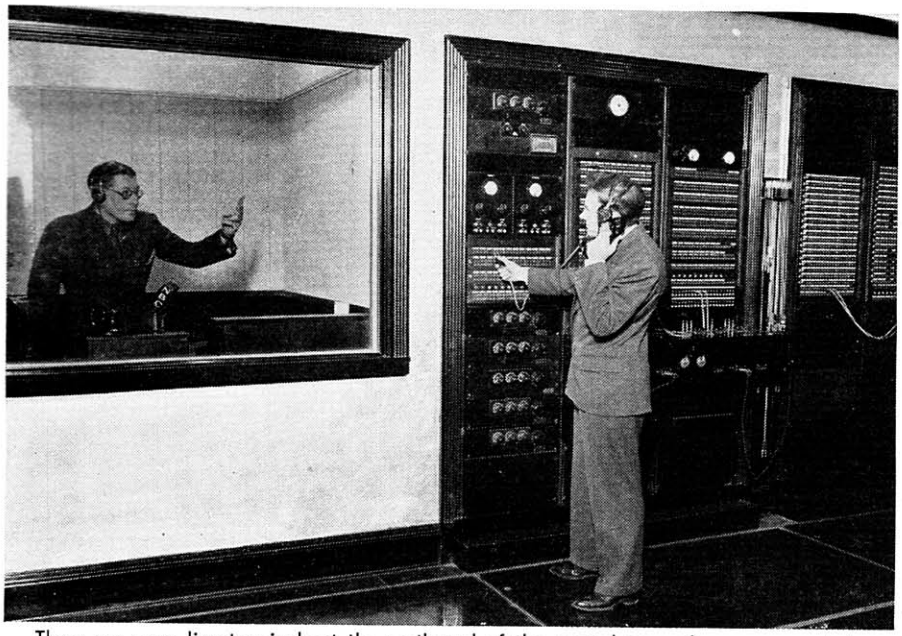


There are more live terminals at the south end of the control room than you can shake two cross patch cords at. Announcer signals, "2 seconds before next switching."

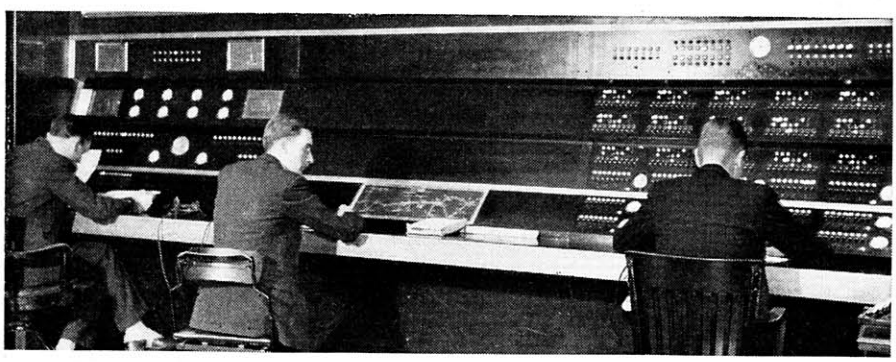
by JACK RYAN
NBC, Press Dept., Chicago, Ill.

It takes only two men plus over five hundred push-buttons to track one of NBC's programs through Chicago. The author tells how you get your program.

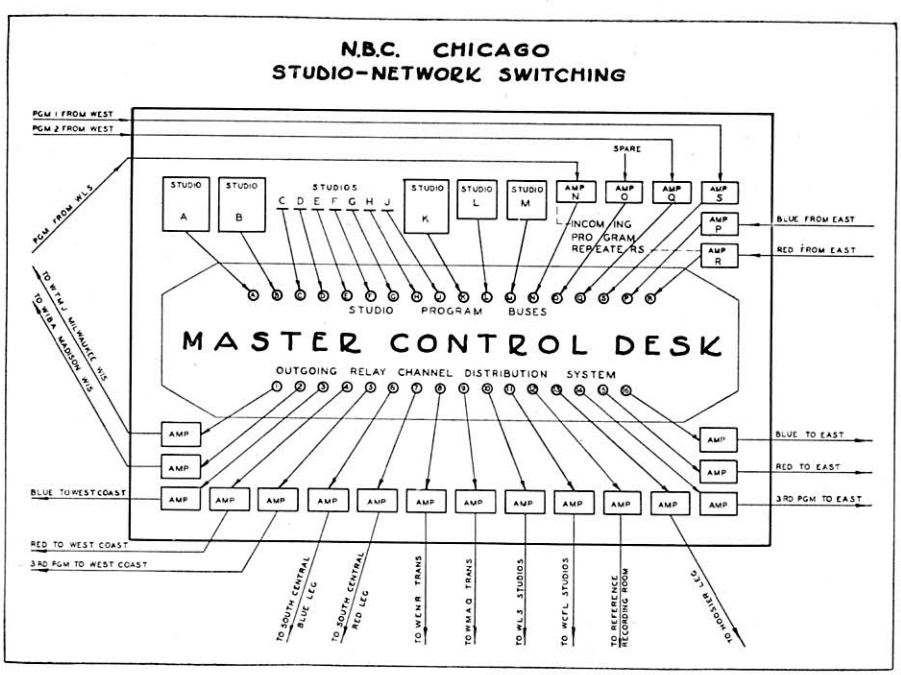
THE *Nerve Center* OF A

TWO men and 547 push buttons control one of the greatest radio switch-tracks in the nation—the NBC master control desk in Chicago.

Take a look at a railroad map of the U. S. A. The lines run out, east, west, north, and south, a mass of creeping threads that hook the coasts to the borders and that tie the Everglades in with the Dust Bowl. If you wanted to chop that knot of lines at the most vulnerable spot, you would seek out Chicago, because it is at Chicago that the biggest mass of those creeping threads sag or bend around to cross and recross in the same spot. Chicago, from a railroad standpoint, is the great half-way station, the point where you can box the compass with reshipment directions.



The master control board—one of the greatest radio switch tracks in the world.



Block diagram of what takes place inside the control room radio switch track.

As with railroading, so it is with radio, in one sense, for at sometime or other in almost any 24 hour period the program traffic for about 150 stations in the NBC networks will get its switching through Chicago. It doesn't matter where on the NBC map a program originates. If a show has a network it generally slides through the Chicago control desk, to be combed out and headed down the right wires for the ultimate station outlets. But perhaps the most astounding feature of the whole thing is the fact that one single engineer, seated in front of a three-by-five foot section of the main switchboard, can hold the whole of NBC in both hands and use a nearby typewriter to hammer out the operations log at the same time.

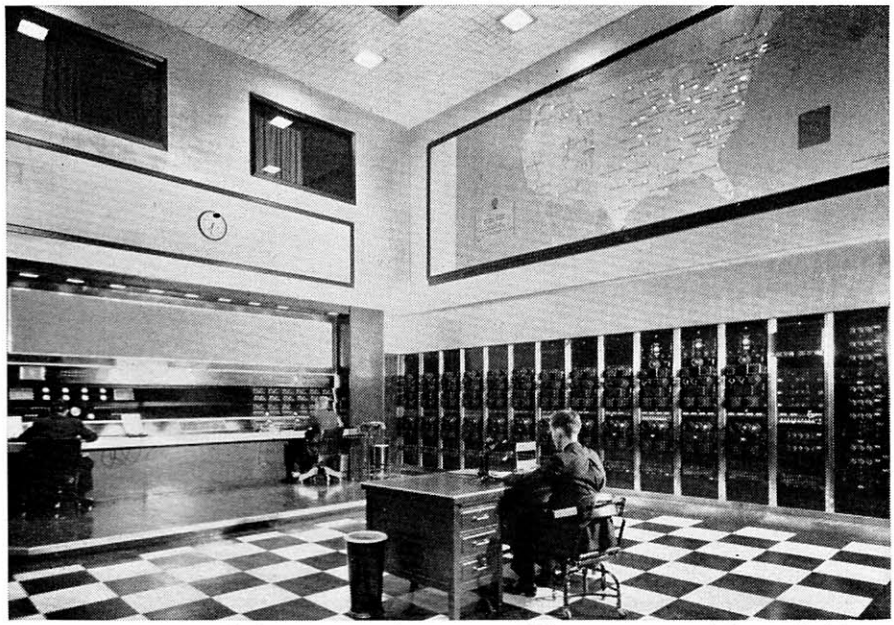
The arrangement of that switchboard is a matter of convenience. It looks simple, but it isn't. The very unpretentiousness of the board's operation is a perfect mask for a singularly difficult engineering achievement. Not counting power supply apparatus, meters, and gauges of various sorts, it takes something more than 18,000 individual pieces of equipment to make that board function as it must function—and keeping track of 18,000 pieces of equipment is no simple job in any man's language.

It was some years ago that NBC engineers found that relay switching was the answer to most of their traffic routing problems, and it is on a complicated system of relays that the functioning of the

main control room at Chicago is dependent. It takes just 976 relays and 7,444 relay contacts to complete the switching layout for the main control room and the adjacent studios at Chicago, and there are 864 indicating lamps in the setup to let the engineers and announcers know what switch buttons to push. Not counting the local switching which the announcer handles from the studio, the main board handles around 1,000 channel switches in a normal day's work. Nobody has ever had time to stop and count up the channel switches on a day when the networks are really busy, but the other figure gives a fair idea of what to expect.

But, getting away from the stratosphere statistics for a moment, a clearer idea of the main control rooom function may be obtained by following a program out of the studios, through the board and down the specially engineered telephone lines.

Two days before a program goes on the air, the engineering staff gets its copies of the Advance Program Traffic Schedule, a big pink or blue multigraphed sheet (the



In this large room all the programs that come to Chicago are re-routed on schedule.

BROADCAST NETWORK

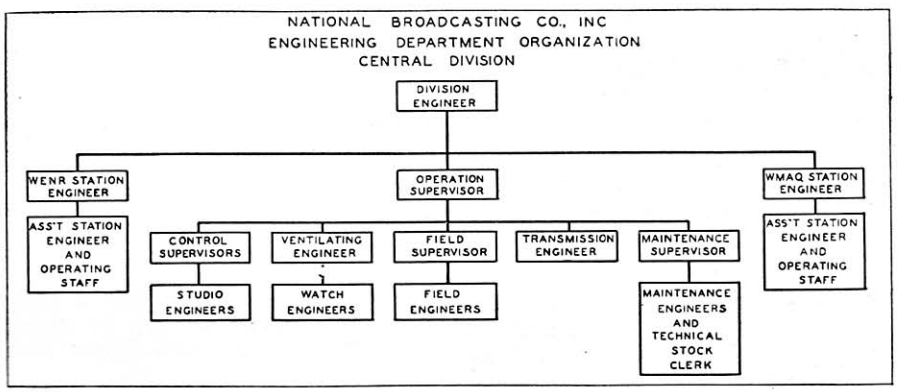
color varies with the network) which serves to give a preliminary listing of what programs are coming up. The day before the program is aired, a mimeographed Local Program Traffic Schedule is handed down. This sheet contains detailed information about studios, production, time, announcers, cues for the NBC chimes, etc. This is the engineer's route sheet, to be checked and rechecked, corrected for last minute changes, and to guide his work at the switchboard. Finally, via teletype from New York headquarters, comes the Operating Order for the broadcast, a brief paragraph noting time, program, outlets and chimes cue. Operating orders may be received anywhere from four hours to 15 minutes before a given show goes on the air.

Taking a typical order out of the day's schedule, the outsider would be presented with the following heiroglyphics:

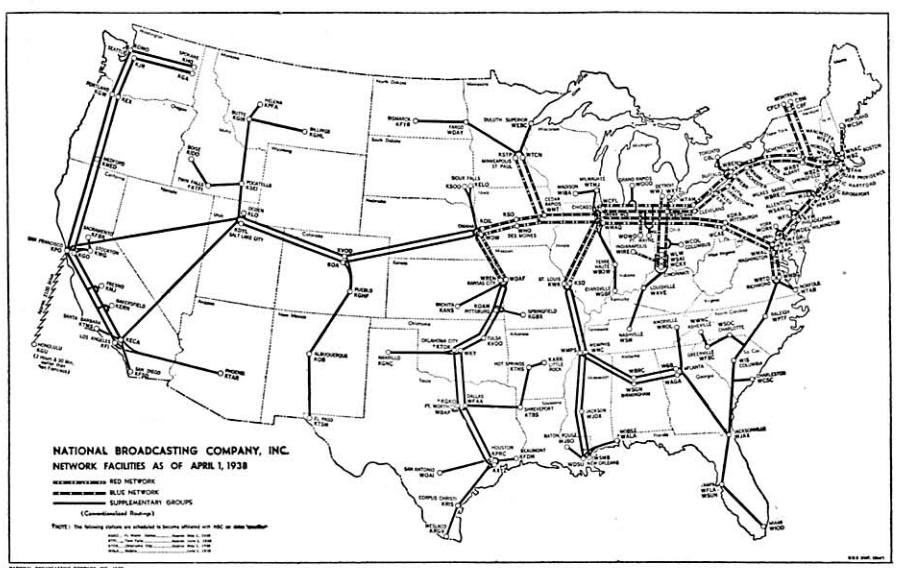
O O
NO 5
TIME 9-915AM CNYT
BLUE BKFST CLUB (SUS CHI) (NON)
ILL MID COUN LOU NTN HOS

Reading like Greek to anyone but an NBC engineer, in translation the "O O" stands simply for Operating Order. A literal reading would make the message state "This is Operating Order No. 5, scheduling a broadcast from 9:00 to 9:15 a. m., New York Time (all programs, however long, are ordered by 15 minute intervals). On the Blue network, the NBC *Breakfast Club* will originate as a sustaining broadcast from Chicago studios. There will be no break (NON) at the end of this 15 minute period, because the program is scheduled to last longer than that. The program will return to Chicago on the Blue leg from the east (ILL), feeding stations enroute. The east will receive

(*Continued on page* 72)



To insure smooth working and letter-perfect results, the engineering staff at NBC, Chicago, is divided up much the same as the Army. Highest coordination is necessary.



A chart of lines fed by NBC in normal conditions. Emergencies create many more lines.

The Nerve Center of a Broadcast Network

(*Continued from page 7*)

the program on the east-bound Blue leg (MID). The program also takes a Blue leg west (COUN). Another Blue leg will go to south central stations (LOU). The broadcast will also go over the lines to WTMJ, Milwaukee, and WIBA, Madison, Wis. (NTN). The final route tied in on this broadcast is the Hoosier leg (HOS)."

For the next 15 minute period of the *Breakfast Club*, the engineer will have approximately the same type of order, with such additions or changes as may include more or fewer stations on the broadcast. At the end of the order for that second 15 minutes there will be a notation reading "CGM," which means that Chicago will ring chimes for the network.

With that work order in front of him, the switchbank engineer in the main control room pre-sets his relays to wheel the right channels into line. Outlets from the studio where the *Breakfast Club* is to be produced are all tied across the six legs which will take the show (they could hook nine channels across if they had to). Somewhere, in a radio studio, an announcer gets ready to wind up a broadcast that goes off the air at 9:00 a.m. He pushes the chimes button on his own small switchboard, setting off a relay system that operates the chimes machine. The next instant he pushes another button, clearing his studio and the channels that studio was using. Almost simultaneously that same operation is going on for other channels that will now be concerned with the *Breakfast Club* broadcast.

In main control, a buzzer sets up a clamor and continues to buzz until all channels have been properly set up, and the *Breakfast Club* is ready for piping down all the lines. The buzzer is there just in case somebody happened to forget the cues, and if the necessity arises the engineers are ready to slip in a few patch cords or make whatever changes are necessary to get the routings right.

With everything ready to take the broadcast, the network channels are automatically transferred to the bus from the studio where the *Breakfast Club* will originate, and the show goes out to the network. While it takes some time to give a rough idea of how the setup works, the switching takes practically no time at all because the relays are ready to make an instantaneous change-over. With the program started, the switchbank engineer makes a lightning checkup, using a row of buttons, lights, meters, and monitoring loud speakers to tell him if all the required channels are getting the broadcast and at the proper level. Meantime, down at the other end of the main control desk, the control supervisor is monitoring the output. Under his hands are enough relay buttons to cut loud speakers in on anything that may be moving locally or on the networks. There are four speakers mounted behind a screen at the top of the control panel so that it is possible to have an auditory check in addition to the visual check provided by the meters in front of him.

Taking a look at the main control room itself is like taking a look at a well ordered kitchen between mealtimes. Nothing is out of place, there is no disorder visible anywhere, and there is very little to indicate the true importance of the place. Along the east wall are located the local studio amplifiers and buses—the terminals bringing the local shows in for rerouting to local stations, or to the networks. The main control desk stretches across the north side of the room, and the west side is taken up with an orderly row of line amplifiers. Just to forestall failure, provision is made for emergency feeds to take care of any amplifiers that may go out.

To complete the picture of the four walls, the south side of the room has a concentration of plug-in panels and patch cords to handle special hookups, or for emergency service. During a national election that part of the control room is a busy spot indeed, but it serves an interesting function in its daily routine too. There are *telephone effects* filters that can be plugged in there for studio use. It also has facilities for tying up the echo chambers, and for special interconnecting studio hookups. There are outlets also for special variable filters that produce weird voice effects, such as the ones Arch Oboler writes into the *Lights Out* scripts when he wants a dead man to speak. On each side of this equipment terminal board are the windows fronting on two very tiny studios. Fact is, the term for these two cubicles is "nemo booths." Each is provided with an announcer's control panel, somewhat more complex than the usual studio panel, a microphone, a studio speaker and amplifier, and a chair. In these booths the local announcements are handled for programs that originate elsewhere on the networks.

Getting back to the figures on the equipment, the system at the NBC Chicago studios requires a total of 152 amplifiers of various types, broken up into preamps, studio amps, line amps, monitoring amps, headset monitoring amps, and house monitoring amps. It takes a total of 3,160 jacks, 2,148 of them in the main control room, to handle all the possible contingencies that may arise. Besides the switch buttons at the command of engineers in the main control room, it takes about 300 more buttons to care for boards operated by announcers and studio engineers. Indicating lamps about parallel the switch buttons in location and number. Not counting generating and battery equipment, there are 104 other miscellaneous items of equipment that make broadcasting possible, including microphones, line equalizers, and volume indicators. It's a tidy collection of apparatus, dependent on a constant maintenance system for its functioning.

Incidentally, the studio air conditioning system takes one headache out of operations in an odd way. The terminal board at the south side of the main control room, as has been indicated, is a point at which it is possible to cut in on anything coming or going. The jacks used on this board are all spring contact type, and

ordinarily would be subject to some trouble through normal corrosion of the contact points. However, the air conditioning system purifies incoming air to an extent where corrosive elements are practically eliminated and the jacks, as a consequence, are trouble free.

Supplying the power for all the amplifier operations is the job of a duplicated set of generators and batteries designed to insure transmission under any conditions. Two sets of motor-generators are used for both A and B voltage supplies. For the A side, 440 volts of DC is piped to the motor generator from the city lines. The generator feeds direct to the storage battery bank where, through a floating hookup, 14 volts at 250 amps is fed to the A lines. This entire setup is available in duplicate equipment, and it is standard practice to use alternate power supplies on alternate days of the month. City DC mains also supply the motor-generator units for the B current. A similar generator and battery arrangement is also used to deliver 400 volts at 4 amps to the B terminals. The storage batteries alone would be able to supply A and B current for operations during a considerable period of time following any power line interruption.

Speaking about those safeguards against possible power breakdown, since it would be rather difficult to continue operations in the dark, the studio lighting circuits can be switched instantly from AC to DC.

No picture of this Chicago radio switchtrack would be complete without some mention of the organization that it takes to make it work. Under Howard C. Luttgens, division engineer, there are just exactly 95 people in the NBC Central Division Engineering Department. Included in that small army are station engineers, operation supervisor, control supervisors, transmission engineers, studio engineers, field engineers, maintenance engineers, the operating staffs of WMAQ and WENR, and two young ladies who are the department's secretaries.

An overall picture of main control room operations at NBC Chicago is probably best summarized in terms of programs that have to slide through that all-important switchboard in a given period of time. During the month of May, 4,932 programs were routed through it for a total of 1,843 hours. Out of this total, 449 hours came from Chicago studios of NBC, 71 hours originated in field broadcasts from points in or near Chicago, and the balance was made up of programs relayed through from east, west, north, and south. Add it up this way if you like—in May, there were 31 days, or exactly 744 hours to be ticked off on the clock. For each one of those 744 hours, the engineers at the main control desk saw an average of 2.5 hours of programs slide under their fingers and before their eyes.

-30-

OOPS! SO SORRY!

In the August Issue of RADIO NEWS in the component parts list on the "Ham Shack" page, T2 was inadvertantly left out. It should be a Stancor A-5528 output transformer, or any pp plates of 6L6's Class A to 4, 8, 15, & 500 ohm line Trans. To Mr. Gamache, our apologies!