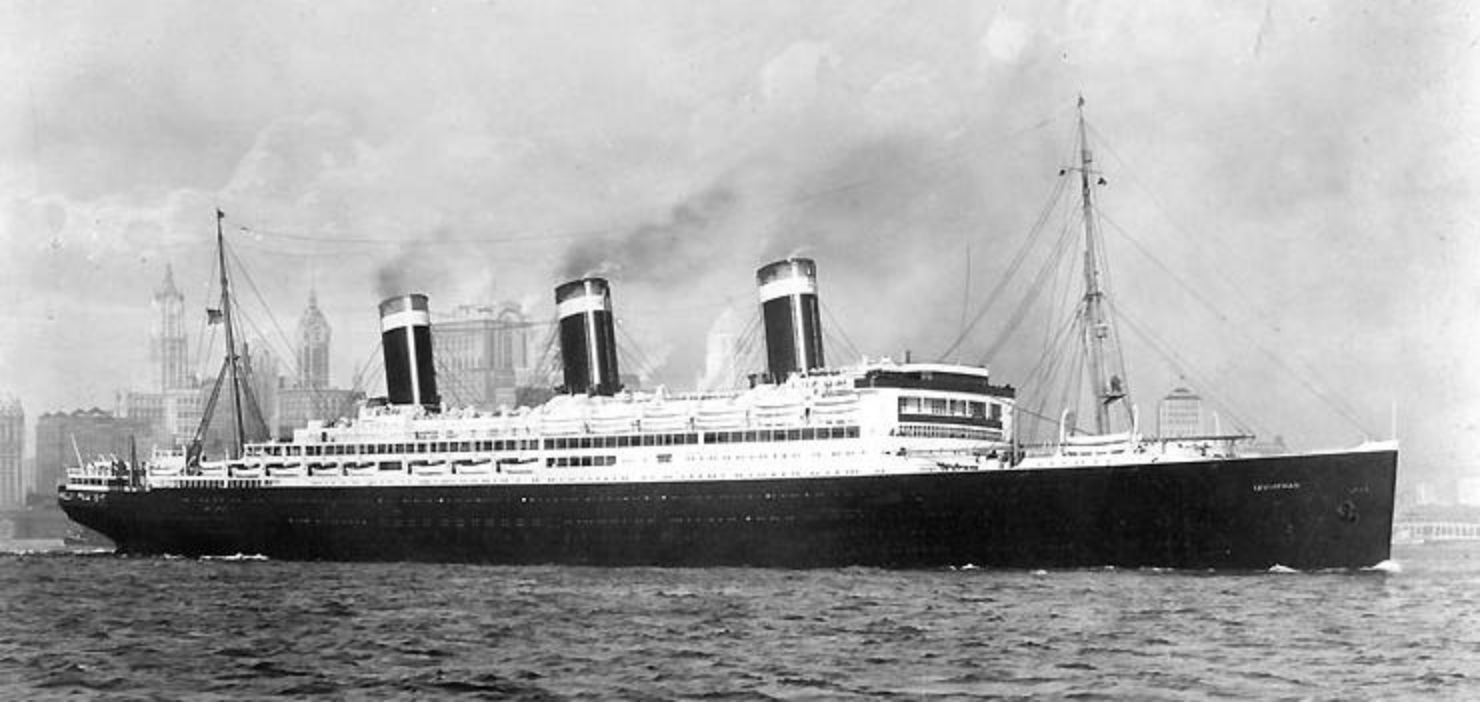


LEVIATHAN WILL TRY A RADIO BROADCAST

First Program Sent From Ship at Sea to Shore to Go on Network Tonight.

That was the headline in *The New York Times* on Sunday, November 30, 1930. Broadcasting was ten years old, "radio" much older, but this was to be the first "program"–news and entertainment for general consumption–sent from a sea-going ship.

Originally called the *Vaterland* when she was built in Germany before World War I, the 54,000+ ton passenger vessel–said to be the largest in the world at the time–spent a year in transatlantic passenger service for the Hamburg America Line until 1917 when the war intervened and she was seized by the U.S. government. Recommissioned the USS *Leviathan*, she was in military service until purchased by the United States Lines, which operated her (albeit never profitably) for 21 years.

SS *Leviathan* had been in her semi-annual dry dock in Boston, and was to arrive in New York on Monday morning after a one-day trip. The broadcast, arranged by NBC, took place on Sunday night at 2320 local time and lasted for an hour. It was sent by shortwave on 4177.5 kHz. to the American Telephone and Telegraph receiving station in the coastal town of Forked River, New Jersey, from whence it was sent by wire to WEAF in New York and out to the NBC network.

The president of United States Lines was aboard the ship for this trip, as was David Sarnoff, president of RCA, NBC's founding parent, and some 500 passengers (the ship could accommodate 3,000 but carried on average less than half that number). For entertainment during long ocean crossings, the ship was outfitted with a night club known as the Club Leviathan, which was where the program originated.

Announcing duties during the program went to Phillip Carlin of WEAF. Also on the program were soprano and comedienne Mildred Hunt and tenor James Melton. The show was preceded by a preview of what the *Times* called "a talking motion picture" (the talkies were but a few years old).

Said the *Times* on Monday: "The reception to radio listeners in New York was marred by considerable fading, the orchestral music and songs jumping from faint tones to loud." Presumably that was the quality on the broadcast band. The broadcast, and the ship, are now long forgotten, but it was surely an exciting DX event for those who were apparently able to hear the broadcast direct, as evidenced by the letter shown below, which was received by David F. Thomas of Proctorville, Ohio, active in DX circles at the time and for many decades later. The letter was accompanied by a booklet, "Voiceways Overseas from Lawrenceville," the New Jersey location of one of AT&T's main ship-to-shore facilities. It is also reproduced below.

Jerry Berg

TRANSMISSION OF PROGRAM MATERIAL FROM S. S. LEVIATHAN

AMERICAN TELEPHONE AND TELEGRAPH COMPANY

LONG LINES DEPARTMENT

15 DEY STREET

R. N. NICELY
PLANT SUPERINTENDENT

NEW YORK December 23, 1930

IN REPLY PLEASE REFER TO

FILE NO.

In reply to recent requests concerning a program transmitted from the S. S. Leviathan enroute from Boston to New York on the evening of November 30, 1930,-

Entertainment provided in the Night Club of the S. S. Leviathan was picked up and transmitted on the regular ship to shore radio telephone circuit of the American Telephone and Telegraph Company to that Company's receiving station at Forked River, N.J. From that point the program was transmitted by wire to New York City and connected to the network of the National Broadcasting Company who distributed it to various broadcasting stations on its network. Transmission from the S. S. Leviathan to the American Telephone and Telegraph Company receiving station at Forked River, N.J., was on a frequency of 4177.5 kilocycles.


VOICEWAYS
OVERSEAS
from Lawrenceville

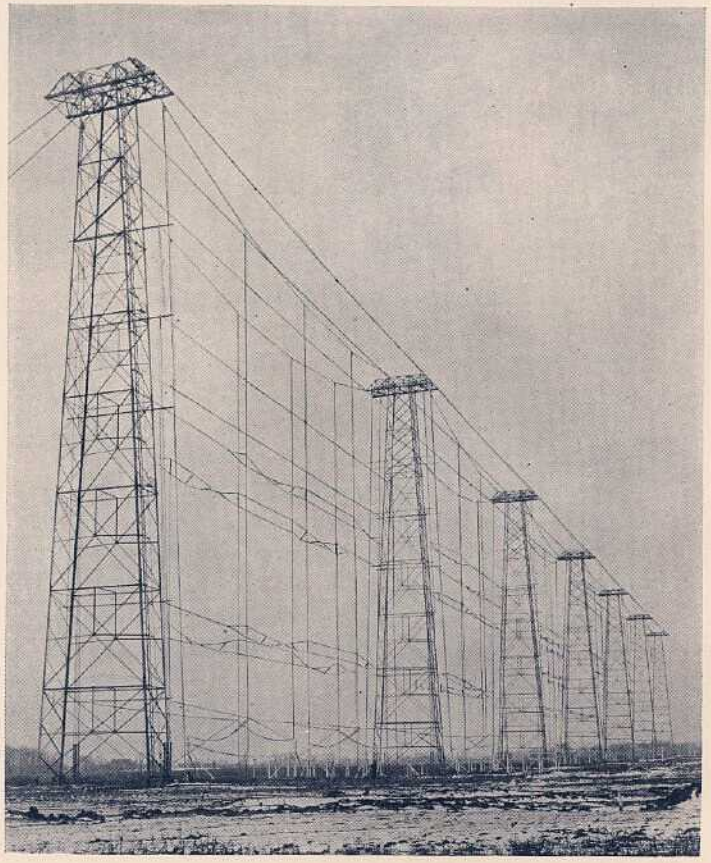
Cover Picture by
FAIRCHILD AERIAL SURVEYS, Inc.

THE ELDER TWIN

In the latter part of the Nineteenth Century students of "natural philosophy" discovered that under certain conditions an electric current flowing in a circuit gave rise to electric waves in the surrounding space.

The phenomena recorded by these scientists were radio waves—*short* waves. Yet nearly forty years were to elapse before this kind of wave was to seriously engage the attention of those who were studying radio.

There were many reasons for this. For years it was not possible to generate continuously the high frequency current necessary to produce the continuous wave required. One swallow does not make a summer and one wave does not make a signal. The first stages in the commercial development of radio were, therefore, in the field of long wave transmission.



The huge curtain of wires used in bridging the 5,300 miles to Buenos Aires.

THE SHORT WAVE IS REDISCOVERED

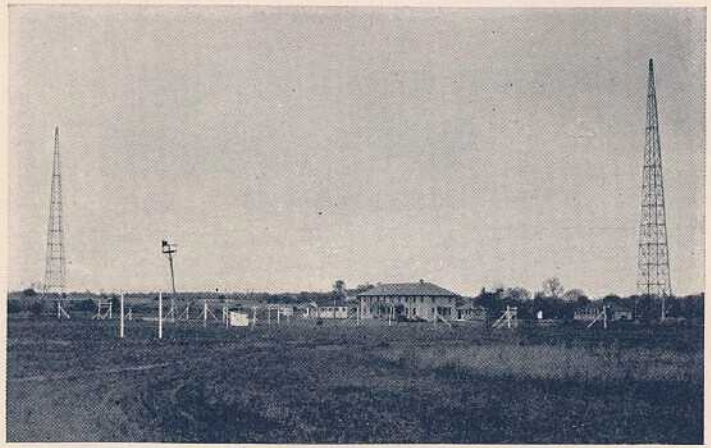
With the tremendous interest on every side in the subject of radio, especially after the advent of the radio telephone, it was not long before the air was "full of voices"—uncomfortably so for efficient communication.

Students of the subject therefore began to investigate the possibilities below the 100-meter line. Technical development had facilitated such researches with the invention of the vacuum tube and other high frequency oscillators. It was not long before the commercial possibilities of this branch of radio were clearly evident to those pioneering the research.

TRANSATLANTIC SHORT WAVE

In June, 1926, the American Telephone and Telegraph Company began overseas tests of short wave radio telephony, using its experimental station at Deal Beach, N. J., and apparatus which had been set up near London. By the time service had been established over a long wave circuit by the joint action of the American Company and the British Post Office, short wave experiments had reached a stage where the circuit from Deal Beach could be used on many of the calls.

The commercial possibilities having been clearly demonstrated, plans went quickly forward on both sides of the Atlantic. On this side, construction was begun on receiving and transmitting centers that could be expanded to meet future



The experimental station of the Bell Laboratories at Deal Beach, N. J., played an important role in overseas short wave radio telephony

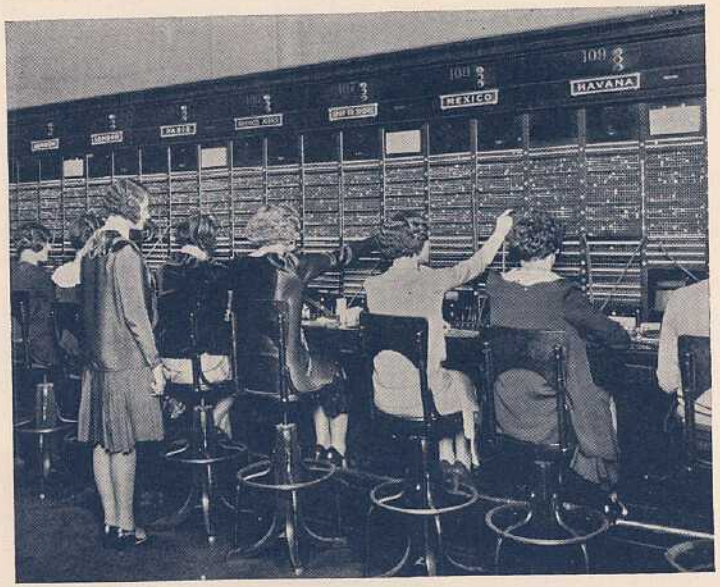
demands. In the late summer of 1928, the first apparatus at the receiving center at Netcong, N. J., went into service; making, with the service from Deal Beach, a two-way short wave channel. In June, 1929, another receiver at Netcong and the first transmitter at Lawrenceville were cut in on a second short wave circuit to England.

In September of the same year, the Lawrenceville station took over the circuit that Deal Beach had been handling. The following December Lawrenceville and Netcong provided equipment for a third circuit. Meanwhile, temporary receiving stations at New Southgate, England, and Cupar, Scotland, had been replaced by a permanent station at Baldock, Eng., and transmitters had been set up at Rugby. Thus, at the end of 1929, there were three complete short-wave circuits in operation.

In April, 1930, the two short-wave stations established another overseas link when their equipment was put in operation on the channel to South America. This consisted of a circuit

from Lawrenceville to a receiving station at Platanos near Buenos Aires and another circuit from a transmitting station at Hurlingham, also near Buenos Aires, to Netcong.

While there are still many mysteries regarding their behavior, short waves have certain decided advantages. In general, the difference between signal strength and noise is greater than in the case of long waves. Then, too, the greater part of the power goes into the sky wave rather than the ground wave. In the former there is much less dissipation of energy. Finally, where directional characteristics are desirable as in the case of overseas operation, the antenna required for a certain degree of directiveness is much smaller in short wave than in long wave transmission.



Switchboard at New York Long Distance office, where all Overseas Calls are handled

CHANNELS OVERSEAS

Radio telephone channels across the Atlantic now link the telephone systems of three continents. This establishes an interconnected system embracing North America, Great Britain and practically all of Western Europe, and the three South American republics of Argentina, Uruguay and Chile. This intercontinental network makes possible the establishment of a circuit all the way from the Pacific Coast or Mexico City to Helsingfors in Finland or to Spanish Morocco; or again, from Vancouver in British Columbia to Valparaiso, Chile. In all, these transoceanic channels interconnect more than 30,000,000 telephones, or roughly 86 per cent of all the instruments in the world.

Testboard at Long Distance Control Room in New York City, at which wire lines to the various radio stations are concentrated. The operator at this board tests these lines and also co-ordinates the operation of the various radio channels

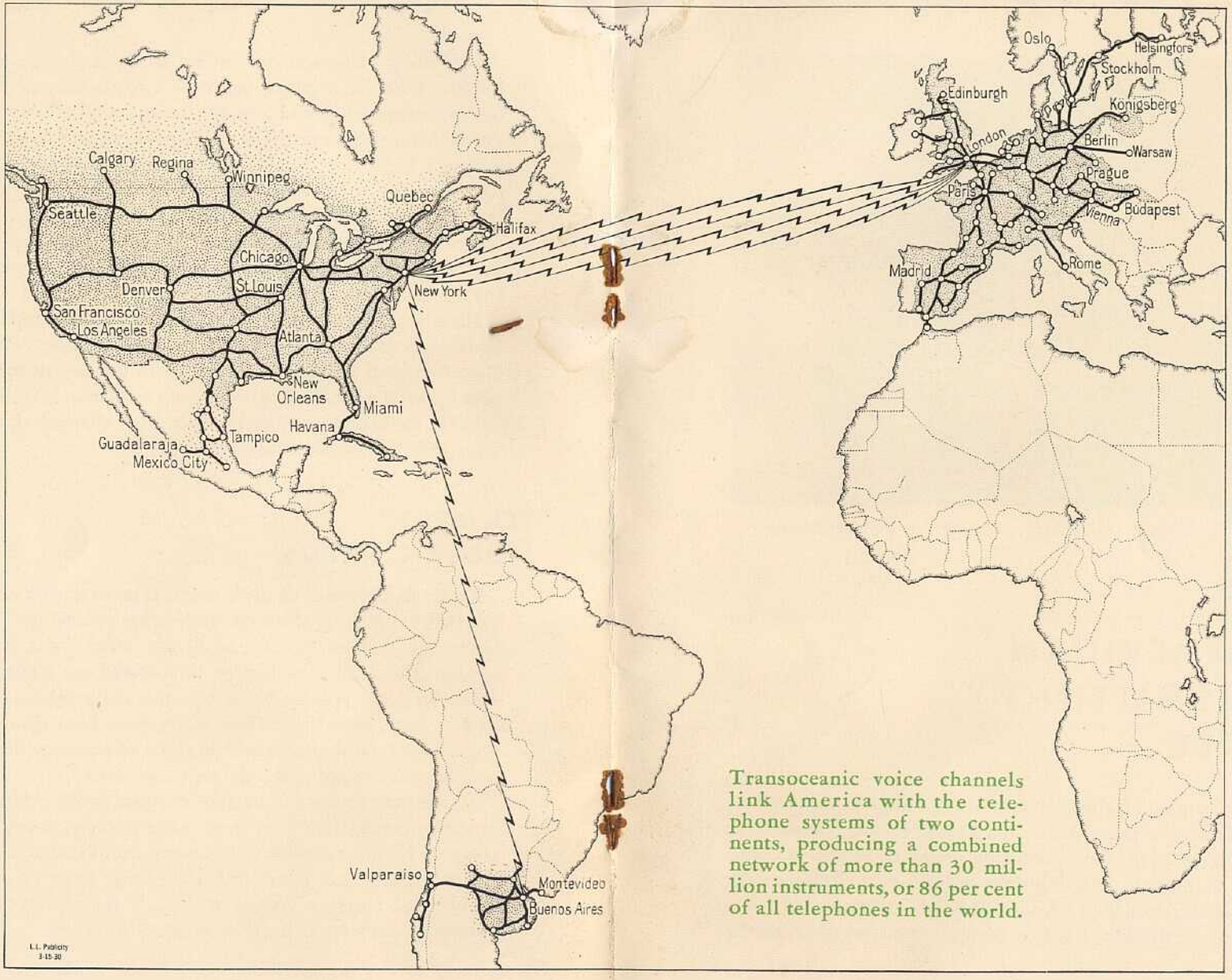
Both long and short waves are used on the channel to Europe. With the original long wave circuit, the newer facilities at Lawrenceville and Netcong make a total of four circuits available for this service. The use of both types of transmission insures a highly dependable service. This is enhanced by the fact that the three short wave circuits use different wave lengths and that each circuit can in turn operate on several wave lengths. Further, these wave lengths are so selected that they will provide most satisfactory transmission throughout the diurnal and seasonal periods.

Since the circuit to South America practically straddles the Equator, it is comparatively remote from the severe magnetic disturbances of the polar regions. As in the case of the European circuits, several wave lengths are available. It is therefore possible to maintain a highly dependable channel along this 5,300 mile path with a single circuit.

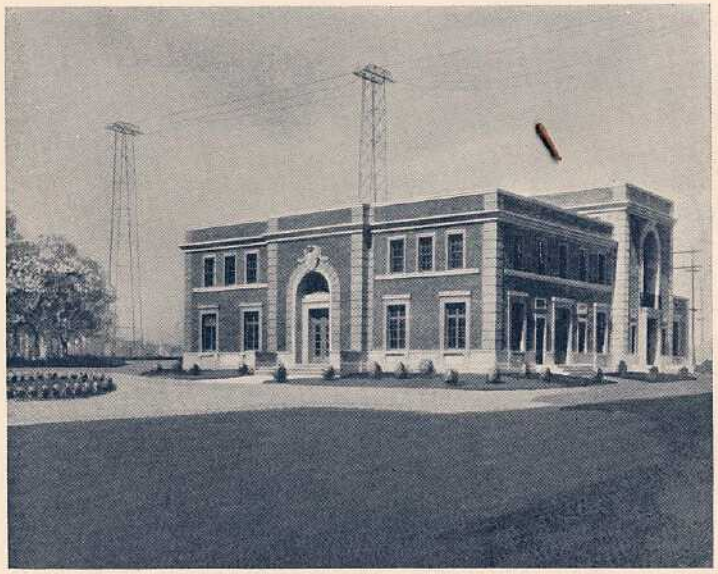
TO MEET MODERN NEEDS

In the development of these overseas services, the emphasis has been on making them convenient for general use. "Long Distance" handles the call, as in any other "out-of-town" service. The service to Europe is operated on a continuous basis. To South America it is available daily from 9:00 a.m. to 6:30 p.m., New York Time. Rates have been reduced to a point where the service is within reach of anyone whose business or social affairs touch the two continents.

To meet the future demands for overseas traffic evident from present growth, steps have been taken to provide other voice channels between continent and continent. In addition, voice communication has been established with ships at sea on a commercial basis—a service which, it is anticipated, will eventually embrace all large passenger liners.



Transoceanic voice channels link America with the telephone systems of two continents, producing a combined network of more than 30 million instruments, or 86 per cent of all telephones in the world.



Main Building at Lawrenceville, housing two of the transmitters

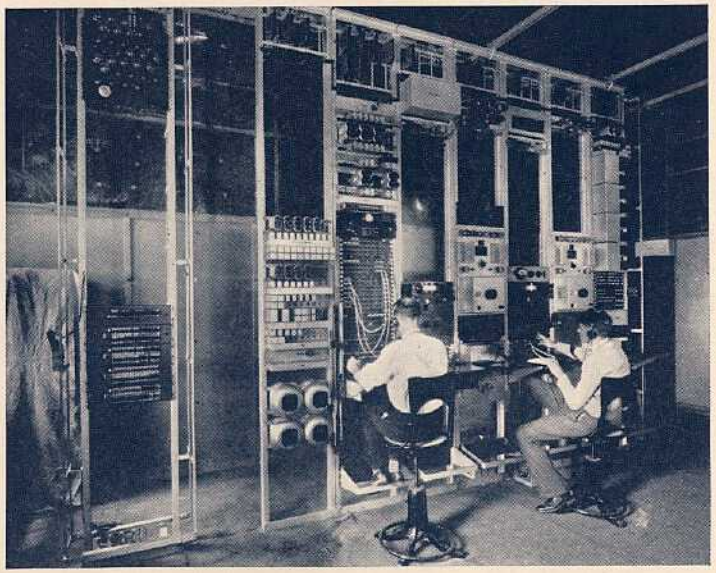
THE AMERICAN TRANSMITTING CENTER

In the center of a wide plain, almost ideal in location for the radiation of short waves, the Lawrenceville Transmitting Center is one of the focal points for voice communication overseas, handling all outgoing short wave radio telephone calls from North America to Europe and South America.

Lawrenceville now has four transmitting sets, three for the

channels to England and one for the channel to South America. These are housed in two buildings, two sets in each. In the larger of these buildings is the apparatus which prepares the voice current, coming from the subscriber over ordinary telephone wires, for its introduction into the radio transmitter.

Adjacent to the buildings are the antennas, great curtains of wire, strung from 28 steel towers 180 feet high, in a "V" formation, that stretch for more than a mile. On the longer side of the "V" are the antennas for communicating with England and on the shorter side the antennas for the South American circuit. Each of the four transmitters has its own antenna system associated with it. Each of these systems comprises several antennas to handle the wave lengths assigned to its transmitter.

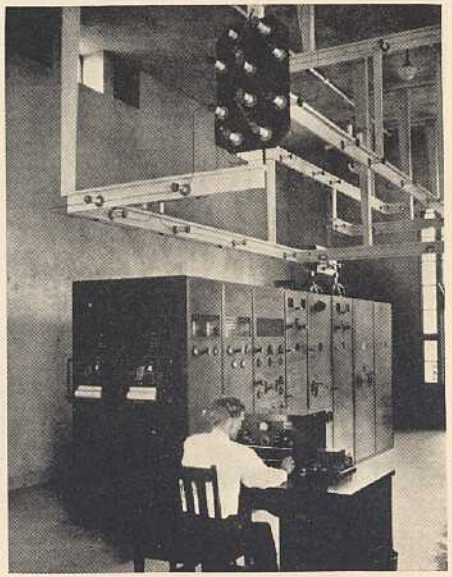


Line Terminal Room, where wire part of the circuit ends

BRIDGING THE OCEAN BY TELEPHONE

A transatlantic telephone call is made in the same way as any other long distance call. When a subscriber wishes to "ring up" a friend in Europe he asks for long distance. All overseas calls are routed through the long distance office of the American Telephone and Telegraph Company in New York City.

From here the voice current goes by wire along the New York-Philadelphia cable, to a point south of Lawrenceville, where it enters a branch cable that takes it to the station. An open wire line from New York north of the station provides an emergency route. At Lawrenceville the current set up in the



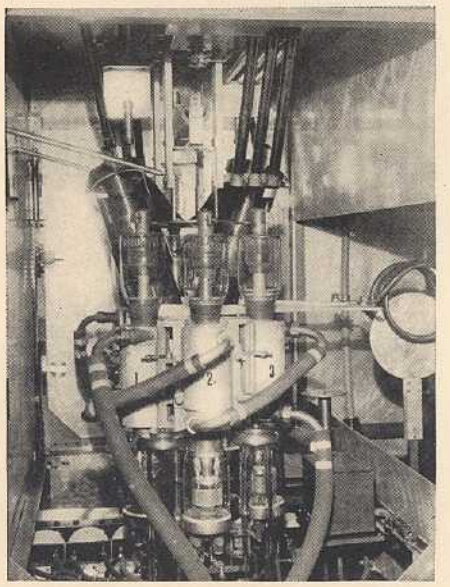
Control turret, with one of transmitting sets in background

telephone wire by the voice of the subscriber enters the "line terminal room." This room is completely sheathed in copper, which prevents the radio waves leaving the antenna from coming back and impairing the operation of the apparatus indoors.

THE TRANSMITTER PICKS IT UP

From the line terminal room the voice current is carried to a "control turret" in the transmitter room where an operator can make the final adjustments necessary to proper operation of the circuit.

After amplification the voice current enters a modulator where it is "blended" with a current of very high frequency—between five million and twenty-five million cycles per



Six 10-kilowatt tubes used in one of the output stages of a transmitting set. Coupling coils on right, monitoring amplifier boxes at lower right

second—generated by vacuum tube oscillators. This high frequency current provides a resultant current of the characteristics necessary for transmission through the ether. To maintain the frequency of this current within narrow limits, quartz crystals are employed. Uniform functioning of these crystals is assured by sealing them in heat-insulated ovens, the temperature of which is accurately and automatically regulated.

PRODUCING AMPLIFICATION

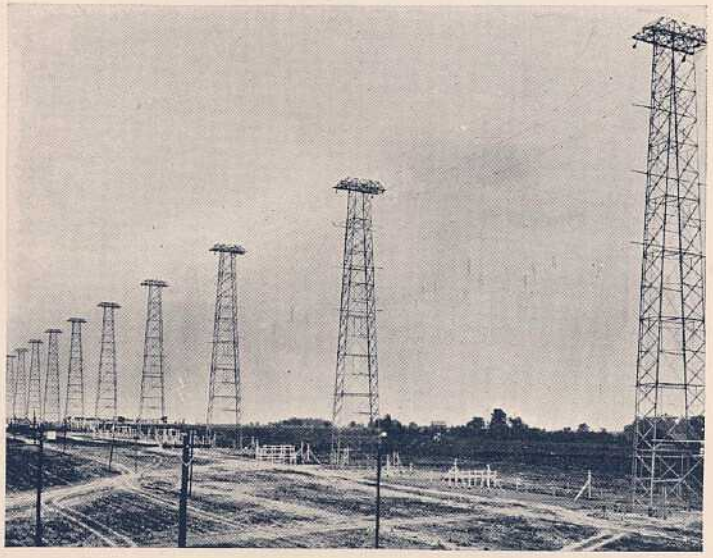
Special apparatus produces the tremendous amplification required. Alternating current brought to the station at 4,100 volts is stepped up to about 10,000 volts. It then passes to a rectifier where the alternating current is converted into direct current. This "high pressure" direct current flows to the plate circuits of huge water-cooled vacuum tube amplifiers. The modulated current is impressed on these tubes which amplify it to enormous proportions. The resultant current is sent to the antenna, from which it is launched into the ether in the form of radio waves sufficiently powerful to bridge the distance to the receiving station.

THE ANTENNAS

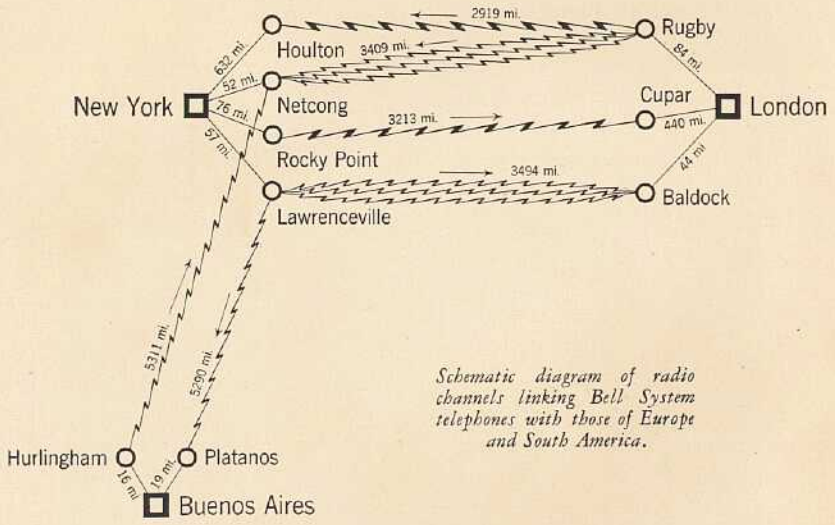
The antennas used are of the "curtain" type, and consist of networks of wires in the form of coarse-mesh curtains. Due to the arrangement and interconnection of these wires the signals sent out have a marked directional effect. Impulses from the various vertical segments neutralize each other in the plane of the curtain, while those in the direction perpendicular to that plane reinforce each other. The curtain is therefore hung broadside to the direction of transmission.

With this type of antenna the signals sent out in the opposite direction from the receiving station are equally strong. To divert these to useful purpose a "reflector" curtain is hung behind the "exciter" or active curtain. This is similar in design to the other but not electrically connected to it, the only current flowing in it being that induced by the exciter curtain. This curtain reflects practically the entire radio energy in such a way that it reinforces the impulses sent out in the direction of the receiving station.

The advantages of such an antenna are obvious. So far as possible every bit of power from the transmitter is concentrated in the desired direction and there is only a small amount of the radiated energy sent in other directions.



Row of towers carrying the antennas for the circuits to Europe



Schematic diagram of radio channels linking Bell System telephones with those of Europe and South America.

AMONG THE HUNDREDS OF OVERSEAS POINTS NOW REACHED BY TELEPHONE

City	*Rate**
London	$30.00
Paris	33.75
Berlin	35.25
Stockholm	36.75
Madrid	36.00
Vienna	36.00
Rome	36.00
Buenos Aires	36.00
Montevideo	37.20
Santiago	39.00

*For a three-minute call from New York