

The New "Times Square" Studio of the N.B.C.

A peep behind the scenes of broadcasting, showing the enormously elaborate nature of the equipment required to insure that chain programs are put "on the air" smoothly and without delay

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A MODERN broadcasting studio is primarily a workshop and has been designed accordingly. The disposition of artists, instruments, pick-up and control devices and other paraphernalia is such as to leave but limited space for a guest audience. Besides this, there is the problem of change of acoustical state of the studio space where a considerable mass of sound-absorbing material (such as human bodies) has been introduced. Irregularities in the matter of variations from the program balance determined during a rehearsal to that obtained during the actual presentation of a program, with a considerable guest audience added, have been experienced. Special precautions on the part of a trained studio staff must be taken in this regard.

To provide a studio, therefore, to accommodate a larger guest audience and one in which the operation of producing radio entertainment should be fully visible, with no uncontrollable factors introduced, the Times Square Studio of the National Broadcasting Co. was conceived and a specially-constructed auditorium atop the New Amsterdam Theatre in New York has been adapted to the purpose. Investigation was made of the technical considerations involved, and an installation designed accordingly.

Numerous Microphones Needed

Twenty-six condenser microphone "outlets" or positions were installed in various parts of the house. These were placed along the footlights, in the orchestra pit, up in the

"fly-loft," the wings, at the balcony rail, and in the auditorium ceiling, to afford any sort of pickup that may be necessary to a particular production.

The outlet circuits are led to a panel on

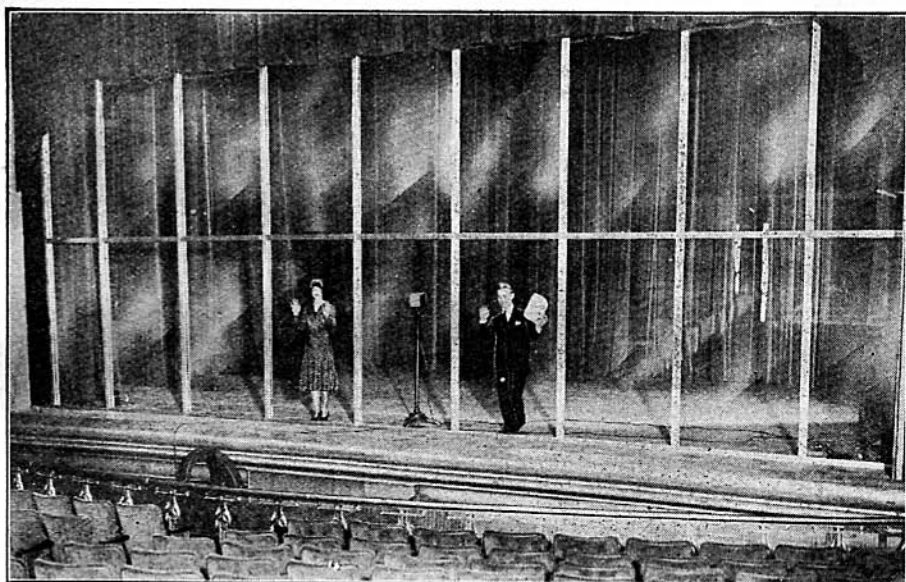


Fig. A (above)

The six-ton glass curtain which cuts off the stage from the audience while programs are being broadcast, and prevents outside noises from being picked up by the stage microphones; the audience, watching the artists, hears them, not directly, but through reproducers which are connected into the amplifiers through the "gain control," as shown in Fig. 1. With curtain raised, the program may be picked up by microphones in the pit, which also record audience sounds.

Fig. B (left)

The control board and the gain-control operator's desk at the Times Square studio. The desk at the right is in front of a double-glassed observation window, through which the operator is watching the performance below him on the stage, as well as the audience in front, while he "monitors" the amplified program.

the control board, from whence they may be "patched" or connected into a "mixer"; the output of which is then amplified and monitored in the usual manner and transmitted over a telephone line to the main control room of the N. B. C. at 711 Fifth Avenue.

A booth, located high above the stage, at the rear of the house and affording a good view of both the stage and the house, was transformed into a control and monitoring room. A speech-input control board and a power-supply switchboard were installed therein and the room acoustically treated. The gain-control operator's position is at a small control desk in front of a double-glassed observation window through which he can keep in sight the entire proceedings below him.

Isolating the Stage Sounds

A special feature on the stage is the glass curtain which can be lowered to isolate the performers on the stage proper from the audience. This curtain is made of large rectangles of plate glass set in a steel frame or grille. The entire assembly weighs six tons and has an average sound attenuation of twenty-five decibels.* Whenever this curtain is lowered, the audience hears the program through loud speakers located in the orchestra pit; which are operated from amplifiers bridged across the return monitoring amplifiers as shown at the lower left in the accompanying circuit layout (Fig. 1).

* See note at end of article.



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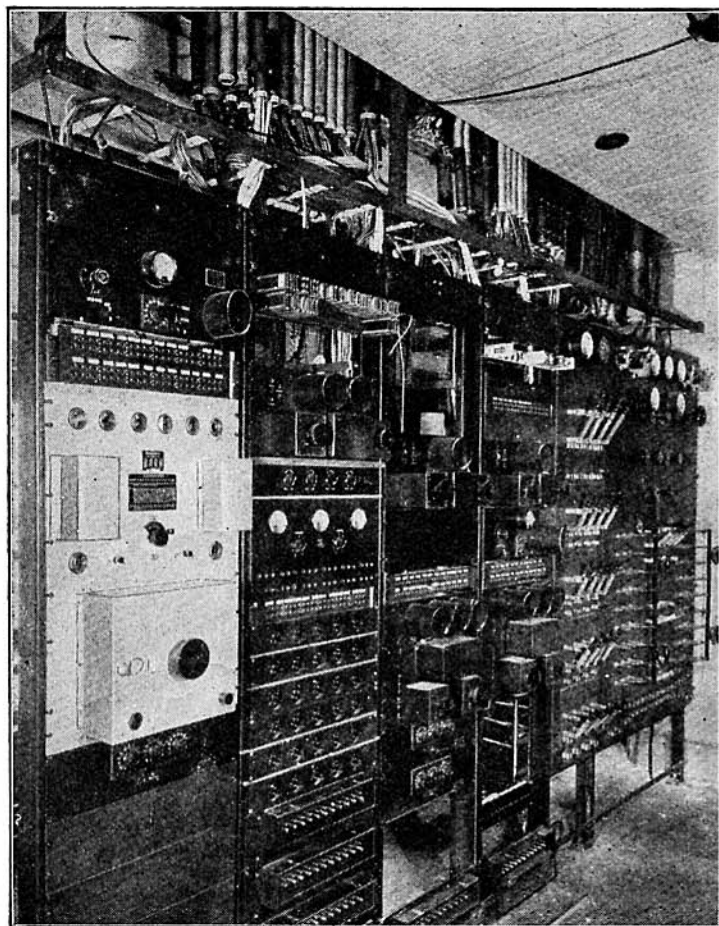


Fig. C

The speech-input control board and the power-supply switch-board, of the Times Square studio of the National Broadcasting Company, photographed during its installation in the New Amsterdam Theatre, at Broadway and Forty-Second St., New York City. An idea of the elaborate nature of the equipment shown in schematic form in the diagram below will be gained from this picture. (The cylinders protruding from the front of the panels are protectors for vacuum tubes, mounted thus horizontally for quick replacement.) The apparatus is ready in complete duplicate for every part; so that a failure cannot cause more than an instant's delay.

Fig. 1 (below)

This diagram shows merely the order of the complicated units, housed in part in the panel illustrated above, through which the pick-ups of the numerous microphones are blended.

a loud speaker on the stage and also makes inoperative the local monitoring speakers to prevent acoustic feedback.

Local and Remote Controls

On the speech-input control board up in the booth are mounted the microphone and line amplifiers, condenser microphone, power supply panels, volume indicators, power amplifier to operate the pit loud speakers, an audio oscillator and associated testing apparatus and the various circuit switch terminations. A spare unit which can be cut in immediately, in an emergency, is provided for every piece of apparatus in the program line-up. Spare condenser microphones are always set up, needing only to be "faded in" to supplant a defective one which is simultaneously "faded out."

Two 14-volt banks of storage cells for vacuum-tube filament lighting, and two 402-volt banks of storage cells for high-voltage plate supply, are located in a battery room under the stage. The power board to control charge and discharge is located adjacent to the speech-input control board in the booth.

At the volume-control operator's desk are located a six-position mixer, a main and a vernier gain control, an "interphone" and an order wire connecting with the Fifth Avenue control room, a volume indicator and the switching keys for signaling the announcer.

An interesting condition, mainly psychological, was apparent during the tryouts of this studio. It was found that the difference in volume between the dialogue, the announcements, and the spoken programs in general

An advantage of operating with the curtain lowered, beside that of isolation from the audience, is that soft-voiced dialogue, crooners, "whispering" baritones and the like may be heard at proper volume in the house; whereas, if the curtain were raised, the actual sound itself, though sufficient to actuate the sensitive microphone, would be but poorly distinguishable by the audience.

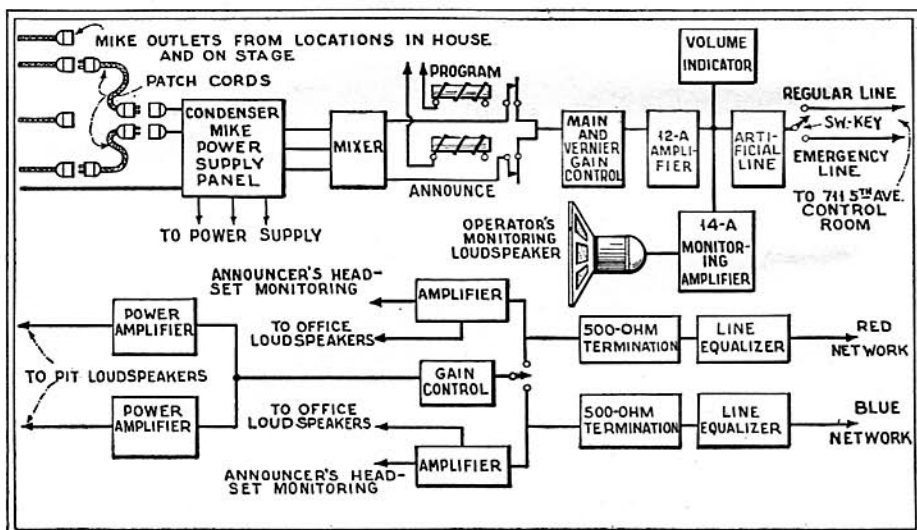
The studio can also be operated with the curtain raised, and it has been so used on several occasions. When the curtain is out of the way, the artists play as to an audience, in the regular manner of theatrical presentations; and sound-concentrating pickup devices, located out in the house above the audience and facing the stage are employed to pick up the program. Microphones out in the house are also used to pick up room noise and applause, when this is desired.

The use of sound concentrators or directional pickup devices solves many of the problems of acoustical interference and program balance. Properly employed, they give the reproduction a definition, and at the same time a blending, that can rarely be achieved by other means.

The inclusion of all the various types of microphone pickups in the Times Square Studio is in accordance with the plan to make it a very flexible installation.

The Announcer's Pulpit

An announcer's control stand or "pulpit" located on the stage, contains, besides the announcer's microphone, the necessary controls for connecting in either the announcer's or the program microphones. It also provides the announcer with signal lights ("stand-by" and "go-ahead") and jacks by means of



which he can monitor, with a pair of headphones, any of the N. B. C. programs passing through the Fifth Avenue control room. This is necessary for the synchronization of the various networks.

The "pulpit" is semi-portable and its circuits are terminated at the end of a flexible cable, which may be plugged in at several locations about the stage to suit whatever setup is used.

Between the control room and the stage is provided a "studio address" system by means of which a director in the booth can talk back to the stage during rehearsals. A button on a microphone stand up in the booth, when pressed, connects the microphone to

and that of the musical programs (especially with large orchestras as heard through the loud speakers with the glass curtain lowered) was unsatisfactory. The sight of the physically large ensemble of instruments made it necessary to satisfy expectations by bringing up the volume much above that of the spoken dialogue; the fact being, of course, that since the spoken dialogue had been increased in volume, beyond the natural case, the orchestra volume had to be increased proportionately. This necessitated a separate volume control on the pit loud speakers; it is controlled by an operator located out in the audience on the balcony.

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output, and an '80 rectifier. The chassis is wired to receive the leads of a phonograph pick-up, to which it gives a stage of screen-grid amplification as well as the normal two stages of audio.

GANGED RESISTOR UNITS

FOR the sake of convenience in mounting and wiring, several prominent set manufacturers are ganging their metallized resistor units, by arranging them side by side in a row and strapping them together at their center with one straight strip beneath and a corrugated strip on top, with screws through holes at the ends of the strips. This method is possible only with resistors having an insulated body rather than a conducting body. Connections are readily made to the ends of the resistors, which are fully exposed and free for the purpose.

The ganging of metallized resistors makes for a compact, simple, readily-serviced receiver; since all resistors are concentrated in one place where they may be readily checked up and replaced if necessary.

TROUBLE-SHOOTERS' RECORDS

TO assist listeners in identifying different kinds of local noises and static, a Czechoslovakian firm has produced a phonograph record in which every known form of interference is included from natural atmospheric to the noises created by household appliances. It is said that listeners and radio clubs are highly enthusiastic over this idea and that a wide circulation has been gained for the records.

Times Square Studio

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A somewhat similar problem in estimating the proper balance between announcements and the other parts of the program to produce a pleasing combination, necessitated the practice of keeping the volume of the announcements six decibels* below the program level. This is a policy followed in all N. B. C. studio operating practices.

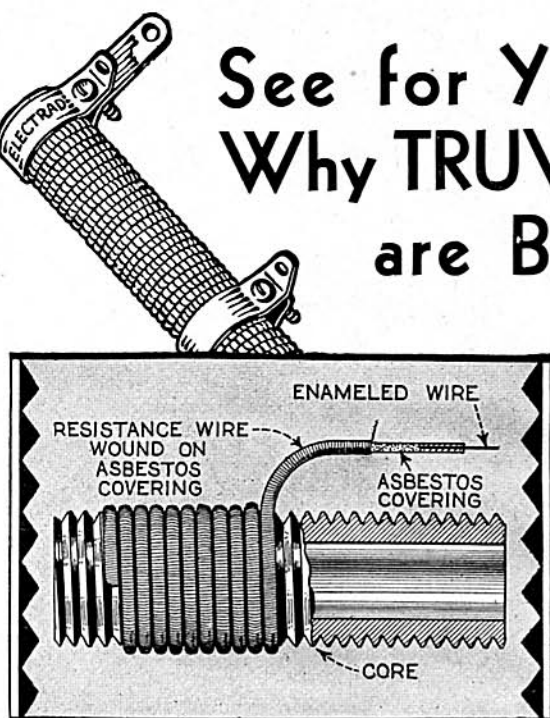
(This studio, at last reports, is being fitted also with television pickups for broadcast tests.—Editor.)

*The decibel is a unit devised by telephone engineers to measure increase or decrease, either in the volume of a sound, or in the power of the A.F. electric current which is used to produce a sound (the word is derived from the name of Alexander Graham Bell, inventor of the telephone). Because the human ear has not a "straight-line characteristic," the decibel must be measured, not on a straight scale, like volts or amperes, but on a logarithmic scale. This is another way of saying that the ear judges the amount of change in the loudness of a sound, not by the actual value of the pressure upon it, but in proportion to the degree of loudness to which it has last accommodated itself. A small "absolute" change in the volume of a weak sound gives just as distinct an effect as a very great "absolute" change in the power creating a very loud noise. The noticeable change in the "volume" of a sound, or power output, is one amounting to about 25% up or 20% down from the previous value. This ratio is one "decibel"; also known as a "transmission unit," because it was originally devised to measure the loss of audible signal strength in transmission through standard telephone cable. The number of decibels by which the volume of sound, or wattage of A.F. current, is varied is numerically equal to ten times the "common logarithm" ("to base 10") of the ratio of change—or twenty times the logarithm of the ratio of change in either voltage or current.

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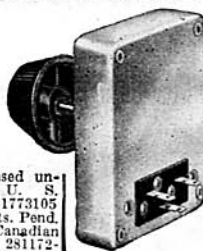
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