

FIG 1
▲ Transmission lines on the Brown campus carry studio and remote programs, and serve network intercommunications.

◀ A 1-act play going over the Brown Network. The students are: (left to right) Howard B. Lyman '42, Victor J. Millery '41, Helen E. Starrett, '40; George A. Stuckert '42, Barbara P. Allen, Pembroke '40; and Helen N. Thomas, Pembroke '40.

INTER-COLLEGE WIRED-RADIO NETWORK

A 2-WAY interphone started Brown U. student Abraham on a chain of thought which concluded last month in plans for an intercollegiate wired-radio "broadcasting" network!

This project — which has earned for these New England college students the distinction of being the first in the United States to institute an intercollege wired-radio system—calls for linking Brown, Dartmouth, M.I.T. and Wesleyan together over a leased wire system so that each college can broadcast to the other. At least 10 other colleges and universities it is expected will soon join this System, and others are being invited to hook-in.

It will not only provide entertainment for listeners, and experience for radio-minded students handling the technical details, but it will promote "friendly contacts" between the institutions taking part, the sponsors believe. Operation at present is on 570 kc.

STUDENT WIRED-RADIO

The network idea grew from Brown U.'s complete student-owned and -operated intramural system, conceived by George Abraham '40, Chairman of the board of the Brown Network, during his freshman year and originating from a simple 2-way communication hook-up with a friend in his dormitory.

Today the Brown Network is a major extra-curricular organization, with elaborate sound-proof studios and a central control room in Faunce House; 30 stations in dormitories and fraternity houses where programs can originate; and, a 3-board staff of 75 members at Brown and Pembroke College in charge of programs, advertising and technical arrangements, for its estimated daily audience of 2,000 listeners.

Technically the network is a wired-radio-frequency system, broadcasting on a 570-kilocycle band. Programs are carried over 30,000 feet of wire strung through steam tunnels into dormitories and fraternity houses, but the power used is so small that broadcasts can be heard only on radio sets within a few feet of the transmission lines. The network accordingly needs no license.

PROGRAMS

What sort of material do you suppose would be included in such a "school" program? Well, let us see. Let's take for example the program which appeared in an issue of the *Brown Daily Herald*, last month; we reproduce it, at right, just as it appeared.

In fact, daily programs are just as varied as those heard over commercial stations.

The network has a portable unit which is used in relaying dinghy races, campus interviews, athletic contests, and other outside events to the central control room.

An extensive intercollegiate wired-radio "broadcasting" system, first of its kind in the country, and now in the course of development at Brown University, is here described. The system, which first is to tie-in Brown, Dartmouth, Massachusetts Institute of Technology, and Wesleyan as a nucleus, soon will include 15 colleges!

N. H. LESSEM

A faculty advisory board is cooperating with the network in expanding its activities. Following in general a program pattern already tried out, the network will broadcast not only all available campus events, but will map out an extensive series of musical, dramatic and feature entertainment originating under the network's own auspices. Much of the expense

involved will be written off through advertising contracts—an innovation begun successfully a year ago.

The 2 block diagrams indicate the essentials of the "broadcasting" system, and the important equipment in the studio in Faunce House.

TRANSMISSION SYSTEM

FIG. 1.—As Fig. 1 indicates, all of the transmissions are performed by means of wires. "To points on the campus, we have run our own wires," says David Borst, in describing this system to *Radio-Craft*; these are a fine, single conductor when used for carrying audio signals, or twisted pair when used for the transmission of radio-frequency signals. To more remote points, and connecting the Pembroke facilities, rented telephone lines are used. Of course, no attempt is made to send radio signals over telephone wires.

The lines on the Brown campus are used for 3 distinct types of service:

- (1) To carry the radio signals which compose the programs.
- (2) To bring in signals from the 2 portable amplifiers so that important lectures, concerts, and interview programs may be obtained, and
- (3) For intercommunication among members of the Network who have microphones attached to their radio sets and who are connected to this separate line.

NETWORK STUDIO

FIG. 2.—The studio diagram, Fig. 2, may appear a bit complicated because Brown has incorporated a number of refinements which are not essential to broadcasting, but which aid materially in putting out good programs.

All the equipment is housed in a 2-bay relay rack and is mounted on standard panels. All signals entering the studio or leaving the studio over lines pass through the 2 line panels which are equipped with rows of jacks so that many different circuits may be put up quickly by means of patch cords. All the signals comprising the program pass through the 8-channel program mixer and master gain control, from there they are sent to the proper amplifiers and transmitters as indicated.

In addition to the main program a 2nd program may be rehearsed over the Re-

BROWN NETWORK

570 On Your Dial

AFTERNOON PROGRAM

- 4:00—Discs with Avery
- 4:30—Movie Reviews by Loretta Curran and Bill Clark
- 4:45—Midweek Special
- 5:00—Town Hall This Afternoon
- 5:30—Pembroke at the Turntables
- 6:00—Sign Off

EVENING PROGRAM

- 8:00—Battle of Wits
- 8:30—Brown - Harvard Varsity Basketball Game
- 10:00—News
- 10:15—Music We Like
- 10:30—Sign Off

hearsal Board, or it may be used to test a future program; furthermore, communication with people on the inter-dormitory line may be had over the proper amplifier.

The studio speaker may be set to reproduce signals from any line, or signals on the Rehearsal Board, as well as the main program. Cue signals consisting of the program at that time may be sent over the lines to remote points from which a program is about to originate by throwing switches on the program mixer. Also on the mixer is a volume indicating meter, which augments the earphones on the R.F. monitor in helping to keep the program at the proper level.

OPERATION

All of the panels are provided with circuit-opening jacks so that any panel may be disconnected from its present service and used elsewhere by means of patch cords. The operator sits in front of the program mixer which is mounted on a slanting panel. He faces the studio, and on his left is the relay rack bay, and on his right the 2 phonograph turntables and pickups. Microphone outlets are provided in convenient places around the room.

If need be, 1 man can run an entire program, but usually there are 2 men on deck, and sometimes 3. If a program outside of the studio is expected, additional men are required to operate the portable equipment.

Planning a program requires the work of men on the 3 boards of the network. A member of the Program Board plans the programs, sees that the script is written, and provides the announcers; a member of the Technical Board provides the switch-board operators and additional operators for the portable unit service; and a member of the Business Board provides the advertising copy if the program is sponsored.

Colleges and Universities contemplating tying-in to the Brown Network may still be in doubt as to just what technical complications they might be letting themselves in for. To these institutions the following additional technical information is directed in proof that neither undue complexity nor any considerable expense are involved.

ESSENTIAL EQUIPMENT

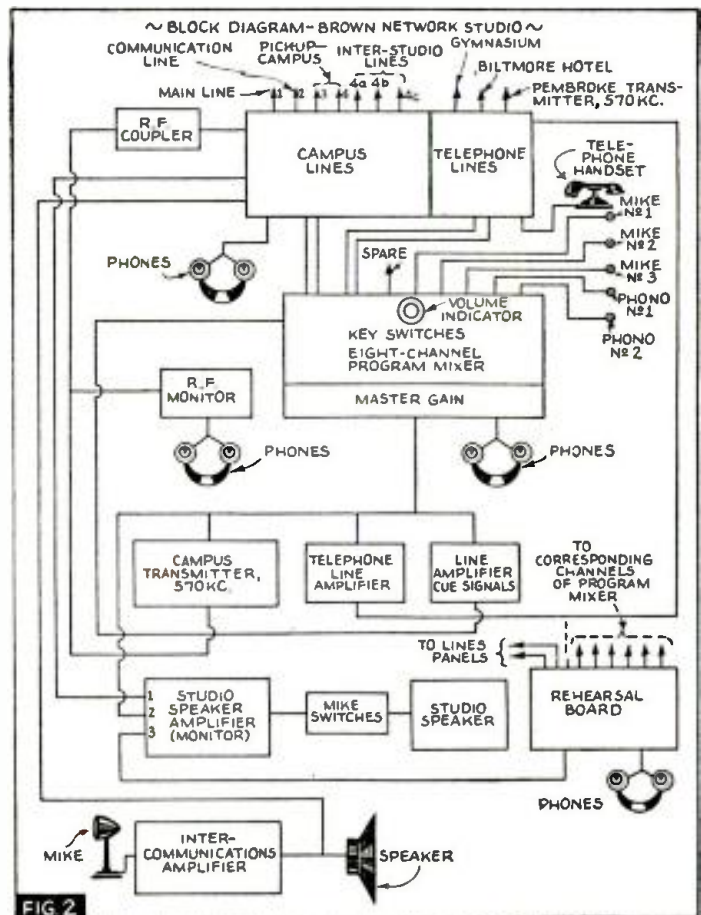
The initial equipment which is necessary to put out a variety of broadcasts is surprisingly small in amount. The most essential part is the small radio transmitter. Also needed are 2 phonograph turntables and pickups, one or more good quality microphones, and an amplifier capable of supplying the needed gain.

Provision to monitor the signals in the studio is desirable, and if programs from outside of the studio are contemplated a means of amplifying signals coming into the studio over a line must be devised. Remote broadcasts require additional amplifiers and mikes which are to be used on the broadcast location. In time this equipment will be added-to, but these additions will not be needed at first.

Two transmission methods are possible. It is possible either to send radio signals from one transmitter over a line and couple this line to the top-floor heating pipes of the buildings to be covered, or to send audio signals over a line and have a small transmitter modulated by these signals located in, and coupled to, every building to be covered.

In case there is a group of buildings at some distance from the studios a combination of the 2 methods may be used. Audio would be sent from the studio to one building in the group, and R.F. from a transmitter located there to the other buildings

The equipment shown in this drawing is operated as follows: Key switches: (6 gain controls are placed on right, 1 switch per control): up—to Rehearsal Board, center—off, down—to master gain. Two gain controls on left (2 switches per control, each terminating in plug on lines panels): up—cue signals on line, middle—communication on line, telephone headset, or intercommunications amplifier, down—to master gain (switches on mike channels cut studio's speaker when down).



in the group. Local campus conditions will suggest the best arrangement to be used.

LINES FOR WIRED-RADIO

Various types of lines may be used, and each has its advantages. By far the least expensive is a single conductor with ground-return. This line works very well for audio circuits when run either between roof tops or underground in a tunnel, but R.F. signals should not be sent over this type of line if it is strung in the open.

Lines in the open should be made of fine wire, about No. 22 A.W.G., and the spans should be of bronze; while copper wire should be used if it is to be tacked along woodwork. Underground lines should be well insulated. Double-conductor twisted-pair lines are the best to employ for both R.F. and A.F., and for R.F. are imperative if the line is to be in the open for any length. Coupling devices to this line are more expensive, and the wire will cost at least a cent a foot. However, such a line is much more efficient, radiates less, and is more permanent than the single-conductor type.

Finally, telephone lines may be rented between buildings. They have 2 conductors, and are only for audio frequencies. Don't overlook the possibility of sending both A.F. and R.F. over the same line. This is especially easy with the first type.

Audio signals may be coupled to the single-strand lines by means of a 0.1-mf. condenser or an A.F. transformer, one end of the winding being grounded. Signals at R.F. may be coupled through a 250 mmf. condenser or a tuned circuit. Transformer coupling must be employed for both R.F. and A.F. on the twisted-pair line, the turns-ratio of the transformer depending upon the impedance of the line. A tuned secondary for the R.F. transformer is necessary.

It has been found excellent practice to couple the R.F. from either type of line to the radiator heating system someplace near

the top of the building to be covered, through the 250 mmf. condenser or R.F. transformer mentioned.

SOURCE OF SUPPLY

Most of the equipment needed in the studios is available from radio mailorder houses, and is described briefly as follows:

The transmitter may be one of the many types of small phonograph oscillators on the market. Next, an amplifier with several controls is recommended. For mikes, any inexpensive model would do. A reasonably-priced pickup and turntables are next on the list.

No great audio power is needed to modulate the oscillator recommended, therefore a connection should be made to the grid or plate of the driver tube in the amplifier and the signal from there fed to the oscillator. Since the amplifier may not work without a loudspeaker (for field inductance) this speaker may be used for the studio monitor. Arrange some way to turn it off when the mikes are on!

The A.F. output of the final tubes of the amplifier may also be sent over a line to cue an incoming program over that line. This is a good way to tell the operator at the remote position to "go ahead."

Inquiries regarding the Brown Network may be addressed to the University or to Radio-Craft.

This intercollegiate wired-radio network may well forecast a nation-wide development of far-reaching importance. However this is not the only interest which attaches to this article on the newest application of wired-radio. For this article also includes complete directions for setting up a wired-radio intercommunication or broadcasting system. Such systems may be used for point-to-point communication in schools, factories, large business organizations, etc. Need we say more to wide-awake Service and sound men?—Editor