and ease of maintenance. The need for reliability is obvious, but the methods to be used to promote it in an installation comprising a multiplicity of units and perhaps as many as fifty electronic valves are not so obvious. Moreover, it is very desirable that every fault should be anticipated and made to bring about complete failure to operate rather than give rise to a misleading result . . . There must be an interim period for the logical development of wartime radar prototypes, and it is from those firms with the longest experience of the sea and with established coastal maintenance organisations rather than manufacturers of purely radio apparatus that we shall look for the most serious contributions to practical marine radar. As for cost, radar will certainly be expensive, but in a large vessel where a difference of a few hours in arrival time means a difference of hundreds, even thousands, of pounds in operating expenses, radar will not only soon pay for itself, but give a handsome dividend.'

In peacetime the economic factor assumes vital importance. Consequently, a great deal of development became necessary in order to ensure that the shipowner should be provided with reliable instruments; reasonable in first cost; simple in operation; easy to maintain, and which would give him continuous and first-class service with the minimum of care and attention.

After the end of the war, the Admiralty offered 250 of the Naval Radar Type 268 to be used until such time as the producers could manufacture a type which would be suitable (and less costly) for commercial use. As an example of the value of ship-borne radar it may be recalled that the 20,000-ton C.P.R. liner *Empress of Canada*, fitted with the Admiralty Type 268, was navigated, in a thick fog, all the way from the Bar, past the docks, and tied up to the landing stage at Liverpool through the efficient use of radar.

Type 268 radar has given very valuable service in bridging the gap between the end of the war and the production of radar equipment designed specially for the Merchant Navy, but is now rapidly being replaced by the Radiolocator.

Radar in Wartime

One example of the use of radar during the war is worthy of record.

In March 1944 the new Prince liner, *Chinese Prince*, under Captain Thornton, detected a Japanese submarine manœuvring into position for attack. Instead of running away, Captain Thornton turned towards the enemy's position and went for her at full speed. The Japanese commander, as had been intended, thought that he was being attacked and immediately crash dived far below attacking depth while the *Chinese Prince* made off.

It was not long before they discovered that the enemy was in pursuit, so Captain Thornton made for the shelter of a cluster of atolls through which, with darkness falling rapidly, no submarine would dare to venture submerged. The channel between them was intricate, but this route seemed to offer the only alternative to having this new ship with a very valuable cargo sunk.

The intricate channel was bordered by palm trees, and although it was dark these were clearly indicated on the radar screen, thus enabling the master to navigate the vessel through the channel, a manœuvre which would have deterred most navigators in daylight. By the time she reached open water on the other side there was no sign of her assailant, and she proceeded on her voyage.

In May 1948 the Ministry of Transport published a specification for Mercantile Marine radar equipment, and manufacturers were informed that, so far as could be foreseen, the Ministry would not add to or revise the specification until some years' experience of its operation had been gained; but should experience prove any alteration to be desirable, long notice would be given of any proposed change, and sets manufactured to that specification would not normally be affected by the issue of any new specification.

The chief requirements were that, when fitted at a height of 40 ft. above the water line, the set should give a clear indication at maximum range of:

(*a*) *Coastlines*
At 20 nautical miles when the ground rises to 200 ft.
At seven nautical miles when the ground rises to 20 ft.

(*b*) *Surface Objects*
At seven nautical miles on a tramp 5000 g.r.t.
At three nautical miles on a fishing vessel of length 30 ft.
At two nautical miles on a typical second-class buoy.

At minimum range a small object (*e.g.*, second-class buoy) should remain visible down to a range of 50 yards. This performance should be obtainable with a normal adjustment of the controls (*i.e.*, so that on the shortest range scale a second-class buoy at a range of one mile remained visible).

The Marconi Radiolocator

The first model of the Marconi radar set was exhibited in London in May 1946. Later, after some modification, this set was fitted in a cross-Channel ship for practical seagoing tests. Another model was kept at the laboratories so that any changes suggested as a result of ship working could be carried out quickly and tested. The actual sets, too, were changed over. The experience thus gained proved invaluable to the engineers working on the job, and equipment has been evolved which they know is worthy to bear the name Marconi. Prototype models of the Radiolocator were fitted in British ships for purpose of extensive sea trials on all the oceans of the world.

The Marconi Radiolocator was designed to meet the Ministry of Transport specification for a marine radar and consists of the following main items of equipment:

(*a*) Aerial Scanner.

(*b*) Transmitter Assembly.

(*c*) Main Display Console.

(*d*) Motor Alternator and Automatic Control Panel.

The aerial scanner, which is normally mounted on a structure erected on the deck above the chart room or wheelhouse, consists of a parabolic reflector of 5 ft. section arranged to rotate continuously at 30 r.p.m. and designed to withstand a windage up to 80 knots. Situated below the aerial pedestal is the transmitter unit, containing the magnetron, modulator, and other associated equipment, together with the early stages of the receiver. Installation is greatly simplified by this arrangement since no long wave guide runs are required as no frequency higher than the intermediate frequency is present in the main display unit.

The main display console is a compact, self-contained unit designed for installation in the chartroom or wheelhouse. The assembly has four main units, which are withdrawable for ease of maintenance. The display is presented in the form of a Plan Position Indicator (P.P.I. screen) of 9 in. diameter which is carried in the upper part of the cabinet and slightly tilted in order to give a natural and comfortable viewing angle. Remote display units may also be provided if required up to a total of three displays, one of these being in the form of the chart comparison type. Range on the various displays can be varied independently of one another, thus allowing, for instance, an officer in the wheelhouse to observe objects at short range on the display, while the navigator is observing targets at long range on the chart comparison display. The motor alternator has an input of either 110 volts or 220 volts D.C. from the ship's mains, and supplies 180 volts 500 cycles to the Radiolocator. A performance indicator unit is included with the equipment which enables an unskilled operator to check the performance of the apparatus while it is in use.

The Company is now engaged in the production of Radiolocators on a very large scale, and already some hundreds of this modern marine radar equipment have been installed on board merchant vessels, where they are giving complete satisfaction.

Radar and VHF Radiotelephony

Radar has already been used on shore in ports and harbours to deal with shipping traffic entering or leaving in poor visibility. In confined and crowded waters ship radar may not be fully effective owing to the masking effect of buildings and warehouses in the docks. Liverpool was the first port to install radar and, during foggy weather, ships are advised of their positions by radiotelephone, and directed as necessary.

Radar equipment is being used by Wallasey ferries to assist masters of the ferry boats to cross the river and safely approach the stages during poor visibility. Instead, however, of equipping the boats with radar, it was decided that the greatest efficiency would be achieved by fitting the radar equipment ashore and passing all information regarding shipping, distances, etc., on to the masters.

The link between shore and ferry boat is carried out by Marconi VHF equipment. Striking proof of the efficiency of the system has been given in foggy weather. This system of control leaves the masters of the ferries free to concentrate on their navigation while hearing a brief running commentary from a loudspeaker at their elbow advising them of their progress. It would not be so simple if they had to study their own indicator screens on board the vessels.

In addition to the Liverpool area, radar installations, in co-operation with Marconi VHF radiotelephone equipment, have been installed at Douglas (Isle of Man) and in the Port of London at Tilbury.

At Douglas the radar provides the harbour authorities with a complete picture of ships navigating the harbour area, and the Marconi VHF radiotelephone service enables them to direct the movements of ships so that they can proceed safely and expeditiously in conditions of bad visibility.

In the Port of London at Tilbury Riverside Station, the radar set is installed in part of one of the waiting rooms on the station, and the scanner is placed above the clock on Tilbury Riverside Station. Communication between the radar operator and the ferry vessels is by means of a Marconi two-way radiotelephone, and the ferries are guided across the Thames from berth to berth in a manner similar to that in operation on the Mersey with the Wallasey ferries.

Towage companies in the Liverpool, north-east coast and other areas have also installed Marconi two-way radiotelephone equipment at their offices ashore for communication with their tugs. Not only is the Marconi equipment in these ships of value as a means of ensuring the greatest efficiency in passing instructions to the vessels, but it is also of use for ship-to-ship use, especially when two or more tugs are working in company.

The equipment installed both on board these vessels and ashore is a lightweight set which can be operated almost as easily as an ordinary home telephone. Because of its small size it can be installed on almost any convenient bench or table. At the shore end of the link it can stand quite conveniently on, for instance, an executive's desk, where it is available for immediate operation whenever required.

Marconi VHF equipment has been supplied to the Southampton Harbour Board; one set is fitted in the harbour office and the other on the launch *Sharb*, which works over the area from above Northam Bridge down to below Calshot, including Hamble River up to Bursledon Bridge. Full loudspeaker communication is kept up throughout the area, and there is a complete absence of fading even when the small launch is right under the lee of a great liner.

Ship-to-shore telephony on high frequencies is becoming increasingly popular in the large liners, where it is used by the master for communication with pilot cutters, tugs, and owners' offices.

CHAPTER THIRTY-FOUR

An Unrivalled Service Organisation

Now let us deal with another aspect of the Marconi Marine Company's activities which is of the greatest importance. Ever since the formation of the Marconi International Marine Communication Company, when it established the world's first wireless service for merchant ships, it has provided British shipowners with an unrivalled service organisation equipped and staffed to advise and assist them and the masters of their ships in any part of the world on any problem which may arise in marine wireless matters. The Marconi International Marine Communication Company, in supplying and servicing wireless communication and navigational aid equipment to the British Mercantile Marine, has, as a result of that experience, adopted as its motto, 'Service, Security, and Progress'.

From the beginning it was the intention of the founders of the Company not to sell their apparatus and leave the purchasers to operate and keep it in working order themselves, but to provide a service by installing the apparatus, supplying efficient officers to operate it, and maintaining it in a state of efficiency to perform the work for which it was intended. It is obvious that if wireless apparatus is to possess its full value it must always be in full working order. To make such a demand of delicate instruments subjected to the effects of weather conditions in all parts of the world requires a very complete system of inspection and overhaul. It means experts and spare parts in practically every port of importance at home and abroad.

With over 200 service stations established at ports all over the world, staffed by some 3000 competent technicians, and some 2200 qualified Radio Officers ready to serve in vessels at any time, shipowners are enabled to get the maximum benefit from the Marconi apparatus in their ships.

But the business of conducting marine wireless does not finish with the provision of apparatus and men. The Marconi Marine Company is so organised that it is able to offer to shipowners a comprehensive service covering not only the supply and maintenance of wireless installations, but also to relieve them of all responsibility in connection with the analysis and settlement of international telegraph accounts with British and foreign telegraph administrations.

Staffing the Depots

When the war ended the Company decided, as part of its post-war policy, further to improve and expand its service organisation to ensure that it would keep pace with the growing technical complexity of the new apparatus and the increasing demand for it. With this object in view the Marconi depots throughout the world have been re-equipped with modern test equipment and tools to enable them to deal with the very complicated equipment installed in ships under the present and prospective statutory requirements. In addition, the Company has inaugurated special courses for training personnel in the maintenance of newly-developed equipments, including radar.

The whole of the technical staff at the depots, including depot managers, first served as Radio Officers at sea. The junior clerical staff employed at the depots are encouraged to study for the Postmaster-General's certificate and go to sea as Radio Officers.

A great deal of care is taken in the selection of those who appear to be qualified for appointment to shore jobs; and when a Radio Officer is chosen as a Temporary Marine Technical Assistant the manner in which he carries out his new duties is carefully watched and noted by the Depot Manager with a view to ascertaining his capabilities and qualifications for further promotion. Particulars respecting his grade as a Radio Officer at sea, the period served afloat and ashore, his technical ability, both theoretical and practical, his physical fitness, clerical ability, initiative, personality, and suitability for promotion to Technical Assistant, are all carefully noted. If, after a probationary period, it is found that a man is not sufficiently advanced, he is returned to the sea staff or the probationary period may be extended. Every endeavour, therefore, is made to ensure that the depots are equipped with personnel able to carry out the exacting duties which are required to keep ships' apparatus in full efficiency.

A wireless company may have the finest designers in the world, the most efficient manufacturing plant and facilities, the best transport arrangements, and the most complete stocks of apparatus and spare parts, but unless the apparatus is properly serviced by the depot organisation it cannot be reliable in operation.

Growth of Servicing Requirements

The work of the Marconi Inspectors and Technical Assistants calls not only for technical ability and experience but initiative and clear thinking; for maintenance work involves the finding and remedying of faults which may have developed in all types of apparatus such as transmitters, receivers, direction finders, echo-sounders, auto-alarms, radar, sound-reproducing equipment, etc. The service personnel must, therefore, keep themselves abreast of the latest technical developments, for ships must not be delayed in port and any defects must be remedied in the shortest possible time. All depot managers and key personnel are on the telephone at their homes and can be contacted day or night; and it is not too much to say that the Marconi depots operate a day-and-night service.

The growth of servicing requirements over the past twenty years or so has been enormous. Whereas, at the time of the first world war, a large passenger vessel would carry only a fairly simple transmitter and receiver, a comparative vessel to-day will be equipped with MF, HF, VHF, and radiotelephone transmitters, various receivers, radar, direction finder, echo-sounder, SRE, and, in addition, the lifeboats will be fitted with wireless communication equipment. It will be appreciated that this elaborate installation calls for considerable technical skill and organisation for its maintenance. In addition to thousands of deep sea ships, the Marconi Marine Company services wireless equipment in hundreds of trawlers. It is to meet this ever-growing demand for servicing that the Company has extended the technical facilities available at all its depots throughout the world.

As a result of the deliberations of the International Conference on Safety of Life at Sea held in London in the early summer of 1948, far greater calls will be made in the future upon the servicing organisation and the depots of the Marconi Company, for whereas, formerly, the installation of direction-finding apparatus was compulsory only in passenger ships of 5000 tons gross and upwards (although, of course, many other ships fitted it voluntarily), under the 1948 Convention all ships of 1600 tons gross and upwards will, when engaged in International voyages, have to carry such apparatus.

Another big change when the new Convention comes into force, which is expected to be on January 1, 1951, will be that all ships of 1600 tons gross and upwards will be required to keep continuous radio watch, either by means of a Radio Officer or, when he himself cannot listen, by means of an auto-alarm. Further, all cargo ships between 500 and 1600 tons gross will have to fit either a radiotelegraph or a radiotelephone installation, and carry a Radio Officer or a qualified radiotelephone operator.

A higher standard of radio equipment has also been prescribed, and the minimum range of the main radio installation for ships of 1600 tons gross and upwards will in future be at least 150 nautical miles. There will be corresponding increases in the normal ranges of emergency equipment.

As for radar, it was felt that the time had not yet come to make the installation compulsory. In order to provide trained personnel for the maintenance of the ever-growing number of Radiolocator equipments being fitted in all types of ships, the Marconi Marine Company opened radar schools for depot technical staff and Radio Officers. All the Marconi depots at home and abroad now have radar-trained personnel available for the servicing of Radiolocators, and all Radio Officers appointed to ships fitted with Radiolocators have been thoroughly trained in their maintenance and operation.

In recent years there have been great developments in VHF communication, and a large number of radio telephone equipments employing this system is now in use in small craft, which also make great demands on Marconi servicing facilities.

CHAPTER THIRTY-FIVE

A Comprehensive Ship Service

It is not unfair to suggest that the depots which serve the London and Liverpool areas are responsible for maintaining a larger amount of tonnage in full wireless efficiency than falls to the lot of other United Kingdom establishments. But each and every one of the depots has an important place in the organisation for servicing ships of all types and classes. Our Mercantile Marine is composed of great passenger liners, cargo passenger liners, tramp ships or general utility vessels, seagoing oil tankers, refrigerated ships, colliers, coasters, coastal oil carriers, and various smaller craft, all of which play their part in maintaining our sea trade at home and overseas. Our fishing fleet is expanding and, as previously mentioned, this provides a large proportion of the Company's business; and competent and adequate staffs must be available at the fishing ports to give that service which is necessary to maintain the trawlers and other units of the fishing fleet in full efficiency. The work of the depots, therefore, varies according to local demands. Hull and Grimsby and Lowestoft, Fleetwood, Leith and Aberdeen, are all spokes in the wheel which turns to keep ships in service.

Glasgow, Newcastle, Liverpool, and Belfast are situated in the shipbuilding districts and, in addition to the regular servicing of ships using the ports under their supervision, the respective depots are responsible for the installation of wireless apparatus in the new ships as they are launched and fitted out. During the past few years the output of new tonnage from British yards on the Clyde and East Coast of Scotland, the North-East Coast, Birkenhead and Barrow-in-Furness, Belfast, and other shipbuilding districts has been round about 1,000,000 tons gross per annum, and 85 to 90 per cent. of that tonnage is fitted with Marconi wireless apparatus and other radio aids to navigation.

Similarly, the completion of new fishing vessels provides a great deal of installation work. Such a large total of new tonnage coming into service every year to replace that which has become obsolescent or which is required for increased sea traffic means a great deal of work for the depot staffs who carry out installations either with or without the assistance of skilled technicians sent from the Company's headquarters; and the depots must be ready and able speedily to undertake these duties, however great the pressure may be.

Team work in connection with the service given is, of course, of the highest importance, and all who have dealings with the various depots, large or small, are greatly impressed with the spirit which animates every member of the depot staffs to give of his best to maintain the Company's tradition of service to the shipping industry. This is one of those invisible assets of the Company upon which too high a value cannot be placed. The spirit of service pervades the whole organisation from top to bottom, now as always. This and the high quality of the equipment is responsible for maintaining the Marconi Company in its position as the premier wireless organisation in the world.

The London Depot

Let us first deal with London, where a new depot, planned and built in accordance with the Company's aim to give the very best possible service to ships, was opened in 1949. The movement of shipping in the London area increases year by year, especially now that practically all the pre-war regular passenger ships which survived the war are back again in commission and new additions have been made to fleets engaged in Far Eastern, Indian, Australian, New Zealand, and South African services from this country.

Until 1916 the Marconi Marine Company's service work for shipping in the London area was directed and supervised from the Head Office, which at that time was situated at Marconi House, Strand, London; but the ever-growing wireless needs of the area necessitated a more comprehensive service than could be provided with ease from the Head Office. In order to meet these demands, therefore, a Marconi Service depot was established at East Ham in November 1916.

This depot, more convenient to the central dock area of London, continued to act as the focal point for the fitting and maintenance of Marconi equipment on board ships using the Port of London. These depot premises were completely destroyed by enemy action in January 1943. Two of the Company's staff lost their lives in this bombing.

Temporary premises were found, and as soon as circumstances permitted, work was begun on a new depot, Marconi House, Wakefield Street, East Ham, which was completed in 1949. In designing the layout of the new Marconi House, East Ham, the opportunity was taken to create a completely new concept in planning the offices, stores, and workrooms so that the large and increasing business of the area could be carried out in the most efficient and expeditious manner.

The area for which the East Ham depot is responsible has grown until to-day the new Marconi House serves shipping not only in the Port of London, but all other ports from Ipswich to Littlehampton. In addition it acts as a central store for Marconi marine equipment for the whole of this country and abroad.

The manager at East Ham is Mr. C. T. Sanders, who commenced sea duties in 1909 in the Cunard liner *Carmania* as Radio Officer. During his ten years' sea service he served in many important ships, finally in H.M.S. *Olympic* from October 1917 to April 1919. Being at sea throughout the 1914-1918 war, he had many exciting experiences. Serving in the *Arcadian* when war broke out, this vessel was part of the Transatlantic convoy which transported the first Canadian Expeditionary Force to the United Kingdom.

Mr. Sanders left the sea in April 1919 to take up shore duties at the Liverpool depot as acting inspector, being appointed inspector in 1921. In 1926, during the absence of the superintendent, Mr. J. Connell, he took charge of that depot, and in 1932 he was appointed as the Company's representative at Hull, remaining at that depot until his appointment as Depot Manager at East Ham in 1944, succeeding Mr. A. J. Chesterton, who had been in charge of the depot since 1928.

The East Ham depot gave the nation valuable service during the two world wars. As an historical record it should be noted that shortly after the commencement of hostilities in 1939 a base was established at Dover to deal with Admiralty requirements, and early in 1940 bases were also established at Sheerness, Harwich, and Ipswich. In order to cover the additional work in this area it was found necessary to double the technical staff.

From September 1940 until January 1943, the Admiralty Port Wireless Officer, Lieutenant-Commander H. J. Mason, R.N., was accommodated at the East Ham depot premises, which established close liaison between the Admiralty and the depot. As a point of interest, before Lieutenant-Commander Mason retired in August 1945, he stated 'The Marconi International Marine Communication Co. Ltd. has been of the greatest assistance to this Department throughout the war period'.

At the commencement of hostilities in 1939, the activities of the depot were concentrated on the equipping of all types of war vessels to Admiralty specifications in addition to the Mercantile Marine.

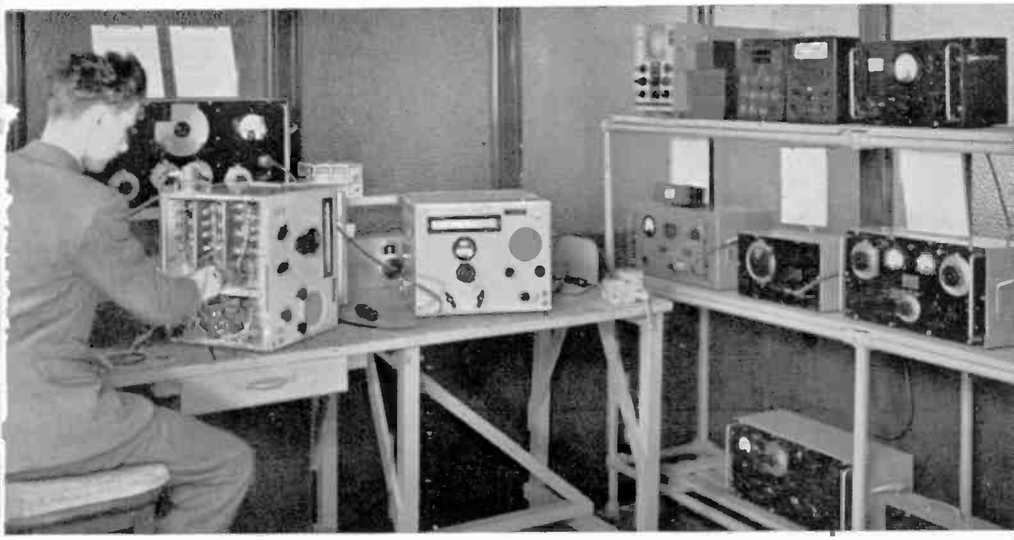
Early in 1944 arrangements were made to cover 'D' Day requirements, and by the end of May the same year some twenty-three bases extending from Ipswich to Littlehampton were established in order to cover the servicing of landing craft of various types, but, happily, as a result of the first landing being entirely successful, these bases were not used to any large extent.

After 'VE' Day the depot was engaged in refitting installations on mine-sweepers, before being returned to their original owners for fishing purposes.

right: *The Marconi Depot, East Ham, London*

below : *The Receiver Test Room*

at foot of page: *The Main Stores*



many important appointments before being placed in charge of Liverpool. Not the least important task which he was called upon to undertake, however, was to assist in the training of wireless operators during the war of 1914-1918. He was for many years the Company's representative in New York, and until 1931 he was in charge of the Company's affairs in the United States, after which he assumed control of the Liverpool depot.

The port of Fleetwood comes into the north-west area, but the depot has its own manager and technical staff. A considerable number of trawlers are serviced at this port. The depot manager is Mr. H. M. Palmer.

The Cardiff Depot

Another British depot which is now housed in a newly-equipped building is that at Cardiff, where the depot manager is Mr. J. M. O'Meara, who entered the service of the Marine Company in June 1915, and during the first world war served in ammunition transports, troop, and hospital ships. In 1921 he served aboard the M.V. *Seminole*, the first ship to be diverted three times in one voyage by the then new 'Marconi Long-Distance Service to Ships at Sea' through Poldhu High Power Spark Station.

After serving in other important vessels, he was transferred ashore at Swansea to become inspector's assistant under the jurisdiction of the Cardiff depot. Promoted to inspector in October 1934, he was given charge in early 1935 of the newly-created Swansea Depot.

In 1944 he served as joint depot manager at Glasgow depot before being appointed to Cardiff.

The depot is situated in the heart of Cardiff's shipping area in Mount Stuart Square, only two minutes away from the main dock entrance and the Mercantile Marine Office. The building (formerly Pacific House), was redesigned and in part rebuilt to meet the depot's special needs. In addition to spacious offices and stores accommodation there are two well-equipped workshops and a test room; a lecture room and a very bright and comfortable waiting room for Radio Officers. The lecture room is used for the exchange of technical information between members of the staff, and lectures and discussions on technical subjects take place from time to time.

An important service carried out by the Cardiff depot, which now includes the area previously controlled by the Swansea depot is the recalibration of ships' direction finders.

DF Calibration Service

During November 1946, the Marconi Company installed equipment in the pilot boat *Lady Seager* stationed at Barry Roads, and, with the approval of the pilotage authority, a joint experimental Calibration Service was inaugurated. The success of this experimental service was almost immediate and many ships' masters and marine superintendents have testified to its utility. Telephone calls booking DF calibration reservations have been received direct from owners' offices as far away as Scottish and other centres.

The equipment installed in the *Lady Seager* not only anticipated but conformed to the requirements laid down in Ministry of Transport circular M.305 dated March 1947, entitled *Notice to Shipowners, Masters, and Marine Wireless Companies.*

The work involved in each DF calibration is carried out by experienced members of the marine technical staff of the Company's Cardiff depot. During the first eight months the experimental service was in operation some 128 shipborne direction finders were successfully calibrated.

Swinging the ship as for compass adjustment has been adopted as the most satisfactory method, due largely to the ease with which the calibrating officer can control the rate of angle change as necessary. Compass adjustment can often proceed simultaneously since the Marconi Company have taken the precaution of providing an independent 'Pelorus' for use where required.

The service is available to all ships at all times, excluding hours of darkness, and a brief period each Friday forenoon when the *Lady Seager* is bunkering.

The Southampton Depot

The fitting and maintenance of the wireless installations in ships using all ports between Bognor Regis and Portland come under the jurisdiction of the Southampton depot, which has, perhaps, as great a variety of work to carry out as any other depot, for it is the home of the largest liners.

The technical staff at this depot were responsible for the fitting of the first Marconi Radiolocators in the British Mercantile Marine, namely, in the Cunard White Star liner *Mauretania*, the Orient liner *Orontes*, and Elder and Fyffe's *Matina*. They have also fitted Radiolocators in the Royal Mail Lines' *Andes* and *Alcantara*

As most of the large ships based on the port of Southampton are equipped with comprehensive wireless installations, and spend so little time in port, the work of maintenance is required to be carried out with great despatch.

Apart from the many large passenger liners using the port of Southampton, the depot has to look after the wireless installations in the cross-Channel and coastal ships operating in this large area.

In addition, the Southampton depot has carried out the fitting of wireless telegraph and telephone installations, etc., in many yachts and small craft constructed at the shipyards in the area—Southampton, Cowes, Gosport, Hamble, Porchester, Lymington, Itchen, and Hayling Island. It may be of interest to note that in recent years the depot has fitted equipments in the King of Norway's yacht *Norge*, Lord Camrose's *Virginia*, the Hon. Max Aitken's *Miramichi*, Sir Bernard Docker's *Shemara*, Lord Iliffe's *Radiant*, the Hon. Neville Berry's *Explorer*, the Hon. Denis Berry's *Islay Mist II*, Sir George Preston's *Heniesta*, Sir Hugh Dawson's *Verity*, the Hon. Morton Weir's *Titan*, Mr. Jack Billmeir's *Auronia*, etc.

Another claim made for Southampton is that it was the first port in the country to have the VHF system installed. This was to the order of the Southampton Harbour Board and was the first in the country to be working commercially.

The depot manager at Southampton is Mr. C. E. Tuck. He went to sea as a Radio Officer in 1920, having previously served in the Royal Engineers (Signals) in 1914–1918. He had varied experiences in cargo vessels and passenger ships such as the *Empress of Britain* and the *Oropesa*. He was appointed inspector ashore in 1925 and held various appointments at home and abroad. In 1942 to the end of the last war he served as depot manager at Gibraltar, and upon his return to the United Kingdom was appointed to the position he now holds.

Scottish Depots

The opening in 1949 of a new Marconi depot in St. Vincent Street, Glasgow, began another chapter in the Company's history of service to shipping on the west coast of Scotland, a service which started thirty-nine years ago when the first Marconi base in Glasgow was established in 1911 to provide local, readily-available fitting and maintenance facilities for the rapidly growing numbers of Marconi-equipped vessels calling at ports in the Clyde area as well as for the fine ships built at its many famous yards.

Since those comparatively early days of marine wireless communication the great concentration of shipping in this area, extending from Mallaig to Stranraer, has made ever-growing demands on the service facilities of the Glasgow depot, and immediately after the war planning was begun for a new Marconi House which would be better fitted to deal with the heavy requirements of marine radio communication and navigational aids under present-day conditions. Here at the Glasgow depot every possible radio need of modern shipping can receive attention.

A good deal of the work undertaken by the Glasgow depot is in connection with new tonnage, although in recent years, just after the war, many ships which had been used for trooping came to the Clyde for reconditioning. Some of the new ships required the whole range of Marconi apparatus. The New Zealand liner *Rangitiki*, for example, was fitted with the 'Oceanspan' W/T installation, the 'Lodestone' direction finder, sound-reproducing equipment and the Radiolocator. The first Radiolocator to be fitted in Glasgow was in the British India Company's liner *Dara*, but this instrument has also been fitted in the Canadian Pacific liner *Empress of France*, and other ships. Numerous smaller vessels like those of the Coast Lines, Burns Laird, MacBrayne, and other shipping companies are all fitted with Marconi apparatus.

The Glasgow depot manager is Mr. J. P. Dawson. He joined the seagoing staff just prior to the first world war, and served at sea throughout hostilities. He has served at depots at home and abroad, including Cardiff, Newcastle, Hong Kong, Singapore, and Southampton. He was appointed depot manager at Glasgow in 1945.

On the Scottish east coast, Leith also is in the centre of a shipbuilding district. Henry Robb's yard is responsible for the construction of a fairly large number of high-class ships; and not far away are the yards of the Burntisland Shipbuilding Company, and the Caledon Shipbuilding and Engineering Company at Dundee. All these yards provide a demand for new installations for the vessels built. Much of the maintenance work carried out by this depot is in respect of trawlers.

The depot manager, Mr. A. F. Harrison, went to sea as a Marconi Radio Officer in 1917, his first ship being the Cunard liner *Carmania*. He served on various ships trading to all parts of the world until 1936, when he was appointed technical assistant at Leith. He became depot inspector in 1945 and depot manager in 1948.

At Aberdeen, although the greater part of the time worked at this depot is taken up with servicing the fishing fleets sailing from north-east Scottish ports, there are many calls from coasters and occasional calls by deep-water ships. An important part of the work is the fitting and maintenance of Echometers, radio telephone, and direction finders on seine-net drifters sailing from the ports of the Moray Firth. These are small wooden vessels of from forty to ninety feet long. There are bases at Peterhead, Fraserburgh, and Buckie, and extensions are contemplated to Macduff and Lossiemouth. The depot manager is Mr. V. G. Oastler, who joined the Company as an experienced Radio Officer in 1929. Some two years later he was transferred to the Sounding Device Section and specialised in echo-sounding equipment, installing and demonstrating Echometers on trawlers in the districts of Hull and Grimsby.

North-East Coast Depots

Newcastle also, being situated in the centre of one of the most important shipbuilding districts, has a great deal of work to do in fitting out new ships. Some of the Tyne-built vessels are of a highly specialised character; but two of the largest and most important ships to leave this area in recent years were the reconditioned P. and O. liner *Strathaird* and the Shaw Savill liner *Dominion Monarch*. The former was fitted with 'Worldspan' equipment, two 'Yeoman' receivers, 'Lodestone' direction finder, 'Seagraph' Echometer, and a very comprehensive broadcast and gramophone reproducing equipment.

The *Dominion Monarch*, which came to the Tyne for reconditioning, was completely stripped of her original wireless equipment, and fitted with a complete range of Marconi equipment including Radiolocator. The installation of the Radiolocator was particular successful. Fog was encountered throughout the five-day sea trials. Due to the excellent picture provided by the Radiolocator, kept in almost constant use, the trials programme was carried out completely without hitch. A sound-reproducing equipment was installed with a total of seventy-six loud speakers throughout the ship, together with microphones for the relay of announcements, gramophone records or music from the ship's orchestra.

Many other interesting vessels require the attention of the depot, such as whale factory ships. Two of these vessels have been fitted with Radiolocators; and another addition to their comprehensive equipment was the 'Transarctic' radiotelephone and transmitter. This is used by the whale catchers for 'homing' to the factory ship. The fitting of this equipment was responsible for an example of the 'team work' previously mentioned. It was a rush order and the clockwork mechanism could not be designed and made in time; but the Glasgow depot came to the rescue and very quickly designed, made, and sent on the necessary parts. The fitting was completed and Glasgow had the satisfaction of picking up the beacon signals during tests at Newcastle quayside.

The normal activities of the Newcastle depot in respect of maintenance are with tramps, tankers, and colliers. In addition a good many foreign vessels have to be serviced. The fishing season also brings a certain amount of work to the north-east coast area, which extends from Whitby to Seahouses, Northumberland. The depot manager is Mr. D. Dodds. He joined the Company as a Radio Officer in 1917 and was appointed Inspector's Assistant in 1924, serving at various depots until appointed depot manager at Milford Haven in 1944, and of Newcastle in 1948.

East Coast Depots

On the east coast of England, we have Hull, Grimsby, and Lowestoft. The depots at these three ports are mainly concerned with the fishing industry, although in addition Hull is used by coastal as well as deep-sea vessels. The Hull depot serves between 150 and 200 vessels of the fishing fleet and has over 100 Radio Operators serving in trawlers. The equipment carried by the larger trawlers is as comprehensive as that in much larger deep-sea vessels. The equipment in many trawlers comprises 'Oceanspan' transmitter with its associated receivers, 'Lodestone' direction finder, 'Seagraph' Echometer, and, in some cases, Radiolocator radar equipment. Experience has shown that, due to the robust construction of this apparatus, it stands up well to the arduous conditions encountered by trawlers, and the standard of communication from these vessels is very high.

The first fishing vessel to be fitted with the Marconi Radiolocator was the 650-ton Hull trawler *Benella*, owned by Messrs. J. Marr and Son. The Radiolocator is exceptionally useful to the fishing fleet. In the past boats with full catches have often been delayed by poor visibility, at best having to grope their way to market through congested areas. With the aid of the Radiolocator, which shows clearly the relative positions of other craft in the vicinity, the loaded boat need no longer be fogbound, but can 'see' her way with greatly increased ease and assurance to the port where she can market her catch ahead of the others. The example of the *Benella* was followed by other boats built for the same owners; and several other trawler owners have fitted their vessels with the Radiolocator.

In addition to her Radiolocator the *Benella* was fitted with the latest Marconi communication equipment and other navigational aids. For communication she had an 'Oceanspan' medium and short wave transmitter, and a 'Yeoman' receiver. A second 'Yeoman' and a Marconi telephony transmitter were installed for speech communication. The *Benella* was also provided with 'Oceanic' sound-reproducing equipment for entertainment and announcement purposes. This installation supplied five loud speakers in various parts of the boat, and could also be switched over to operate a loud-hailer. A Marconi direction-indicator was also fitted in the *Benella* as an additional aid to navigation in thick weather. This instrument is also useful for locating other vessels of the fleet which may be fishing well on a good ground. To complete her navigational aid equipment, this trawler had the two latest types of echometer—the 'Seavisa' and 'Seagraph'.

The very complete radio and radar installation in fishing vessels like the *Benella* demonstrates the fact that the modern fisherman recognises the value of these communication and navigational aids in his work, from the points of view of both safety and efficiency. Fishing craft of to-day are often equipped with larger wireless installations than many a deep-sea ship, and they use them to the full; for there is no room in a trawler for a piece of apparatus that does not play its part in the everlasting struggle to win a living from the sea.

The depot manager at Hull is Mr. J. R. Thomson. He joined the Company in 1911 and served as a Radio Officer on a variety of vessels. His sea service includes periods in the first *Mauretania* and also in the White Star liner *Olympic*, of which he was Chief Radio Officer for twelve years. He was appointed inspector to the East Ham depot in 1936, later transferring to Hull where he became depot manager in 1944.

Grimsby's list of Marconi-fitted trawlers is now round about 300, and although the service required is practically the same as that at other fishing ports, Grimsby plays a very important part in maintaining Britain's fishing fleet in complete efficiency so far as Marconi wireless and other apparatus are concerned.

The Lowestoft depot embraces the whole of the East Anglian area, and during the herring fishing some 400 to 500 vessels fitted with Marconi apparatus are engaged. The Lowestoft depot suffered from enemy action during the war, but has now been completely reconstructed. Mr. F. H. Hunt, who was appointed in charge of the original base, is still there as depot manager.

Wireless service was provided for the vessels of the East Anglian fishing fleets in September 1933, when the first Marconi depot in the area was opened. Trawler owners and skippers, never slow in assessing the worth of a new aid to fishing, were quick to realise how useful radio-communication could be to them in their business, and the first boats using the ports of Lowestoft and Yarmouth to have Marconi radiotelephone sets installed were fitted before the month was ended.

The advent of wireless communication in East Anglian fleets was quickly followed by the echometer; and trawler owners, impressed by the potentialities of this apparatus, both as a navigational aid and as a fish-locating device, soon took to the new aid to fishing.

Other 'Home' depots for servicing ships are established at Avonmouth (manager, Mr. N. C. Bow), Belfast (Mr. G. F. Lamb), Dublin (Mr. J. Fogarty), Falmouth (Mr. C. J. A. Gill), and Milford Haven (Mr. R. McRae); and bases are maintained at the more important smaller ports in each depot area.

Depots and bases are allocated at all the principal ports throughout the world, the most important of which are Port Said, Bombay, Calcutta, Singapore, Hong Kong, Capetown, Durban, Buenos Aires, and New York; and these, together with those established by Associated

Marine Companies throughout the world, all of which are staffed by experienced technical personnel, afford servicing facilities to all Marconi-equipped vessels, irrespective of ownership or flag, at well over two hundred ports throughout the world.

CHAPTER THIRTY-SIX

Opportunities for Radio Officers

ANOTHER important duty which is carried out by the various depots is in supplying ships with competent and efficient Radio Officers. Radio Officers are assigned to ships through the depots, East Ham being responsible for the supply of men to ships operating to and from London; Newcastle for ships using the Tyne; and so on. There are to-day over 2200 Marconi Radio Officers serving at sea, a fact which indicates the amount of activity which must be displayed at the depots in dealing with such matters as appointments, leave, pay, etc. It is also an indication that young men with the salt of the sea in their blood, looking for an occupation which will satisfy their desire for a fuller life and enable them to render a necessary and valuable service to their country, are attracted by the opportunities which the wireless service has to offer.

The remuneration of a Radio Officer consists of salary, seniority pay where applicable, and allowances. The monthly rates of pay, with food found, range from £20 a month for officers with less than six months' experience at sea to £40 for three years and over, according to the class and size of ship. There are in addition various allowances with extra pay for prolonged service abroad, for duty in tankers, and for appointments in foreign ships. Leave on pay for officers serving in deep-sea vessels is twenty-one days per annum, and eighteen days for Radio Officers serving in home trade vessels, as well as extra leave for Sundays spent at sea.

In addition to a good salary, which increases in the course of years, the marine wireless service gives opportunities for seeing the world—countries, towns, cities, and ports which are only names to those with shore occupations. It provides contacts with the peoples of other nations, of all sorts and conditions, with experience of their customs, ways of living, their attitude towards life, their forms of national and local government. A Radio Officer does not spend all his seagoing life with one shipping company as many navigating and engineer officers may do. He has opportunities for serving in many types of ships—liners, tramps, tankers, whalers, whale factory ships, etc.; and his work, therefore, is of a far more varied character than that of other seafarers.

It has also been suggested that a Radio Officer has more leisure for study and recreation than other members of the crew; but although this may or may not be true he certainly is the one who is relied upon by his shipmates for maintaining contact with the world outside the ship. His status on board is that of equality with the navigating officers.

The success of the marine wireless service in peace and in war indicates that a Radio Officer must possess qualities and initiative which enable him to deal with any difficult situation which might arise. His work requires and develops an efficiency in organisation and in the execution of his duties.

Early Days at Sea

In those early days, before the advantages of the new invention of wireless were fully appreciated, wireless was considered to be something of a nuisance imposed on ships by regulations. The first Radio Officers frequently came up against men who had been at sea more years than they had been on earth and who still held scorn for this 'new-fangled contraption'.

Some shipmasters had spent many years of their lives on ships without wireless; they had sailed the seven seas and helped to build up Britain's supremacy at sea before ever wireless was thought of. They were averse to carrying another 'passenger' on the articles 'merely for the sake of a few signals'; and, generally, the rest of the officers were more or less forced to take their cue from the master. The members of the deck and engine room departments both looked upon themselves as trained professional men with four or five years' hard training behind their certificates of the lowest grade. They were, therefore, inclined to look somewhat askance at the six to twelve months' certificated operator, and referred to him cheerfully as 'Sparks'.

The writer remembers Captain W. H. Coombs, President of the Officers' (Merchant Navy) Federation, pointing out on one occasion that a similar state of affairs came about shortly after the passing of sail to steam, when the adoption of mechanical means of propulsion brought the ships' engineer into being.

Many of the sail-trained masters and officers resented this march of progress to mechanised propulsion. They particularly resented the essential service of engineer officers to relieve them of the propulsion side of a ship's voyage. The engineer officer was a man bred in a different tradition, who first went to sea as a grown man, not as a malleable youth. Most of the deck department, said Captain Coombs, 'of course, behaved as gentlemen and treated these newcomers to the sea business as brother officers—experts in a new technique. Others, unfortunately, regarded them as intruders, and ill-used the inherent powers of ship masters by setting out to make life as unpleasant as possible and to minimise the essential value of their skill and services in that co-operative effort which is so necessary for a ship's success.'

This controversy still existed to some extent when the first seagoing ship was fitted with Marconi's Wireless Telegraphy; and many are the stories told by Radio Officers of their experiences in those early days. One of those pioneer Radio Officers, in reminiscent mood, has described how on one occasion the master found the barometer of more than usual interest. Apparently he had been finding out something about wireless at the last port of call, for he sent a quartermaster along to the wireless cabin with a message asking the Radio Officer to get the weather report from Choshi, in Japan. Although this was well beyond the normal range of the set, the Radio Officer was able to get a message through and copy the reply. This was sent to the master, who was now on the bridge. This was then sent back to the cabin with a message to the effect that it was of no value as it did not contain the particulars the master required. So the operator called up Choshi again, but this time there was no reply. The second officer then came along to the wireless room and said the master was 'cussing a treat.'

'For Heaven's sake', he said, 'get some more information'. The Radio Officer did his best, but to no purpose, but while retuning his receiver he caught a feeble signal, and recognised his own call letters. It was the Radio Officer of another steamer who had heard his efforts to get through to Choshi and wanted to know what kind of weather the first ship was having. He was told and then replied: 'Get me an official weather report from your navigating officer and I'll do the same'. After a brief interval the messages were exchanged and, as luck would have it, the first Radio Officer was able to give his captain the information he desired, and more. The two references fitted together admirably and clearly showed the master that the ship was in the track of a typhoon, and course was altered accordingly. The ship managed to dodge the typhoon and got nothing worse than a bad blow.

The chief officer later came along to the wireless cabin and said: 'If you ever want a testimony about that wireless, you go to the "Old Man". He is up there chuckling and rubbing his hands and cannot find anything too good to say about it.' Thus another master was converted.

Accommodation Aboard Ship

The accommodation for Radio Officers aboard ship was not, generally, of a high standard in those early days, especially in the cargo ships, and the wireless cabin was frequently a light wooden structure on deck. It will be remembered that in an earlier chapter appeared a description of the first wireless cabin in a British seagoing ship, the *Lake Champlain*; and for some time thereafter the accommodation for the wireless apparatus and its operation left much to be desired.

The following narrative, which was written from information supplied by Radio Officer V. A. K. Smith, and published in *The Signal*, the monthly journal of the Radio Officers' Union, of June 1924, will be read with some interest.

'It was on March 31, 1924', wrote Radio Officer Smith, 'that our ship weighed anchor and left Bahia Blanca, homeward bound with a cargo of over 5000 tons of grain for Manchester. In the early hours of the following morning a strong southerly breeze sprang up, which by daybreak had assumed gale force. All hatches were examined and everything loose was made secure. Seas were being shipped fore and aft when an hour before noon a tremendous sea broke over the forecastle head, carrying away a drum of heavy wire and half of the railings, together with the two ventilators, all of which fell in number one hatch and "stove" it in.

'The ship, which was then making about three knots, was immediately stopped, and all hands ordered to repair the damage lest the hold became flooded. It was a difficult task, but eventually the hatches were secured and covers renewed. By noon a hurricane was blowing from the south with tremendous force.

'The wireless cabin and the operator's sleeping room were of thick wood construction with an iron girder foundation and overlapped the after well deck occupying one of the most exposed positions on the vessel. After a period of two hours' wireless watch at noon the Radio Officer came off watch and entered his sleeping cabin. Having an hour and a half before his next watch commenced, he took up a book, wedged himself between the chest of drawers and his bunk in order to keep his feet, when, with a terrific crash of timber, the room was plunged into darkness. He felt himself being jammed between the bunk and the chest of drawers and violently thrown about.

'Imagining he was now on the well deck inside the wrecked cabin, he lowered his arms and felt about for some time, but to his horror he began to sink—his sleeping room together with the wireless cabin had been washed overboard bodily and he was sinking through the bottom. Opening his eyes he found he was well under the water entangled in the wreckage. He struggled desperately to free himself and endeavoured to rise, but was struck a violent blow on the head by loose wreckage or wireless gear. Luckily he still retained consciousness, but his plight was increased when his left foot became entangled and he began to sink. He had now become frantically alarmed, and unsuccessfully made an attempt to unlace his boot, when fortunately he was able to fix the toecap and thus wrenched it off completely, and it may be said that by this lucky wrench his life was saved and he came to the surface.

'A fair swimmer, it was nevertheless impossible to swim in such mountainous seas, but he managed to board some wreckage of the wireless cabin, and while floating on the crest of a wave sighted the ship. He began to give up hope for he could see no sign of life, but a welcome lifebuoy which came floating towards him dispelled his fears, and he knew that an attempt at rescue was being made. He was able to grab the lifebuoy only to find that the rope was missing. Meanwhile the steamer was coming astern and he could see some of the crew waving to him. By the skilful seamanship of the master, the vessel was manœuvred so as to enable the third officer to throw another lifebuoy, this time quite close, which the radio officer succeeded in grabbing.

'The ship was then getting closer, and he could plainly see the chief officer making signs to him to get into the lifebuoy. He was loth to leave go of the wreckage, but knowing the officers were doing their utmost to save him he got into the buoy. As he was being pulled towards the ship he turned three complete somersaults in the water, but grimly held on. The engines were still going astern, and he thought he would be caught by the propeller, but when quite close to him it was stopped. The ship was still rolling and plunging heavily, and he was frightened of the poop crashing into him; in fact it did come within a foot of his head, when he was suddenly heaved out of the water and willing hands of the officers and sailors pulled him aboard.

'He was bleeding from numerous cuts, and as it was impossible to take him across the sea-swept decks, he was taken to the carpenter's quarters in the poop, and after a good rub down put to bed.

'At the end of his report Radio Officer Smith expressed his deep appreciation of officers and sailors alike who bravely risked their lives to save his. "Their heroic conduct will never be effaced from my memory", he wrote. "I am proud to have sailed with such splendid men. Thanks to their efforts and a good constitution I feel none the worse for my thrilling adventure." '

It may or may not be necessary to add that the above story was vouched for by the master, Captain G. L. Cline; but if additional proof of its truth is required it may perhaps be found in the fact, as mentioned by the Editor of *The Signal*, that Mr. Smith, who had lost all his personal effects as a result of the incident, fortunately had 'had the foresight and prudence to take out a policy with the A.W.C.T. Insurance of Personal Effects Scheme before sailing, and his claim of £60 in this respect was fully met a few days after his arrival in England'.

As a result of this experience the Radio Officers' Union called the attention of the Mercantile Marine Department of the Board of Trade to the danger of wireless cabins being fixed in an exposed position and constructed of wood; and soon thereafter the Department instructed their surveyors to pay careful attention to the strength and security of the wireless house and to satisfy themselves that it was sufficiently strong to withstand the force of heavy seas which might strike on or against it.

If we compare those light structures with the illustrations reproduced in this book of the wireless rooms in some of the modern British ships, we get some indication of the tremendous progress which has been made, not only in wireless itself but in the accommodation for its installation and operation.

The accommodation for the officers when off duty, for sleeping and resting, is generally of a high standard in ships built since the war. There was admittedly some justification for complaints which were made, not only by the Radio Officers but by other seagoing officers and ratings in the Merchant Navy, regarding accommodation in some pre-war-built ships; but frequently when these vessels are being overhauled, advantage is taken of the opportunity to improve the accommodation; for the modern shipowner is fully aware of the effect that good sleeping and dining accommodation, and the provision of facilities for rest and recreation, can have in creating an environment which makes all the difference as to whether a ship is manned by a contented or a disgruntled crew.

It is true that more remains to be done in this respect, but progress is being made; and it is good to read from time to time such phrases as: 'The accommodation provided on this vessel is first-class, and the Company is to be congratulated for the thought which has been given to the comfort of the officer personnel'.

That is a quotation from a recent issue of the official organ of the Radio Officers' Union which, in the past, has been very critical regarding such accommodation. Like other seafarers the Radio Officers deserve the best accommodation which it is possible to provide; for in the comparatively short time which has elapsed since the first radio signal was sent and received from a merchant vessel, Radio Officers have built up a tradition of service second to none, and their bravery in face of danger, both in peace and war, has established a common bond with all other seafarers.

Stories of Peacetime Duty

Radio Officers are proud of their job and of the records they have established. Here is a story of peacetime duty which earned the admiration and praise of the captain of the great German liner *Europa* just before the last war. It concerns a British ship named *Blairgowrie* which sailed from Glasgow in February 1935. She encountered abnormally bad weather towards the end of the month in the North Atlantic, when she foundered with all hands. The Radio Officer was

C. J. Taylor; and here is the tribute paid to him by the commander of the *Europa,* which answered the *Blairgowrie's* distress call. Captain Scharf said: 'The captain of the *Blairgowrie* and his wireless operator behaved like men in their last moments. Their messages came over so clearly that they must have been keeping calm, and we know they stuck to their posts to the end. I should like to write to their relatives to tell them how brave these men were.'

The *Blairgowrie* was a vessel of 3300 tons. Herr Berbig, the first Radio Officer of the *Europa*, said 'there was nothing to show that the sender was in deadly peril and near death. His last signals to the *Europa* were "Pretty hopeless, old man. Don't think we can last another fifteen minutes. Lying right over on our side. Huge seas coming over every second. Will hang on until the last." Then a few minutes later came the signal, "Listing dangerously. Suffic . . . water . . ." then —silence; and nothing more was heard or seen of the ill-fated vessel.'

But let us take a more recent example of the manner in which the Radio Officer carries out his duty in times of peril when steady nerves and a cool head are required. The trawler *Epine* was lost through stranding, together with fourteen members of her crew. The Radio Officer was not among the survivors; but his coolness and courage before and after the stranding received a magnificent tribute from one of his colleagues in another vessel, as the following letter to the Marconi Company shows:

'Dear Sir,

As an old and experienced operator I feel it is my duty to write a few words of appreciation of the cool, calm courage of the late operator of the *Epine.*

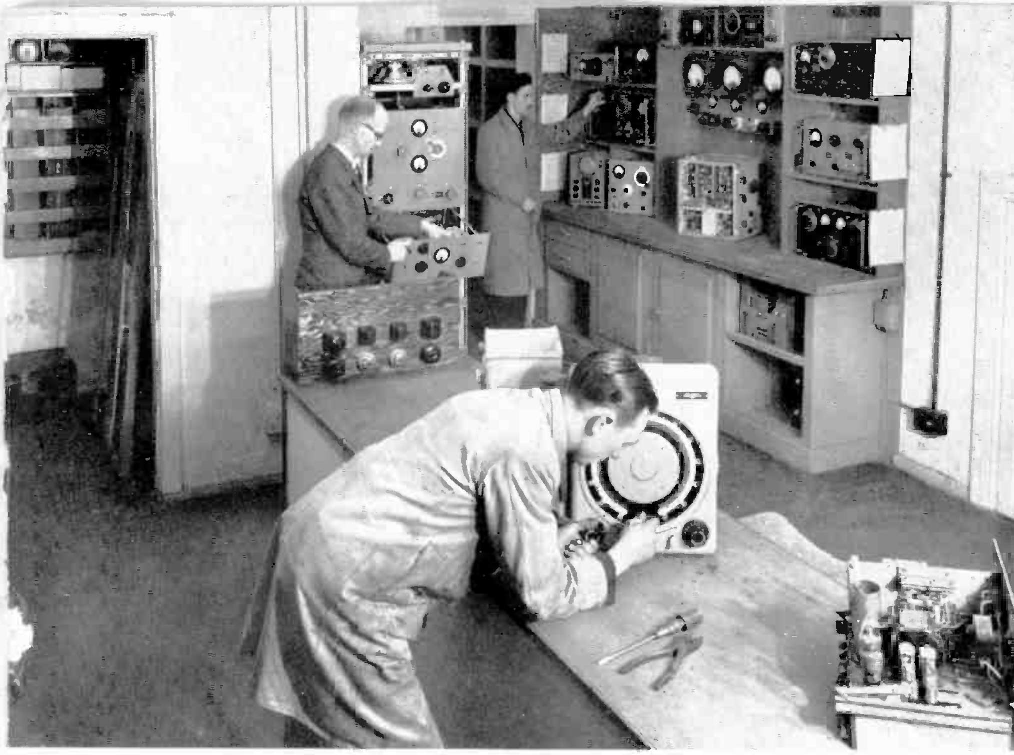
'When his ship struck the rocks at midnight on March 13 in a south-west hurricane, he was left alone in darkness, as the wireless room was down aft.

'He came on the air and passed his SOS report just as casually as if he were giving a routine fishing report. After that he made his way to the bridge and back to the wireless room at hourly intervals in spite of the fact that mountainous seas were breaking over the ship. At four a.m. he said he had managed to struggle aft, but that he did not know if he would be able to get back to the bridge.

'In all my time at sea I have never heard of such calmness in the face of danger. His conduct has made me feel proud to be a member of the same profession.

Yours very sincerely,

(*Signed*) E. M. Scully.'



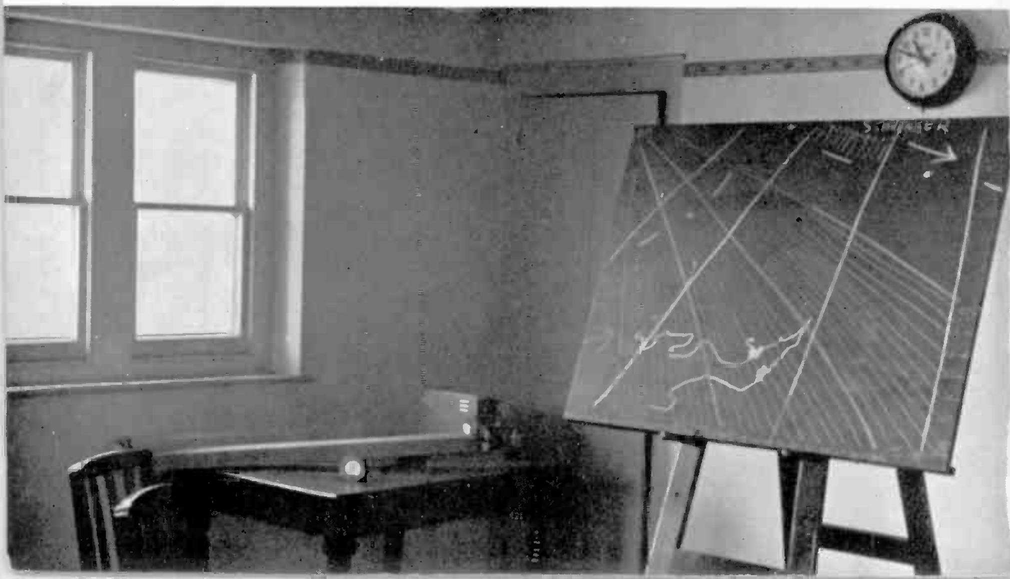
The Repair Shop in Marconi House, St. Vincent Street, Glasgow. Testing gear mounted in racks facilitates the overhauling of equipment

The Main Store, Marconi House, St. Vincent Street, Glasgow

left: *The Test Room at Marconi House, Cardiff*

above: *The Radio Officers' Waiting Room*

below: *The Lecture Room*



Another case which comes to my mind is that of the British steamer *Langleecrag*, which was wrecked off the coast of Newfoundland and broke in half. The survivors, after abandoning ship, were marooned on an island where for some days they lived what was described as a Robinson Crusoe existence. The Radio Officer, B. Stockland, at great risk, returned to the ship on several occasions and, by means of an improvised aerial, maintained communication with the Marconi Station at Belle Isle and thereby was instrumental in obtaining assistance.

CHAPTER THIRTY-SEVEN

Wireless Staff Afloat and on Shore

ALL these gallant acts which have been recorded, both in peace and in war, indicate to my mind not only the devotion to duty of the Radio Officer but his resource and alertness in difficult circumstances, and, above all, his high moral character. I have previously said that the work of the Radio Officer requires and develops efficiency in organisation. I would be inclined to add also that it develops business acumen. I could give examples of this, but no one brought into daily contact with the wireless service at sea will dispute the statement.

Is it, therefore, surprising that the management of the various departments in the wireless organisations is almost exclusively in the hands of men who formerly served on the sea staff? We have seen how the majority of the depot staffs of the Marconi Marine Company began their careers as marine Radio Officers. At one depot I recently checked over the staff. I found that the depot manager, the chief inspector, twelve technical assistants, and two of the clerical staff had previously served at sea as Radio Officers. Of the two on the clerical staff, one had been injured at sea and the other had suffered ill-health as a result of war service.

The marine wireless service is a profession which offers as bright an outlook as any other department of the Merchant Navy, not excluding that of the deck officer. Since wireless became a concrete commercial factor hundreds of remunerative posts the world over, carrying responsibility and social status, have been opened up and filled by men who began their careers as seagoing operators.

The history of the Marconi Companies abounds with the names of Radio Officers who have played their part, sometimes a very arduous part, in the development of wireless; and credit must be given to those early pioneers who joined the organisation at the dawn of the present century for their work in laying the foundations upon which the success and development of the wireless industry have been built. They believed that they were assisting at the birth of a new industry which would ultimately benefit not only the men at sea in providing additional safety for themselves and the ships in which they served but mankind in general. The world owes much to those enthusiastic young men, who helped to establish wireless telegraphy, responsible for saving hundreds of thousands of lives, as well as the many amenities which have followed as a result of Marconi's great invention.

I oft-times feel that great as is the praise due to Marconi for his faith and his will to succeed despite all the disappointments and discouragement which he encountered, we are apt to overlook the services of those who helped him both at sea and on land, sometimes going without their small salaries for weeks when there was not sufficient money in the exchequer to pay them. They realised that the Marconi Company was a young company, they hitched their wagon to a star, and in the end their determination and courage and vision received their due reward.

No task was too great, no role too small; whatever work they were called upon to undertake was carried out in a spirit of service for the common good. The staff were required to help in many ways. In the early days of marine wireless the ship's aerial was not a single wire but two wires kept apart by 'spreaders', and it is recalled how on one day an operator would carry the spreaders down to the ship to be rigged and the following day would be asked to transport the accumulators, two at a time, with a pole slipped through the handles.

When only a few ships were fitted with wireless telegraphy, and land stations and other vessels with which to communicate were few in numbers, the actual work of operating the instrument aud sending messages was light, although the Radio Officers were on duty for about eighteen hours a day; but later—and I take as an example the maiden voyage of the first *Mauretania* in 1907—the operators were sometimes kept busy sending messages for more than twelve hours on end, and in making up accounts and abstracts of all the messages sent, so that accounts could be checked at the clearing house on land and everything should be ready by the time the vessel docked.

Some Well-known Radio Officers

Some of these early Radio Officers found opportunities for the exercise of their talents and their experience in other fields. Wireless communication was extending its sphere of activities in many directions apart from the marine wireless service; and if one surveys the radio field all over the world one cannot fail to be impressed by the many former Radio Officers who have reached the topmost rung of the ladder. With television in its infancy, and radar and broadcasting still not fully developed, the future holds no fewer opportunities than the past. The knowledge and experience which a man acquires when serving as a Radio Officer or as a marine technical assistant are of a kind which can be applied in many directions. Binns, Fisk, Ginman, Haley, Sarnoff, are but five of the prominent names in the radio industry of to-day. All were one-time Marconi operators.

Jack Binns had already won his place among the immortals in wireless history when the *Republic's* passengers and crew were saved as a result of his work as a Radio Officer in that ship. He is now vice-president of the Hazeltine Electronics Corporation of New York.

Sir Ernest Fisk, managing director of Electric and Musical Industries, Limited, commenced his career as a Radio Officer. He was one of the two operators serving in the *Lucania* when that vessel was the crack liner of the Cunard Company and when it was sometimes so difficult to get Poldhu's signals that the operator had to go into the 'silence chamber' with a blanket over his head to keep out extraneous noises in order to receive the messages correctly.

Albert H. Ginman is President of the Canadian Marconi Company. He joined the Marconi Marine Company in November 1901 and was Radio Officer in the *Lucania* when a game of chess was being played between two ships at sea. The *Lucania's* opponents were in the American liner *Philadelphia*. He was the officer in charge of the wireless station at Siasconsett, on the American coast, at the time when that station received Binns' distress signals from the *Republic* and sent out the news of the disaster to such ships as were within range, and giving the *Republic's* position, which in short time brought the *Baltic* and other ships to the rescue.

Sir William Haley, the present Director-General of the British Broadcasting Corporation, was at one time a seagoing Radio Officer, He served in merchant ships during the first world war but later entered the journalistic profession. Prior to his appointment with the B.B.C. he was a director of the company which controlled the *Manchester Guardian*.

And Brigadier-General David Sarnoff, the present President and Chairman of the Radio Corporation of America, was once a Marconi Radio Officer. His life story is an indication that those who wish to serve mankind in the higher branches of industry, science, and commerce, can still find opportunities for such service, for Sarnoff was selling newspapers on the streets of New York at the early age of nine. His wireless career began as an office boy in Marconi's American office. It was while acting as operator in charge of a newly-installed radio station on the top of the Wanamaker Store, New York City, that Sarnoff, then barely twenty-one years old, picked up the startling radio message on April 14, 1912: 'SOS, S.S. *Titanic* ran into iceberg. Sinking fast'. For the next seventy-two hours, the young operator sat continuously at his post straining to catch every signal that might come through the ether.

It was from the *Carpathia* and the *Olympic* that Sarnoff began receiving details of the tragedy and the list of survivors. Not until he had given the world the full list of survivors, did he leave his wireless key.

In 1919 the Marconi Company of America became the Radio Corporation of America, and Sarnoff was appointed commercial manager. Three years later he was R.C.A.'s vice-president and general manager, and in 1935 he became its president.

Early Pioneers

But it was within the shore organisation that innumerable opportunities were provided for the early helpers and assistants of Marconi to give their best service. Many of these pioneers have passed on, but their names are still honoured by those younger men who were privileged to work with them. Not all of those early assistants of Marconi served at sea as Radio Officers. Kemp, for example, was recommended to Marconi by Sir William Preece, of the Post Office. Others, such as Franklin, Round, Gray, Vyvyan, and Dowsett, who were to link up with the Marconi Companies in the early nineteen hundreds, found their service on the technical side of the parent company.

W. W. Bradfield, general manager of the Marine Company for many years, joined the parent company in 1897, and for the first quarter-century of the Marine Company's existence (he died in 1925) played a notable part in the development of modern wireless; and it may fairly be stated that he was largely responsible for the efficiency of the marine wireless service and the high standards which it had then reached.

F. S. Hayburn, who joined the Marconi Marine Company in 1904, had spent the first ten years of his business career in the telegraph branch of the Post Office. He was a born organiser, and his capacity in this regard was fully demonstrated during the years of depression between the two wars when he was responsible for reorganising the administration of the Company to meet the prevailing conditions. He was Bradfield's chief assistant until the latter's death. He was appointed general manager in 1927, deputy managing director in the following year and managing director in 1933 in succession to the late F. G. Kellaway, who had followed Godfrey Isaacs as managing director on the retirement of the latter.

Hayburn will long be remembered by many of those who now serve the Company for his encouragement and help in times of difficulty. As one of his colleagues said: 'He had an intense interest in human nature, and a mixture of kindliness and sentimentality unusual in a man of his mental attainments and wide responsibilities'. He remarked on more than one occasion that the characteristic of wireless that attracted him when he decided to offer his services as a telegraph service engineer to the Marconi Company was its humanitarianism; and it was that aspect of the art that had animated his every effort to co-operate in the development of wireless. 'The existence of wireless gear in a ship', he once said to the writer, 'affords master and crew a remarkable sense of security, and this doubtless has a powerful psychological effect for good in the lessening of anxiety and fear. Similar benefit accrues to relatives ashore, and thereby is the sum of human happiness augmented.'

Mr. H. C. Van de Velde succeeded Mr. Hayburn as managing director of the Marconi Marine Company in 1936. The board of directors of the Company was reconstituted when the controlling interest was taken over by the English Electric Company in 1946, and Mr. Van de Velde is now Deputy to the Managing Director.

During the first world war he served with the Royal Flying Corps in France, and in 1919 joined the Marconi organisation as an aircraft wireless engineer. In this capacity he had much to do with the initial organisation of wireless communication on the commercial air routes between England and the Continent and was responsible for the building of the wireless station at the London airport at Croydon. He remained with the Aircraft Department until his appointment as Joint Sales Manager in 1929. In succeeding Mr. Hayburn as managing director of the Marine Company, he brought to that company an experience of management and of the varied applications of wireless to commercial uses which ensured a continuance of the sound and far-seeing policy which had always characterised the direction of the company.

Leadership and Wise Management

It may be that Mr. Van de Velde has not been so much in the public eye as some of his predecessors, but in my view this is probably due to the fact that, in his opinion, the success of any business enterprise does not depend upon one personality alone but can only be achieved through the devoted efforts of all connected with it.

As in the field of sport, teamwork spells success. The forwards in a football eleven cannot score goals without the aid of the half-backs; the backs and the goalkeeper also have responsible parts to play. The wise captain does not obtrude his personality, rather is he the inspiration behind the planning of the movements in which the team as a whole co-operates—'the guide, philosopher, and friend'. He keeps it playing as a team. There is no doubt that it is this spirit of teamwork which impresses itself upon all who are brought into contact with the Marconi organisation. It is the duty of the management to carry out the policy of the directors, but it is the manner and spirit in which this is undertaken that indicates the capacity of those in control.

Marconi died in 1937, but in the thirteen years which have since elapsed the Company has gone from strength to strength, and its present pre-eminence in the field of marine wireless is unquestioned. It was truly said of the great inventor that 'he was a good judge of men', and those to whom he handed on the torch are imbued with the same aspirations that supported him throughout his active life.

A notable example of a Radio Officer being promoted to high executive office is the present general manager, Mr. Ronald Ferguson. As mentioned in a previous chapter he was the Chief Radio Officer in the *Empress of Ireland* when that ship was sunk in the St. Lawrence in 1914 and received a high compliment for his work on that occasion from the President of the Court which was set up to inquire into the causes of the disaster. It was not long afterwards that Mr. Ferguson was offered a very important position with the Canadian Pacific Ocean Services, and he served that company for some time. But his heart was in wireless, and he joined the Royal Flying Corps as a wireless officer. After the end of the 1914-1918 war he joined the Radio Communication Company before that company was taken over in 1928 by the Marconi Marine Company, of which not long afterwards he was made joint general manager.

Not many of the earliest pioneers among the Radio Officers are still with us, but perhaps the one best-known to the shipping community is Mr. J. Lewis, who retired in 1948. It was due to him in large measure that the echometer established itself as an additional aid to navigation in so short a time after its introduction to the shipping world. Mr. Lewis first served as a Radio Officer both ashore and afloat after joining the Company in 1902 and latterly as joint general manager. As chairman of the employers' side on the Radio Officers' Panel of the National Maritime Board since its inauguration down to the year of his retirement, he served not only the wireless companies represented on the panel but the shipping industry as a whole, for in the discussions and the thrashing out of problems which arise in connection with the work of Radio Officers, the tact and wise counsel which he displayed did much towards preserving an atmosphere of understanding and tolerance, and respect for differing points of view, which is required when delicate negotiations are being undertaken.

Mention should also be made of another well-known personality, Mr. A. R. Harding, who joined the Marconi Marine Company in 1910, who served the Company in various capacities, becoming General Manager in 1929. Mr. Harding retired in 1948 and now acts as Contracts Consultant to the Company.

Other present members of the Marine organisation who first served as Radio Officers are the three service managers: Mr. A. J. Chesterton (Depots); Mr. S. Stanbridge (Operating and Traffic); Mr. R. C. Older (Fittings and Stores).

CHAPTER THIRTY-EIGHT

Conclusion

ON AUGUST 12, 1946. The English Electric Company acquired control of Marconi's Wireless Telegraph Company, Limited, who were proprietors of a very substantial holding in the Marine Company. As a result of this new development, the Board of the Marine Company was reconstituted with Sir George Nelson, chairman of The English Electric Company, as its new chairman and managing director. There is no doubt that this association has proved and will continue to prove of the greatest value to the Marine Company, for it will ensure that the whole of the resources of The English Electric Company, as well as Marconi's Wireless Telegraph Company, will be available to it in its future work. Sir George Nelson has stated that he and his colleagues are keenly alive to the world-wide prestige of the name 'Marconi', and that it will be their constant endeavour to ensure that equipment of the latest design and the maximum efficiency shall be installed afloat so that the apparatus and the staff on land and sea can be of the greatest possible service both to those who sail and operate the ships as well as to those who travel in them.

World's Debt to Marconi

We have come a long way during the past fifty years. Half a century ago the transmission of messages without wires over a distance of a score of miles or so was considered a miracle. To-day it is possible for any ship, wherever she may be, to have direct communication with any part of the world. Fifty years ago when ships sailed on voyages to various parts of the world they were immediately lost to human knowledge until, by the seaworthiness of the vessel, the seamanship of the master, and the grace of God, news of them was received from a passing vessel or some foreign port.

They sailed into the unknown. They knew not what they would meet—hurricanes, typhoons, and gales; whether it would be their lot to collide with an iceberg or to hit a half-submerged derelict. There was only the skill and the sixth sense of the shipmaster to envisage what lay ahead and to navigate the ship free from disaster. The crew were in complete isolation. If their ship should meet with accident there was no reliable means for sending a call for assistance.

It is well that we should think upon these things in order to appreciate the blessings of wireless and the beneficent results that have followed since Marconi and his colleagues made his invention available for marine communication. To-day, with the aid of the direction finder, echo-sounder and radar, the mariner is able to ascertain his ship's position with great accuracy even under the most adverse weather conditions; to measure instantaneously the depth of water under the ship's keel, and, in the thickest fog, to 'see' by means of the radar the exact position of all fixed and mobile objects in the vicinity, thus permitting him to navigate with confidence and safety in congested waters. In addition to these electronic navigational aids, the mariner can, through the medium of the world-wide meteorological services, obtain the latest weather reports and can check his chronometers whenever desired by wireless time signals. If, in spite of these wonderful aids to navigation, a ship should meet with an accident any necessary assistance can immediately be summoned.

In this short span of fifty years these benefits have accrued to those who manage and operate our ships and to all who travel across the seas. The debt the world owes to Marconi and those who assisted and followed him is incalculable. It can never be paid; but their reward for the services they have rendered lies in the knowledge that through their efforts the fullest possible measure of safety has been provided for all those who go down to the sea in ships and do business in deep waters. It is this principle of service which has been so fully maintained throughout the past fifty years; it is this principle of service which will continue to inspire all those who serve in the Marconi organisation to-day; and it is this principle of service which has become a tradition to be followed by those who come after them in the future; for there is no greater and more satisfying occupation in life than in service to one's fellow men.

LIST OF ILLUSTRATIONS

INDEX

SHIPS MENTIONED

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