Radio News

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IT'S A MAN'S JOB

Behind That Microphone

An Interesting Story of the Little-known But Important Jobs at Which Many Efficient Radio Men Toil in Bringing Broadcasting to Its Present-day Position of Perfection. It Is Entirely Possible That There Are Numbers of Our Readers Who Could Qualify, After a Bit of Efficient Study, for Some of These Positions Which Are Full of Interest and Remunerative

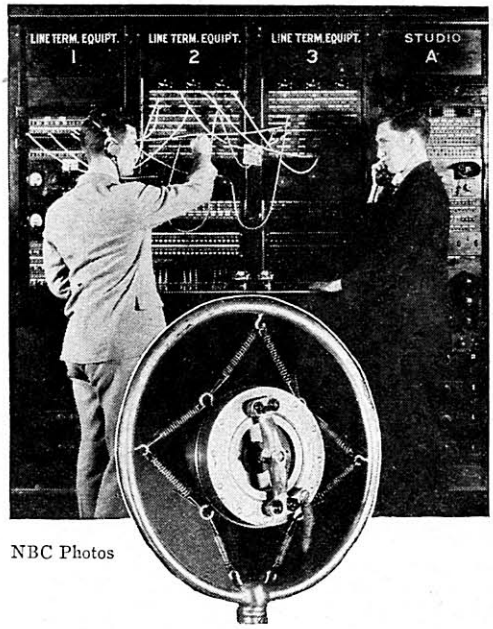
By **Albert Pfaltz**

IN the theatre the inspiring cry has always been, "The Show must go on!" In broadcasting—a show business on an international scale—the same spirit prevails. And it is the radio engineer and his associates who now manipulate the intricate networks of the present day, who plan and execute the broadcasting of world news events, who make possible the maintenance of high quality radio service.

The casual studio engineer may notice the control room engineer sitting behind the glass window of his booth busy at the monitoring panel. He may also notice the announcer's apparatus with its switches and tiny colored lights. His main interest, of course, is in the program this side of the microphone. If he is the average radio fan he knows nothing whatever about what happens to the program between the two physical points—one of them visible to him—of the studio microphone and the antenna of the broadcast transmitter. What happens to the sound in that comparatively short and instantaneous travel is not his concern in the slightest. It is one of those things that he takes for granted.

An Important Work

And yet the safeguarding of a program between those two points is a work of engineering art as important, in every respect, as that of the artists and announcers. Scores of trained engineers are constantly on the job, planning, testing, monitoring. Taken in *toto* their work may be described as designed to preserve two things in any given broadcast—fidelity and continuity.



NBC Photos

TENDING THE LAND LINES

Have you wondered just how that program from cross country is switched so quickly and at exactly the right instant to your local station's antenna? Here are engineer workers who tend the line terminal equipment panels in connecting the proper stations with the desired program, although they may be separated by thousands of miles

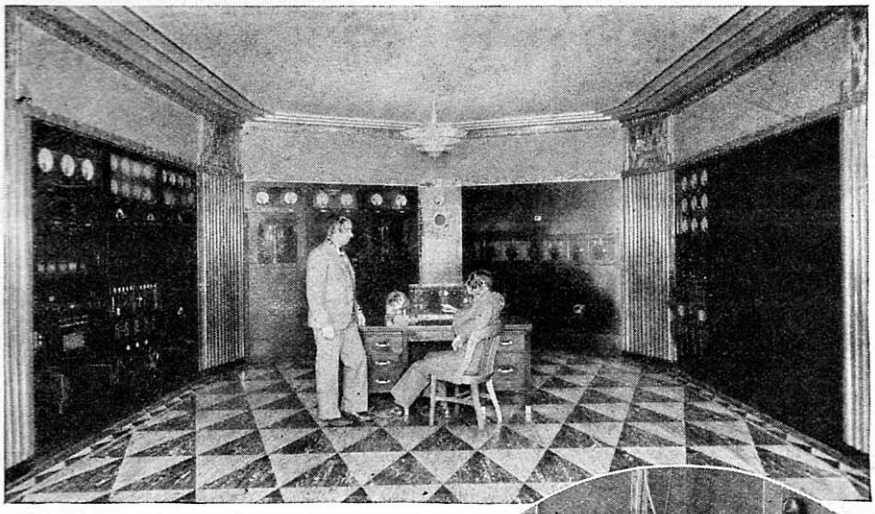
Broadcast programs originate either in a studio or in the field, the latter being otherwise known as "Nemo" pickups.

The first named type is comparatively simple. For a brief picture of the engineering methods employed let us look in at 711 Fifth Avenue, in New York, NBC headquarters.

It is the announcer who actually controls the switching of a program from the studio, where a broadcast is about to begin or end. Let us assume that the artists, the announcer and the control room engineer are waiting for the preceding program to end and receive their cue to begin. The announcer, who is standing before a row of push-buttons and lights on a little panel, is listening by means of headphones to the concluding minutes of a program coming from another studio. At the conclusion he receives a signal which tells him that the other program has been completed and that his studio now "has the air."

Accurately Timed Switching

Our announcer now strikes the familiar four-note chimes and gives the station identification. These chimes are utilized as switching cues by individual stations and supplementary networks joining or leaving the chain. A problem of synchronization arises here as the smaller chains which tap the basic networks at a distance from New York may take program service from either the basic Red or Blue networks. If one network program finishes a few seconds ahead of schedule the announcer for the other network takes control of both for the time necessary to give the chimes. All per-



TRANSMITTING ROOM AT WEAF

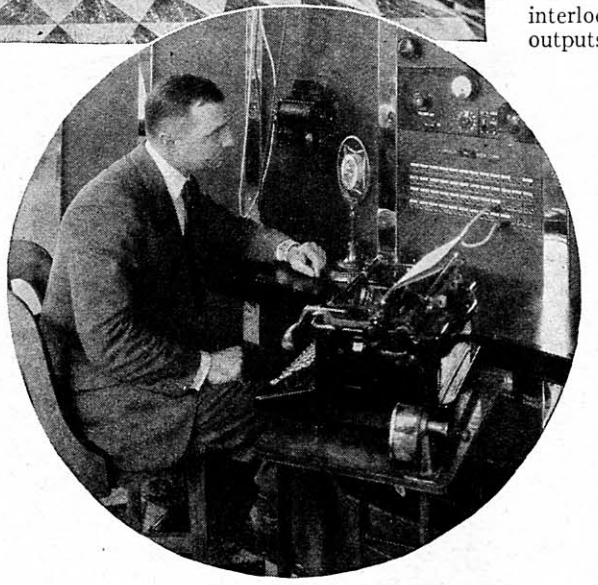
Shown at the control panel is Gerald Gray, in charge of the station, and, standing, Raymond Guy, radio engineer of the NBC. These men are in charge of complete operations and repair of the powerful 50-kilowatt transmitter shown at center. At the left is the low-powered unit panel, including modulators and frequency-controlling devices. At the right is the power-control equipment and a dummy antenna system

sonnel—announcers, control room engineers, etc.—are in possession of essential information concerning the distribution of a program and either the announcer or the studio engineer can set up or release the required program channel.

The duties of the studio engineer who monitors the program from the control room are fairly familiar. It is his job to control sound levels and faithfully follow his program cues, such as those calling for the fading down of music behind an announcement or the balancing of microphones.

Each studio has a twenty-four-hour reserve storage-battery supply for use in case of failure of the commercial power source.

So much for the individual studio set-up—and there are eight such at headquarters in New York.



AT THE CONTROL PANEL

Fred Hanek seated at the control apparatus at Bellmore. He is looking at the oscillograph, on which a continuous moving picture of the broadcast's signals may be observed

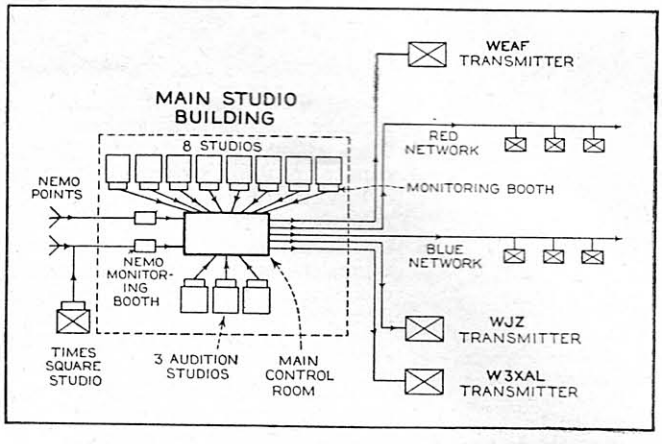
Because of the fact that several programs may be on the air simultaneously, from either studio or Nemo points or origin and that combinations of local transmitters and networks are continually shifting, it may safely be said that the main control room at headquarters is the nerve centre of operations. Responsibility for the operation of studios and the distribution of programs is centered here.

Some idea of the complexity of the layout immediately surrounding the main control room may be obtained from Figures 1 and 2.

Through constant supervision at this point, programs are dispatched to designated places at proper levels and at definite times. This requires two things—an interlocking system for transferring the outputs of various studios to one or more distribution channels and facilities for checking the program at important points.

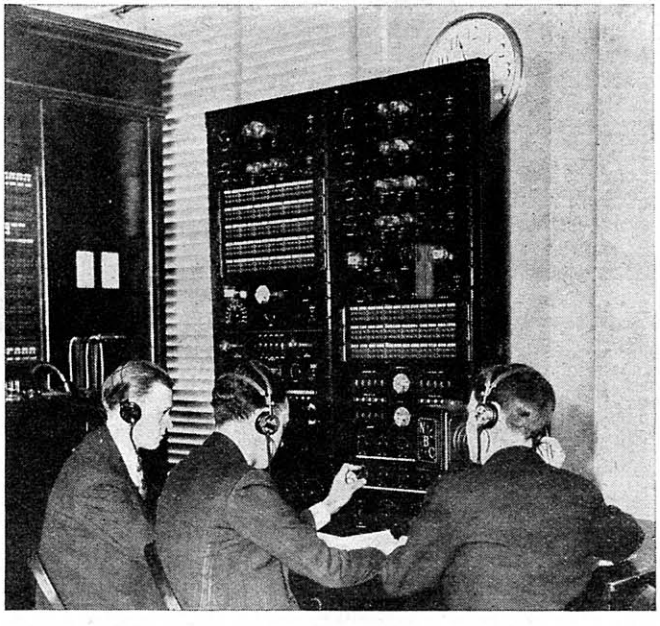
The control room supervisor has available volume indicators and a loudspeaker, the former showing output levels of studio and line amplifiers while the latter may be connected to either of these points. In addition, the signal light shows whether the local transmitters, WJZ and WEAF, are "on" or "off" the air, and a neon lamp indicates whether the carrier is being modulated and, roughly, the degree of modulation. A circuit can be quickly patched around any faulty unit as the input and output connections of most of the equipment in each studio appear on jacks in the control-room apparatus.

Furthermore, telephone connections to all monitoring booths and telegraph circuits to all networks and local transmitters are avail-



PROGRAM CIRCUITS AT NEW YORK

Figure 1. This schematic diagram shows the NBC program circuits in New York City, including nine studios and three audition studios, connecting to the main control room



SPECIAL BROADCAST SWITCHBOARD

These panels, connected in circuit, took care of the broadcast of an "Air Raid" over New York City. Seated at the board are George Milne, division engineer; Ferdinand Wankel, engineer, and William B. Miller, director of special broadcast events of the NBC system

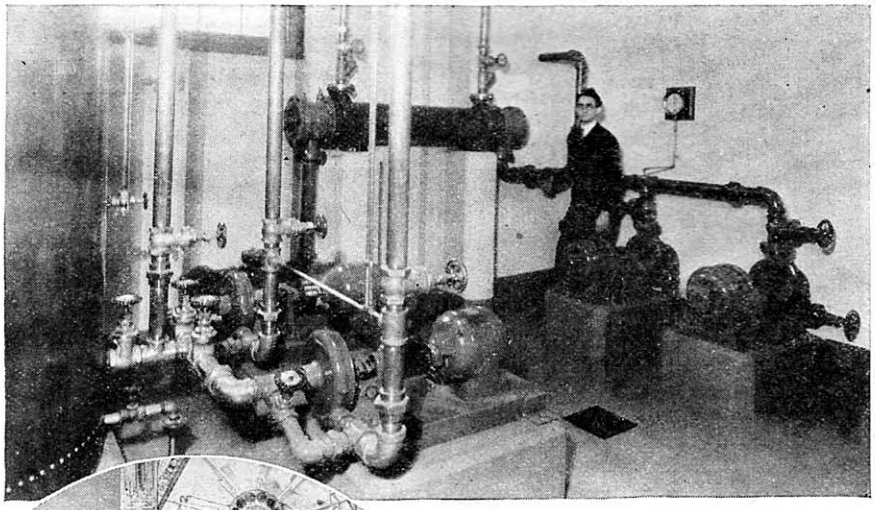
able to the control-room supervisor.

Present-day broadcasting depends, very largely for uninterrupted service, on the efficiency of the network of telephone lines which connect cities, studios and transmitters. The telephone company is responsible for the maintenance of program service between network stations. Few persons realize that dozens, and sometimes hundreds, of wiremen are stationed at strategic points during an important network program where, because of the single factor of geography, almost any kind of climatic condition may be encountered—to say nothing of an "act of God" which might cause a truck loaded with high-explosives to collide with a telephone pole!

However, engineers of the broadcasting company frequently check the transmission characteristics of all long-line networks. The shorter local lines, which seldom give trouble, are checked daily and then rechecked immediately prior to a broadcast. Frequency characteristics are also taken covering the entire circuit from microphone to antenna.

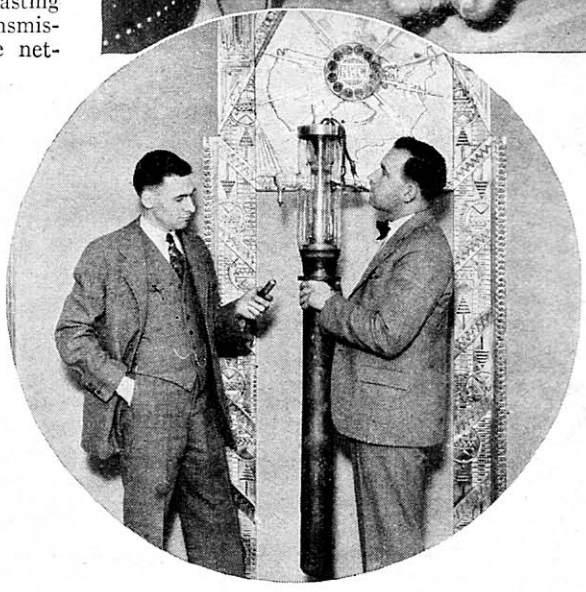
Before outlining the more intricate problems involved in the handling of a big news event broadcast, such as the arrival of the air armada over New York or the initial trip of the Graf Zeppelin, let us consider the transmitter—the comparatively new WEAF, for example, which is the last step in the engineering chain required to put a program on the air.

The new $300,000 transmitter was installed in a recently constructed wing of the WEAF operating building at Bellmore, Long Island. O. B. Hanson, manager of plant operation and engineering, and Raymond Guy, radio engineer, declare that this apparatus, which embodies the latest ideas of radio transmission, now makes every sound picked up by the microphone audible to listeners as far away as New Zealand.



LONELY, BUT IMPORTANT

Here is Engineer Dietsch, who has complete control and operation to the cooling equipment in the pump room of the WEAF transmitter building. If this equipment failed for only a short period of time, the transmitter would go off the air and thousands of dollars' worth of tubes and associate apparatus would be ruined

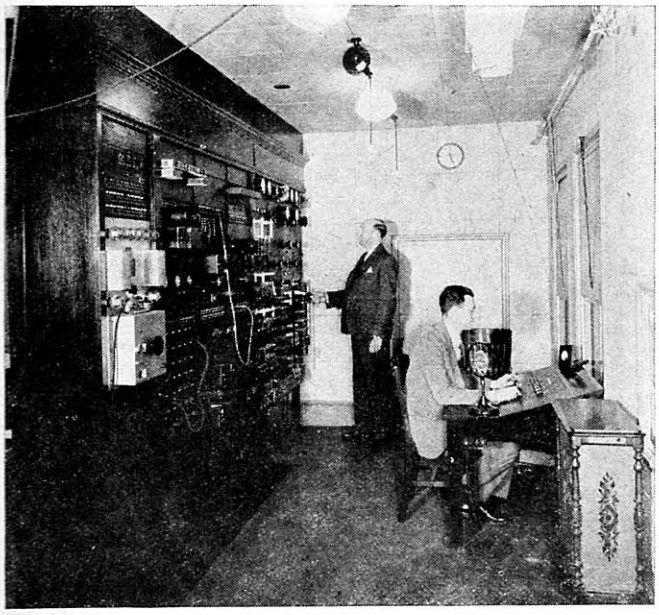


A $1,500 VACUUM TUBE

Here are the station engineers holding the largest size transmitting tube and comparing it with the small 199 receiving tube employed in early battery-operated receivers

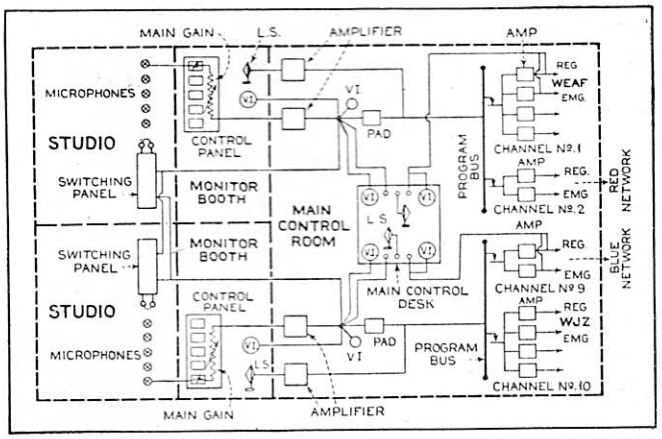
The station operates with a maximum power of 50,000 watts. With the modulation increased from less than fifty to one hundred percent, listeners receive the signals several times louder. High and low notes, sibilants and certain sounds, heretofore heard indistinctly or lost entirely, now are transmitted perfectly. The equipment includes the latest refinement in crystal-control apparatus to hold the station on its assigned wavelength, giving increased frequency stability. Careful observations show that the fluctuation is only ten cycles in 660,000. The transmitter employs two 100-kilowatt type tubes which stand five feet high and require thirty gallons of water, per-minute, to cool them.

The central control panel gives (*Continued on page* 884)



CONTROL ROOM OF TIMES SQUARE STUDIO

You never think of these watchful engineers on duty when you listen to a program from this famous studio, but they are there with eyes, ears and brains alert to conquer any emergency that might tend to interfere with the broadcasts



CONTROL PANEL CIRCUITS

Figure 2. Schematic diagram of the actual program circuits to the studios and to the channels of the control room shown as part of the diagram in Figure 1

Behind That Microphone

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the operator an unobstructed view of the apparatus, while an oscillograph gives a moving picture of the transmitter's output.

Every possible safeguard is present to insure continuous operation of the large water-cooled tubes. Tube failure may often endanger surrounding apparatus. For one thing, the supply of cooling water must be adequately sustained. Furthermore, operational steps must be taken in the proper order—as, for example, the application of filament power only when an adequate flow of water is assured and the application of plate power, after that of grid-bias voltage. An interlocking relay system functions in the event of failure, or overloading, of any unit, thus disconnecting service before any serious damage can result.

Tube replacement is handled by a push-button arrangement on the desk of the transmitter engineer. Duplicate units and rapid replacement facilities are also provided for other apparatus.

Lightning has long been a great danger to a transmitting station—and still is—although radio engineers have recently developed certain safeguards. Charges of lightning which have entered the station on the lead-in have been known to melt 30-inch condenser plates to molten liquid. Today the modern set-up includes static drains which consist of a coil and a resistor, across the apparatus from antenna to ground.

But what happens when an SOS signal is on the air?

Every broadcast transmitter is equipped with a special receiving set, adjusted for the reception of 600-meter waves, the wavelength assigned by international agreement, for SOS signals. A big loudspeaker is placed at an advantageous point so that the transmitter crew can hear any signals that come through. The operators, who work in eight-hour shifts, are constantly alert to any signals received. If any signal even remotely suggesting an SOS is heard, the station immediately telephones the nearest U. S. Navy Yard for advice. If the station operators are confident of the signal they immediately discontinue broadcasting, otherwise they await orders from the Navy Yard. Broadcasting is resumed when the Navy department sends out permission to resume by 600-meter signals.

The ordinary distribution problem involved in a network broadcast is difficult enough but in point of complexity the Nemo broadcast, often requiring seven or eight announcers, a corps of engineers and the supplementary use of short waves, takes the grand prize. Engineers and announcers have often spent days of preparation and rehearsal in advance of such an occasion.

Before describing some of the interesting engineering hook-ups used on important news broadcasts, it is necessary to speak of the piece of apparatus, recently designed, that serves as the nerve center coordinating all activities in the field.

Technically known as the "semi-portable Nemo switching equipment," the extremely flexible, compact and efficient apparatus developed and built by the engineers is a miniature broadcasting studio.

This apparatus, supplied with batteries for use where regular power supply is unavailable, is contained in a box measuring approximately 2½ x 4 x 7 feet and weighing a half ton. The "box" may be shipped to any desired centralized point from which wires are radiated to whatever locations participate in the broadcast.

When completely installed, the equipment is capable of provided ten-way communication, among as many locations. Ten announcers, within any radius—even scattered throughout the country—could talk among themselves and also to the broadcast listeners. This intercommunication is accomplished by means of special "feedback" amplifiers which permit each point to hear every other point. Inter-communicating telephone circuits are also provided. Each of these ten broadcast circuits may be controlled for volume, or switched "on the air," separately or simultaneously.

The program director at the central control point can talk to any of the distant announcers by means of the feedback amplifiers and, unknown to the listening radio audience, can direct the entire broadcast.

Provision is made for testing a set of circuits while the others are being used, for broadcast and testing equipment is provided for the rigorous checking of telephone circuits required in the broadcast field.

It is probable that only a small fraction of the millions of listeners have the slightest knowledge of the men sweating behind the scenes, in radio. They listen to a broadcast as a simple, matter of fact and connected narrative, without realizing that many men have worked for days—or, at the very least, for hours—to make it possible. That is as it should be.

But it is these "unknown" workers, unseen, unheard and unsung, who have produced a radio-minded nation which today accepts with utter calmness the voice of Col. Lindbergh speaking from Tokio, music from Chicago or an address from Rome.

A Boon to the Deaf

(*Continued from page* 845)

A Pointer on Demonstrating

Now for a few words concerning the problems and reactions of deaf persons. The serviceman will oftentimes find in demonstrating the Ear Aid that the deaf person trying it offers some objections to the background noise. The Ear Aid itself is silent in operation, there being no noticeable tube noise or "carbon hiss" in the microphone. The noise, occasionally complained about by deaf people using this unit (or any other highly sensitive hearing aid) is nothing more than the noise which a person of normal hearing hears all the time but to which he has become so accustomed that it is no longer noticed. The deaf person, on the other hand, does not hear these ordinary noises so that, except in unusually noisy locations, the world is a thing of quiet to him although myriad sounds of varying intensity are always present. But give such a person a sensitive hearing device and he starts to hear all of these sounds and immediately assumes that the unfamiliar noise is in the hearing device itself.

Experience indicates that this objection becomes less and less as the subject continues to use the device. After a few days he or she is no more conscious of these sounds than is a person of normal hearing.

This condition is one which both the serviceman who is demonstrating the hearing aid and the person to whom a demonstration