

Special form of switchboard and radio controls for connecting the radio link with the regular telephone system.

THE RADIO LINKS AT SEA

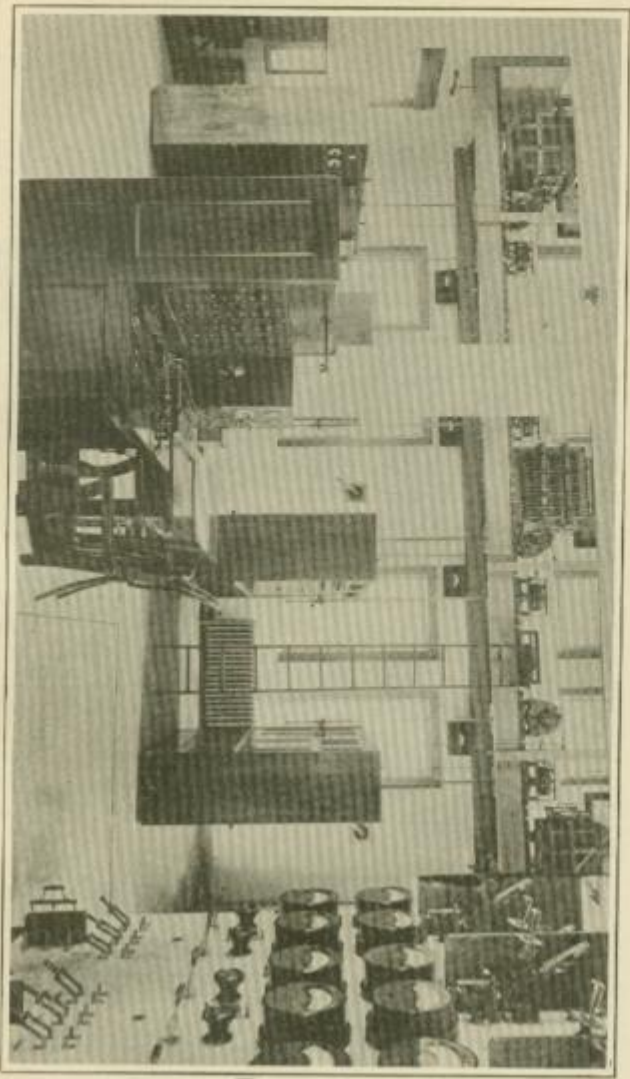
The day is not far distant when every passenger steamer at sea will be just as much within reach of the regular telephone system and just as much an integral part of that system as the modern city apartment. There is nothing new in this prophecy: it has been talked about and virtually promised ever since radio telephony came into existence a decade and a half ago. But today we are making very substantial progress toward the early realization of telephony from ship to shore, along with all the other things promised for radio telephony.

Already we are telephoning to sea over the regular telephone lines. Experiments are being carried on, and while much remains to be done in the way of perfecting and refining the various details of this combined telephone and radio telephone system, the results indicate that the idea is feasible and most likely practical. A person talks over the regular telephone line and listens in the same manner as usual. The other person on board ship also speaks in the usual manner. Aside from occasional interference from other radio transmitters, especially radio telegraph, there is nothing to indicate that the conversation is other than an ordinary telephone conversation.

Recently an official of the Bell System was called to the telephone at his residence in New Canaan, Conn., to answer a call from Captain Rind, who was on his ship the "America" of the United States Line as it approached New York. At the time, the "America" was still 24 hours from port, or about 370 miles distant.

"Hello, this is Captain Rind."

"Captain, this is Mr. Thayer of the telephone company. I'm up in New Canaan. I understand you are three or four hundred miles at sea."



Typical radio installation employed for the radio link. This is an interior view of the Deal Beach station of the American Telephone & Telegraph Company.

"Yes, we were 370 miles from Ambrose light at 7:30. We expect to dock tomorrow evening at 7 or 8."

"What kind of a trip are you having?"

"We're having a good trip for this time of the year."

"Well, I'm glad to have had the pleasure of speaking to you. I think it is fine that we can meet and talk this way."

That was how the conversation ran. Over 100,000 persons heard the conversation; for the radio link, connecting the wire telephone system with the ship radio set, makes use of radio waves that may be intercepted and heard with the usual radio receiving set. It may be that at some future date some combination of wave lengths will be employed to make the radio telephone link more or less private; but for the time being the conversations are more or less public because of the large number of amateur receiving sets within range.

Preliminary to her last voyage to Europe, the steamship "America" had been equipped with a radio telephone set. Throughout the eastward trip tests were carried out between the ship and the radio telephone station of the Bell System located at Deal Beach, N. J., some 33 miles south of New York in an air line. These tests were overheard night after night by numerous radio amateurs along the North Atlantic coast, and led to many questions concerning their purpose. Similar inquiries were anticipated upon the return of the ship and it was thought desirable by the telephone officials to advise the public by means of a demonstration before representatives of the press.

The evening of March 5th was selected as the time for this demonstration, since the ship was scheduled to be then between 350 and 400 miles from port, a distance considered to be the fair working range, under normal atmospheric conditions, for the radio transmitters both on board ship and at Deal Beach. The success of the demonstration proved that the time had been well chosen; for, with the exception of 10 or 15 minutes during which the wireless waves were subject to "fading," as the radio engineers say,

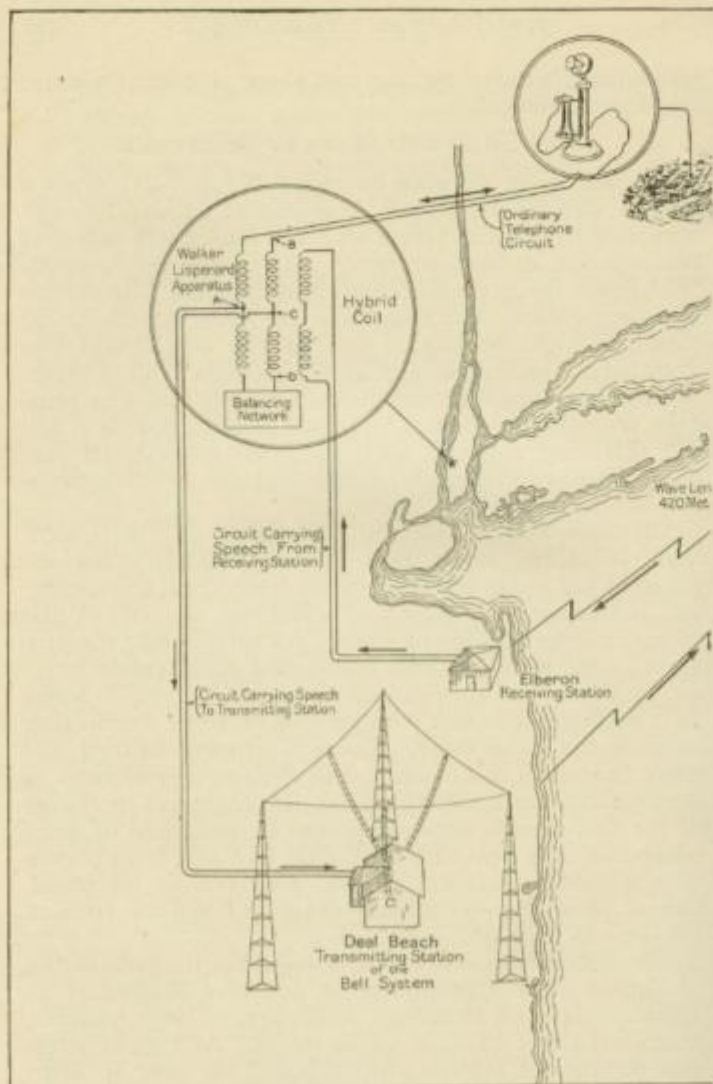
telephoning between the ship and shore proceeded without the slightest difficulty.

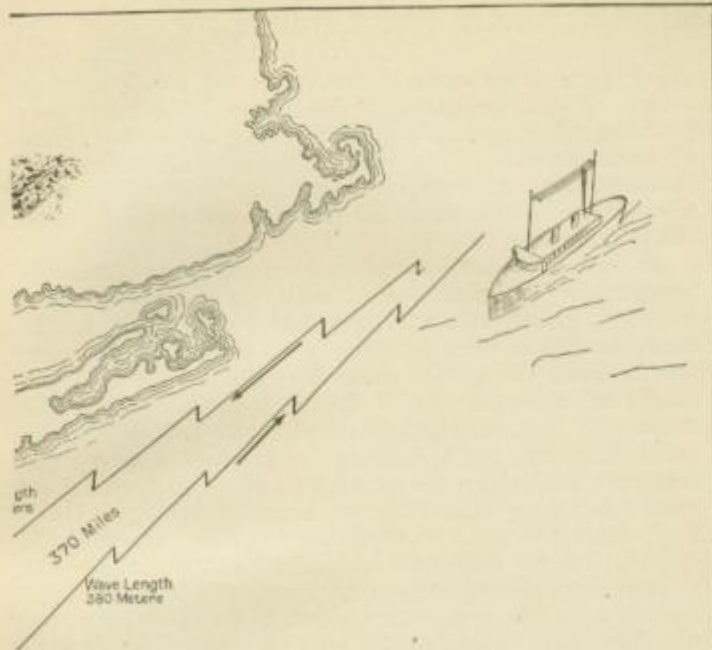
TYING SHIPS AND SHORE BY TELEPHONE

The schematic drawing on pages 322 and 323 gives a general idea of how these experiments in ship-to-shore telephony have been carried on. The reader will note that two separate stations are being used on the Jersey coast. Deal Beach being the transmitting station and Elberon the receiving station. For those who are more technically inclined, it might be pointed out that the wire circuit was operated on the four-wire principle between Walker Street and the radio stations, and on the ordinary two-wire principle from Walker Street to New Canaan. A hybrid coil and balancing network, such as forms an essential part of all telephone repeaters, established the union between the two- and four-wire circuits.

The steamship "America," belonging to the United States Shipping Board fleet, is a 28,000-ton vessel engaged in passenger service between New York, Cherbourg, and Bremen. On the trip of which we are writing she carried a large booking of passengers who, during the progress of the tests, not only manifested considerable interest in them but also expressed in no uncertain terms their willingness to talk with persons on shore should they be given the opportunity. These passengers, in turn, had many friends in this country who were equally anxious to communicate with them; indeed, the engineers in charge of the Deal Beach station reported an avalanche of more telephonic calls than they took time to count from parties who wanted permission to talk with friends on board. One of these requests actually came by telephone from as far west as Chicago.

The demonstration not only brought out the possibilities of ship-to-shore communication, but also illustrated its shortcomings—shortcomings which are, in large measure, characteristic of radio in all its forms. At regular intervals throughout the test, which lasted for over an hour, intelligible communication with the ship was prevented by





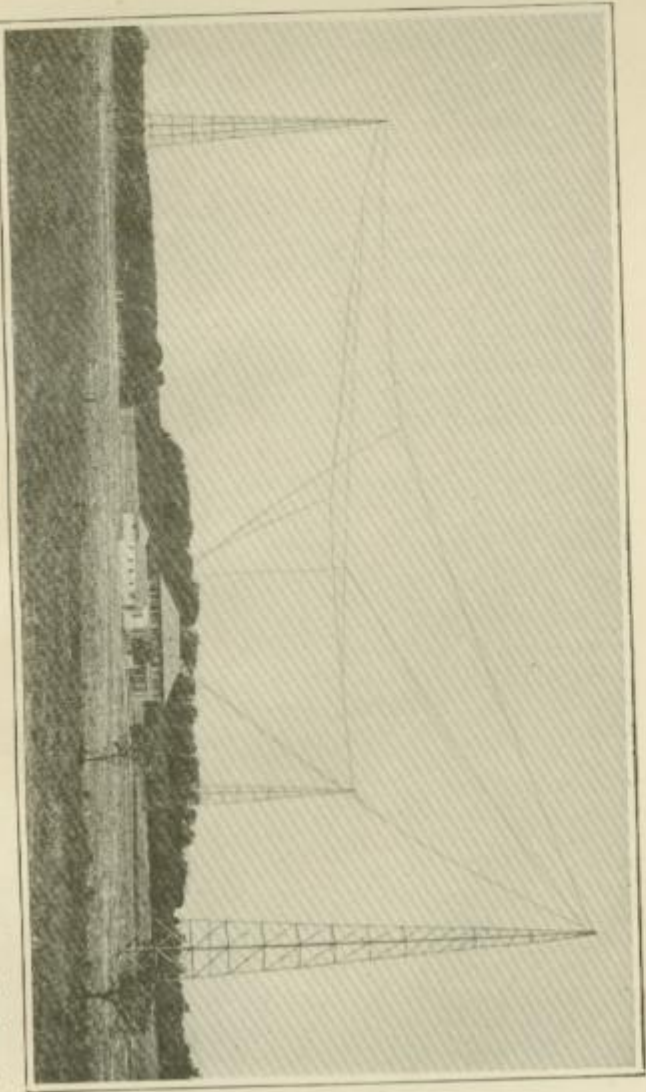
General scheme of the radio link as employed to couple up a ship with the wire telephone system. This particular diagram applies to the experiments conducted by the American Telephone & Telegraph Company between the steamer "America" and the Deal Beach station. The arrangement in the large circle represents the coupling system at the test room in the New York headquarters of the telephone company. Two-way communication is maintained with the radio link, by using a transmitting and a receiving station at the land end, as depicted.

interference from spark stations, most of which were on vessels at sea, the spark stations near New York very generously having stopped their sending during the period of demonstration. The elimination of interference between stations, all engaged in carrying commercial business, is one of the important technical problems of radio still waiting solution.

Another limitation of the radio telephone was forcibly brought out by the number of telephone calls which came in from persons who said they had simple radio sets in their homes and were listening in on the whole conversation between the speakers on shore and on the ship. A telephone message, once it has been given to the radio transmitter for propagation through the air, is virtually public property, and as upwards of one-half million radio amateurs throughout the country know, it is the simplest matter in the world to listen in on such a message. However, there are ways in which secrecy may ultimately be obtained for the radio link of a telephone system.

Moreover, atmospheric conditions exert a marked influence upon the ease with which a radio message travels through space. These conditions vary greatly from day to day and from hour to hour. This can well be illustrated by the observations which have been made in connection with the radio link of the telephone system operating between Long Beach, California, and Catalina Island. The distance between the mainland and the island is 30 miles, and the sets have been made sufficiently powerful to transmit speech across this distance under the most unfavorable conditions. On the other hand, it has been found that this amount of power is sufficient under exceptionally favorable conditions to make these messages readily audible in New Zealand, 5,000 miles away. One of the most difficult radio problems the telephone engineers have encountered is the transmission of a fixed quantity of current over the telephone lines in spite of the extremely variable intensity of the radio signals which are to be relayed over these lines.

Another atmospheric phenomenon which is a source of



General view of the aerial and the station buildings of the transmitting station of the American Telephone & Telegraph Company at Dead Beach. This station has been used in connecting the land telephone system with ships at sea.

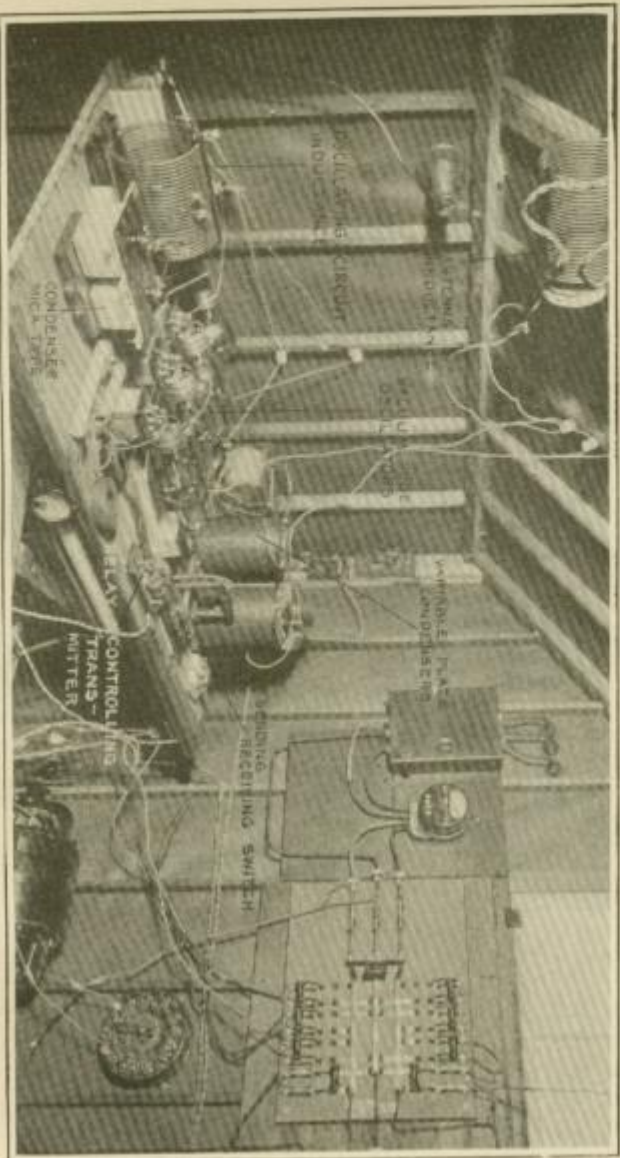
most serious disturbance to radio transmission and which thus far has baffled all attempts to eliminate it, is the so-called "static." Fortunately, for the demonstration we have just described, there was very little static present. Its occurrence varies greatly with the season of the year, and in the northern hemisphere is particularly troublesome during summer. Indeed, there are hours and even days together when all but the strongest radio signals are obliterated.

The radio link—the spanning of space between bits of regular telephone system—must come. The difficulties in the way of everyday, practical ship-to-shore communication are numerous and formidable, but they are certain to be brushed aside just as so many other obstacles in radio have been overcome.

AND WHAT OF THE FUTURE?

To say that the radio link between land units and between land units and ships at sea, is here in a practical and workaday way would be to exaggerate the facts in the case. Much remains to be done, as any one who has listened in to the experiments must realize. The interference from other radio stations, the static, the fading away of a transmitter—all these features hamper radio telephony to a marked degree and must be very much ameliorated before we can hope for a system that will be as positive and reliable as our present wire telephones. Of course, for short spans, like the Long Beach-Avalon radio link, for which a good deal of power is employed in view of the short distance, the results are really reliable; but then the radio link must be capable of spanning many hundred miles, especially in telephoning to sea, if it is to be made of some commercial value.

The question of secrecy is an important one, for nobody cares to be talking to a relative or friend while one hundred thousand other persons are listening in. Just so long as the messages stay on the wires, they are private, but at the present stage of radio telephony the moment these same messages are passed through the radio trans-



A continuous-wave transmitter which is representative of the more advanced amateur radio stations of today. The simplicity of the CW transmitter, together with its sharpness of tone, makes it more and more popular with the amateur. This particular installation was used in spanning the Atlantic during recent amateur tests.

mitter they become public property. However, this question of secrecy can be solved—and it will be solved, in the very near future. There are several ways in which this end can be attained. Perhaps the ultimate solution will be obtained by a system of double or triple waves employed simultaneously for the transmission of speech so that unless a person has a receiving set which intercepts a certain combination of waves, only a small and almost unintelligible part of the conversation will be detected. It is also quite possible to use a device at the transmitting end which continually alters the wave length of the transmitted radiophone waves, while the receiving set is also provided with a means of altering its wave length in step with the transmitter.

As for static, it will be with us for many years to come. There have been many so-called static eliminators introduced from time to time, and we are assured over and over again that this arch enemy of radio has been banished for all time. But the fact remains that despite all kinds of static eliminators said to be practical and available, we continue to be troubled by static in our commercial and amateur work alike.

The wire telephone was not perfected overnight, and we cannot expect the radio telephone, which dates back to but a few years in point of real, practical development, to evolve into perfected communication overnight. Then the problems of transmitting through space are considerably more numerous and involved than those of the wire telephone. It is going to take time, but the day must come when the radio telephone will be an everyday convenience.