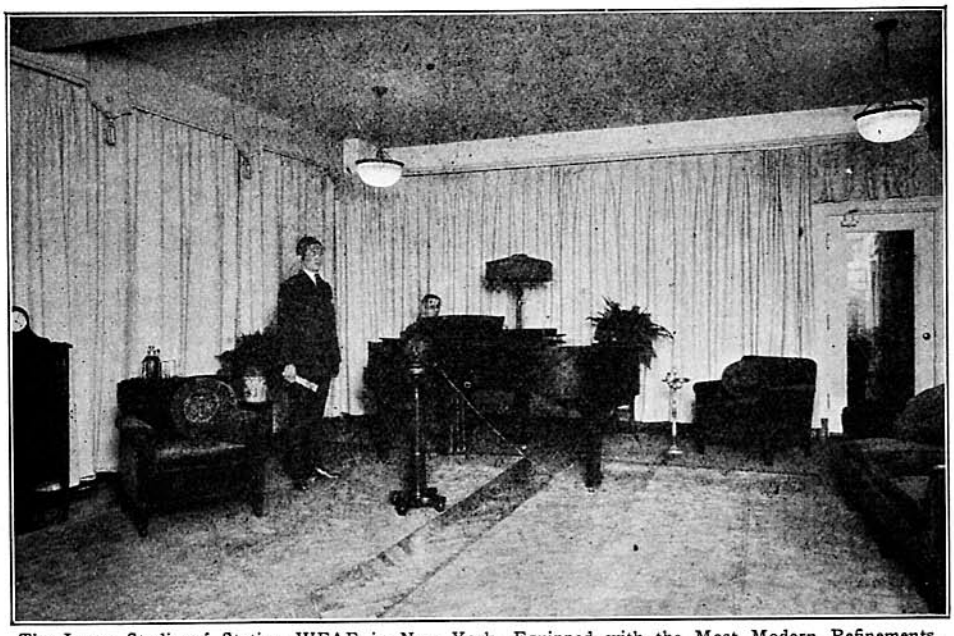
WEAF'S New Broadcasting Studios

By EDGAR H. FELIX

ON Monday, April 30, was placed in operation a most modern broadcasting studio, designed by the engineers of the American Telephone and Telegraph Company. It embodies all the lessons learned by six months of broadcasting from the Walker street studios of WEAF. Although these studios embodied all the latest practice of a year and a half ago, great improvements were made in acoustic qualities in the new studios which are located at 195 Broadway. From this point all broadcasting through WEAF, which is located at 463 West street, New York City, will be controlled.

Minute attention to detail is responsible for much of the improved acoustic qualities of the new studios. For instance, the floors are laid in pitch and mechanically insulated from the walls. In this way, none of the vibration transmitted to the floor, because the musical instruments are in contact with it, is passed to the walls and to the ceiling of the studio.

No studio can be ideal for every purpose unless the deadening is adjustable to suit the special means of the particular program being transmitted. WEAF's new studios have adjustable deadening curtains which can be easily changed between numbers of the program. A single speaker before the microphone requires but little deadening. If too much deadening is used the effect is apparent to the critical listener. A band, on the other hand, requires considerable deadening in order to avoid reverberation effects. All this can be taken care of by the studio director without delaying the program.

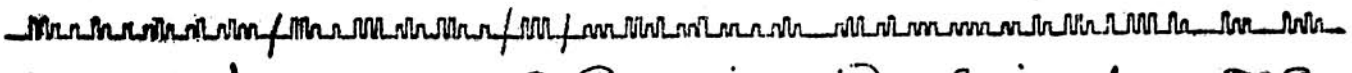


The Large Studio of Station WEAF in New York, Equipped with the Most Modern Refinements. A Smaller Studio Used at the Same Time Prevents Any Delay Between the Numbers of a Program, as Either of Them May Be Switched On.

To give an inviting and homelike appearance, the studio and reception rooms are comfortably yet simply furnished in Old English of the Georgian period. H. F. Huber and Company planned the decorations and furnishings. Particular attention was given by these specialists to acoustic effects which might create reverberation detrimental to the purity of broadcasting. Combining comfort and utility without sacrifice of acoustic properties required careful study of the problem.

(*Continued on page* 92)

New Alphabet for Radio and Land Lines



By General George O. Squier Washington D.C.

Sample of Tape Printed on the New Recorder. Note That Dots and Dashes Are of the Same Length But Vary in Height.

DUE to the rapid expansion of the use of radio telephony and telegraphy, the problem of interference, both natural and artificial, is becoming each day more and more pressing for solution. The conservation of the ether lanes is suddenly rising to international importance. In addition, the daily growing uses of radio for the solution of auxiliary problems such as range finding, navigation, beacons, etc., further serve to complicate the problem, and furthermore, it is believed that we are on the threshold of another development, viz., photo-broadcasting, which will require and demand additional ether channels to serve the public of the near future. It may be said, therefore, that the fundamental problem for the radio engineer is to devise methods to utilize these limited channels to the greatest extent possible, and to bend his efforts to the extension of their limits, both high and low.

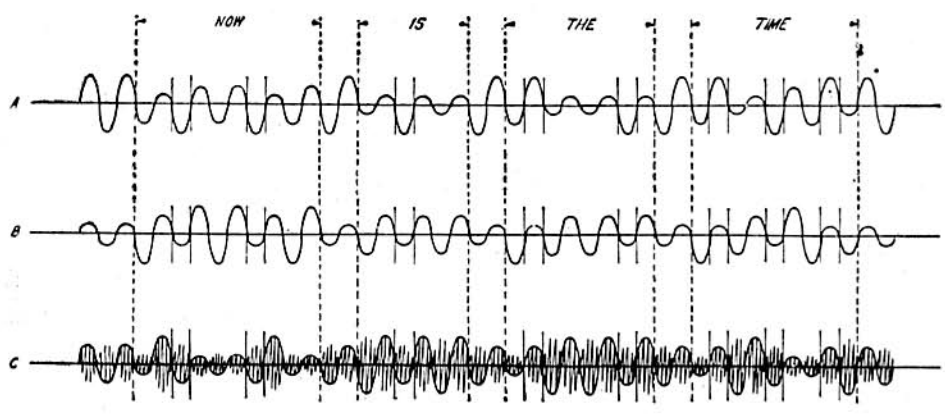


FIGURE 2.

Different Methods of Using Signal Corps Alphabet. In A the Dots Are Smallest in Amplitude, the Dashes Are Medium and the Spaces Are Largest, While in B the Spaces Are Smallest, the Dots Medium and the Dashes Largest. In C the Dashes Are Smallest, the Spaces Medium and the Dots Largest. There Are Three Other Possible Permutations of Amplitude Not Shown Here.

In the case of artificial disturbances the chief offender, from an engineering standpoint, is the radio telegraph practice as it is universally conducted at present. Radio telephony and music of all classes have a form of modulation which is scientifically more sound than that of telegraphy. It is impossible at present to tune out the high-power radio telegraph stations, especially when a receiving station is in close proximity. Such stations, as at present operated, produce a veritable eruption in the ether, creating disturbances over a wide range of frequencies, and these serve to interfere with any form of radio receiver yet devised. Who has not experienced this in the operation of his radio receiving set? Radio telegraphic transmission, therefore, demands new consideration and new study from a scientific standpoint.

About eighty years ago Morse invented the telegraph alphabet of dots and dashes, and the modification of it, known as the International Morse, is now the universal method of international radio telegraphy. This method is believed to be fundamentally unscientific, and the time has come to thoroughly consider a radical revision of the method of sending telegraphic messages. I do not here refer to an actual change at present in the Morse alphabet as regards the combinations of dots, dashes and spaces assigned

(*Continued on page* 89)

my point, by an examination of Fig. 1 it is seen that a modulating frequency as low as 10 per second, which is a very high frequency for ocean cable practice, corresponds to 75 words a minute, which is far higher than any form of sound reception. A modulating frequency of 60 cycles per second, the normal power frequency, corresponds to a speed of 450 words a minute, of five letters each.

If this speed, for traffic reasons, is too great, it is only necessary to make the same perforations in the transmitting tape correspond to a suitable even multiple of a semicycle to reduce the speed to any desired value. For instance, by making each of the signaling units correspond to six complete cycles of current instead of one semicycle, the speed of signaling is reduced to 37½ words a minute, a commercial speed of signaling. In this method of using the alphabet, wave trains are employed as the signaling elements.

The ratio of the lowest frequencies employed in radio to the modulating frequencies here considered is of the order of thousands.

At present the radio engineer has utilized and made his own all of the audio frequency range and at least several octaves of the radio frequency range, and has devised apparatus for the amplification and rectification of both of these ranges, audio and radio. This plan proposes to enter the unused infra-audio range, which would not only add a most useful band of frequencies to those now used, but would give a band below the range of the human ear. If this band were employed for telegraphy, an aditional advantage would be that it could not interfere with any radio receiving. This method of eliminating interferences is the most effective.

Finally, it is seen that by the method proposed here it is possible to modulate a single radio frequency by a number of modulating frequencies, and thus multiply the capacity of each radio frequency channel.

In 1921 the writer attended at Paris an International Technical Conference on outstanding radio problems, and for two months special delegates of the five great powers gave consideration to technical points connected with international radio telephony and telegraphy. Such matters as logarithmic decrements, disposition and allocation of wave-lengths, radiation, etc., were considered. It is now proposed that the general subject of a suitable method for transmitting telegraphic signals either for radio, land lines or submarine cables be considered at the next International Technical Conference,, with a view, if possible, of unifying all branches of telegraphy using the same system of modulation for the signals.

WEAF'S New Broadcasting Studios

(*Continued from page* 11)

DOUBLE STUDIOS ELIMINATE TIME LOSS

The paramount feature of the new studio installation is the use of two studios, a small one for singers, speakers and small groups of instruments, and a second large studio for bands, large choruses and orchestras. Between the two studios is the announcer's booth from which the programs are directed.

The use of two studios will improve the running off of programs because it will obviate much of the delay to which the radio audience is subjected when single studios are used. While an orchestra is

assembling in the large studio, the radio audience will be entertained by soloists or speakers in the small studio. And when the large studios are in use, an artist or speaker is preparing to broadcast in the smaller studio. In this way, programs can be run off with a minimum of delay.

Another feature, which will contribute to the quality of programs, is the special equipment provided in the announcer's booth. It has large windows opening into the studios on either side enabling the announcer to see exactly what is going on in each studio. By means of simple switches, he can put "on the air" the various microphones as required. These include the regular and emergency microphones in the small studio, in the large studio, in the announcing booth and those installed at remote control points, such as theatres, auditoriums, etc.

SPECIAL ANNOUNCER'S BOOTH

The announcer's booth is especially sound insulated so that practically none of the music from either studio is radiated into the booth, which is of terra cotta structure lined with alternate layers of felt and sheet iron. The booth windows are of double plate glass with a dead air space between and are hung in piano felt.

Within the booth is located a small monitoring loud-speaker, actuated by the current output of the studios. The announcer thus hears the studio music exactly as it is sent into the ether for the radio audience, and he controls the placing of instruments and the action of performers in the studio as determined by the radio output, that is, from the standpoint of the radio audience. This new feature eliminates the mistakes in placing of instruments which occur when the announcer or studio director is in the studio where the artists perform. His ear is not able to judge correctly what is going "on the air," from hearing the music being rendered in the studio.

A special loud-speaking equipment enables the announcer to give instructions to artists in each studio and to check up the correct pronunciation of titles and names of selections while broadcasting is going on from the other studio. Through this loud-speaking equipment, also, all announcements are made available to the artists in the studio. In this way, each artist knows how he is introduced to the radio audience and is ready to follow the announcer promptly.

A large and comfortable reception room with doors leading directly into each studio is provided for the artists. A special loud-speaking equipment furnishes them with entertainment while they are waiting. In order to prevent unauthorized entry into the studios, particularly while broadcasting is going on, a special type of door knob is provided, which cannot be opened by anyone unless he knows the special combination. In this way, interruption of broadcasting is made very unlikely.

NEW TECHNICAL FEATURES

The plant department is adjacent to the studio. Here all studio and remote control circuits terminate in a power input panel and are connected with the special line to the radio transmitter located at West street. A system of adjustable distortion net-work is located in the plant department so that the attenuation of lines controlling broadcasting from remote control points can be suitably equalized for radio broadcasting purposes. All remote control will thus be handled at one point by a specially trained crew.

Several new types of measuring instruments have been developed and installed which enable the engineer to determine the gain of amplification attained by any particular group of amplifiers in the broadcasting system.

An input operator is constantly monitoring the currents which pass through the input control panel to the radio transmitter

to 463 West street. A part of the input to the West street line is diverted to a loud-speaking equipment, which keeps the input operator informed as to the quality of the music or speech and enables him to make any necessary corrections.

A special ventilation system has been installed in both studios, which changes the air within them every seven minutes. This assures cool and clean air even in mid-summer. In order to eliminate street noises during broadcasting, the windows to the street may be kept closed without interfering with the comfort of the artists.

The new facilities will result in a marked improvement in the programs and will practically eliminate long waits between numbers occasioned by switching from one studio to another or to remote control points when broadcasting is done from outside.

A New System of Radio Control

(*Continued from page 20*)

Our fourth problem was to correct one of the inherent weaknesses of the tuning fork when used for this kind of work. The inertia which causes it to resist going into motion also makes it continue to vibrate for an appreciable length of time after the exciting force has been removed. For instantaneous control this is a distinct disadvantage. The writer overcame this by using forks in pairs, the first to operate and the second to release the object controlled.

It should now be possible to follow the diagram marked (A). When the key of fork A, at the transmitting station, is pressed, its frequency is imparted to the carrier wave. At the receiving station when properly tuned this wave, built up by the power amplifier, actuates the microphonic relay opening and clos-