

# Looking Back Over Thirty Years of Radio

*How the Vision of a Great Scientist Has Acted to Perfect Radio Communication and to Develop the Art Through Times of Change and Progress—The Swing from Long Waves and High Power to the Short-Wave, Medium-Power "Beam"*



AT THE BRIDGWATER, ENGLAND, "SISTEMA A FASCIO" STATION "Sistema a Fascio," as some are well aware, being the Italian for "Beam System." The five masts to the left are for reception from Canada, while the five to the right are for receiving signals from South Africa

**N**OT since the July, 1925, RADIO BROADCAST have we been privileged to present an article by Senatore Marconi. In the issue referred to, the article, "Will Beam Stations Revolutionize Radio?" described in the great scientist's own words his experiments with beam transmission, and his feeling of the future of radio transmission along these lines. In the present article, which is in part an address delivered by Senatore Marconi in Bologna, Italy, at the commemoration exercises of the thirtieth anniversary of his first patent in wireless telegraphy, Mr. Marconi describes how wireless has progressed since the earliest days and tells more about his own part in the recent development of beam transmission. He pays, it will be noted, graceful tribute to other investigators in this field, to whom much is owing.—THE EDITOR.

By GUGLIELMO MARCONI

from my boyhood, the experimental discovery of electric waves made by Hertz, in confirmation of the mathematical hypothesis of Maxwell regarding the electromagnetic theory of light, and the brilliant pursuit of such researches made by our great Bolognese physicist, Augusto Righi (to whose memory I always bow with devout admiration) had fascinated my mind, and I soon had the idea, I might almost say the intuition, that these waves might in a not distant future furnish mankind with a new and powerful means of communication which could be utilized not only across continents and seas, but also on ships with a vast diminution of the dangers of navigation and with the abolition of the isolation of anyone crossing the sea.

The happy results obtained over noteworthy distances by means of electric waves have been, in my opinion, due in great part to the discovery made by me in 1895 of the effect of the so-called "antennas" or "raised aerials" connected with both transmitting and receiving apparatus.

Such a device was naturally the consequence of a happy inspiration and our mind never forgets, however great the absence, the place where a first happy inspiration was born.

But during my forced absence from Bologna the nostalgia of my native city often invaded my mind; often enough during the eighty-six times I crossed the Atlantic, during the long periods of time spent in the solitudes of Canada and of Ireland, my thoughts which to many seemed fixed on the study of the apparatus which I had before me, flew far away instead, flew to my dear Bologna, to which I am bound by the most sacred affections and the dearest memories.

Since I left Bologna in 1896 and obtained my first Patent of Invention on the 2nd of June in that year, what immense difficulties have had to be surmounted to attain the purpose which I had set myself, and in which my faith was never shaken, even when illustrious scientists had to express the most discouraging opinions!

It had been objected that the curvature

**S**INCE February, 1896, the date of my departure from Bologna after the first experiments in wireless telegraphy I carried out at the Villa di Pontecchio, my life has been spent far from that city. My absence has been caused by the force of events, which has been greater than that of my will.

Radio telegraphy, which appeared to me destined to connect the thought of all the peoples of the world, required for its development a very great space, and I chose for my first laboratory, the Atlantic Ocean.

From my youth, I would almost say

of the earth would inexorably hinder communications over distances greater than a few tens of kilometres, but I did not believe this and I was soon able to prove by my experiments conducted between the Lizard and the Isle of Wight off the coast of England, across a distance of 300 kilometres, in which the curvature of the earth intervenes rather considerably, that it did not offer any obstacle to radio telegraphic transmission.

LONG DISTANCE "WIRELESS" A DREAM?

IT WAS then affirmed that transmissions over still greater distances were the dream of a visionary but after the experiments which I carried out in December, 1901, between England and Newfoundland in North America, during which I succeeded in communicating for the first time across the Atlantic Ocean, everyone began to be convinced that very probably there would no longer be any distance in the world which could obstruct the propagation of electric waves.

The happy result obtained by those first experiments of mine between Europe and America encouraged me in the prosecution of my studies to face the solution of a difficult problem—commercial radio telegraph communication between Europe and America, and with so many other distant countries where the practical object to be reached would justify the risk of the expenditure of a huge capital for the execution of experiments which, in Italy, were qualified as of rather doubtful success.

In my experiments conducted on the Atlantic during the winter of 1902 I found myself impeded by an unforeseen difficulty caused by the effect of solar light on radio telegraphic transmissions, a phenomenon which I discovered during a voyage made on board the ship *Philadelphia*; on account of the effect of the light, at a distance of more than 700 miles all reception became impossible when the sun rose. But with the increase of the wavelength I found that this difficulty also could be overcome.

Then all students of radio telegraphy devoted themselves to the use of longer and longer waves and thus from those of 1000 and 2000 meters there was a gradual transition to the use of waves which reached the length of over 30 kilometres.

Other difficulties presented themselves as a result of interference between neighboring stations, a difficulty which, it seemed, would cause a very great limitation in the practical applications of radio telegraphy. But with new tuned circuits, which I patented in 1898 and 1900 and experimented with on the south coast of England, such difficulties also disappeared for the greater part. It was then proved for the first time that many neighboring stations among those tuned on different

waves could communicate simultaneously without interfering with each other.

Following my first long-distance experiments over the sea, it was affirmed that communications across mountainous continents would be impossible. But with the wireless telegraph experiments on the Royal Vessel *Carlo Alberto*, which, by the will of H. M. the King of Italy, was placed

development of radio telegraphy was finished; that its employment might be useful at sea for the safety of human life during navigation, but that its employment would be rather limited and rather difficult between distant continents.

It was stated that radio telegraphy would never be in a position to compete with other rapid means of communication over long distances, such as that carried on by cables.

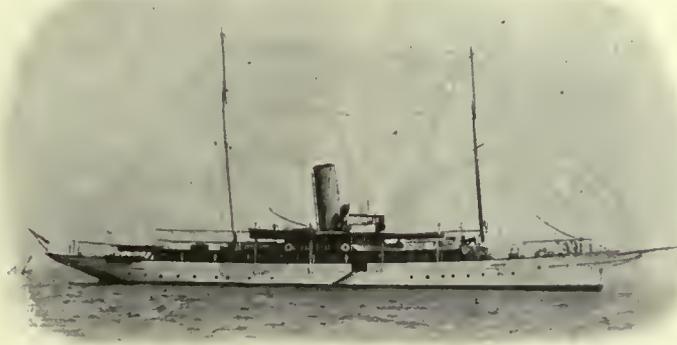
But even in the face of such observations often made officially in the parliaments of great nations, I was never discouraged. We Bolognese often smile in the face of the most difficult situations.

PROGRESS AIDS PROGRESS

IN FACT, by means of the use of thermionic valves—a brilliant conception of Fleming, perfected by DeForest, Langmuir, and Armstrong in America, by Meissner in Germany, and by Round and Franklin in England—and by means of the use of balanced tuned circuits, of electric filters, of power amplifiers and

finally of directional radiators, I succeeded in obtaining results such as to ensure a regular radio telegraphic service by day and night between Europe and America; thus also, in 1918, I could for the first time in history communicate from England to Australia, i. e., almost as far as the antipodes, over a distance of about 20,000 kilometres (12,500 miles).

But to obtain such results, huge and very costly installations were required, based on the use of many hundreds of kilo-



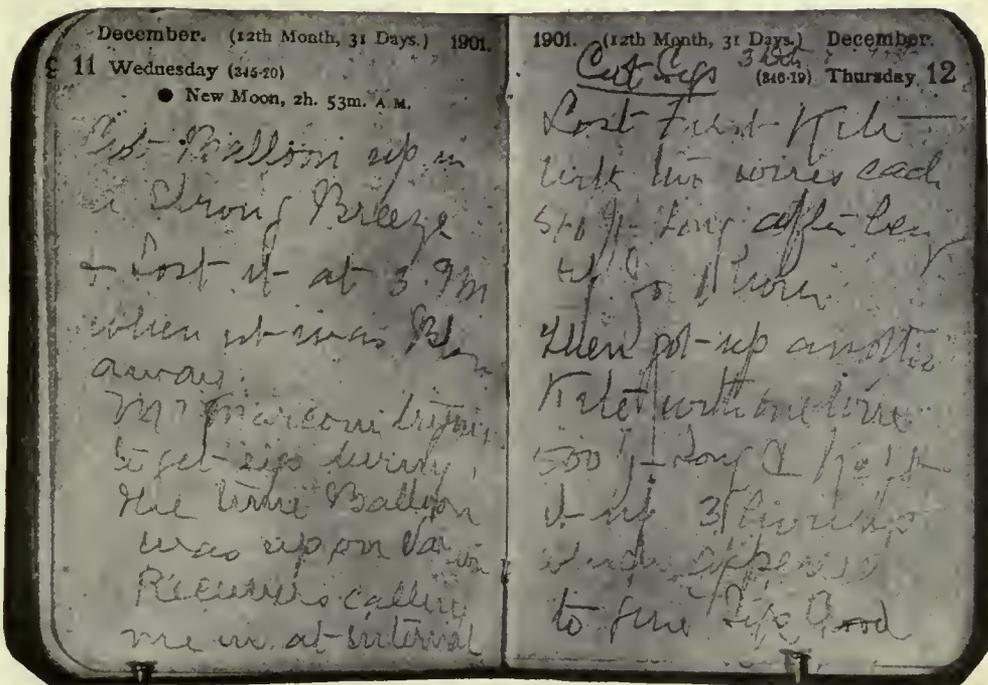
THE "ELETTRA"

Marconi's private radio yacht. Very many of the Senatore's experiments have been carried out from the middle of the ocean aboard the well appointed *Elettra*

at my disposal, I was able to demonstrate that the Alps and Pyrenees were easily surmounted by the electric waves I was using.

But there always remained inexplicable periods of interruption; there also always remained great difficulties occasioned by the low sensitiveness of the receivers then used; there also always remained the enormous obstacles produced by atmospheric electric discharges.

It was then said that at that point the



AN HISTORICAL DOCUMENT

Pages from the diary of Mr. S. S. Kemp, Marconi's assistant at Signal Hill, Newfoundland, just about twenty-five years ago (December 12th, 1901), when wireless signals were first transmitted across the Atlantic from Poldhu, England, and received at the Newfoundland station. This was the occasion of the transmission of the famous letter "S"

watts of electrical energy radiated almost circularly; so that the object I had set myself of finding, a means of rapid communication more economical than that afforded by the ordinary wire or cable telegraph, seemed to a great extent frustrated.

I then thought again of my first experiments at Pontecchio. I again remembered all I had then proposed to pursue by means of the radiation of electric waves concentrated in a beam by means of suitable reflectors.

Thus in 1917, at Genoa, where I devoted myself to particular studies for military purposes, I made numerous distance experiments with the first beam (the Italian is "a fascio") apparatus, using short waves, that is of two or three meters length. Yes! "Beam System" ("Sistema a Fascio").

I do not now use any of these words because I am a Fascist and because Fascismo, for the fortunes of Italy, is triumphant. I always claim for myself the honor of having been the first Fascist in radio telegraphy, the first to recognize the desirability of uniting in a beam (*fascio*) the electric rays, as the Honorable Mussolini has first recognized in the political field the necessity of uniting in a "*fascio*" all the best energies of the country for the greater greatness of Italy.

But long waves were no longer suitable owing to the use of my Beam System. This system, instead of radiating the waves in all directions, concentrates them in the desired direction almost like a beam of light projected from a reflector. The British Government has officially decided to use this Beam System on the greatest scale for

direct communications between the most important Dominions and the Mother Country. And yet I was responsible for having caused the expenditure of hundreds of millions on long-wave stations.

A certain courage was therefore necessary to say "Let us turn back."

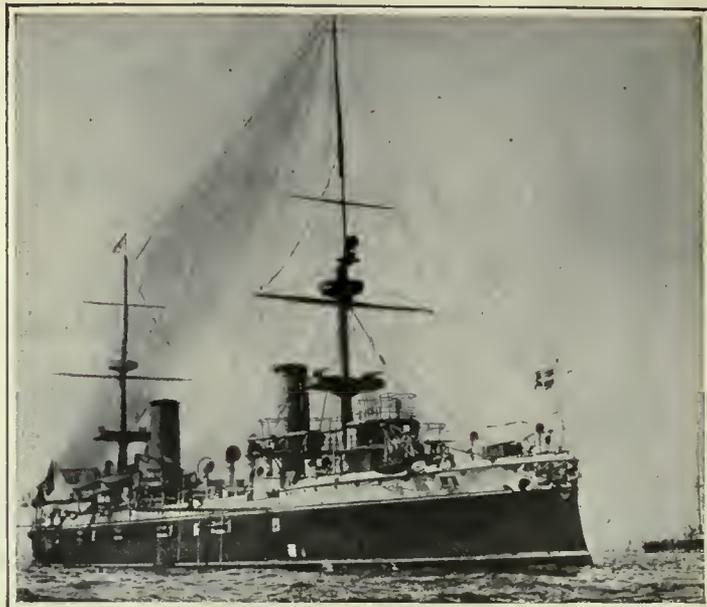
#### TURNING BACK PAGES OF RADIO HISTORY

**B**UT the Bolognese, after building at Bologna one of the highest towers in Italy, did not hesitate to build near it another much lower one.

Near the longest wave stations I was the first to have had constructed, I did not hesitate placing beam stations using very short waves.

In my practical study on the ranges of transmission of such waves, while cruising on the Atlantic for several months aboard my yacht *Elettra* in 1923, I was able to discover some of their very valuable properties unknown to science before that time.

I thus gathered that by using short waves in installations of very low power with a suitable reflector it was possible to



THE ITALIAN WARSHIP "CARLO ALBERTO"

When Senatore Marconi had made his first long-distance experiments across sea, it was generally opined that communication across mountainous country would not be feasible. The King of Italy placed at Marconi's disposal the *Carlo Alberto* from which experiments were conducted, and these proved conclusively that the above supposition was incorrect, for communication across the Alps and Pyrenees was effected without difficulty

carry on the most regular, rapid, and economical service by day and night between the antipodes of the globe, that is between England and Australia.

With such short-wave installations I was able in May, 1924, for the first time in history, to cause the human voice transmitted from England to be heard and understood in distant Australia.

#### RADIO—ALMOST UNIVERSAL TO-DAY

**T**O-DAY there are thousands of ships equipped with radio telegraphy for the safety of human life at sea and to maintain alive the daily activity of the countless persons who cross the oceans; to-day radio communications between Europe and America, the Far East and South America handle a huge traffic to the advantage of the growing demands of civilization; to-day millions of radio telephonic receivers scattered in the most distant countries carry on continuous communication with the greatest centers radiating news of everything of interest to mankind; to-day, by means of circular radio telephonic diffusion (so-called "broadcasting"), public opinion can be kept calm during any popular disturbance which interferes with the peace-making work of the press, as was proved on the occasion of the recent general strike in England; to-day many hundreds of thousands of people find occupation, study, and work in the new industry created by radio telegraphy; to-day aerial navigation is possible and safe up to the farthest bounds by means of radio communication, as has been recently demonstrated by the great triumph of Italian boldness and technical training obtained in the glorious *Norge* expedition.

The field of radio transmissions is con-



IN HIS SEA-GOING LABORATORY

Senatore Marconi is here shown amongst some of the experimental apparatus on board his famous yacht *Elettra*. He has crossed the Atlantic eighty-six times, many times in his own yacht

tinually getting wider, thus the radio transmission of photographs to a distance is already an accomplished fact and even now the practical solution of the great problem of television is seen to be possible in the near future.

Before concluding, I would like to send a respectful greeting to the numerous band of efficient scientists, seekers after the truth, and humble workers scattered all over the globe whose work has contributed to make possible the progress obtained; I wish once more to record with deep admiration and reverent affection the great figure of Augusto Righi who, with his genius and his indefatigable effort, did so much for the study of electric waves.

The clever and classical work on the Optics of Electrical Oscillations accomplished here at Bologna by Augusto Righi led to results which, from the walls of his laboratory, became the admiration of the students of physical sciences throughout the world.



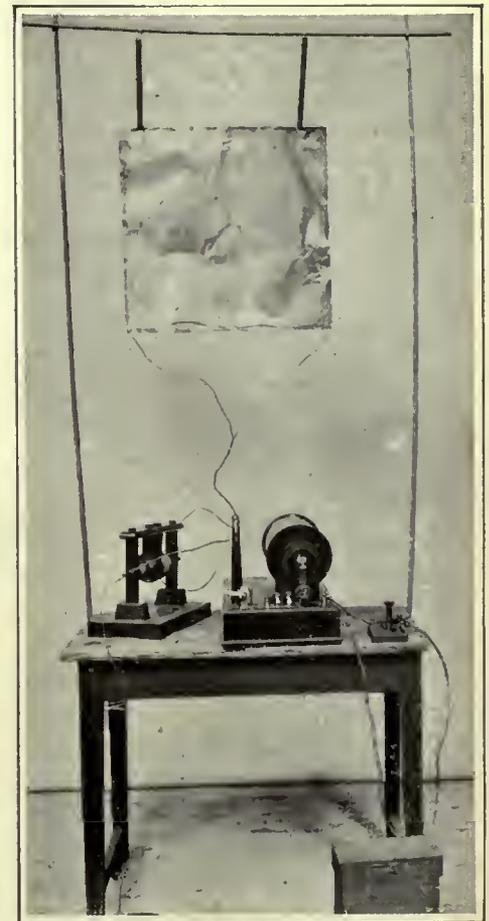
BEAM STATION EQUIPMENT

"I was responsible for having caused the expenditure of hundreds of millions on long-wave stations. A certain courage was therefore necessary to say let us turn back," says Marconi with reference to the development of the short-wave beam station. The above picture shows the tube rectifier panels of the Bodmin, England, beam station



COMPARISON IS ODIIOUS, SO THEY SAY

Yet let us turn to page 39 of the May, 1926, RADIO BROADCAST, and see how Warner Bros. modern 250-watt portable outfit, 6 XBR, compares with the somewhat antiquated mobile affair illustrated above. Those of you who have seen 6 XBR on the road will be in an even better position to contrast, though it is hardly possible that the "puffing billy" depicted will ever be seen on Main Street again. It is a twenty-year old contraption used by Senatore Marconi in one of his first attempts at a portable field station. A cylinder of copper forms the antenna. To the extreme right stands the Senatore



MARCONI'S FIRST TRANSMITTER

Was fashioned after the model in this picture. The apparatus includes the induction coil for obtaining a high voltage with a multiple coil spark gap, one side of which is connected to the antenna, which is in the form of a copper sheet slung, by means of insulators, between two posts. The other side of the spark gap is connected to ground