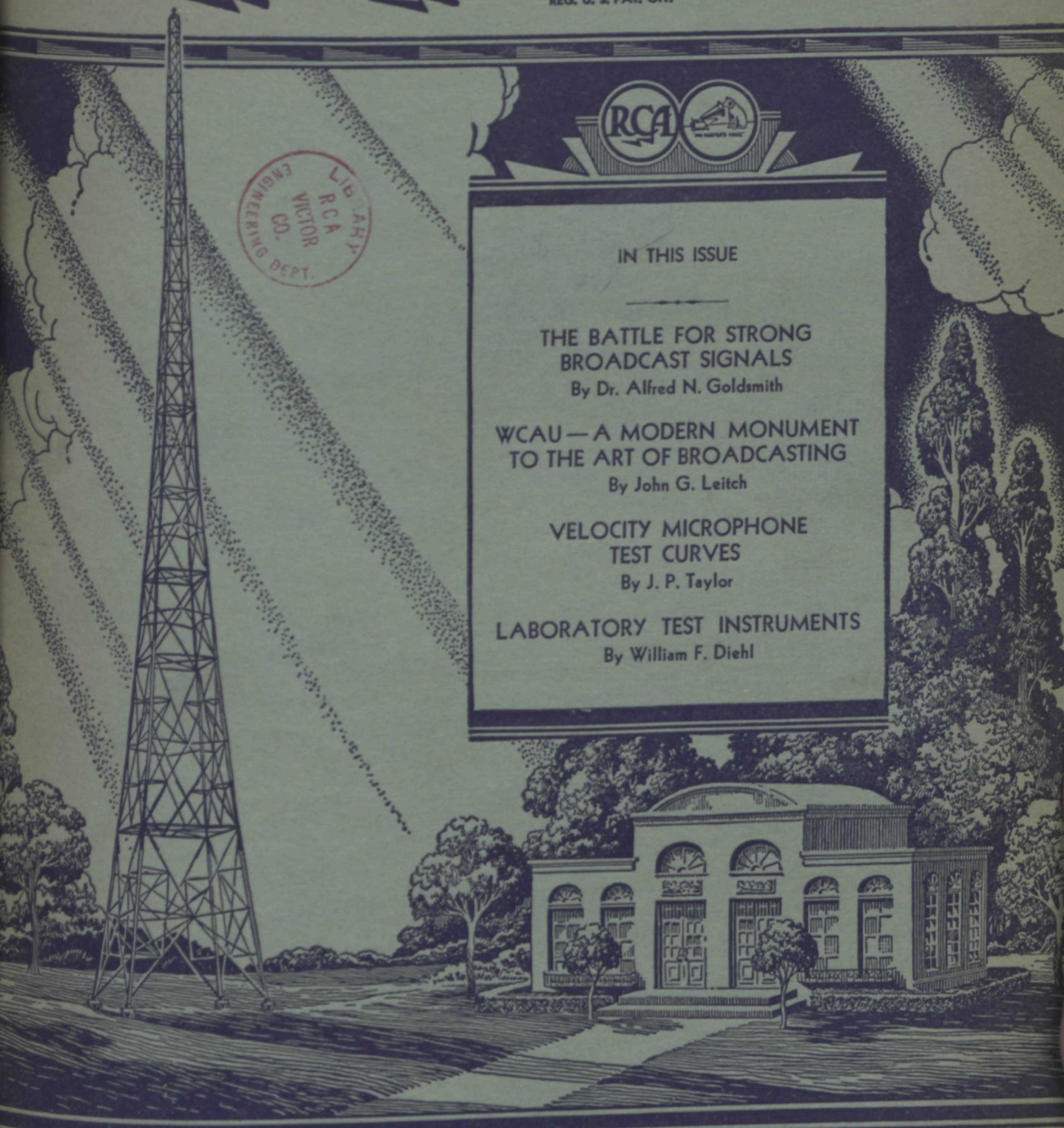
BROADCAST NEWS

REG. U. S. PAT. OFF.



IN THIS ISSUE

RCA Victor Company, Inc., Camden, N.J.

NUMBER 7 PRICE 25 CENTS APRIL 1933

RCA Victor Company, Inc.

A Radio Corporation of America Subsidiary

Camden, N. J.

"RADIO HEADQUARTERS"

DAVID SARNOFF, Chairman

E. T. CUNNINGHAM, President

G. K. THROCKMORTON, Executive Vice-President

I. E. LAMBERT, Vice-President and General Counsel

P. G. McCOLLUM, Comptroller

E. A. NICHOLAS, Vice-President In Charge of Sales

W. R. G. BAKER, Vice-President In Charge of Manufacturing and Engineering

J. D. COOK, Treasurer

F. S. KANE, Secretary

H. SADENWATER, Manager — J. M. SAWYER, Assistant Manager

ENGINEERING PRODUCTS DIVISION

TRANSMITTER SALES SECTION

(OF ENGINEERING PRODUCTS DIVISION)

I. R. BAKER, Manager
S. W. GOULDEN, Commercial Engineer
J. P. TAYLOR, Sales Engineer
A. H. CASTOR, Power Radiotron Sales
T. A. SMITH, C. B. S. Contact
C. L. BEACH, N. B. C. Contact

PIERRE BOUCHERON, Advertising Manager

1 EASTERN DISTRICT—T. A. Smith, 153 E. 24th St., New York City. W. H. Beltz, Assistant

MAINE, VERMONT, NEW HAMPSHIRE, MASSACHUSETTS, RHODE ISLAND, CONNECTICUT, NEW YORK, NEW JERSEY, PENNSYLVANIA, MARYLAND, WEST VIRGINIA, DELAWARE, VIRGINIA, NORTH CAROLINA, SOUTH CAROLINA

2 CENTRAL DISTRICT—H. C. Vance, 111 North Canal St., Chicago, Ill. D. A. Reesor, Assistant

NORTH DAKOTA, SOUTH DAKOTA, NEBRASKA, WISCONSIN, MISSOURI, IOWA, MINNESOTA, ILLINOIS, INDIANA, KENTUCKY, OHIO, MICHIGAN, KANSAS

3 WESTERN DISTRICT—C. F. Coombs, 235 Montgomery St., San Francisco, Calif.

WASHINGTON, OREGON, CALIFORNIA, IDAHO, NEVADA, UTAH, ARIZONA, NEW MEXICO, COLORADO, MONTANA, WYOMING

4 SOUTHERN DISTRICT—B. Adler, Santa Fe Bldg., Dallas, Texas. W. M. Witty, Assistant

TEXAS, OKLAHOMA, TENNESSEE, ARKANSAS, LOUISIANA, MISSISSIPPI, ALABAMA, GEORGIA, FLORIDA

BROADCAST TRANSMITTERS
POLICE TRANSMITTERS
SPECIAL COMMUNICATION EQUIPMENT
POWER RADIOTRONS
POLICE RECEIVERS

BROADCAST NEWS

Edited by
E. JAY QUINBY

NUMBER 7 APRIL, 1933

MURAL DECORATION IN STUDIO C, STATION WCAU

"GREAT GOD RADIO"

By John Vassos

"THE GREAT GOD WHO WITH ONE TOUCH OF HIS FINGER SPANS THE EARTH. HE SPEAKS FROM THE SHORES OF OCEAN TO OCEAN; HE FLIES OVER THE MOUNTAINS. FLEETER THAN THE WIND; HE HAS ANNIHILATED TIME AND SPACE.

A SHIP IS IN DISTRESS—THE GOD SPEAKS AND HUMAN LIVES ARE SAVED. WE HAVE HARNESSED ONLY A TITHE OF HIS FLEETNESS; HIS POWER—OF WHAT IS HE NOT CAPABLE? TO WHAT HEIGHTS MAY HE NOT GO? HIS WINGS ARE STILL UNTRIED, HIS POWERS NOT YET GAUGED."—EXCERPT FROM CONTEMPO.

THIS CONCEPTION IS THE POETIC AND SYMBOLIC SIDE OF RADIO. THE GREAT GOD RADIO HAS BEEN CAPTURED IN THE MOTIF OF A RADIO TUBE WITH THE GOD AS THE FILAMENT. THE VISTAS THAT HAVE BEEN OPENED TO MAN BY HIS GREAT INVENTION ARE EXPRESSED ON THE LEFT BY SCENES OF FOREST AND MOUNTAIN, OF SKY AND SEA. ON THE RIGHT ARE HOMES AND BUILDINGS INTO WHICH THE GREAT GOD REACHES, WITH STREAMS OF ELECTRONS RISING IN CRESCENDO FROM BELOW. AT THE VERY TOP IS A DESIGN WHICH SYMBOLIZES MAN'S HOPE AND VISION—THAT BY MEANS OF RADIO HE MAY SOME DAY SPEAK WITH THE STARS AND COMMUNICATE WITH OTHER WORLDS.

Published Occasionally and

WCAU—A Modern Monument to the Art of Broadcasting

By JOHN G. LEITCH, Technical Supervisor, WCAU

Editor's Note—Here is an example of what can be done in the way of building an ideal Broadcasting Station—sparing no expense or effort to accomplish the highest perfection in keeping with the most advanced knowledge of the art. Broadcasters who are planning new construction or remodeling work may well investigate the precedents set in this most modern installation. We feel that the importance of the subject justifies more than the usual amount of space, and we believe that our readers will share our gratitude to Mr. Leitch for this excellent and detailed description of WCAU.

JOHN G. LEITCH

TECHNICAL SUPERVISOR, **WCAU.** HE SAW SERVICE IN THE U. S. ARMY SIGNAL CORPS DURING THE WORLD WAR, AND LATER ENTERED THE EMPLOY OF RCA AS RADIO INSPECTOR. HE WAS SUBSEQUENTLY APPOINTED U. S. RADIO INSPECTOR IN THE DEPARTMENT OF COMMERCE, AND IS NOW COMMISSIONED AS LIEUTENANT IN THE U. S. NAVAL RESERVE.

ON December 26, 1932, WCAU moved to new quarters in their recently completed building at 1622 Chestnut Street, Philadelphia, located in the heart of the business district. This building is owned and operated by the WCAU Broadcasting Company, designed especially for broadcasting and incorporates the most modern equipment and facilities known to the radio art. The building is nine stories in height and has been designed in such a way that a studio 60 feet x 100 feet can, at some future time, be constructed as an additional story to the building. The exterior of the building is modern in design and the finish is of blue ceramic tile.

A 100 foot tower of glass and stainless steel has been erected on the top of the building, the glass portion also extending down the face of the building approximately 100 feet. The primary purpose of this tower is to support an antenna system used for an auxiliary transmitter operated from this building. Banks of mercury vapor lamps within this tower illuminate it at night, making it an attractive landmark visible for miles in the vicinity of Philadelphia.

The portion of the building devoted entirely to broadcasting consists of offices, studios, control rooms, observation galleries, reception rooms rest rooms for engineers, announcers, musicians, and other members of the staff. Most comfortable accomodations are provided for visiting clients and other guests.

A laboratory and "work shop" have been put at the disposal of Leopold Stokowski, Director of the Philadelphia Orchestra, in order that he may carry on his research and experimental work in connection with the broadcasting art.

Studios

A total of seven studios have been provided, as well as audition and rehearsal rooms varying in size from a speaker's studio which is 22 feet long x 12 feet wide to the largest one, which is 55 feet long, 32 feet wide and 23 feet high. The studios have been completely sound-proofed, sufficient reduction having been specified to prevent any interference between adjoining studios. The floors have been laid on cork and the walls and ceilings are suspended on hangers. The windows from studios to control rooms and observation galleries are of triple plate glass, the panels all being of a different thickness and adequately insulated with cork and felt. The doors leading to the studios are of the heavy duty sound-proof type, approximately 3 inches in thickness, with a lead core, and are well gasketed on all sides to make them sound-tight. They weigh 600 pounds a piece.

The elevator machinery has been placed in the basement instead of in the pent house in order to remove it as far as possible from the studio

DR. LEON LEVY

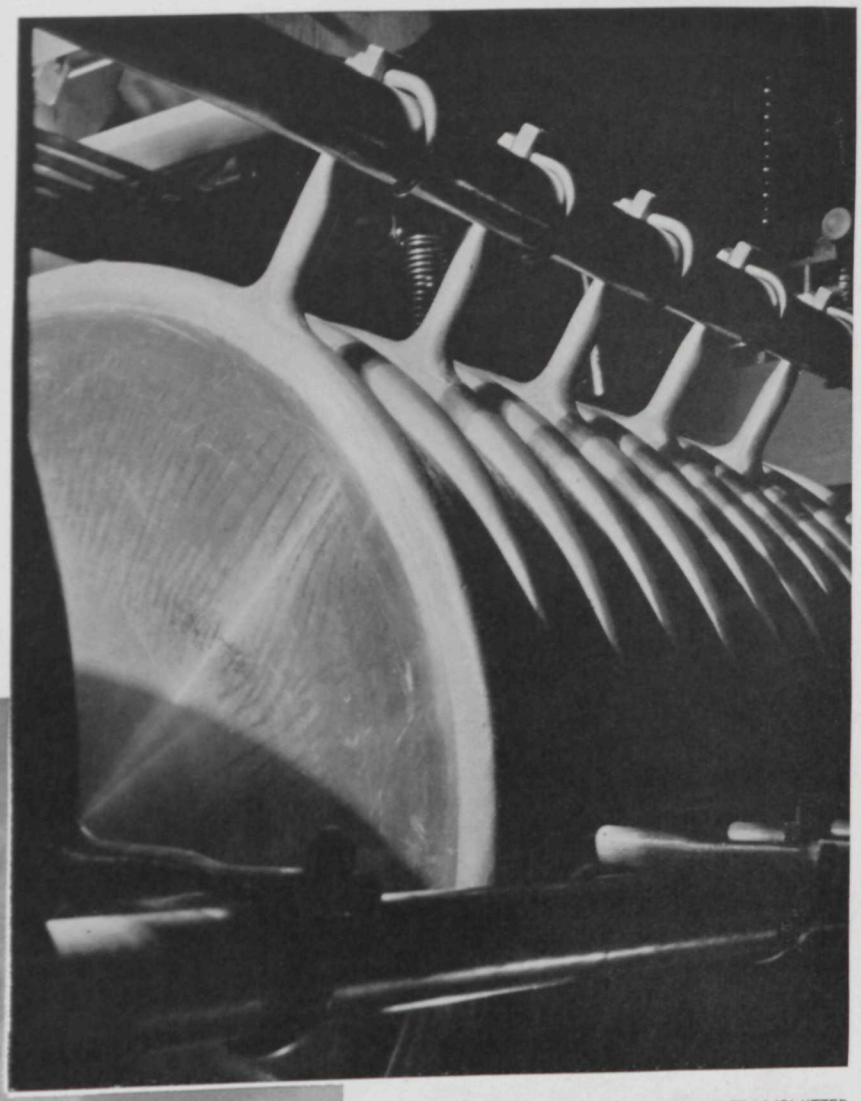
PRESIDENT OF THE **WCAU** BROADCASTING COMPANY AND A DIRECTOR IN THE COLUMBIA BROADCASTING SYSTEM. HE WAS A LIEUTENANT (J. G.) IN THE U. S. NAVY DURING THE WORLD WAR, SERVING AT SEA AND ASHORE. HE IS A GRADUATE OF THE UNIVERSITY OF PENNSYLVANIA.

floors, thereby decreasing the possibility of electrical and mechanical noise from this source effecting the studio transmission.

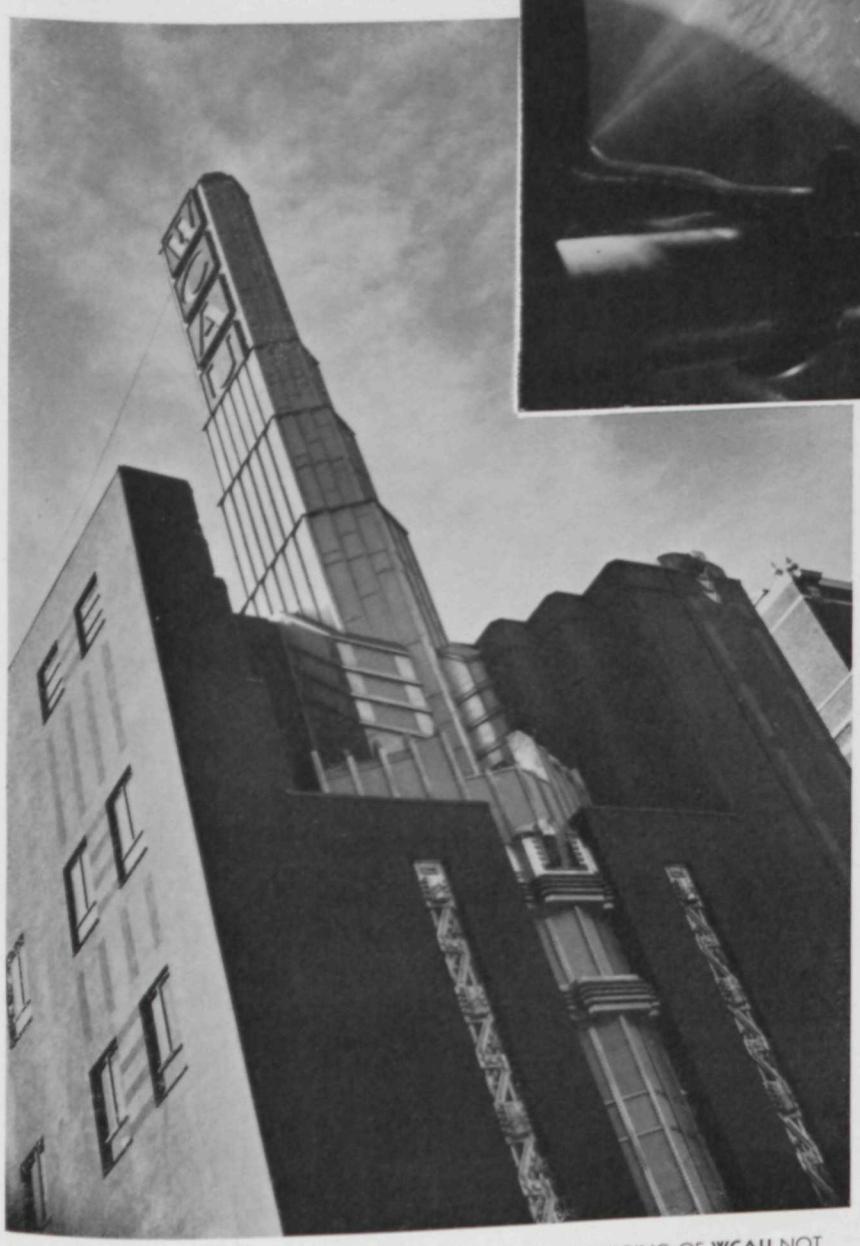
Acoustics

An elaborate acoustical treatment has been provided throughout the studios. The studio walls have been broken up so as to avoid large expanses of parallel surfaces. The "live-end and dead-end" principle has been used in each studio. Approximately 50% of the walls and ceilings are hard, reflecting surfaces and the 50% at the opposite end are sound absorbing surfaces. The orchestras or artists work in the "live" portion of the studio, which is ideal for their purpose, and the microphone pick-up is in the "dead" portion of the studio, which insures the major portion of the sound reaching the microphone is direct sound from the source and not reflected sound from the immediate surrounding surfaces. The sound reduction for each studio was specified for various frequencies from 125 to 9,000 cycles and accomplished by the use of rock wool blankets of varying thicknesses with proper air spacing between these surfaces.

Carpets varying in size and dependent on the size of the studio have been placed on the floor to prevent reflection from the orchestra to the polished floor surface and thence to the microphone.



CONDENSER PLATES IN THE 50 KW TRANSMITTER OF **WCAU**. SILENT, MOTIONLESS—BUT NEVERTHELESS PERFORMING THEIR IMPORTANT PART IN HURLING FAR AND WIDE THE VOICE OF THIS NEW RADIO GIANT.



THE GLASS ENCLOSED STEEL TOWER ATOP THE NEW STUDIO BUILDING OF **WCAU** NOT ONLY SERVES AS A SUPPORT FOR THE ANTENNA OF THE EMERGENCY TRANSMITTER, BUT FORMS A STRIKINGLY ATTRACTIVE LANDMARK, SETTING FORTH THE CALL LETTERS OF THE STATION. AT NIGHT THE ENTIRE TOWER BECOMES A BLUE SHAFT OF LIGHT, WEIRDLY ILLUMINATED FROM WITHIN BY MERCURY VAPOR LAMPS.

An audition room has been provided and acoustically treated in which clients, or prospective clients, may sit at ease and listen to auditions or to programs actually on the air through a high quality bi-acoustic loudspeaker. The telephones have been connected through relays to flashing signals instead of the customary bells and every precaution has been taken to prevent disturbing or distracting the attention of persons in this room.

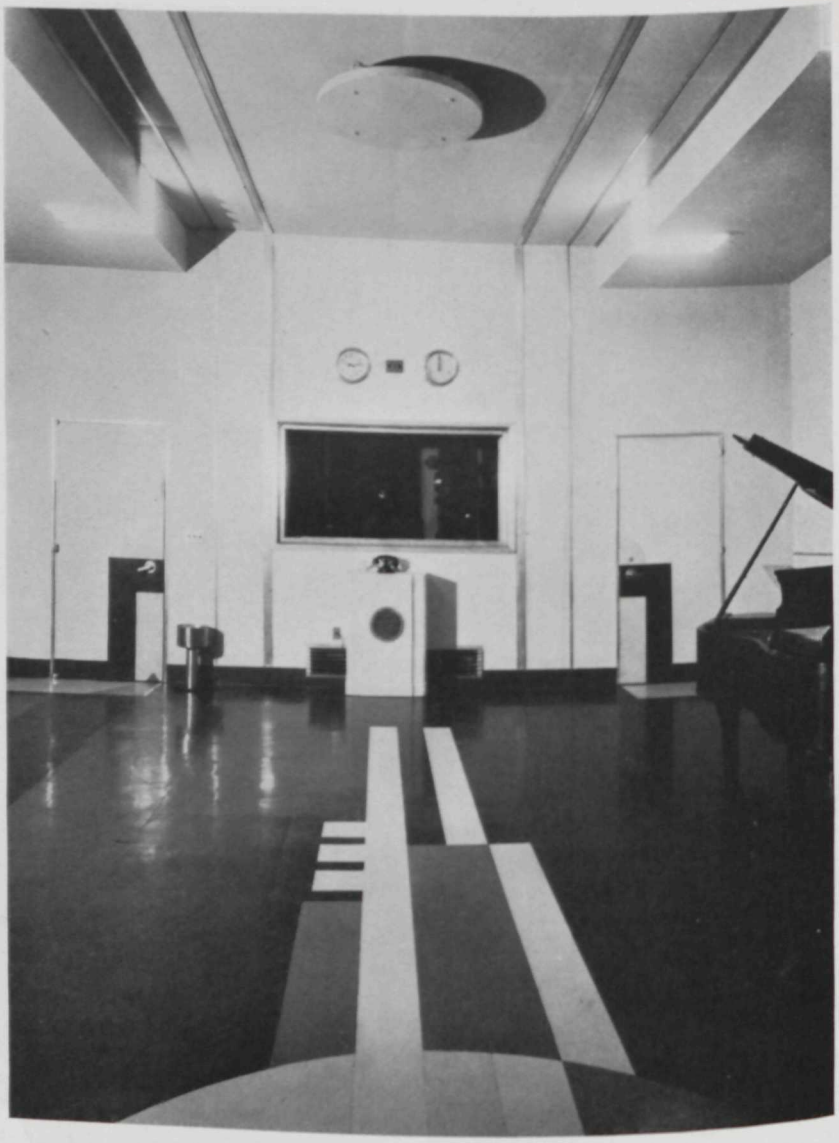
Air Conditioning

An air conditioning system has been installed for washing, humidifying and cooling, which eliminates the necessity of windows in the studios. In order to eliminate any microphone pick-up from moving air and to eliminate the possibility of sound carrying from one studio to another through the air ducts, silencers are installed in both inlet and outlet grilles, each capable of a 30 decibel sound reduction.

Radio Equipment

Equipment of RCA Victor manufacture has been installed throughout The electrical layout of this equipment, the design of special apparatus and the tieing in of this equipment with telephone and A. T. & T. lines, power lines, etc. were worked out through many lengthy conferences attended by Mr. Larry Lyndon, Radio Engineer of RCA Victor, the Columbia System Engineers, Mr. I. R. Baker and Mr. J. P. Taylor, RCA Victor Sales Engineers, and the WCAU Engineers. Mr. Lyndon also supervised the installation and test of equipment and considerable credit is due him for placing his engineering ability and thorough knowledge of audio systems at our disposal and for his untiring cooperation, typical of all departments of RCA Victor having any contact with this work.

Mr. George Crapp, who is at present in charge of the Audio Equipment at WCAU, was in close contact with the latter part of the installation and test work. He and other members of the Engineering Department not only stood regular watches at the old location, but also worked many long hours overtime at the new building. He was, to a great extent, responsible for the satisfactory installation and the subsequent fine performance of the equipment.



STUDIO F, ONE OF LARGE PROPORTIONS, BUT NOT AS LOFTY AS SOME OF THE OTHERS AT STATION **WCAU.** THE CIRCULAR BAFFLE OVERHEAD FORMS PART OF THE AIR CONDITIONING SYSTEM, AND NOT ONLY SUPPRESSES THE SOUND OF THE CIRCULATING AIR WHICH ENTERS THE STUDIO, BUT ALSO DEFLECTS THE AIR CURRENT SO AS TO AVOID UNPLEASANT DRAFTS UPON THE PERFORMERS BELOW. NOTE THE TIME CLOCK AT THE LEFT, AND THE THREE MINUTE WARNING CLOCK AT THE RIGHT OF THE CONTROL OPERATOR'S WINDOW. BETWEEN THESE TWO CLOCKS ARE THE COLORED LIGHTS OF THE SIGNAL SYSTEM.

Frequency Range Broad

The entire installation has an overall frequency characteristic essentially flat from 30 to 8,000 cycles and a considerable portion of it was designed and constructed especially for this station. Each studio has an adjoining control room, which contains a four-position mixing panel with mixing controls, level indicator, relay controls, etc., mounted on the operator's desk and a standard cabinet rack containing amplifiers, jack panels, etc., mounted upon it. The inputs and outputs of all equipment used are connected to the jack panel to provide the greatest flexibility and ease of locating and rectifying trouble should it occur. Each control room is in itself a complete unit, which may be used for audition or rehearsal purposes without patching or setting up in the master control room. A signal system, which is relay-controlled, is installed in each studio to give the announcer and production man a stand-by and go ahead indication, and a loudspeaker is also provided to furnish them "cue" when necessary.

A "talk back" microphone is available for the engineer or pro-

duction man in the control room to enable them to converse with the studio personnel during rehearsals. High quality loudspeakers having a considerably wider frequency range than those commonly used, are suspended in each control room in such a position that the engineer is directly in the sound beam of the loudspeaker and the walls diagonally opposite have been acoustically treated to provide good sound reproduction in these monitoring rooms.

Emergency Equipment

A 1 KW RCA Victor transmitter is installed in the master control room, which may be put on the air immediately in case of shut-down at the 50 KW plant. The antenna, located on the roof, and suspended between the 100 foot glass tower previously mentioned, and a 100 foot mast, is fed from a 600 ohm transmission line approximately 100 feet long and through suitable coupling equipment, located in the penthouse. Facilities are being provided for controlling the transmitter from carrier actuated relays, which will bring it on automatically upon failure at the regular plant and this carrier relay rings a warning bell whenever the carrier of the 50 KW plant is interrupted.

A TYPICAL STUDIO CONTROL ROOM AT **WCAU.** DOUBLE THICKNESS PLATE GLASS WINDOWS, SEPARATED BY SUITABLE AIR SPACE, COMPLETE THE SOUND PROOFING USED IN THE CONSTRUCTION OF THIS CHAMBER. THE CONTROL DESK AND THE PANEL-MOUNTED EQUIPMENT PROVIDE THE MOST UP TO DATE MEANS FOR CONTROLLING AND MONITORING AND FOR PASSING THE PROGRAM ON TO THE MASTER CONTROL ROOM AND THENCE TO THE REMOTELY LOCATED TRANSMITTER.

THE MASTER CONTROL ROOM AT THE STUDIOS OF STATION **WCAU.** MOST OF THE EQUIPMENT SHOWN IN THIS VIEW REPRESENTS THE INTERMEDIATE STEP BETWEEN THE STUDIOS AND THE REMOTELY LOCATED 50 KILOWATT TRANSMITTER. HOWEVER, THE TWO PANEL UNITS AT THE EXTREME RIGHT ARE THE 1 KILOWATT EMERGENCY TRANSMITTER WHICH IMMEDIATELY PUTS THE PROGRAM ON THE AIR IN THE EVENT OF AN EMERGENCY SHUT-DOWN OF THE MAIN TRANSMITTER.

Microphones

The studios are equipped with twenty-two of the new RCA Victor velocity type microphones. The high quality of this microphone and its superiority to other types in use, has been the subject of a number of articles in recent publications and it is not necessary that it be taken up here.

Monitoring

By means of eight key switches, and associated relays, the announcer in the stand-by studio is enabled to monitor on any of the four out-going channels and to announce on any or all of these channels by depressing the proper key switches. A schematic diagram of this equipment is shown in the master control layout.

Studio–Station Lines

Three high quality telephone lines have been installed by the Bell Telephone Company between our control room and the plant at Newtown Square. These lines are "flat" within one-half a decibel over the frequency range—30 to 8,000 cycles!

Intercommunicating System

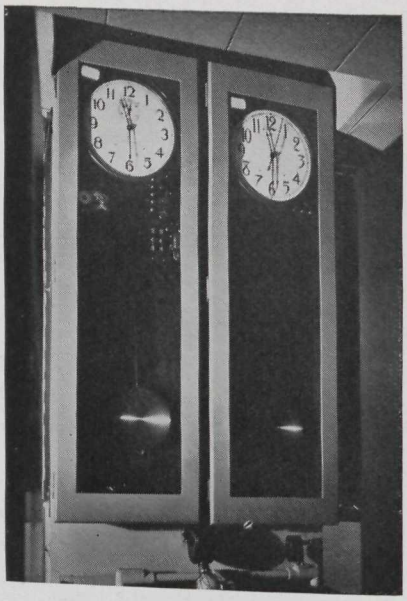
A house public address system is provided, with microphones installed in master control and before the PBX operator, in order that any persons may be paged when needed. Loudspeakers are provided throughout the halls and office floors in connection with this system and a code calling system, which is a part of the house inter-communicating telephone system, is also reproduced through these same speakers.

Four radio channels and one audio channel from master control, are fed to each office, observation gallery, reception room, etc., the majority of which are provided with selector switches and volume controls.

Time System

A master clock, designed and manufactured by the International Time Recording Company, has been installed throughout the offices and studios, controlled from a central point in the master control room and checked twice daily with Arlington time. In addition to the regular secondary clocks in the studios and control rooms, a special "three minute" clock has been provided, which automatically starts at 12, 27, 42 and 57 minutes after the hour and runs for three minutes. It has a single sweep hand and a large dial calibrated in seconds (the 360 degrees of the dial being calibrated in a total of 180 seconds) thus enabling the announcer and production men to know exactly how many seconds they have to close one program, or to start the succeeding program.

The master clock, incidentally, performs various other functions, such as turning on and off the radio receiver used for checking the Arlington time signals at the proper periods each day. The master clock hourly resets all secondary clocks which may have slightly deviated and the whole system, because of not being entirely dependent on the house current supply, will run for several hours without variation after such a failure.



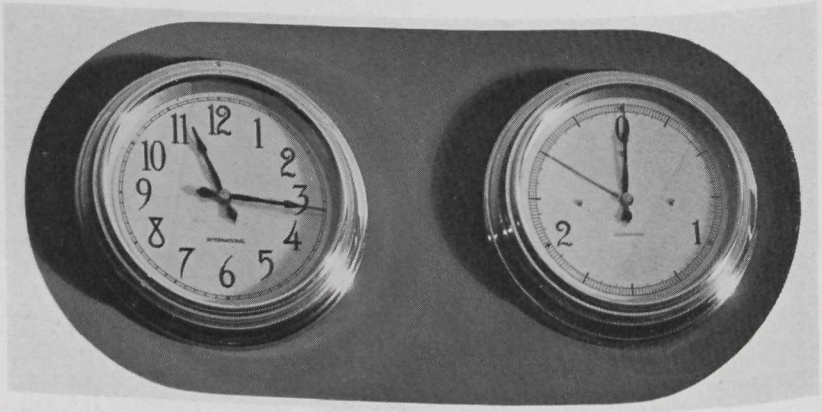
THE MASTER CLOCKS IN THE MASTER CONTROL ROOM AT THE **WCAU** STUDIOS. THESE TIME PIECES CONTROL THE ENTIRE NETWORK OF ELECTRIC CLOCKS THROUGHOUT THE BUILDING, INCLUDING THE THREE MINUTE WARNING CLOCKS IN THE STUDIOS. TIME SIGNALS FROM THE NAVAL RADIO STATION AT ARLINGTON ARE EMPLOYED TO CHECK THESE MASTER CLOCKS TWICE EACH DAY.

Wiring

All radio wiring throughout the studios and control rooms is in lead sheathing and conduit which is thoroughly bonded to the steel frame-work of the building and to ground. All high and low level circuits are well isolated from each other and from all AC wiring throughout the building.

Master Control Room

This is a central distribution point for all of the studio control rooms and considerable attention has been given to making it as flexible as possible, and to provide the switching and distributing of programs with the greatest of ease. Eight standard cabinet racks have been mounted and spaced in such a manner that additional racks may be installed without difficulty. Racks No. 1 and No. 2 contain regular and spare plate voltage rectifiers for furnishing plate voltage to the equipment in Master Control and to the equipment in studio control rooms. Racks No. 3 and No. 4 contain jack panels on which are terminated the inputs and outputs of all master control equipment, Bell Telephone lines, A. T. & T. equipment and lines, and the master control desk switching equipment. There are also mounted on these racks the A. T. & T. and Bell Telephone Company equalizer panels and equipment necessary for receiving programs from remote control points and transmitting programs to various net-works. On racks No. 5 and No. 6 are mounted line amplifiers, level indicators, etc. On racks No. 7 and No. 8 are mounted monitoring amplifiers, a 50 watt amplifier for driving the house speaker system and a four-channel radio receiving system.



THESE TWIN TIME PIECES ARE STANDARD EQUIPMENT IN ALL THE **WCAU** STUDIOS. AT THE LEFT IS THE FAMILIAR TYPE OF ELECTRIC CLOCK, AND AT THE RIGHT IS SHOWN THE SPECIAL THREE MINUTE CLOCK, WHICH IS OF GREAT ASSISTANCE IN PREPARING TO OPEN PROGRAMS EXACTLY ON TIME OR TO CLOSE THEM PROMPTLY IN ORDER TO MAKE WAY FOR THE SUCCEEDING PROGRAM, OR TO MAKE STATION ANNOUNCEMENTS. THEY ARE BOTH CONTROLLED BY THE MASTER CLOCKS IN THE MASTER CONTROL ROOM.

OBSERVATION GALLERY LOCATED BETWEEN STUDIO B (ON THE LEFT) AND STUDIO F (ON THE RIGHT). HERE VISITORS MAY OBSERVE THE PERFORMANCE IN PROGRESS, AND BY MEANS OF THE SPECIAL HIGH QUALITY MONITORING EQUIPMENT CONNECTED TO THE BI-ACOUSTIC LOUDSPEAKER SHOWN AT THE FAR END OF THIS GALLERY, MAY ALSO HEAR THE PROGRAM AS CLEARLY AS THOUGH THEY WERE ACTUALLY IN THE STUDIO.

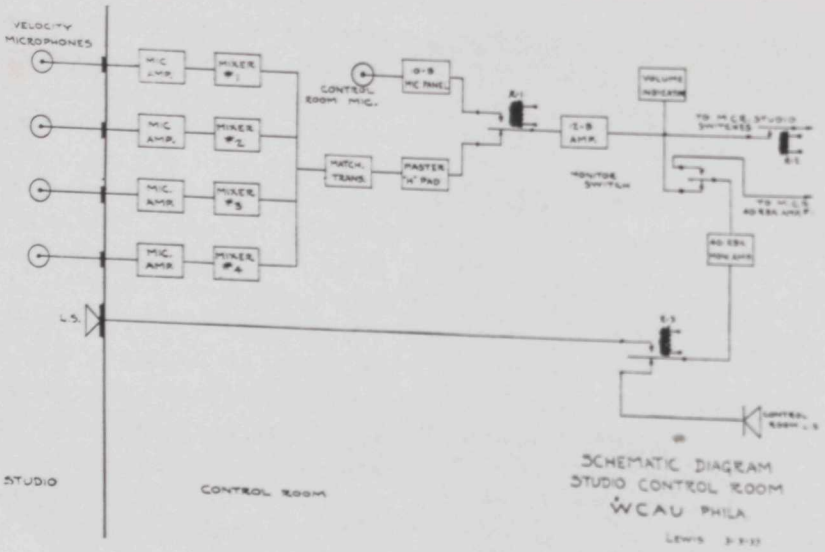
Master Control Desk

The engineer at this desk has before him a channel distribution panel with a variable "H" pad, level indicator meter and relay control for four out-going channels, which are ordinarily set up for WCAU, W3XAU, Columbia System, about 30 programs per week for this network originating in our studios, and a spare for testing purposes. At his left he has a switching panel, which enables him to monitor with either one of two speakers on any of these four channels, to feed either the regular or the emergency transmitter, to make call letter announcements from his desk on WCAU, W3XAU, or to make announcements over the house public address system.

A switching panel on the engineer's right allows him to select the output from any studio, remote control or net-work program and place it on any one or all of the four out-going channels. Jack panels are provided within easy reach for testing and rearranging all circuits by means of patch cords. Three telephone systems are provided, one for inter-communication with the studios, one for office inter-communication and one for Bell Telephone (outside) communication. High quality electric phonograph turntables are installed and ready for instant use in case of an emergency. Telegraph keys and sounders, and a typewriter complete the master control desk equipment, all of which is conveniently accessible to the engineer on watch.

The entire plant has demonstrated its practicability, and the enthusiasm of the operating staff over the design, construction and performance of the entire installation is daily augmented by that of visitors from other leading stations. Those who are contemplating new construction in this line, or modernization of existing stations, will find much of interest at WCAU—and personnel on hand who take just pride in displaying the advantages of the radically new features incorporated in this modern monument to the art of broadcasting.

CLIENTS' AUDITION ROOM. THESE CONFORTABLE SURROUNDINGS TEND TO PLACE THE OCCUPANT AT EASE FOR THE PURPOSE OF LISTENING TO AND JUDGING PROGRAM REHEARSALS. HERE, ALSO, MAY BE HEARD PROGRAMS WHICH ARE ACTUALLY BEING PLACED ON THE AIR.



SCHEMATIC DIAGRAM
STUDIO CONTROL ROOM
WCAU PHILA.

Master Control Schematic Diagram

The accompanying diagram is self-explanatory and shows the equipment and the switching circuits used in connection with the four outgoing channels in the Master Control Room. It should be noted that the input to the variable H pad is through a bridging transformer in order that one or all of the outgoing channels can be multipled on a common program.

The absence of relays should also be noted, this being intentional in order to keep maintenance and possibility of failure at a minimum.

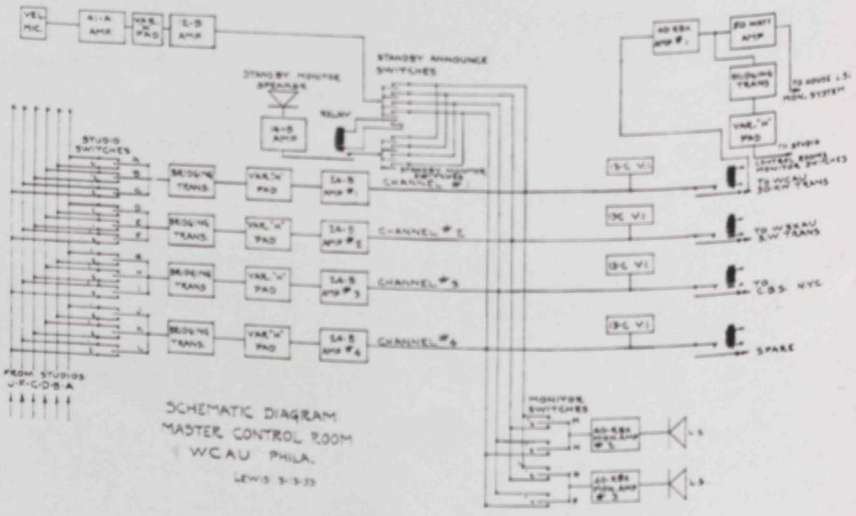
The one high level channel shown at the top of the blue print is used for announcements and call letters and through the stand-by announce switches can be bridged on one or all of the outgoing channels.

Studio Schematic Diagram

A four-channel mixer with a variable H pad as a master fader, a volume indicator and the necessary key switches are mounted on the desk in each small control room with the necessary amplifiers and associated equipment mounted in a standard cabinet rack.

The control room microphone shown on the print, which is connected to the input of the 12-B amplifier through a relay, is used by the production man and the engineer to speak into the studio during a rehearsal.

The relay R-3 is used for opening the control room speaker circuit when this talk microphone is being used and connecting the studio speaker in its place.

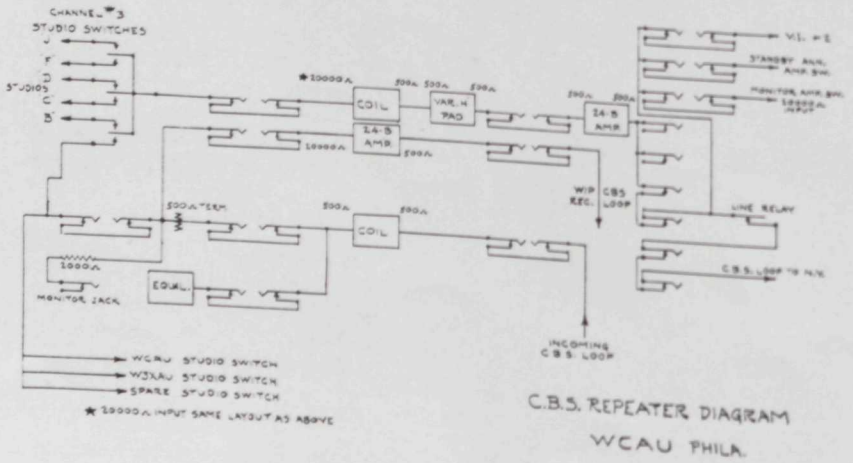


SCHEMATIC DIAGRAM
MASTER CONTROL ROOM
WCAU PHILA.

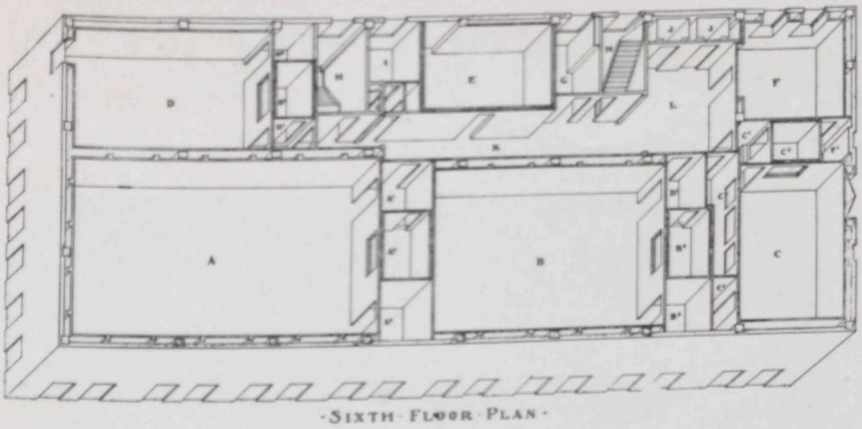
The relay R-2 is closed either from the small control room or from Master Control, the latter being ordinary practice. It is done automatically when that particular studio is connected to the air by Master Control engineer.

CBS Repeater Diagram

The CBS Repeater Diagram is a typical channel through Master Control and, in this case, applies to the CBS round robin circuit which goes in and out of the Master Control Room. It can be seen that the entire lay-out is very flexible and that the switching arrangements are very simple. When a CBS program originates in the Studios of WCAU, the only operation necessary is to



C.B.S. REPEATER DIAGRAM
WCAU PHILA.



-SIXTH FLOOR PLAN-

-LEGEND-

A-B-C-D- STUDIOS
A'-B'-C'-D'- VESTIBULES
A"-B"-C"-D"- CONTROL ROOMS
A"-B"-C"-D"- CLOSETS
C⁴- OBSERVATION GALLERY
E- AUDITION ROOM
F- REHEARSAL ROOM
G- OFFICE - STUDIO MANAGER
H- STAIR TOWERS
I- TOILET R
J- ELEVATORS
K- LOUNGE
L- ELEVATOR LOBBY

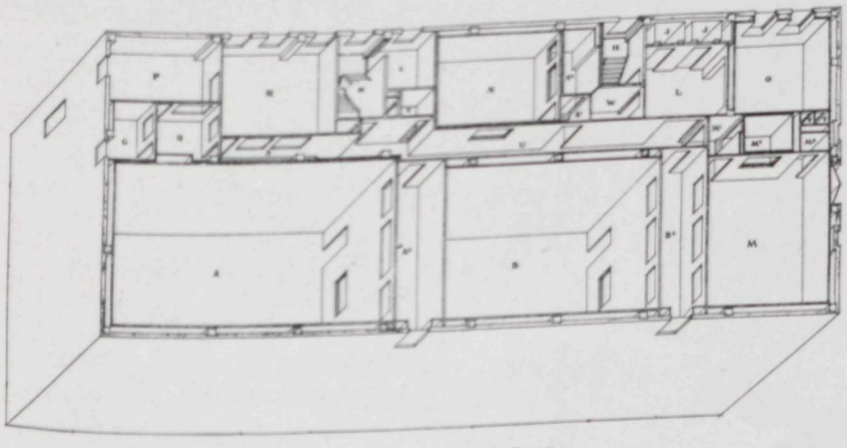
THE SEVENTH FLOOR OF THE NEW **WCAU** BUILDING WHICH HOUSES ONE OF THE MOST MODERN BROADCASTING STUDIOS IN THE WORLD. THIS CROSS SECTION SHOWS THE STUDIOS ON THE SEVENTH FLOOR AND ALSO STUDIOS "A" AND "B" WHICH ALSO TAKE IN THE SIXTH FLOOR. "A" STUDIO IS THE LARGEST AND CAN ACCOMMODATE A SYMPHONY ORCHESTRA OF OVER A HUNDRED PIECES.

being available for announcements on any of the four out-going channels.

It might be interesting to note that a frequency run taken through the equipment shown on the above diagram indicates that it is flat within one decibel over the entire range from 30 to 8,000 cycles. Also that a frequency run taken from the voltage amplifier in the Studio Control Rooms through Master Control over the telephone lines to the plant through the speech input equipment at that place and through the speech amplifier in the transmitter is flat over the same frequency range 30 to 8,000 cycles within 1½ decibels.

open the incoming CBS line and select the proper studio by means of the studio switches shown on the right. This single operation cuts the desired Studio through to the outgoing CBS line, automatically closes the line relay in the Studio Control Room and brings up the red signal in the Studio which informs the announcer that he is cut through to the air. Announcements on this outgoing circuit may be made either from the studio or through the stand-by announce channel, the latter

SPEECH INPUT ROOM AT **WCAU** 50 KW PLANT



-SEVENTH FLOOR PLAN-

-LEGEND-

J- ELEVATORS
L- ELEVATOR LOBBY
O- RECEPTION ROOM
M- MAIN CONTROL ROOM
S- PASSAGE
T- TELEPHONE BOOTHS
U- CORRIDOR
V- JANITORS CLOS.

THE SIXTH FLOOR OF THE NEW **WCAU** BUILDING, SHOWING THE STUDIO LAYOUT. THIS MODERN BROADCASTING BUILDING IS DESIGNED ESPECIALLY FOR RADIO. STUDIOS "A" AND "B" TAKE IN THE SEVENTH FLOOR.

WCAU ENGINEERING STAFF

J. G. Leitch, Technical Supervisor

STUDIOS

Geo. Crapp	—Audio Supervisor
Ed. Johnston	—Master Control
Chas. Smith	—Master Control
Fred. Moore	—Master Control
Henry Geist	—Production Engineer
Allan Muncey	—Production Engineer
Jos. Morrow	—Production Engineer
LeRoy Anspach	—Production Engineer
Ray Stahl	—Production Engineer

50 KW PLANT

Chas. Miller	—Chief Engineer
Sam. Saboroff	—Plant Engineer
Jas. Cunnie	—Plant Engineer
Jas. Harte	—Plant Engineer
Al. Gegenbach	—Plant Engineer
Ed. Carroll	—Plant Engineer
Ed. Beeler	—Plant Maintenance

A Visitor Tours WCAU

By KENNETH W. STOWMAN, In Charge of Public Relations, WCAU

AS A casual passer-by walks along the busy and fashionable Chestnut Street in Philadelphia, he sees a handsome blue building on the south side between 16th and 17th Streets. This new structure stands as a symbolic monument to the radio industry and is noted for its striking beauty. The front of the new home of WCAU is trimmed with stainless steel in designs created by the architect to express impressions of radio.

After sundown the large glass tower atop the building, illuminated from within by mercury vapor lamps, casts a blue light throughout the center of the city and can be seen twenty-five miles away.

A visitor entering the portals of WCAU for the first time is greeted at the entrance with beautiful stainless steel doors and overhead are architectural designs depicting Drama, Music, Literature and Comedy.

The interior of the entrance lobby is of Italian marble with indirect lighting overhead casting a silver glow. As we await the arrival of the elevator to the studio reception room on the seventh floor, we notice a copper cut plate on the outer doors of the elevator. Here the architect has created a masterpiece in the figure of a man holding a WCAU microphone with radio waves emanating from the transmitting station.

As we step into the elevator we are impressed with the unusual interior decoration of the car itself and we imagine that we have been transferred into a new world of modern and artistic conception. The

A PERFORMANCE IN PROGRESS IN STUDIO J. ARTISTS WHO HAVE PERFORMED AMID THESE PLEASANT AND UNUSUALLY BEAUTIFUL SURROUNDINGS AGREE THAT HERE THEY FEEL INSPIRED TO PUT FORTH THEIR FINEST EFFORTS AND THAT SUITABLE ENVIRONMENT IS OF GREAT IMPORTANCE IN ENABLING THEM TO ACHIEVE THE BEST RESULTS.

STUDIO B, LOOKING TOWARD THE "DEAD END." CONSIDERING THE BRILLIANT COLORS AND THE CHROMIUM METALLIC TRIM EMPLOYED IN THE DECORATION SCHEME OF THIS STUDIO, THE ABOVE VIEW IN BLACK AND WHITE HARDLY DOES JUSTICE TO THE SUBJECT.

soft harmonizing color scheme of silver and blue has been carried out in these elevators.

Stepping off at the seventh floor reception room, we are greeted by the welcoming hand of the receptionist. This room has been finished in a striking alliance of chinese red, and black putty color, with furniture finished in light tan leather. As we leave the reception room we walk into the first observation gallery from which point we are afforded a view of studio "B" which is two stories high and is furnished in gray, blue and chromium plated metal. On the other side of the gallery we see studio "F," one of the smaller broadcasting rooms, decorated in salmon, gray and black.

Pausing for a moment in the visitors' observation gallery, we observe through the double thickness plate glass windows on the right a program in progress in Studio B, and through the medium of the concealed loudspeakers in this gallery, we hear perfectly all that is in progress in this studio just as though we were in there with the artists. However, we may converse and comment upon the program from this vantage point without in any way interfering with the program, or without danger of having our voices picked up by the sensitive microphones in the studio.

Shifting our gaze to the left, we observe through another large double plate glass window that a rehearsal is being held in Studio F, and as our attention is attracted to this new scene, our guide touches a switch

MURAL DECORATION IN STUDIO J, AT WCAU

ELECTRICAL TRANSCRIPTION EQUIPMENT IN STUDIO H. THIS STUDIO IS A SPECIALLY AIR CONDITIONED CHAMBER DESIGNED TO PREVENT WARPING OF THE RECORDS IN THE METALLIC FILES AND TO INSURE UNIFORM PERFORMANCE. DURING ALL ELECTRICAL TRANSCRIPTION PROGRAMS. THE AVERAGE PERSON DOES NOT REALIZE THAT FOUR PERSONS ARE REQUIRED TO HANDLE PROGRAMS OF THIS TYPE—ONE PRODUCTION MAN, ONE ENGINEER, ONE ANNOUNCER, AND A TESTING AND TIMING SUPERVISOR.

"RADIO TEMPO"

By John Vassos

Here is an actual union between art and industry—art in the form of music serving industry.

In this decoration is shown the activity which takes place behind the scenes—and reaches ends of the earth.

In the lower left are the architects and designer planning this radio building and above a glimpse of Philadelphia's new rising skyline the female figure is a symbol of voice coming into the rhythmic modulations of the new radio organ with the organist, above are current events—politics, conflicts of nations, personalities of rulers, etc.

At the lower right are the factories and above industrial wonders of man—railways, bridges, dams, tunnels, airplanes, Zeppelins, motors, ships—all typifying industry served by radio with "big business" in the form of the rising skyscraper.

and, as if by magic, we begin to hear what is in progress from this new direction. We see the program director raise his hand for silence, and we hear him make suggestions for certain improvements. We learn that no one ventures to put a program on the air from the WCAU studios until it is rehearsed to the point where it has become letter perfect.

Returning our gaze through the window into Studio B on the right, we observe that the hand on the "three minute clock" has commenced to travel around the dial and we observe that the orchestra leader has raised his left hand in warning to the musicians and that he has quickened the beat of his baton so as to bring the closing selection to completion in time to make way for the station announcement. As our guide switches the reproducing loudspeaker back to Studio B, we hear the closing strains of a familiar radio theme song fade away as the voice of the announcer a hundred miles away in New York make the CBS signature, and directly thereafter, we hear the voice of some unseen local announcer in the WCAU building add the station call letters, and we notice that the hand on the three minute clock has completed its course around the dial and has returned to zero. With clock-like precision, the opening strains of a new program reach our ears, and while the background music continues, we hear the WCAU announcer introducing the program of a new period. It all looks and sounds very simple, but those of us who have ever undertaken a bit of broadcasting or program work and have attempted to live up to these schedules, fully appreciate that it is not as easy as it appears. The casual listener at his own fireside little realizes the complex arrangements, the elaborate preparations, and the skill and precision which are necessary to bring to his ears the smooth flowing programs and unbroken continuity which hour by

STUDIO A, LOOKING TOWARD THE "LIVE END." THE THREE SOUND PROOF WINDOWS AT THE TOP PERMIT VISITORS TO OBSERVE THE PERFORMERS AND THE CENTRAL WINDOW BELOW SEPARATES THE LOCAL CONTROL OPERATOR FROM THE STUDIO. THE MASSIVE SOUND PROOF DOORS AT THE LEFT AND THE RIGHT EACH WEIGH 600 POUNDS. THE LOUDSPEAKER BELOW THE CONTROL OPERATOR'S WINDOW, AND A SPECIAL MICROPHONE FOR THE PURPOSE, PERMIT TWO WAY CONVERSATIONS WHEN DESIRED BETWEEN PERFORMERS IN THE STUDIO AND THE OPERATOR IN THE STUDIO CONTROL ROOM.

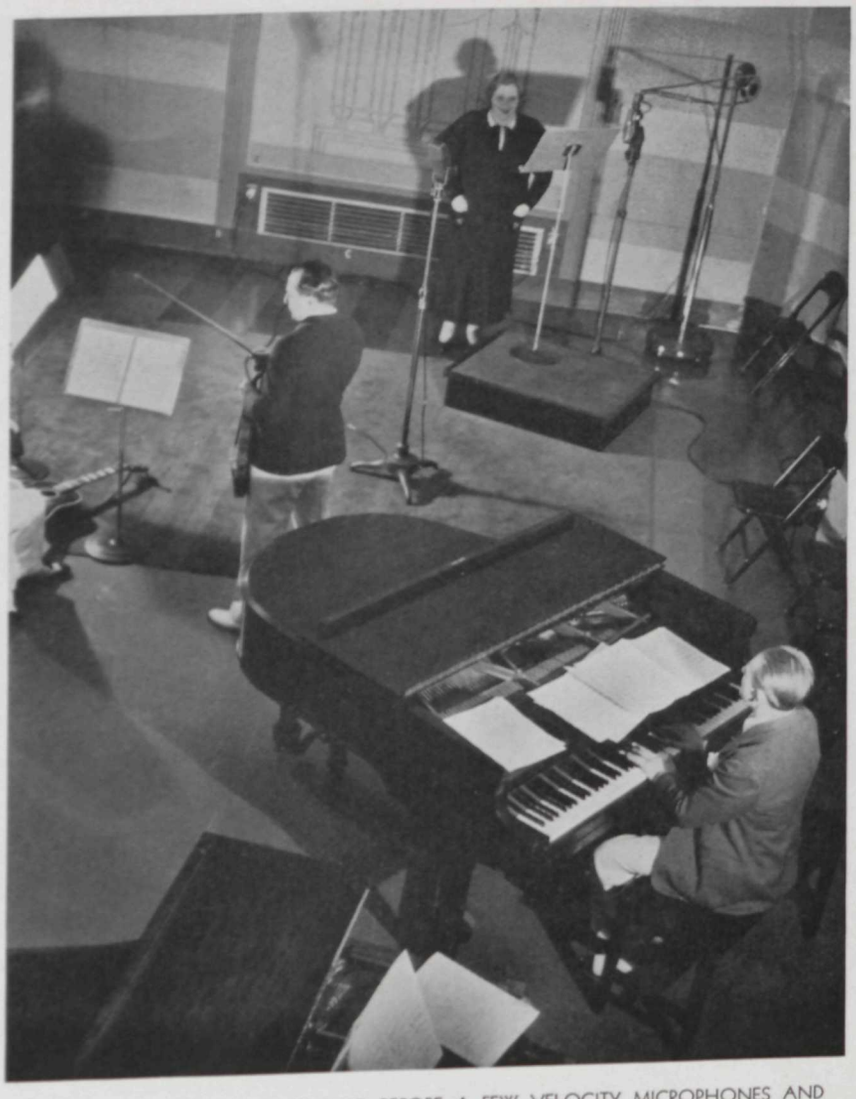
THE **"LON ROSS"** TROUPE, READY FOR THEIR TURN IN STUDIO C. NOTE THE CALL LETTERS OF THE STATION CLEVERLY WORKED INTO THE ACOUSTIC RUG.

hour are produced at a big broadcasting plant like that of WCAU.

As we leave the gallery we turn left, down the hall and on the right is studio "J" which is the most modern in design of all the studios. This room is colored in deep blue and black and the sheet metal which covers the sound proofing has a brilliant chromium finish. In the center of the wall in the "dead" end is the mural "Radio Tempo" which depicts the advances of modern radio created by the famous contemporary artist, John Vassos. The entrance to studio "A" is on the left a short distance down the hall and as we look through the observation window we see the largest studio in WCAU, designed to accommodate a large symphony orchestra. This studio is finished in a harmony of French gray, blue and chromium, in vertical decorative arrangement.

Our guide has tapped us on the shoulder—he has more to show us, and we leave the visitors' observation gallery and follow him down the corridor, between blazing vertical columns of modern semi-indirect lighting fixtures.

Leaving the gallery of studio "A" we continue our journey down the hallway to the Master Control Room, from which point the programs originating in the studios are sent by land wire thirteen miles distant to the WCAU transmitter at Newtown Square, Pa. Looking through the window we see the eight standard cabinet racks where the inputs and outputs of all master control equipments terminate. The engineer seated in the center of a "U" shaped console can control programs originating in any point of the building. Telegraph instruments on his right give him a direct connection with the New York studios of the Columbia Broadcasting System, and on his left is a microphone which he can use in emergencies to call for an extra announcer or engineer. At the extreme right in this



KATE SMITH, HERSELF, PERFORMING BEFORE A FEW VELOCITY MICROPHONES AND SUPPORTED BY A COUPLE OF PIANISTS AND OTHER MUSICIANS IN STUDIO D. MANY OF THE FEATURE PROGRAMS FOR THE COLUMBIA NETWORK ORIGINATE IN THE STUDIOS OF STATION **WCAU.**

VIEW FROM VISITORS' OBSERVATION GALLERY, TOWARD THE "DEAD END" OF STUDIO D. HERE THE ENGINEERS' SYMBOLS OF RADIO CIRCUITS HAVE BEEN CLEVERLY WORKED INTO THE DECORATIVE SCHEME IN MODERN FASHION.

room is a 1 KW RCA Victor Transmitter which has been installed in case of an emergency and which can be put on the air in thirty seconds.

Another studio where announcers stand-by to give call letters can be seen from the observation window in the Master Control room. This may be used also for emergency purposes. Studio "H" which is next to "G" is used entirely for electrical transcriptions and is also air conditioned like the other WCAU studios.

Leaving the seventh floor we take the rear stairway and go down a half flight to the observation gallery of studio "D." In this studio a special imported fabric in salmon and sand colors is employed to cover the walls, which are two stories high, and the design in the fabric achieves a most modern effect.

Our journey continues and we visit the sixth floor where we see studio "C," one of the smaller rooms, used for intimate broadcasts. Here another mural of John Vassos entitled, "Great God Radio," has been painted on the wall.

The clients audition room which is on this floor has been furnished with home like comfort and one might imagine himself transported into a modern living room. As we enter we see a large loudspeaker is on the right, and inviting chairs and lounges to afford clients a restful atmosphere while listening to their proposed programs. The entrances to studios "A," "B" and "D" are located on this floor as well as a rehearsal room for the artists.

STUDIO J, WHERE AN EXOTIC AND CHEERFUL DECORATING SCHEME EMPLOYING FLAT TONES OF BLACK, GREY AND BRILLIANTLY BURNISHED CHROMIUM METAL PRODUCES A PECULIAR STIMULATING EFFECT UPON THE PERFORMING ARTISTS.

A CORNER OF **DR. LEVY'S** PRIVATE OFFICE. THE WALLS ARE LINED WITH TEAKWOOD PANELS, SURROUNDED BY WALNUT TRIM. MULTITONE BROWN DRAPES AND BROWN CARPET AND UPHOLSTERY CARRY OUT THE WARM BUT MODERN DECORATIVE SCHEME. HERE IS A COMBINATION OF PLEASING APPEARANCE AND PRACTICAL UTILITY.

On the fifth floor an elaborate work shop and experimental laboratory has been set up. Here quarters for the announcers and for musicians have also been provided.

We step back into the elevator and are taken to the eighth floor and as we step off into the business reception room, a color scheme of chalk-blue and gray meets our eyes. Chairs and unusual desks of modern

design in various colors are used throughout these offices.

One of the most striking points of beauty on the executive floor is the office of Dr. Leon Levy, President of WCAU. The walls of his office are finished with horizontal panels of teakwood, and the furniture has been created especially for the surroundings. All the latest developments in office efficiency have been combined in this room.

The studio building has been decorated and furnished throughout in strictly modern style. The architectural work and interior decorating was done under the supervision of Mr. Robert Heller of New York.

With our journey completed we leave WCAU and return to our homes with a different idea as to the surroundings in which radio programs are created and presented.

In the evenings while we sit back in our easy chair listening to our own radio set we find a new interest in the WCAU program as we reflect upon the marvels of modern science and beauty that is woven into the unique WCAU building. It is really a miniature Hollywood transported from the Pacific Coast to the heart of Philadelphia's business district.

'STUDIO C, LOOKING TOWARD THE "DEAD END." THIS STUDIO, LIKE THE OTHERS AT **WCAU,** IS DECORATED IN STRICTLY MODERN MANNER, AND THE ACTUAL COLOR SCHEME MUST BE SEEN TO GAIN FULL APPRECIATION OF ITS BEAUTY.

THE **"SAVITT STRING QUARTETTE"** PERFORMING IN STUDIO F. NOTE THE VELOCITY MICROPHONE SUSPENDED OVERHEAD ON A SPECIALLY CONSTRUCTED MOVABLE BRACKET.

The studios of WCAU are open for inspection between the hours of 9 A. M. and 11 P. M., daily including Sunday. A cordial invitation is extended to you and your friends to spend an hour with us when you visit Philadelphia. Passes are issued to each visitor and can be obtained by writing to the station in advance of your visit or by calling at the information desk on the eighth floor.

The Battle For Strong Broadcast Signals

By DR. ALFRED N. GOLDSMITH

(Consulting Engineer; Past President, Institute of Radio Engineers; President, Society of Motion Picture Engineers)

RADIO broadcasting is so young in years that it seems odd that its history should be so crowded that one can readily recall days when broadcast methods and traditions were entirely different from those of 1933. In the dozen years during which this great service of mass communication has come to maturity, it has developed new ideas, exploded outworn notions, and established new standards of performance at a dizzying pace.

Consider the History

If we go back in fancy to 1922, we find astonishingly different views from those of to-day prevalent as to how broadcasting should be carried out and how best to improve the service to the listener. One gentleman, highly placed in a leading university which was considering entering the broadcast transmitting field with a 500-watt transmitter, carefully studied what he believed to be the facts concerning the capabilities of such transmitters. He then gravely announced that he was convinced that higher powers than 500 watts should be *prohibited* (fatal word!). To him a 1,000-watt station was practically "Public Radio Enemy Number 1." When this gentleman was pressed for an explanation of his relentless hostility to anything more than the mystical number of 500 watts, he explained that transmitters of this power could cover the entire United States! The proof was that on many a winter evening he had heard 500-watt stations at vast distances. Such ideas as "*service* range" were practically unknown except to a few courageous engineers who braved the violent wrath of amateurs and salesmen alike in their contention that the range of a station was not the distance over which it might be heard on occasion if all the circumstances were just right but

rather the distance over which it could be heard reliably, winter and summer, and day and night. They stressed the idea of service at a time when the enthusiastic radio field was interested in ideas of novelty and romance. No wonder there was a hot battle between those in the opposite schools of thought!

In those same days, another gentleman felt that the installation of a second station in a given town or near it, even though of the same power as the existing station, should be prohibited on *any* wave length since "interference was sure to result." A brief examination of some of the receivers in use in those days rather supported his contention. Single-circuit regenerative receivers with extraordinarily highly damped "tuning circuits" were all too common. Selectivity was a happy dream of the future. Fidelity requirements were regarded as satisfied if speech could be understood most of the time and music could be recognized as symphonic, brass band, orchestral, or vocal.

50 Watts?

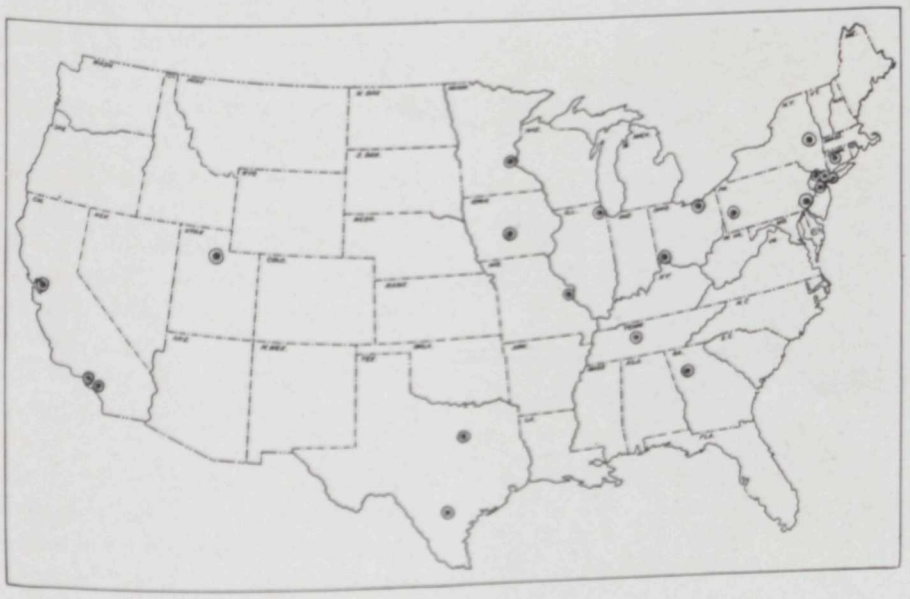
It is a curious fact, in view of our general acceptance of the decimal system, that increases of power which had any significance in the radio broadcasting field were in multiples of ten. The first transmitters had antenna powers of about 50 watts.

500 Watts?

The next important change was the general introduction of the 500-watt transmitter, a tenfold power increase.

WJZ—THE PIONEER 50,000 WATT BROADCASTING STATION.

For some time, it looked as if any attempt to get beyond this power would be impracticable. High-power tubes were not reliably available. Receiver selectivity was strictly limited. And existing broadcasters were resolute to maintain themselves against what they regarded as destructive competition from more powerful stations.



Broadcasting Stations of the United States now Licensed to operate at 50 KW

	Meters	KC	Station	
1	468.5	640	KFI	Los Angeles
2	454.3	650	WEAF	New York
3	394.5	760	WJZ	New York
4	374.8	800	WFAA-WBAP	Fort Worth
5	344.5	870	WENR-WLS	Chicago
6	299.8	1000	WHO-WOC	Des Moines
7	461.3	650	WMS	Nashville
8	280.2	1060	WTIC	Hartford
9	280.2	1070	WTAM	Cleveland
10	256.3	1170	WCAU	Philadelphia
11	252	1190	WOAI	San Antonio
12	379.5	790	KGO	Oakland
13	379.5	790	WGY	Schenectady
14	305.9	980	KDKA	Pittsburgh
15	428.3	700	WLW	Cincinnati
16	422.3	710	WOR	Newark
17	405.2	740	WSB	Atlanta
18	370.2	810	WCCO	Minneapolis
19	348.6	860	WABC	New York
20	275.1	1090	KMOX	St. Louis
21	265.3	1130	KSL	Salt Lake
22	285.5	1050	KNX	Hollywood

5,000 Watts?

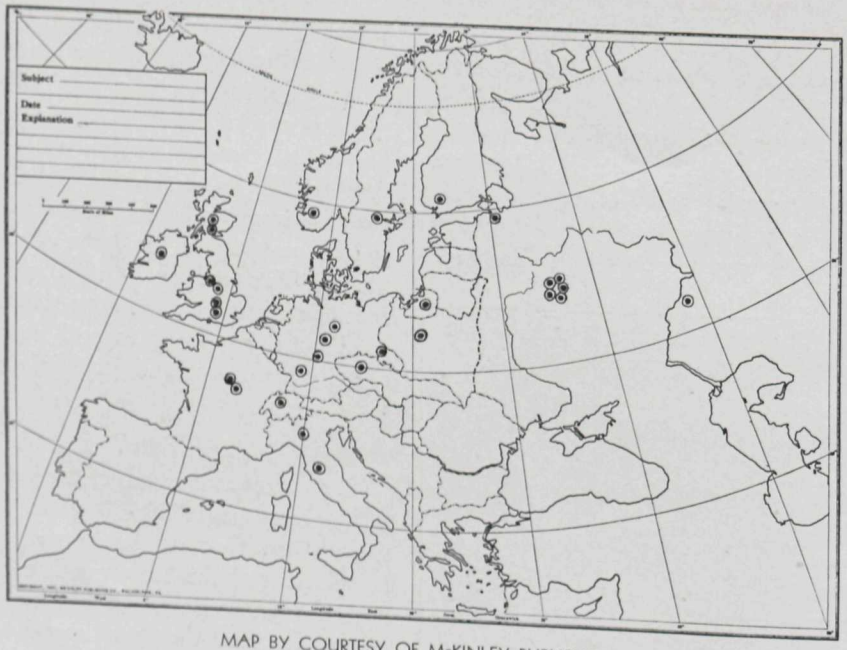
Nevertheless there were those who were sufficiently radical to propose the use of 5,000-watt transmitters, generally located at some distance outside of the nearest center of population. The first transmitter of this unheard-of power to be located in or near a large eastern city brought about a torrent of protest so heated in character that it instantly dropped again to 500 watts and thereafter climbed slowly back to 5,000 watts in small and infrequent steps. Nevertheless the advent of the 5,000-watt transmitter was a great step forward and acted as a real incentive to the radio manufacturers to produce receivers of increased selectivity. And what was perhaps as important, the stronger signals received by the average listener from the newer stations indicated entertainment possibilities and reliability of service such as had not been previously regarded as feasible. As a result, the listeners and manufacturers alike demanded receivers of higher fidelity of reproduction. It is a significant fact that every increase in transmitter power has immediately resulted in a demand for higher receiver fidelity and thus improved the general quality of the service in the home of the listener. This tendency will doubtless continue when the radio art goes beyond existing powers to still more effective stations and still more satisfactory signals.

50,000 Watts?

The next attempted step from 5,000 watts was to 50,000 watts, or thereabouts. One of the important installations of this sort was that of station WJZ at Bound Brook, New Jersey. It was the first so-called "super-power station" in that part of the country, and for a while it looked almost as if it were going to be the last. The day after it started operation, the embattled citizenry of a nearby town (encouraged by some local malcontents) gathered at the railroad station on their way to their daily tasks in New York City and spoke in terms of riot and rebellion. It was declared that the new WJZ was "blanketing" all signals of all other stations, and there was much violent talk of marching on the transmitting station of WJZ and forcibly abating the alleged nuisance. The mode of abatement was left somewhat indefinite, although there were some practical suggestions dealing with burning down the station and lynching the station personnel! And yet, only a few months later, an educational campaign together with the improvement of receivers in the interim, had rendered the previously moot issue as dead as the dodo

And Now—?

Nevertheless there was a fairly long period during which the 50,000-watt transmitter was the bugaboo of radio administrators. To this day the high-power transmitter causes a slightly unpleasant quiver in some super-cautious breasts. Despite this, experiments with power of several hundred kilowatts in the antenna have shown clearly enough that better signals are thus secured toward the outer portion of the service area



MAP BY COURTESY OF McKINLEY PUBLISHING COMPANY, PHILADELPHIA, PA.

European Broadcasting Stations

(50 KW or over)

	Meters	KC	KW	Station
1	1796	167	50	Lahti (Finland)
2	1725	174	75	Radio Paris, C.F.R. (France)
3	1635	183.5	60	Zeesen Konigswusterhausen Generally relays Berlin SW Stn. DJA on 31.38 m. (Germany)
4	1481	202.5	100	Moscow, RV1 Old Komintern (Russia)
5	1412	212.5	120	Warsaw No. 1 (Poland)
6	1304	230	100	Moscow, WZSPS Trade Union (Russia)
7	1117	268.5	40	Moscow, Popoff RV58 (Russia)
8	1083	277	60	Oslo (Norway)
9	1000	300	100	Moscow (Russia)
10	857	350	100	Leningrad (Russia)
11	825	363.6	50	Sverdlovsk, RV5 (Russia)
12	533	563	60	Munich (Germany)
13	488.6	614	120	Prague, No. 1 (Czechoslovakia)
14	480	625	50	North Regional Manchester (England)
15	459.4	653	60	Beromunster Schweizerischer Landessender (Switzerland)
16	441.2	680	50	Rome, IRO SW Station, 2 RO on 25.4 m. (Italy)
17	435.4	689	55	Stockholm, SASA (Sweden)
18	424.3	707	100	Moscow, Imini Stalina (Russia)
19	413	725	80	Athlone (Irish Free State)
20	389.6	770	120	Leipzig (Germany)
21	376.4	797	50	Scottish Regional (Falkirk)
22	360.6	832	60	Muhlacker Stuttgart (Germany)
23	355.9	843	50	London Regional Brookmans Park (England)
24	331.5	905	50	Milan Relays Turin (Italy)
25	328.2	914	60	Poste Parisien (France)
26	325	923	60	Breslau (Germany)
27	301.5	995	50	North National Manchester (England)
28	288.3	1040	50	Scottish National Falkirk (Scotland)
29	276.5	1085	60	Heilsberg (Germany)
30	261.5	1147	50	London National Brookmans Park (England)

of the station (as delimited by fading). Furthermore, even the fading signal at its weakest was not inaudible in general when the higher powers were used, thus making the automatic volume control method for reducing fading more effective on the higher power station signals.

At times there have been suggestions that the power of stations should be increased by doubling or tripling rather than by a tenfold increase. Experience has shown however that for a decisive improvement in received signals, such as will be noticed and applauded by the major portion of the station audience, an increase in power of about tenfold is required. This accounts for the successive step-changes from 50 watts to the present limiting power of 50,000 watts.

About a century ago there were many people who seriously doubted the safety and practicability of steam railroads. Some had a positive dread of travelling at the wild speed of fifteen miles per hour propelled by the alien strength of steam. To-day airplane speeds tenfold greater are commonplace, and humanity awaits calmly enough the possible advent of the stratosphere airplane with its cruising speeds reaching perhaps several hundred miles per hour. In the radio field, however, we are still somewhat frightened of high power for no special reason except tradition. For it is certain that, whether on existing wave lengths or on other and markedly different operating frequencies, higher powers are inevitable and will constitute the final and decisive answer to man-made and natural interference, and will enable the successful use of receivers of the highest fidelity. It is not an exaggeration therefore to say that the battle for high power is the battle for radio itself, and that with the ultimate complete winning of that battle we shall witness truly perfected radio broadcasting service. In the meantime, using the excellent 5-kilowatt and 50-kilowatt transmitters which are available to produce high-quality service over large areas, we shall "carry on" till even better service becomes technically and economically practicable.

Two Girls, Twenty Fingers

Four Organ Manuals, and a Piano,—or Two

MATHILDE and Irene Harding were born in Washington, Pennsylvania, where they started their musical education at an early age.

Mathilde came to New York to study at the Julliard School of Music, while Irene went to Paris where she studied for three years.

Mathilde at first could not decide whether to concentrate on piano, violin, voice, organ, or dancing, as she loved all of these arts. Her final choice was the piano, and she won three fellowships while at Julliard. Her New York debut in Aeolian Hall brought concert engagements all over the country, after which she started her radio career with NBC, continuing however her concert appearances.

Irene Harding specialized in the organ during her studies in Paris, and made extensive concert tours through France and the British Isles. Returning home, she began broadcasting from a Pittsburgh station, where she soon became known to a large audience.

Both sisters teamed up at first with other artists in different cities, but two years ago they finally decided to try working together as each was then looking for a new partner. They soon became popular over the NBC Network for their excellent piano and organ duets, in such programs as "Twenty Fingers of Harmony," "Drifting and Dreaming," the "Dupont Cellophane" program and in their recitals at the famous Waldorf-Astoria Hotel in New York City.

THE HARDING SISTERS
IRENE AND MATHILDE

Irene Harding was a featured artist on the first international broadcast ever given. Both sisters are brunette, but as may be seen in the accompanying picture, they otherwise only slightly resemble each other. They have many mutual friends and spend much time together professionally as well as socially.

Leon Cole,—Organist and Technician

LEON COLE, who for the past dozen years, has been one of the South's leading pipe organists, presents a new series of organ concerts for WSM, Nashville, Tenn., the broadcasting service of The National Life and Accident Insurance Company, appearing each day in the week except Saturday and Sunday. Mr. Cole has been a pipe organ soloist for fifteen years or more and has made it his business to understand the technique of the microphone. In view of the fact that the pipe organ has such a wide range of tone and color, it is a difficult task to learn just how to play for radio broadcasting. Mr. Cole has mastered this art to a surprising degree.

His technical training as a young man during which time he spent years in the trade as a builder of pipe organs has helped him tremendously in his radio work. While he is a fine artist he also has the background of the technical side of the organ business at his finger tips. Mr. Cole is broadcasting from Loew's Theatre in Nashville upon the following schedule: Monday, 9:45-10:00 A. M., Tuesday, 6:45-7:00 A. M., Wednesday, 10:00 A. M., Thursday, 6:45-7:00 A. M., and Friday, 9:45 in the morning. He is one radio artist who always keeps in touch with his public and plays requests whenever possible during his program.

Police Alarm Broadcast News

The Baltimore Police Radio System

SOME months ago a series of robberies occurring in a certain section of Baltimore led to the arrest of a colored man who admitted the offense and said he lived in Washington, D. C. Under examination the culprit was asked why he went to the trouble of making regular trips from Washington to Baltimore instead of confining his efforts to prospects nearer home. Without hesitation the negro answered:

"Well, sir, they got that radio business in Washington and I don't want no messin' with that stuff."

From now on, light fingered gentlemen will have to work elsewhere, for the City of Baltimore also has Police Radio protection. The system which was officially opened March 1, 1933 has been advocated for more than two years by General Charles D. Gaither, Commissioner of Police in Baltimore.

Under General Gaither's direction numerous tests were made by Sergeant William E. Taylor to determine the location of the transmitter and the coverage to be obtained.

Baltimore, having a population of 813,000 is entitled to use the maximum radio power permitted by the Federal Radio Commission, *i. e.*, 500 watts. The city covers 91 square miles and has a large business area containing many tall steel buildings. From experimental data the Northern District Police station was selected for the site of the transmitter. From this point the greatest distance to the city line is 7 miles and any radio "shadow" cast by the steel buildings to the south will fall in the bay where coverage is not particularly required.

Last December the contract for the entire system was awarded by General Gaither to the RCA Victor Company through its Baltimore Distributor, Ollendorf and Hirsch, Inc.

GENERAL CHARLES D. GAITHER
POLICE COMMISSIONER, BALTIMORE, MARYLAND

Immediately a radio school was organized under Sergeant Taylor and selected members of the Police Department received intensive instruction which enabled them to secure government licenses to operate the radio transmitter.

The system as installed by the RCA Victor Company consists of the 500 watt transmitter controlled from police headquarters some miles distant; a conventional "T" antenna connected to the transmitter by a transmission line; and 20 receivers installed in cruising police cars.

The control room at Police Headquarters is the nerve center of the system, for to this room come the telephone calls from citizens requiring police assistance, and from this room go the orders to the cruising cars regarding needed assistance. The dispatcher is provided with a microphone and a voice amplifier connected by telephone lines to the radio transmitter. In front of him is a special signal board which shows at all times the number of cars on duty, their approximate location and whether they are available to execute orders. A dispatcher is on duty at all times. In case of failure of the telephone line which connects the dispatcher's microphone with the transmitter, the alarms can be broadcast directly from the transmitter location.

The voice currents at the far end of the dispatcher's wire are passed through a voice amplifier and are fed directly into the radio transmitter which consists of two units, the 100 watt exciter and a 500 watt radio amplifier. The exciter is the standard RCA Victor 100 watt Police Transmitter as provided for smaller cities. The 500 watt amplifier employs the "Class B" system for securing the audio power required for 100— modulation of the 500 watt carrier. The largest tubes used in the transmitter are UV-230-A's which are relatively inexpensive. All direct current high voltages are supplied by mercury vapor rectifier tubes so that

(Continued on Page 42)

RCA Victor Demonstrates Police Radio at Poor Richard Luncheon

Real Fire Substitutes for Alleged "Riot"

At Thursday noon, March 30th, the RCA Victor Company, Inc. staged an entertaining demonstration of various new devices before the Poor Richard Club of Philadelphia. In response to the invitation to furnish the program upon this occasion, the Company sent over a truck-load of new devices, many of which had not yet been introduced to the public. Pierre Boucheron, Advertising Manager of RCA Victor, supervised the demonstrations and acted as spokesman.

Outstanding among the new developments which were demonstrated on this occasion was the new Portable Police Radio equipment, one unit of which was set up in the banquet hall while the other was temporarily installed in a small passenger car which P. A. Anderson drove about the vicinity of the club quarters. During the luncheon, Anderson, while touring the streets of Philadelphia, assumed the role of a police officer in a squad car and kept up a running fire of reports and inquiries which similated the communications which might be expected to pass between police headquarters and police cars so equipped.

In order that the 250 or more members and guests attending the luncheon could hear the communications, a portable RCA Victor Public Address System was connected to the equipment in the dining hall, and the demonstration proved not only amazing, but amusing.

Anderson, affecting a broad Emerald Isle accent, inquired as to the whereabouts of one H. H. Kynett (who happens to be the President of the Poor Richard Club and who was presiding at the luncheon) stating that he was "wanted for snatching a lollypop from a little girl on the corner of Broad Street, between six o'clock." Then followed many other similar inquiries concerning notable guests who were present at the luncheon and each inquiry was greeted with a round of applause from those assembled. Franklin B. Huntington, a direct descendant of Benjamin Franklin, seated at the speaker's table, was also listed amongst those "wanted" by the police.

The high spot of the occasion came when Anderson announced that a riot was in progress at the Poor Richard Club and ordered all available police cars to report at the club premises immediately, adding an order to likewise dispatch the riot squad. No sooner had this announcement been completed, than a fanfare of clanging bells and screaming sirens was heard from Broad Street, outside the club quarters, and the assembled guests began to experience mingled sensations of amusement and alarm—some thinking that the joke was being carried a little too far. However, it developed that through strange coincidence, fire had been discovered in the Academy of Music, which is diagonally opposite the Poor Richard Club, and the bells and sirens were those of the fire-fighting apparatus which promptly arrived at that point.

TRANSMISSION LINE BETWEEN TRANSMITTER AND ANTENNA, AT **WPET,** NEWLY INSTALLED RCA VICTOR POLICE RADIO STATION AT LEXINGTON, KY.

Shortly thereafter, Anderson appeared in the dining room, and disclaimed all responsibility for this last realistic touch which had been added to the "act."

The communications during this demonstration were held on high frequencies outside the regular police radio band, so as not to be in any way mistaken for genuine police communications.

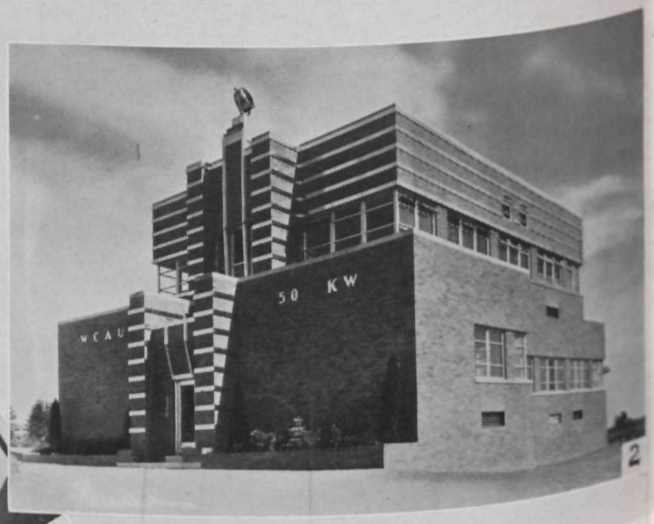
The demonstration, however, was most impressive, two-way communication having been maintained between the Poor Richard Club building and Mr. Anderson's automobile for more than a half hour, during which Mr. Anderson was cruising about the city streets. Obviously, this communication might just as well have been between Police Headquarters and any or all squad cars similarly equipped.

The apparatus employed for the purpose consisted of a complete transmitter and receiver combined in one unit and sufficiently portable for a patrolman to carry about on his person while walking his beat.

FRANCE ESTABLISHES POLICE RADIO SERVICE

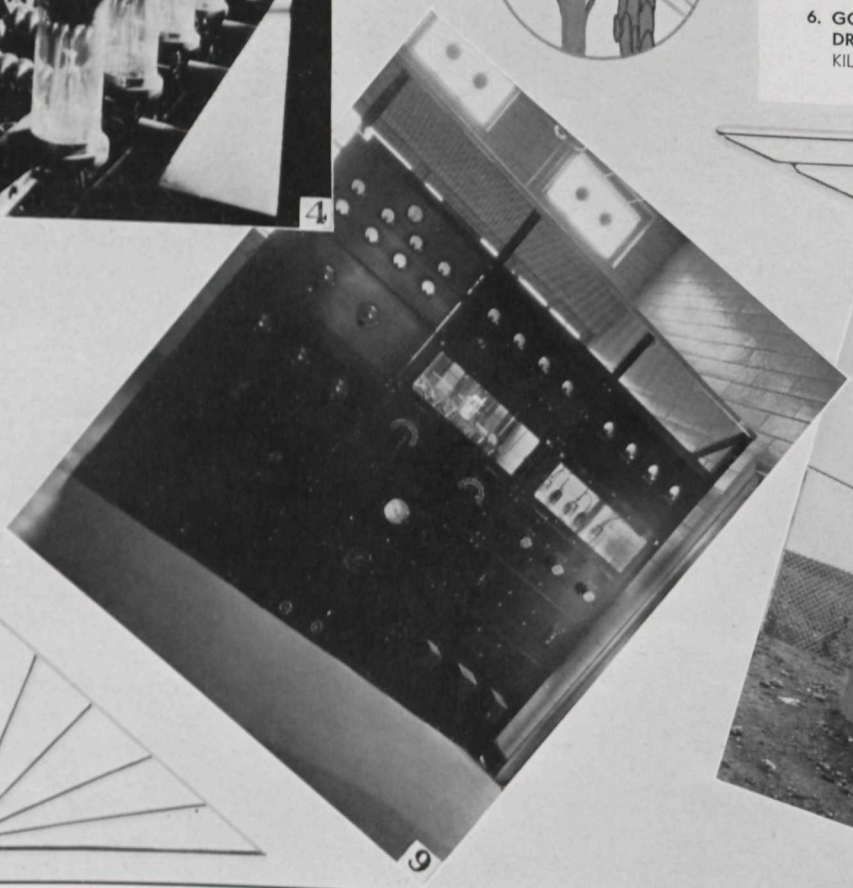
Reprinted by permission from New York Evening Post Foreign Service.

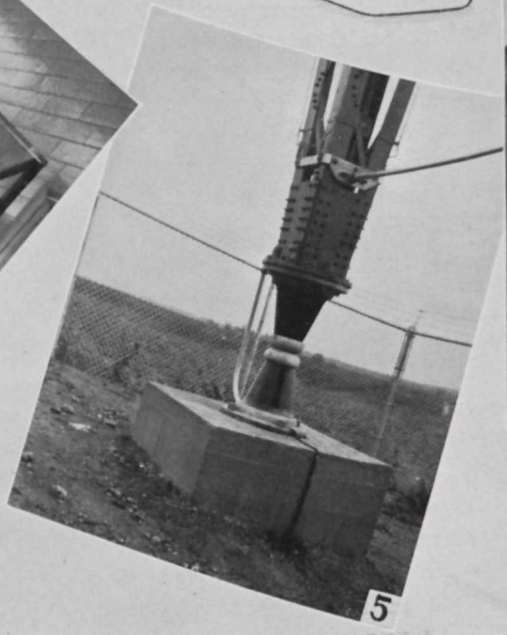
A decree establishing a police wireless service and taking control of the broadcasting stations of France has been issued by the Ministry of the Interior. The Surete Generale will control the central office of the police network from the Ministry of the Interior. It will send out police messages to sub-stations which are being set up in various parts of the country. The central station will also communicate with stations abroad when international co-operation is necessary. It is understood that the new organization will be responsible for the control of all transmitting stations, including those operated by amateurs, and for the detection of unauthorized stations.

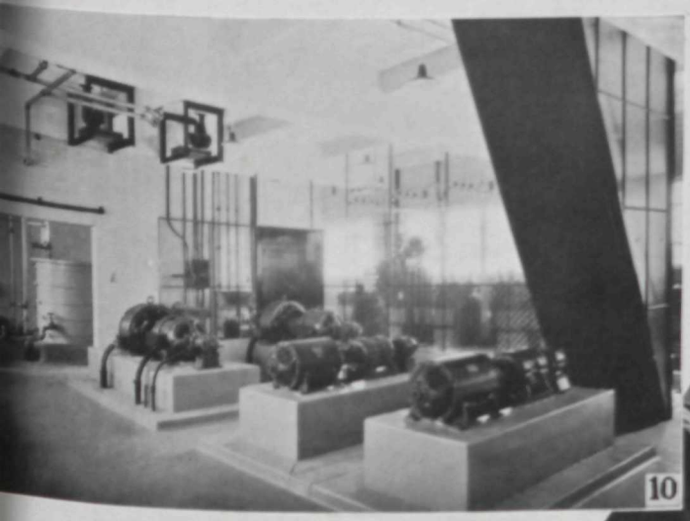


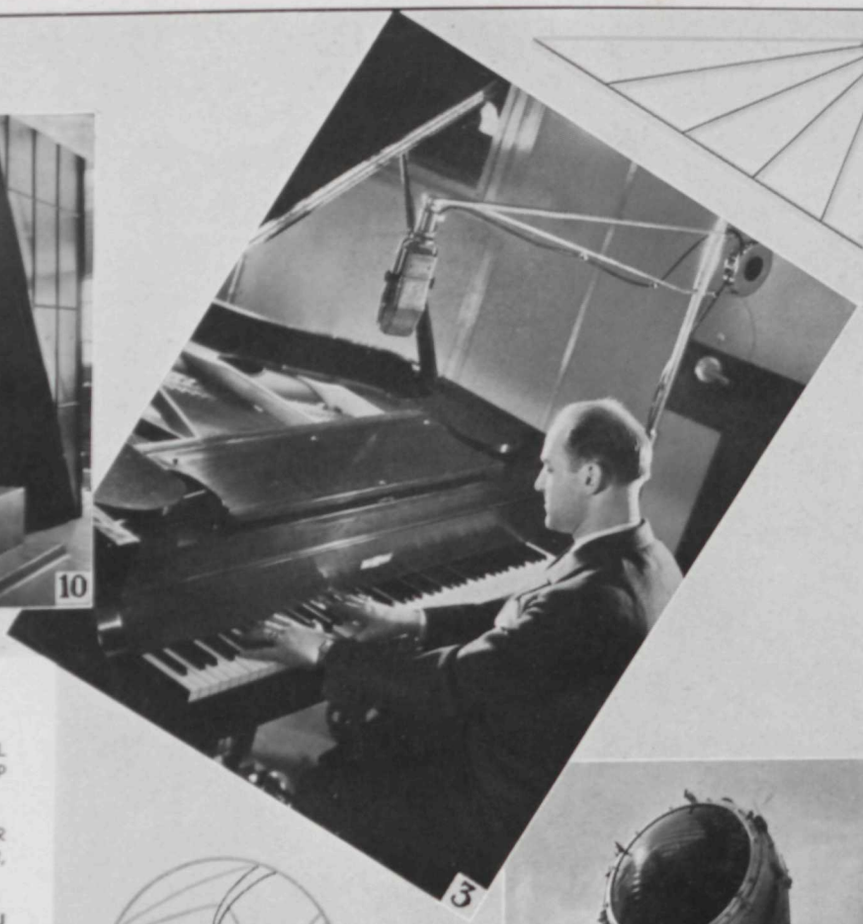
RANDOM VIEWS IN

1. **JOHN VASSO,** THE ARTIST, STANDING BEFORE ONE OF HIS LATEST CREATIONS, THE "GREAT GOD RADIO," MURAL DESIGN IN ONE OF THE **WCAU** STUDIOS.
2. EXTERIOR VIEW OF THE NEW 50 KILOWATT BUILDING OF **WCAU,** LOCATED AT NEWTOWN SQUARE, PENNSYLVANIA, THIRTEEN MILES FROM PHILADELPHIA.
3. **BEN GREENBLATT,** PIANIST, PERFORMS BEFORE ONE OF THE NEW VELOCITY MICROPHONES, MOUNTED ON A UNIQUE TYPE OF BRACKET USED IN THE **WCAU** STUDIOS.
4. A BATTERY OF UV-857 RADIOTRONS IN THE 50 KILOWATT TRANSMITTER.
5. BASE INSULATOR OF THE VERTICAL RADIATOR.
6. **GOVERNOR PINCHOT** OF PENNSYLVANIA CONGRATULATES **DR. LEVY** AT THE OPENING CEREMONIES OF THE NEW 50 KILOWATT TRANSMITTER OF STATION **WCAU.**









AND ABOUT WCAU

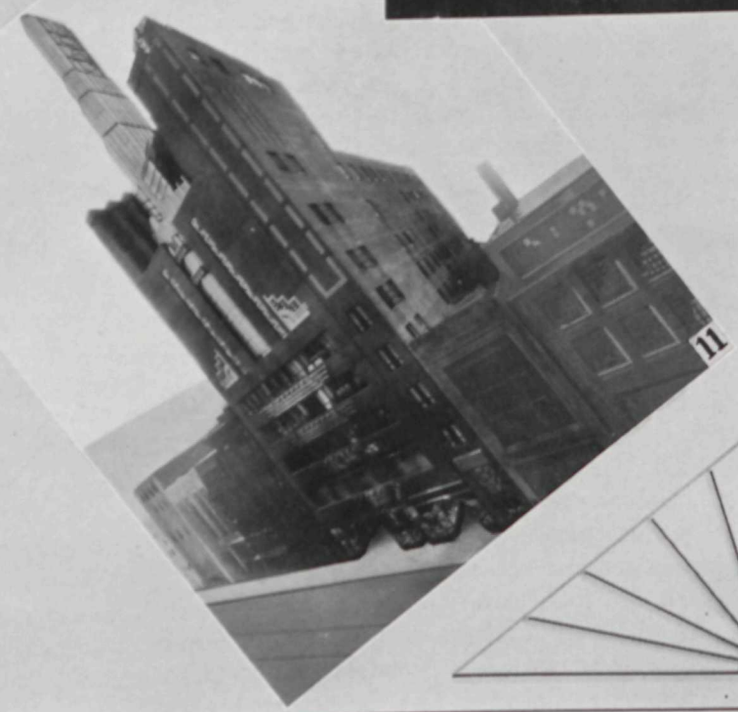
7. THE 500 FOOT STEEL TOWER WHICH FORMS THE VERTICAL RADIATOR FOR THIS MODERN STATION, LOCATED ON BISHOP HOLLOW ROAD, NEWTOWN SQUARE, PENNSYLVANIA.

8. THE GIANT FLOOD LIGHT LOCATED ATOP THE TRANSMITTER BUILDING AND FOCUSSED UPON THE 500 FOOT STEEL TOWER, AS A WARNING TO NIGHT FLYERS IN THIS VICINITY.

9. THE THOUSAND WATT SHORT WAVE TRANSMITTER, **W3XAU** LOCATED AT NEWTOWN SQUARE, PENNSYLVANIA, WHICH CARRIES THE SAME PROGRAM AS **WCAU.**

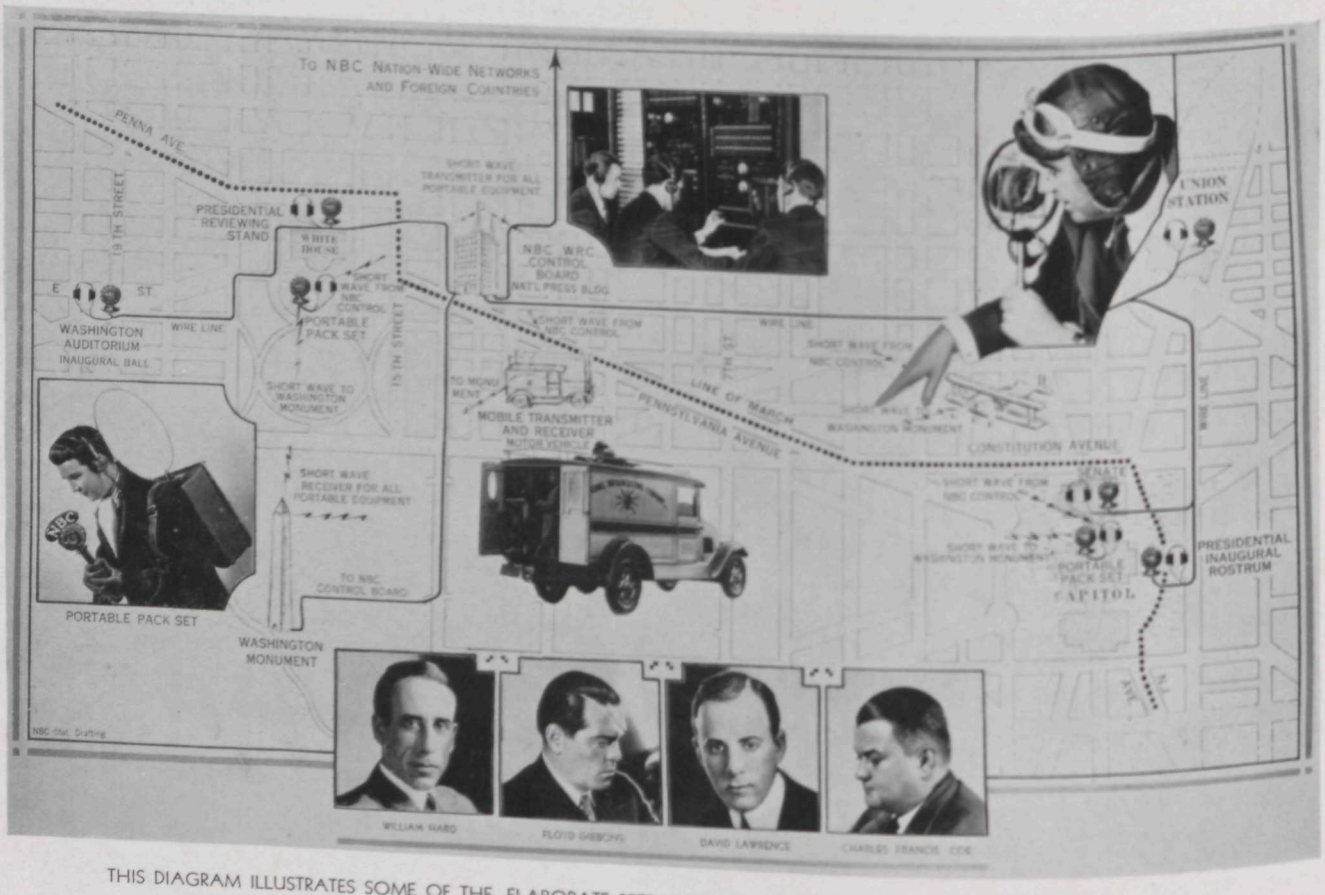
10. POWER ROOM, LOCATED ON THE GROUND FLOOR OF THE TRANSMITTER BUILDING AT NEWTOWN SQUARE, PENNA.

11. THE MODERN STUDIO BUILDING, ERECTED EXPRESSLY FOR **WCAU,** AT 1622 CHESTNUT STREET, PHILADELPHIA.



THE INAUGURAL BROADCAST

A Tribute to the Advertisers



THIS DIAGRAM ILLUSTRATES SOME OF THE ELABORATE PREPARATIONS MADE IN WASHINGTON, D. C. BY **NBC** FOR THIS IMPORTANT EVENT

THE most elaborate broadcast set-up in the history of radio was prepared by the National Broadcasting Company in order to bring the details of this memorable event to the ears of more than a hundred million persons scattered over the entire world on Saturday, March 4, 1933. Not only were the domestic networks throughout the United States furnished with this dramatic and timely program, but through the medium of powerful short wave transmitters, the Inauguration of President Roosevelt was transmitted to the far corners of the earth. Such remote places as Capetown, South Africa, Auckland, New Zealand, and countless other cities and towns in Europe, Asia, and South America, were also furnished with this program. In the United States, 89 stations associated with NBC carried the broadcast, and Stations W3XAL at Bound Brook, N. J., W8XK at Pittsburgh, Penna., W1XAZ at Springfield, Mass., and both W2XAF and W2XAD at Schenectady, N. Y., flashed the interesting events to the listening world at the moment when they were happening.

From early in the morning until late in the afternoon, the coast to coast net works of NBC were combined and carried to the waiting listeners throughout the United States vivid descriptions from announcers equipped with portable short wave transmitters, traveling about the Capitol in automobiles, or soaring through the air in airplanes. Descriptions from the special equipment set up in the White House, the Capitol, the Mayflower Hotel, and also along Pennsylvania Avenue were introduced into the program in rapid succession in accordance with the ever shifting scenes of the important events.

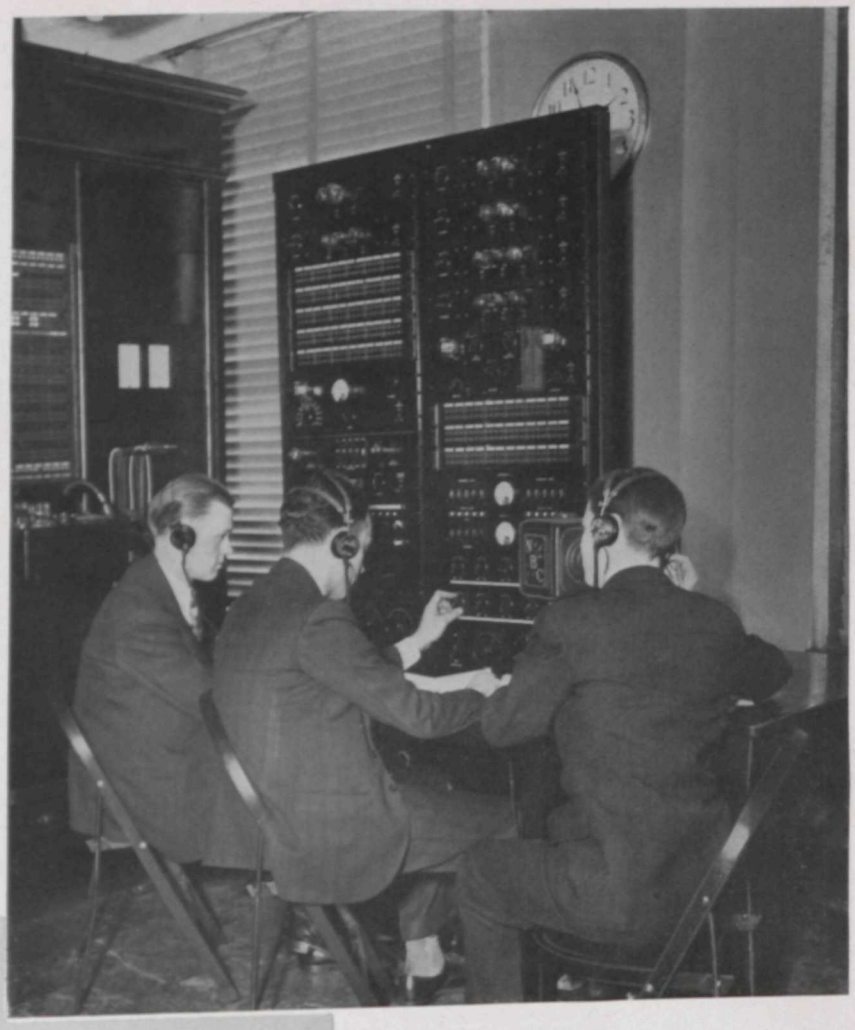
The inspiring and encouraging message in the President's own speech of acceptance and the resultant confidence in the Nation's new chief which immediately was born in the hearts and minds of millions of listening Americans is now a matter of history. But how many of these listeners have realized the tremendous importance of a nation wide chain of radio broadcast stations which made such a valuable service possible? And how many of us have realized that for the most part, it was through the courtesy of the advertisers who support these stations that the time on the air for this great broadcast event was made available, and that in most cases, these radio broadcast stations owe their very existence to the radio advertisers?

Most of us are inclined to accept this gift as we do many others . . . without thought of or credit to the

donor at the time. However, upon reflection we must all admit that after all the advertisers have done the nation a great service, and are probably ready to do the same thing again whenever the occasion arises. True, this is not the prime motive which prompts the advertiser to make his contribution toward the creation and support of this business called "Broadcasting," but the fact remains that he has given us a great and a much needed service in making possible the instant dissemination throughout our nation of important news and history in the making.

RCA VICTOR PARTICIPATES

During the inauguration of our new President, the long parade consisting of loyal patriots and supporters of the victorious Presidential ticket wended its way from the Capitol, where on its steps the country's great leaders took the oath of office, to the White House. At many points along the route great crowds watched the proceedings. Some were particularly fortunate to be able to sit in the reviewing stands particularly constructed for the purpose.

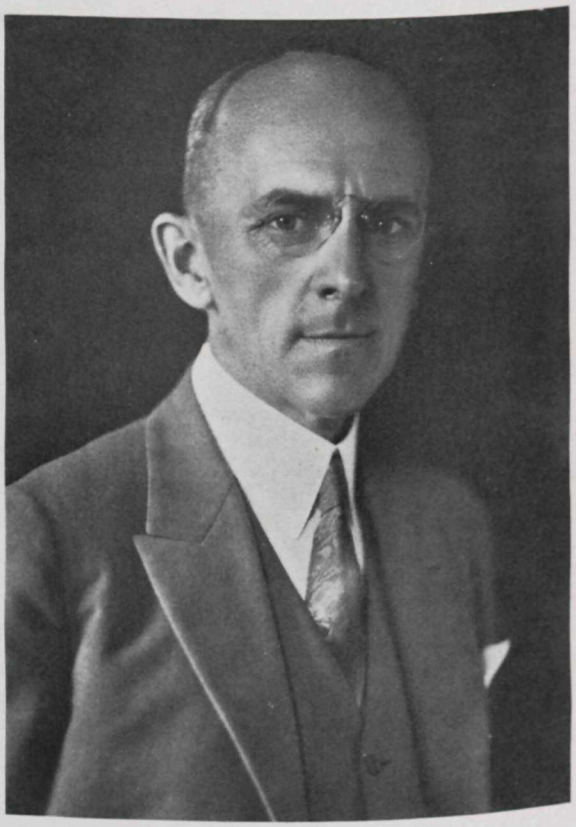


NBC RADIO RELAY TRUCK NEAR THE SCENE OF THE INAUGURATION, AND (ABOVE) CONTROL OPERATORS BUSILY ENGAGED IN TRANSFERRING OUTSIDE PICKUPS FROM ONE VANTAGE POINT TO ANOTHER.

At grand stands, in front of the Treasury Building, just around the corner on Pennsylvania Avenue, and down the avenue near the Capitol, RCA Victor Photophone Sound Reinforcing Equipment had been set up so that the spectators could listen to the proceedings which took place on the Capitol steps. This equipment consisted in each case of an 80 watt Amplifier System with five 37-inch Metal Directional Baffle Loudspeakers. The pick-up at the Capitol was made by NBC through their regular broadcast microphones and fed by telephone wires to the three remote points. In this manner the overflow crowd was able to see the parade and then listen to the ceremonies in comfort. Without such equipment on hand it would have been impossible for the assembled thousands to have heard the proceedings.

NEW RCA VICTOR EXECUTIVES

E. T. CUNNINGHAM
OF RADIO TUBE FAME, WHOM WE GREET AS OUR NEW PRESIDENT, AT THE RCA VICTOR COMPANY, INC., CAMDEN, N. J



G. K. THROCKMORTON
EXECUTIVE VICE-PRESIDENT OF THE RCA VICTOR COMPANY, INC. CAMDEN, N. J.

NEW PRESIDENT FOR RCA VICTOR

David Sarnoff, President of the Radio Corporation of America, on March 17th, made the following statement:

"At a meeting of the Board of Directors of the Radio Corporation of America, held today, J. R. McDonough, Assistant to the President of the Company, was elected Executive Vice-President of the Radio Corporation of America.

As a step toward the consolidation of two of the corporation's wholly-owned subsidiary companies, the RCA Victor Company, Inc., and the RCA Radiotron Company, Inc., Elmer T. Cunningham, now President of the RCA Radiotron Company, Inc., was also elected President of the RCA Victor Company, Inc, succeeding Mr. McDonough in that position.

The RCA Victor and RCA Radiotron Companies are engaged in radio research, engineering, manufacturing and sales activities, the former in the field of radio broadcast receiving instruments, phonographs and other radio equipment, and the latter in the radio tube field.

The election of Mr. McDonough as Executive Vice-President of the Radio Corporation of America and of Mr. Cunningham as President of the RCA Victor Company, is effective as of April 1, 1933."

NEW EXECUTIVE VICE-PRESIDENT

G. K. Throckmorton was elected Executive Vice-President of the RCA Victor Company, Inc., effective April 1st, 1933. Mr. Throckmorton is also President of E. T. Cunningham, Inc., and Executive Vice-President and General Manager of RCA Radiotron Company, Inc.

Assisting Mr. Cunningham, he was in a measure responsible for the remarkable success of the Cunningham Radio Tube brand. At one time he was manager of an iron foundry and later became buyer for Sears Roebuck. He has experience both in the buying side of business as well as in the selling side.

Mr. Throckmorton has a remarkable capacity for work, is quick to grasp the essential facts of any situation and to get right to the point. He has a reputation for being an excellent organizer and for knowing how to get the most out of the individuals in his organization. It is felt that his past association with Mr. Cunningham in the RCA Radiotron Company will make for efficiency in his new post under that same executive.

BROADCASTING PERSONALITIES

Mr. E. K. Cohan, Technical Director of CBS was on a trip in Florida when the attempted assassination of the President-Elect occurred. Cooperating with the local station outlet, he arranged for an interview of an eyewitness over the network shortly afterwards. Those who realize the difficulty of getting lines and facilities on short notice will appreciate the work necessary

LET'S GET ACQUAINTED

to put on this timely broadcast. This ought to be in the same class with the postman-on-vacation-taking-a-walk story.

ROLLYN THOMAS
POPULAR ANNOUNCER AT **WJR,** DETROIT, SHOWN BEFORE THE VELOCITY MICROPHONE. **D. A. REESOR,** REPRESENTATIVE OF RCA VICTOR, SNAPPED THE PICTURE WITH HIS NEW MINIATURE CAMERA.

Florida seems to be a place where missing broadcast officials can be located in chilly weather. Mr. H. O. Landis, of WEEU, Reading, has just returned from a trip, as has Mr. L. Baltimore, of WBRE, Wilkes-Barre.

Mr. H. A. Chinn, formerly of Round Hills laboratory and M.I.T., is in charge of W2XE, the CBS short wave station in New York which started operations March 1st.

Recent visitors to "Radio Headquarters," Camden, N. J. included E. B. Craney of KGIR, Butte, Montana; J. A. Chambers of WLW, Cincinnati, Ohio; H. O. Landis of WEEU, Reading, Pa.; Mr. and Mrs. Charles Jennyss, popular entertainers of WNOX, Knoxville, Tenn.; O. B. Hanson, V. J. Gilcher and R. M. Morris, of NBC in New York City.

Now that the rest of the country has gone completely 3.2, we hope that our friends will still find reason to visit Camden.

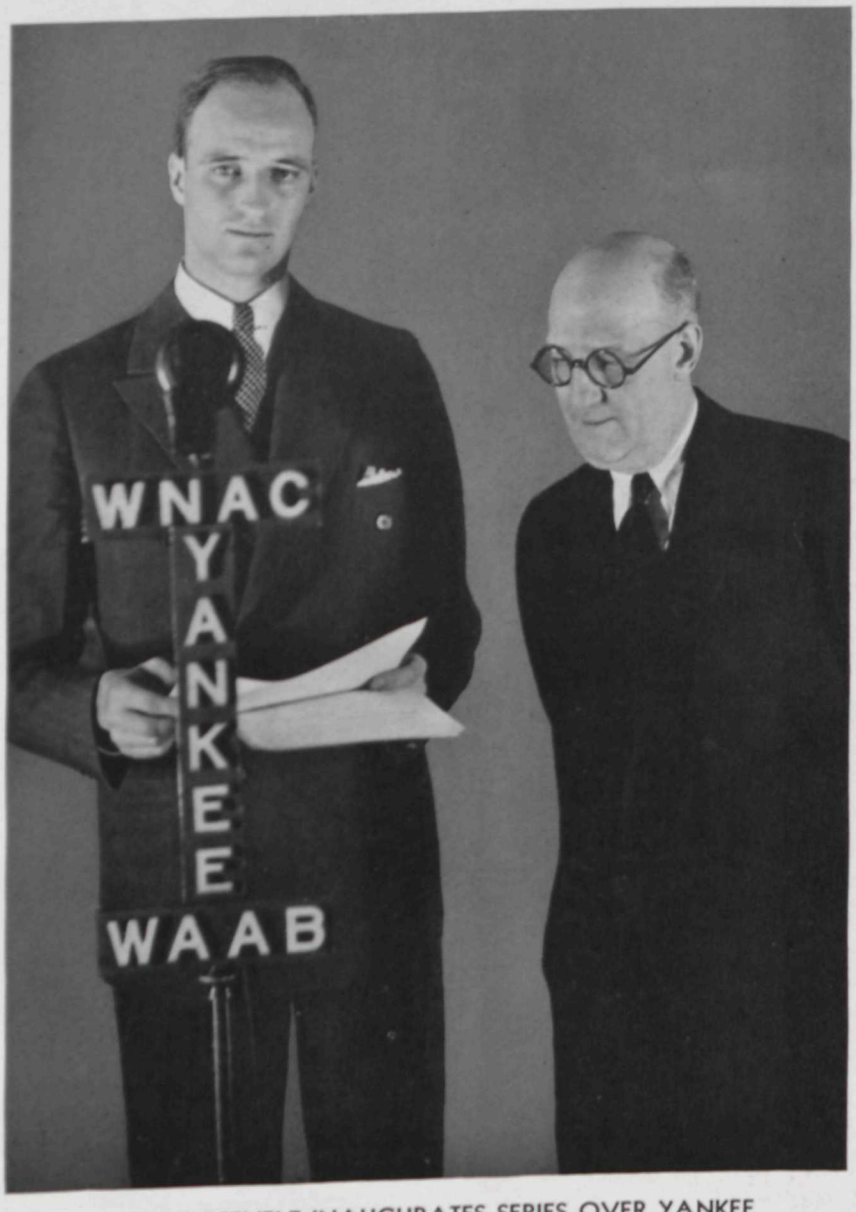
Mr. Robert H. Lingle, Jr., is station engineer of WFBC, Greenville, S. C., which will be on the air shortly with an RCA 250 watt transmitter.

Mr. W. A. Schudt, Jr., is now general manager of WBT, Charlotte, N. C.

Hugh Deadweyler, formerly of WRDW, Augusta, Ga., is now advertising director of WNOX, Knoxville. Mr. Deadweyler has been in radio for the past four years, beginning with KELW, Hollywood, Cal., then with five other California stations. Starting on the air as a singer, Mr. Deadweyler saw the possibilities in the commercial department, and now admits that his principle object in life is "to get results for advertisers." He is assisted in the commercial department by A. N. Hatcher and D. C. Pennington, both new arrivals in the radio field.

Jimmie Lloyd, formerly with WNOX is now program director of WRDW, Augusta, Ga.

"Chuck" Simpson, announcer at WROL, Knoxville, will be associated with WNOX in the future.



JAMES ROOSEVELT INAUGURATES SERIES OVER YANKEE NETWORK

JAMES ROOSEVELT, ELDEST SON OF **PRESIDENT ROOSEVELT,** INAUGURATED A WEEKLY SERIES OF DISCUSSIONS ON NATIONAL AFFAIRS OVER **WNAC** AND ASSOCIATED STATIONS OF THE YANKEE NETWORK, THURSDAY, MARCH 23RD, AT 8:30 P. M. HE WAS INTRODUCED TO THE RADIO AUDIENCE BY **JOHN SHEPARD, 3RD,** PRESIDENT OF SHEPARD BROADCASTING SERVICE. SUBSEQUENT TALKS BY **MR. ROOSEVELT** WILL BE HEARD EVERY THURSDAY EVENING AT 8:30 O'CLOCK OVER THE YANKEE NETWORK.

LET'S GET ACQUAINTED

G. HAROLD PORTER
VICE-PRESIDENT OF THE RCA VICTOR COMPANY, INC., IN CHARGE OF HOLLYWOOD OFFICES.

CLYDE F. COOMBS
THE WESTERN DISTRICT REPRESENTATIVE OF THE RCA VICTOR COMPANY, INC., HANDLING BROADCAST TRANSMITTER SALES.

NEW VICE-PRESIDENT FOR RCA VICTOR

G. Harold Porter, Vice-President in charge of the West Coast activities, with offices at Hollywood, California, was formerly Vice-President in charge of the Pacific Coast activities of the Radio Corporation of America. His new duties include the supervision of the operations of the RCA Victor Company in connection with Photophone Sound-on-Film recording and projection equipment; Sound-on-Disc recording for motion pictures; the production of Victor records of song hits from motion pictures and of outstanding Pacific Coast orchestras and soloists; and electrical transcriptions for broadcasting purposes.

Mr. Porter has had a distinguished and varied career in radio since the early "wireless" days of the art. For the past seven years he has been in charge of the Radio Corporation's numerous West Coast activities in the communications and home entertainment fields, with headquarters at San Francisco. His new offices are located at 1016 North Syracuse Avenue, Hollywood, California.

Clyde F. Coombs represents the Transmitter Sales Section of the RCAVictor Company, Inc., throughout the Western District, which embraces the states of Washington, Oregon, California, Idaho, Nevada, Utah, Arizona, New Mexico, Colorado, Montana and Wyoming. Mr. Coombs recently visited "Radio Headquarters" at Camden, N. J., and we prevailed upon him to sit for his picture, which appears above. We would have introduced him to you through these columns much earlier in the career of this magazine, but in spite of all our efforts, we were unable to obtain his photograph until this writing. However, good things are worth waiting for, and we feel that we have really accomplished something in obtaining the picture of Clyde Coombs. (—And him so bashful.)

He is a graduate of the University of Utah, and he has been with the RCA organization since 1927. Previously, he was a member of the Radio Engineering Department of the General Electric Company in Schenectady, where he played an important part in the development of high powered broadcast transmitters.

He makes his headquarters in the San Francisco office of RCA Victor, at 235 Montgomery Street, and is a familiar figure to Broadcasters in the Western states.

David S. Little, Manager Aviation Radio Section of the RCA Victor Company, Inc., was born June 24, 1903, at Zanesville, Ohio. He was an amateur radio operator in 1915, and in 1919 became a commercial ship radio operator on the Great Lakes for RCA. In 1924 he

Broadcasting Personalities

became Assistant Inspector of the Great Lakes Division, and successively Chief Operator and Assistant Superintendent of the Great Lakes area. When Superintendent George Cole was transferred to the RCA Victor Company, Little became Superintendent of the Great Lakes

DAVID S. LITTLE
MANAGER OF THE AVIATION RADIO SECTION, RCA VICTOR COMPANY, INC.

Division, and in 1932 was transferred to the RCA Victor Company along with Aviation Radio activity.

Deeply interested in flying since watching his uncle build and fly one of the first pusher type aircraft in this country, he made his first flight in 1920 in old "Jennie." When the marine and aviation activities of RCA were combined, this permitted active personal work furthering aviation radio development and sales. He eventually obtained a pilot's license in 1929, and his combination of flying and radio experience proved valuable, permitting application of both in development and sales.

In 1932 he was transferred to the RCA Victor Company and appointed Manager of the Aviation Radio Section. ———

Listeners of WNOX are promised thrills and chills galore in the near future! The "radio division" of their "Little Theatre" movement is presenting the "Mystery of Harlow Manor," under the direction of Louis Lytton, who was for six months a member of the "march of time" cast.

BUDDY MILLER, WNOX

Buddy Miller, one of the South's most capable program directors, is barely twenty years old, and has been announcing since he was seventeen! Buddy will probably murder us for telling his age, because he is one of those chaps who is always getting elected to various committees and programs of civic activities as well as finding time to direct plays at the high school, take extra parts with the local stock company, arrange banquets and be a general good fellow in the bargain! If prophecies were in order, we would make a few . . . as they aren't, we'll just say a "continued good luck, Buddy!" *(Sounds like contemplated matrimony or some other form of impending disaster—Editor.)*

IT'S A GIRL!

January 18th. Larry Lyndon of the RCA Victor Engineering Department, passes out cigars. Good reason. Mr. and Mrs. Lyndon announcing the arrival of Margaret Ann, weight 7 pounds, 6 ounces. Congratulations, Larry! (You saw his picture on page 4 of our April, 1932 issue.)

IT'S A BOY!

February 24th. Chester L. Beach, the NBC contact man of RCA Victor, passes around the stogies. Practically same reason as above. (A boy this time.) Mr. and Mrs. Beach announcing the arrival of Junior, weight 6 pounds, 4 ounces. After all these years. Felicitations Beach, O. M.! (His picture in our October, 1932 issue on page 18.)

IT'S A GIRL!

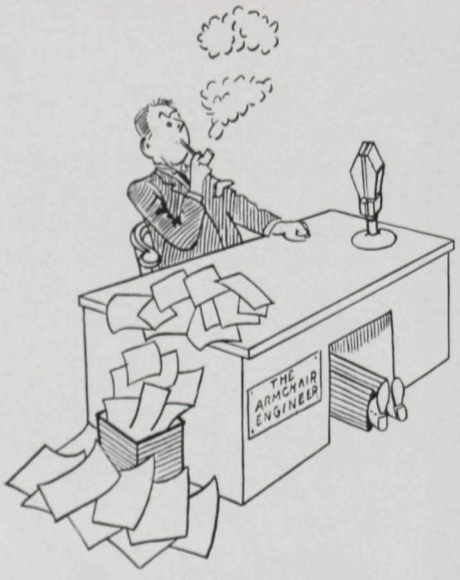
April 5th. More cigars. This time from "Bud" Gamble of the RCA Victor Advertising Department, on account of the arrival of Joan Elizabeth in the home of Mr. and Mrs. Gamble. Weight, 7 pounds, 3 ounces. Congrat—Say . . . Great Scott . . .

IT'S AN EPIDEMIC!!

SAMUEL TAYLOR
ASSISTANT MANAGER, AVIATION RADIO SECTION, RCA VICTOR COMPANY, INC.

Samuel J. Taylor, Assistant Manager Aviation Radio Section of the RCA Victor Company, Inc., was born in Plantersville, S. C., in 1897. He entered the Motor Transport Division of the army in 1917, serving a year in France, being then too young to get a flying commission. He entered the United States Army Flying School at Arcadia, Florida, in 1920, and after graduating in 1921 (one of 23 in a class of 106), bought a ship and did extensive "barnstorming" over the South, Southeast and Southwest. In 1927 he went to work for Stout Air Lines, the only company operating passenger tri-motored Fords, and stayed with that Company until it merged with N. A. T., a division of United Aircraft. He was with this company until June, 1930, when he went with Firestone Tire and Rub-

(Continued on Page 34)



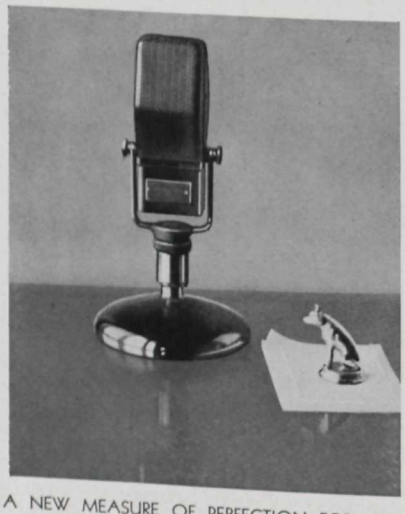
Velocity Microphone Test Curves

The Armchair Engineer Investigates The Manner of Making Them

By J. P. TAYLOR, Sales Engineer, RCA Victor Company, Inc.

Aristides is reported the first to have learned that of even a good thing there can be too much. The Greeks had a way for it. Tired of what a man had to say they could banish him by the expedient of ostracism. The convenient ceremony was carried out by voting on earthenware sherds—the blow falling on the unfortunate whose name was most often written. On one such occasion it is said that an illiterate sitter-by giving Aristides his sherd, and supposing him a common citizen, begged him to write Aristides upon it. He, surprised, asked if Aristides had ever done him any injury. "None at all," said his neighbor, "neither know I the man; but I am tired of hearing him everywhere called the Just." The story would have it that Aristides, without further comment, inscribed his own name. So-o-o-o, if you tire of microphone characteristics, give us your sherd and bore yourself no further.

STRICTLY as one armchair engineer to another—we have talked a bit glibly on velocity mike characteristics. Our Engineering Department has even been heard to mutter something about a little knowledge making a sales engineer. But no more—we've been burned, and plenty. Strangely enough it didn't happen until quite recently. We were holding forth in good fashion on our favorite point—the fact that a frequency calibration of each and every velocity mike sold is made before shipment. Unfortunately there was a stranger in our midst. He was even so rude as to ask some questions. Nor were these questions as innocent as might have been hoped. We had said that microphone response measurements should be made by the Rayleigh disc method. The gentleman, it seemed, was familiar with the method—he brazenly doubted the practicability of applying it to production testing. We hadn't thought of that. We didn't quit right away—we spluttered a bit. But no use, Mephistopheles had us—he knew more about it than we did.



A NEW MEASURE OF PERFECTION FOR "HIS MASTER'S VOICE"—THE **VELOCITY MICROPHONE**

Thus is explained a surprise visit which—with our face still red—we paid the research lab on the following day. After all, we have a reputation of sorts to maintain. Our good friend Dr. Olsen—to whom is due much of the credit for the development which made the velocity microphone practical—patiently answered all of our questions and explained the workings of his Rayleigh disc measuring equipment. Also he gave us some references. The first of these, Lord Rayleigh's "Theory of Sound," you might like—but we must confess to having difficulties with it. The second, a paper by Stuart Ballantine entitled "Technique of Microphone Calibration" covers the subject nicely. It can be found in the Journal of the Acoustical Society for January, 1932—we recommend it if you're interested in the subject.

Methods of Measuring Response

The trend in broadcasting is unmistakably toward increased fidelity. Flat frequency characteristics thus become a necessity. It is generally agreed that a system in which each of the units of the chain from microphone to antenna have such a characteristic would be most satisfactory. For various reasons progress toward meeting this requirement in microphones lagged for some time. Quite recently, however, development of new types of microphones—in particular the Velocity Microphone—has made available instruments closely approaching this standard. Their development has spurred the interest of research engineers in the methods of measuring microphone response.

Various ways of determining the response of a microphone as a function of frequency have been proposed. Only three have been of more than passing importance. They are commonly spoken of as the thermophone, the actuator, and the Rayleigh disc methods.

The Thermophone Method

Historically one of the first, the thermophone method has now been generally discarded in favor of the greater convenience of the other two methods. Briefly, the thermophone when placed against a microphone unit leaves a small space between its inner surface and the diaphragm of the mike. Mounted on the inner surface of the thermophone unit in such a manner as to be centrally located in this enclosed space are several strips of metal foil. These strips carry a steady current on which is superposed the audio frequency current. Variation of temperature in the enclosure resulting from heating of the strips causes the pressure on the diaphragm to vary at the superposed audio frequency—thus simulating the effect of the varying pressure in a sound wave. By means of a formula developed by Ballantine this pressure may be calculated and the microphone thus calibrated. However, assumptions into which a degree of approximation enters must be made. Moreover, certain factors such as temperature distribution which enter the formula cannot be accurately calculated. In practice the enclosure is usually filled with dry hydrogen which is circulated through this space by means of two capillary tubes. Because of this added complexity of the equipment and because of the amount of calculation necessary the thermophone method is now seldom used.

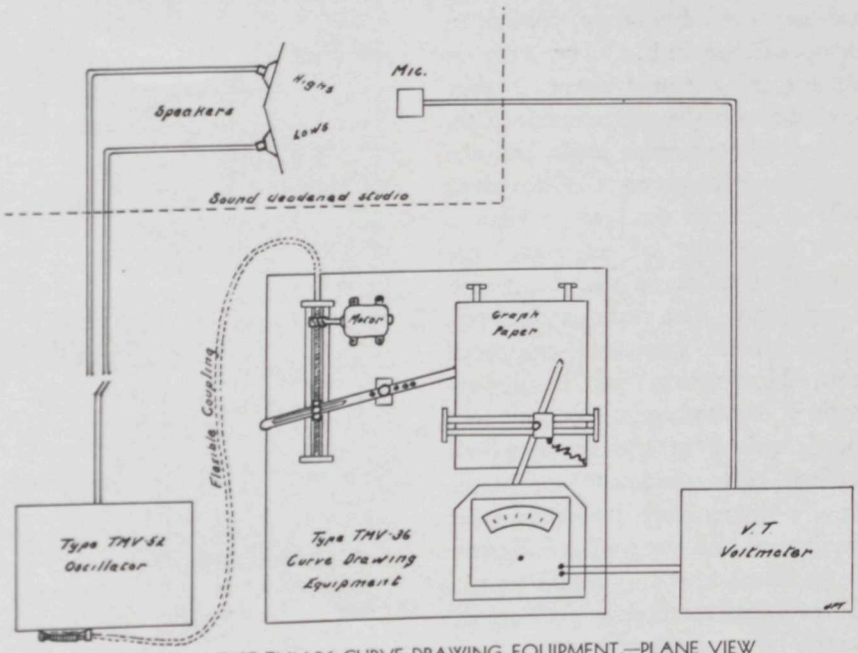


FIGURE 3—TYPE TMV-36 CURVE DRAWING EQUIPMENT,—PLANE VIEW

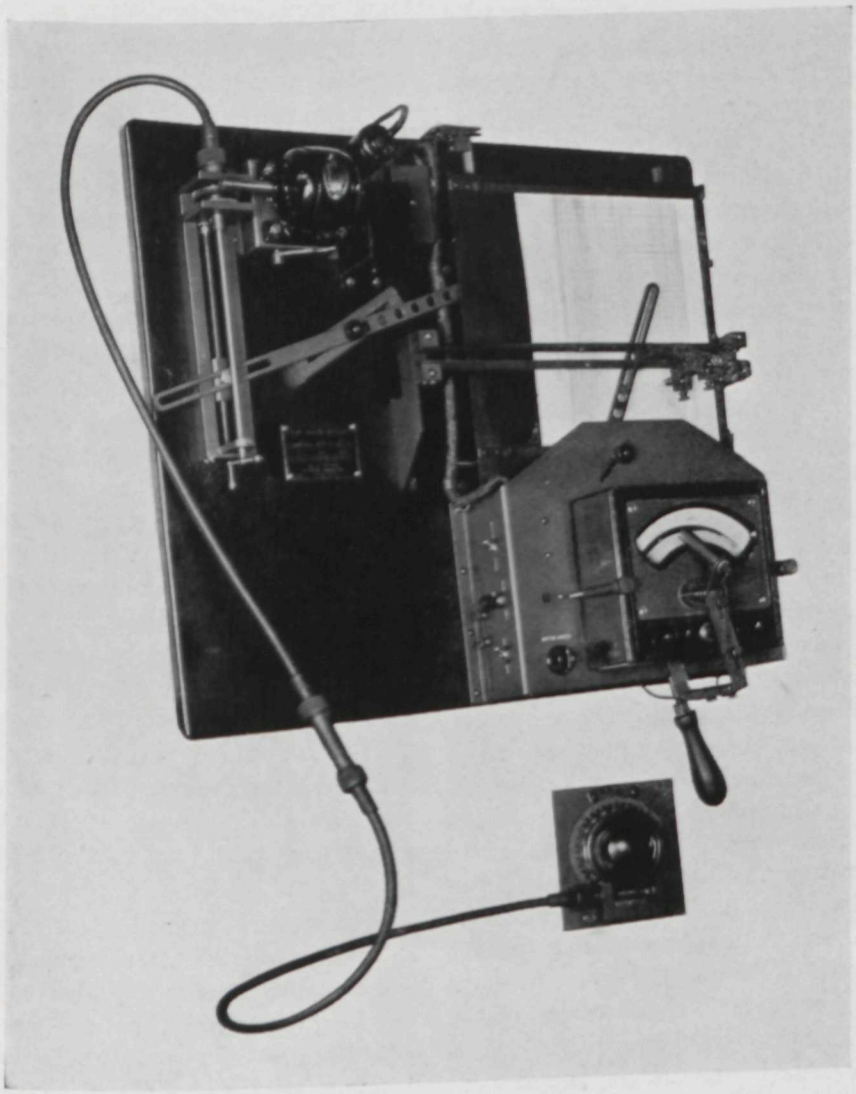


FIGURE 6—TYPE TMV-36 CURVE DRAWING EQUIPMENT

The Actuator Method

The actuator method to a considerable degree overcomes the inconvenience and uncertainty of the thermophone. During the past few years it has been almost universally used in the measurement of condenser microphone response. The actuator itself is a grilled metal plate which is placed parallel to and close to the

diaphragm of the microphone. The grille is given a polarizing voltage and an audio frequency voltage is superposed on this. The varying pressure of a sound wave is thus simulated by the electrostatic force between the actuator grille and the microphone diaphragm. Providing their spacing is not greater than a few hundredths of an inch, the acoustic reaction on the diaphragm is negligible. The electrostatic force, then, can be accurately calculated from the voltages and the dimensions of the system. Compared to that required in the thermophone method this calculation is simple. At the same time the equipment required is also simpler and is more easily manipulated. Unfortunately the actuator method as well as the thermophone method is open to the criticism noted below.

New Methods Necessary

The two methods of microphone calibration outlined above—as well as most other methods in use up until recently—are based on the application of an alternating pressure to the diaphragm by some mechanical means. The assumption is made that this simulated pressure is the same as that at the diaphragm of a microphone in a sound field. For the conventional microphone in ordinary usage this assumption is hardly justified. Firstly all microphones except the Velocity Microphone present an obstructing surface to the sound waves. As a result these waves are diffracted and an increase of pressure on the diaphragm results. This effect—known as pressure-doubling—may increase the response by one hundred percent at frequencies in the neighborhood of 3000 cycles. Secondly, all microphones except the Velocity Microphone have more or less of a cavity in front of the diaphragm. Resonance in this cavity also produces an increase in pressure which may be almost as great as that from pressure-doubling. Neither of these effects are detected in the methods of measurement mentioned above. As a result calibrations made by these methods may be very seriously in error.

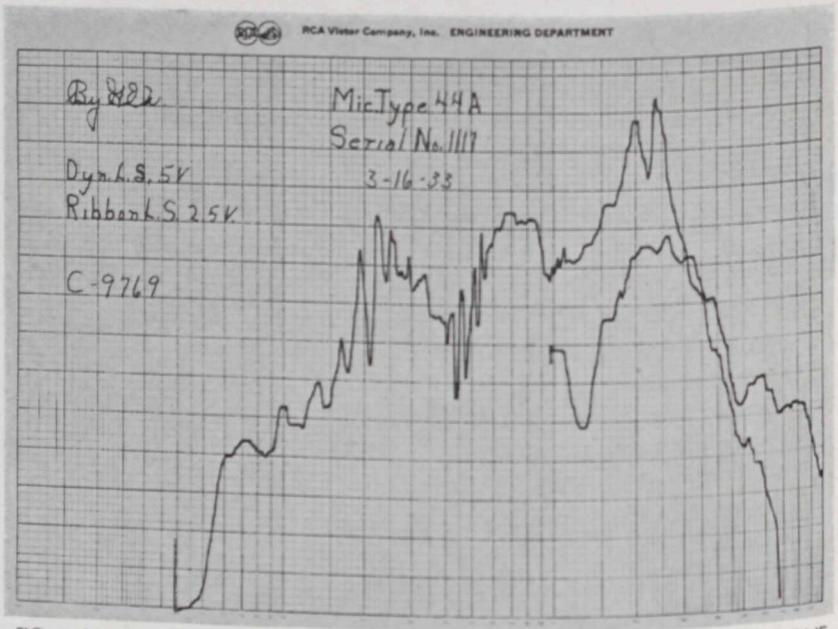


FIG. 4—SAMPLE OF THE PRODUCTION TEST CURVES MADE ON EACH VELOCITY MICROPHONE THIS SHOWS THE CURVE OBTAINED BEFORE ALLOWANCES ARE MADE FOR IRREGULARITIES IN LOUDSPEAKER CHARACTERISTICS.)

Rayleigh Disc Measurements

The errors pointed out above and which have caused these methods to be generally discarded were found a few years ago when an attempt was made to check calibrations made by these methods with a calibration made by the Rayleigh disc method. The latter is due to work done by Lord Rayleigh in the latter part of the last century. In this method the microphone is calibrated by means of a plane sound wave whose intensity is determined by the rotational torque it exerts on a small disc in its beam. As this method is now widely accepted as standard and as it is particularly applicable for measurements on the Velocity Microphone it justifies a more detailed description.

A plain view of the setup for making measurements by this method is shown in Figure 1 herewith. A number of variations of the arrangement may be used but the one shown indicates the working most clearly. An "artificial mouth," more properly a dynamic electrophone, produces a sine wave of any desired audio frequency. Placed equidistant from this source is the microphone to be calibrated and the Rayleigh disc itself. This disc is circular in shape and approximately a quarter inch in diameter. It is very light and is suspended from a thin fibre so as to be free to rotate on its vertical axis. When the system is at rest the plane of the disc is at an angle of 45° to the direction of the sound wave. On the disc surface away from the sound source is secured a tiny mirror. The observer looking through the telescope which is fixed in position sees reflected in the mirror a point on the scale which is mounted as shown in the diagram.

When a flat object such as the Rayleigh disc is suspended in the stream of a current of air it tends to turn itself so that its plane is normal to the air stream. Obviously this tendency is independent of the direction of the stream. Hence a periodic air stream such as a sound wave causes a steady deflection which is proportional to the velocity of the stream. This deflection may, therefore, be used to measure the velocity of a sound wave. The deflection is, of course, determined by observing through the telescope the deflection on the reflected scale. The velocity in a plane sound wave is simply related to the pressure—hence measurements so made are easily converted to terms of pressure in cycles per sq. cm.

The method outlined above eliminates the necessity of assuming that the actual pressure at the diaphragm can be mechanically simulated. The sound waves during the calibration impinge on the diaphragm exactly as in ordinary usage. Thus if the

microphone under test is, because of its construction, subject to increase in pressure due to diffraction or to cavity resonance this will show up in the calibration. As pointed out above the error when these effects are not included is considerable for microphones having diaphragms of considerable dimensions. In the condenser type, for instance, it may be as great as two hundred percent at certain frequencies.

Curves for several types of microphones as made by the Rayleigh disc method in our research laboratory are shown in Figure 2. These are free wave calibration made with a sound input equivalent to a pressure of 10 bars (10 dynes per sq. cm.). A sound pressure of 10 bars is a sound level somewhat above that of a normal voice. It represents a fair average between the usual maximum and minimum levels encountered in the average pickup. Ordinates of output are given in decibel level as compared to a zero reference level of 12.5 milliwatts.

The Ideal Method

Although the construction of the Velocity Microphone is open so that the sound waves pass through and neither diffraction nor cavity resonance occur, nevertheless, the Rayleigh disc method remains the ideal means of measurement. Both the Rayleigh disc and the Velocity Microphone are velocity-operated devices. Since the action of each is therefore similar the method lends itself to considerable precision with relatively simple precautions. Moreover, this microphone has no diaphragm in the ordinary sense of the word and the construction of the moving element is such as to make very difficult any method using mechanically simulated pressure. The Rayleigh disc method is, therefore, used exclusively for such measurements.

In making the actual calibrations in the research laboratory a number of refinements are introduced. For instance the microphone under test and the Rayleigh disc are enclosed within a wind curtain (see Figure 1). This curtain, while permitting free passage of sound, serves to shield the disc from disturbance by extraneous air currents. In addition, all measurements are made in a fairly large room which has been sound-deadened to the greatest possible degree. Were such precaution not taken, reflections would make accurate measurements at frequencies below 1000 cycles almost impossible. However, with this deadening measurements

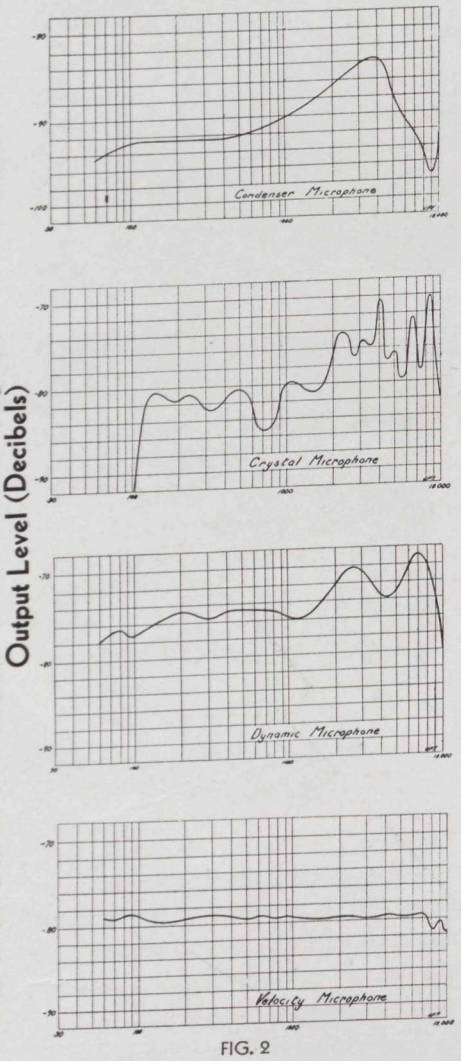


FIG. 2

can be made to below 100 cycles. When calibrations down to 30 cycles are required the measurements must be made in the open at a distance of 100 feet or more from any solid objects which might cause reflections.

It is interesting to note here that for frequencies below 100 cycles even the most "dead" studios actually have considerable reflection. As a result microphone calibrations in this range are of doubtful value. Even a microphone absolutely flat over this range will not reproduce correctly unless studio conditions and the placement of the microphone are favorable. Hence improved response to lower frequencies can only be gained by experiment with various placements. Many studio engineers could doubtless improve their pick-ups by work along this line.

Production Measurements

Needless to say, after even such a casual examination of the Rayleigh disc measuring equipment it was obvious that our belittler was right. The care and precautions required with it could hardly be followed in the production calibration of microphones in quantity. Hence our next visit was to test laboratory to see how they did manage to make test curves on ten to twenty microphones in a single day.

As we might have guessed—had it not been April 7th—the test curves made on production microphones are not absolute calibrations but rather purely arbitrary calibrations made by comparing the output of the microphone under test with the output of a standard microphone under identical conditions. The standard microphone is, of course, a permanent part of the laboratory equipment and is maintained for calibrating purposes only just as are the standards of resistance, capacity, etc. At intervals it is carefully calibrated by the Rayleigh disc method in order to make sure there has been no drift.

The apparatus in the test laboratory is particularly interesting because of the convenience and expediency which it provides in the making of comparative curves of high accuracy. A planeview of the arrangement of this apparatus is shown in Figure 3. The audio frequency for calibration is supplied by a Type TMV-52-A Beat Frequency Oscillator. This electron-coupled oscillator furnishes a convenient means of obtaining a constant signal at any desired audio frequency. A more detailed description of it will be found in an article by W. F. Diehl which appeared in the last issue of *Broadcast News*. The oscillator drives a pair of loudspeakers in the

studio. One of these speakers, of conventional design, covers the low frequency range. The other is a special ribbon type speaker which is capable of a good signal at high frequencies. The use of two speakers makes it possible to make the calibration without need of raising the oscillator level at the higher frequencies. The microphone to be tested is placed in the beam of these speakers as shown in the diagram. The output of the microphone is measured by a vacuum-tube voltmeter.

Distinctive Feature

Up to this point the arrangement can hardly be considered novel. The distinctive feature is the addition to this setup of the Type TMV-36 Curve Drawing Equipment. This device makes the apparatus almost automatic in operation and allows a continuous curve to be drawn in a matter of a minute or so. The diagram of this layout indicates the operation of the equipment fairly well. The motor, through a worm-gear, causes the table on which the graph paper is placed to travel forward under the recording pen. The motor is also geared through a flexible shaft to the tuning condenser of the oscillator. Since this condenser has a log scale the output of the oscillator can readily be synchronized with the log scale on the graph paper. The up and down motion of the pin is controlled by the handle which can be seen protruding from the curve drawer. Mounted just above this handle is a micro-ammeter which is the indicating meter of the vacuum-tube voltmeter. The handle has secured to it a pointer with a small light mounted in the end. The operator, grasping the handle, follows the reading of the micro-ammeter by keeping the tiny beam of light from the pointer on the needle of the meter. In so doing he causes the pen to record the output of the microphone on the graph paper. As the motor tunes the oscillator over the range and simultaneously moves the paper up, a continuous calibration of the microphone is obtained. A sample curve so made is shown in Figure 4. The separate curves obtained with the two loudspeakers can be observed. Such a set of curves is made on each Velocity Microphone and these curves are then compared with similar curves made on the standard microphone. No microphone is shipped unless the curves which are made on it are closely the same as those for the standard. Actually, however, the characteristics of these microphones are almost wholly determined by the inherent design, and rejections on this account are therefore very rare.

A note of caution must be added regarding the curves of Figure 4. The scale used is, of course, arbitrary and is purposely made as large as possible to facilitate comparison. The irregularities of these curves are due almost wholly to the relatively poor characteristics of the speakers used. It is interesting to note that, with the perfection of the Velocity Microphone, development on microphones has proceeded several steps ahead of loudspeaker design. This is in line with the well-established policy in transmitter development, namely to prevent undue and costly obsolescence by keeping transmitter design as far as possible in advance of receiver design.

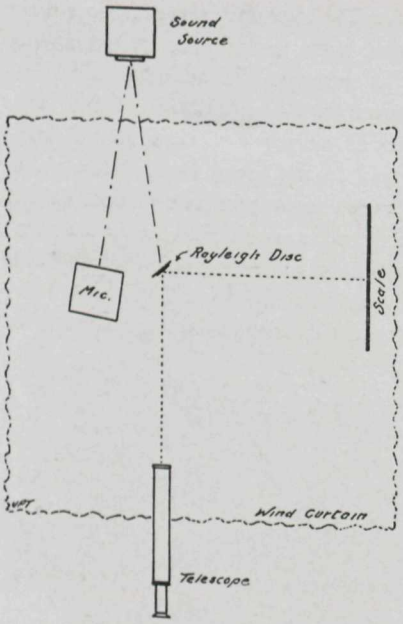


FIGURE 1—THE "RAYLEIGH DISC"

NOTE—The Type TMV-52-B Oscillator which of course has many uses in addition to that indicated herein, is now being manufactured in quantities for use in broadcast stations and laboratories. These instruments will make their appearance on the market on May 1st. The Type TMV-36 Curve Drawing Equipment is one of a considerable group of laboratory instruments which were originally developed by the RCA Victor Company, Inc. for its own use but which are also now available to other prospective users.

FIGURE 5—BEAT FREQUENCY OSCILLATOR

BROADCASTING PERSONALITIES

(Continued from Page 29)

ber Company, piloting their tri-motored Ford on sales and promotion activity. Taylor left Firestone in February, 1933, and joined RCA Victor as Assistant to Dave Little.

During his 11 years experience he has flown all types of ships, has had 3,000 hours of night and day flying in tri-motored planes, which with other experience makes up a total of over 6,000 flying hours, an aggregate reached by few pilots in this country.

His army radio instruction and air line piloting experience particularly adapts him to this newer activity, and wherever aviation stories are told, Sam Taylor is mentioned as a unique figure.

Did You Know?

By W. S. FITZPATRICK

THAT according to Radio Engineering's historical record, New York city's telephone directory of 1880 comprised but 252 names—which is not as many as now listed for a single department of the RCA Victor plant at Camden in their private automatic telephone exchange?

That crystal type radio receivers were used in ship radio service as late as 1920?

That a national radio network will in the late Summer carry a dramatization of the history and growth of radio?

That one may gain an impression of the extent of the RCA Victor plant floor space by imagining its equivalent set in a strip 50 feet wide—which strip would extend from New York to Philadelphia and would require two hours for a fast express train to pass?

RCA RADIOTRONS Cunningham

That a Cunningham Radio Tube or RCA Radiotron showing a pressure inside the bulb of as much as one forty-millionth of the pressure of the air we breathe, is not permitted to leave the factory?

That the tiny holes in the mica "spacers" for element supports in Cunningham Radio Tubes and RCA Radiotrons must check to within one one-thousandth of an inch?

Via RCA

That it is possible to telephone a radiogram destined to London, Paris, Berlin or other important center, to

"FITZ"–THE RADIO RIPLEY

the New York R.C.A. Communications central office and then to receive a reply to the radiogram in from one to three minutes?

RCA Victor BROADCAST EQUIPMENT

That the new antenna tower for WLW will be 831 feet high, but that the 50,000 watt station WSM, near Nashville, holds America's record with its 878 feet towers?

That Peter Van Steeden, NBC entertainer, may be called at his home in New York by spelling out "Big Foot" on the telephone dial?

RCA WORLDWIDE WIRELESS

That the stations of R.C.A. Communications occupy 9,600 acres of land?

That 9,000 miles of private wire connect the stations and offices of R.C.A. Communications?

That R.C.A. Communications transmits pictures, drawings and facsimile of documents directly by radio between London, Berlin, and Buenos Aires as part of its regular service?

That as far as the sending and receiving of messages is concerned, the big high power stations of R.C.A. Communications on Long Island, in New Jersey, and in California, are merely automatic relay points, the actual operation being carried on at the central radio offices in New York and San Francisco?

RCA "HIS MASTER'S VOICE" OF THE AIR

That in the airways services both radio telegraph and radio telephone are used in communication with ground stations?

That in referring to vacuum tubes the terms diode, triode, tetrode and pentode, which puzzle the uninitiated, simply mean two, three, four, and five elements, respectively?

RCA Institutes

That the New York school of R.C.A. Institutes has a transmitter laboratory said to equal any in this country? There are ten separate and distinct types of transmitters there.

That for precautionary measures there are installed at the New York NBC studios, storage batteries with sufficient capacity to run the entire plant, including lights and control equipment, for twenty-four hours?

That Ray Perkins, NBC entertainer, was once a station technician, while Herman G. Ashbaucher, sound technician at the Chicago NBC studios, was formerly a radio singer?

(Continued on Page 41)

RCA Victor Laboratory and Test Instruments

By W. F. DIEHL, Test Engineer, RCA Victor Co., Inc.

IN order to successfully develop products which meet the exacting high quality requirements set up by the RCA Victor Company, it is necessary to have in the Research and Development Laboratories, equipment of high precision and advanced design. It is important also to have a well equipped Standards Laboratory where measurements can be made with equipment accurate to ten (10) times the limits specified for production test. In view of the increased performance required of our products today, it is also essential to have set up in the factory production test equipment which approaches in accuracy and refinement laboratory equipment of a few years ago. To develop equipment of this type requires knowledge of raw materials and electrical circuits in order to guarantee the performance during the service life. This knowledge is obtained through analyses made in our Chemical, Physical, and Life Testing Laboratories.

Materials Testing Laboratories

It is beyond the scope of this short article to discuss in detail the numerous instruments and setups with which these laboratories are equipped. The photographs, however, will serve to show the elaborate but efficient layout of these laboratories which have contributed during the past three (3) years to higher standards now maintained by our suppliers of raw material.

Figure 1 shows a general view of our modern chemical laboratory, the wall to the left enclosing a special insulated balance room. The laboratory is equipped to make all qualitative and quantative analyses, and determine accurately the makeup of materials which go into our products. It is equipped with electroplating tanks, distilled water stills, centrifuge, gas hot plates, steam baths, extraction apparatus, flow test apparatus, electric furnace, electric dry ovens, hydrogen iron apparatus, penetrometers, spectrometer,

spectroscope, refractometer, hydrogen sulphide generator, dessicator, salt spray apparatus, weatherometers, and humidity rooms.

Figure 2 is a general view of the Physical Laboratory where equipment for measuring bursting strength, tensile strength, bending performance, exact physical dimensions, and for making all mechanical tests, is set up.

Figure 3 shows the Life Testing Laboratory where accellerated life tests are made on power transformers, capacitors, resistors, switches, and all electrical and mechanical components to determine their service life. The most interesting equipment in this laboratory—probably the only equipment of its kind in existence—is the capacitor life testing equipment, which is capable of handling 2500 mmfds. under conditions of accellerated D. C. and A. C. voltages at controlled and predetermined temperature.

Figure 4 is a view of the machinery room equipped with two (2) double voltage direct current machines to supply 4000 volts direct current in steps of 1000 volts. (Increments of this voltage being obtained by a control panel in the main life test laboratory.) A 25 KVA 120 cycle alternator feeding four (4) ten (10) KVA transformers and a large reactor (to correct power factor) serves to supply the A. C. ripple in order to simulate conditions of capacitors in actual use.

FIGURE 1—CHEMICAL LABORATORY

These laboratories make possible our exact knowledge of materials

used in our products and make possible our guarantee of service life.

Standards Laboratories

Figure 5 is a general view of the Standards Laboratory where precise measurements of inductance, capacity, resistance, power factor, impedance, and all electrical and magnetic measurements are made. The laboratory is equipped with four (4) double copper screen shielded rooms. One (1) room contains equipment for measuring power factor. The second room is equipped with instruments for measuring inductance and capacity. The third room houses a primary frequency standard, and the fourth is equipped with instruments for measuring R. F. stage gain, intermediate frequency gain, and coupled circuits. A bench is provided for meter calibration, standardization, and special meter development. On the second bench may be seen a number of bridges for measuring inductance and capacity at low frequencies and adjacent to this bench is an adjustable frequency source variable from 20 cycles to 70,000 cycles. Kelvin, Wolf, and Universal Bridges, potentiometers, and a Schackleton bridge with a wide range of precision mutual inductometers makes possible any measurement required. Adjacent to the frequency source may be seen the impedance measuring equipment which has a range of 100 to 100,000 ohms and by means of which iron core reactors with as high as 120 milliamperes D. C. flowing through them, can be measured. On another bench is set up a permeammeter and Epstein core loss equipment and special turn count equipment, which can detect five (5) turns in 40,000.

A sound proof room is available where sound measurements are made and microphones standardized and calibrated by either the Rayleigh disc (showing in Figure 6), piston phone or electrostatic actuator method. Adjacent to this sound proof room is a special double screened cage equipped with secondary frequency standard and precision equipment for calibrating signal generators and other laboratory equipment.

FIGURE 2—PHYSICAL LABORATORY

Laboratory Equipment Now Available to Our Customers

During the latter part of 1930 it was found necessary to develop new laboratory instruments to carry out new developments in the Engineering Department Laboratories. This equipment proved so valuable and its performance and design was so far advanced that many of our customers requested that similar equipment be built for them. The accompanying photographs show a number of instruments which are now in use in development laboratories throughout the United States, Canada, and foreign countries.

Standard Signal Generator, TMV–18–C

Figure 7 illustrates an instrument for taking performance data on radio receivers, radio frequency amplifiers, and field strength measuring equipment. It is useful in measuring tube characteristics, resistance at radio frequencies, power factor, and

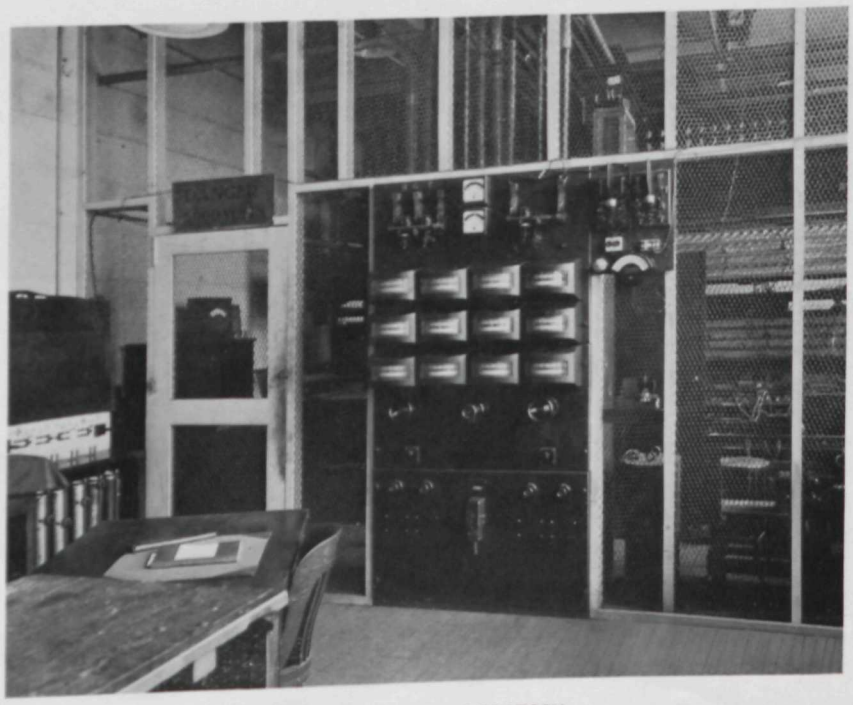


FIGURE 3—LIFE TEST LABORATORY

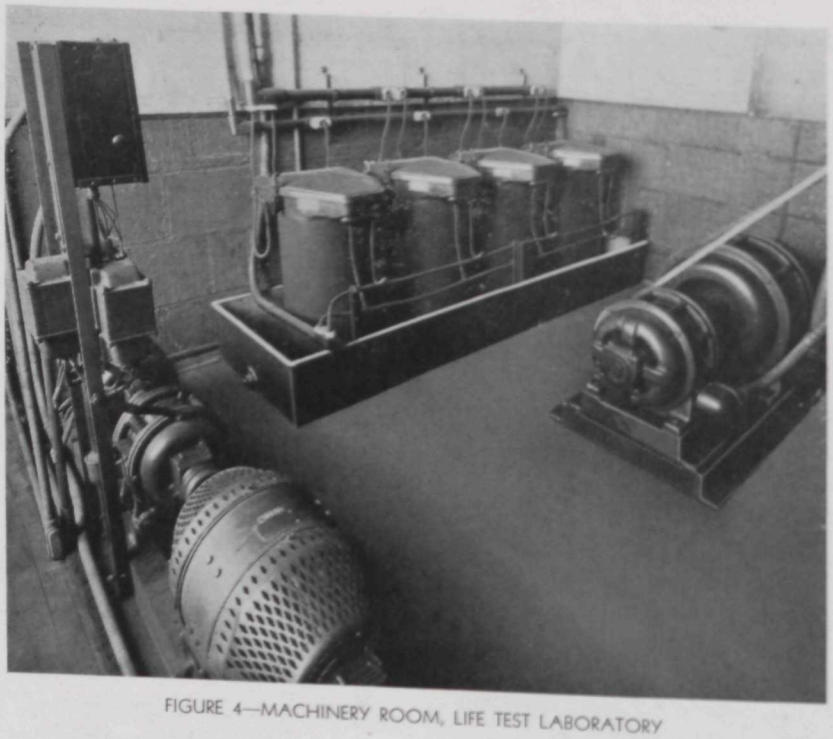


FIGURE 4—MACHINERY ROOM, LIFE TEST LABORATORY

is invaluable in the design of I. F. transformers, radio frequency amplifiers, and in determining the characteristics of coupled circuits. This standard signal generator has a carrier frequency range of 25 kc to 25,000 kc covered by ten (10) shielded plug-in coils easily removable from front panel. A 400 cycle oscillator capable of modulation up to 80% is incorporated and external modulation up to 7000 cycles may be used. The input impedance for external modulation is approximately 4000, the voltage required for 80% being approximately 47 volts and for 30% 17½ volts. The frequency modulation is less than 200 cycles up to 5100 kc for 50% modulation, and increases gradually up to 1500 cycles at 20 megacycles per 30% modulation. At 25 megacycles the leakage is negligible and with the attenuator on 0 no two points have a difference of potential exceeding 0.2 microvolts. The frequency control dial is a type 49-A which spreads .270° rotation of the variable capacitor over 4500 main divisions thereby insuring high accuracy of carrier frequency setting and resetability. A highly stabilized oscillator circuit accounts for the negligible harmonic content, constant output, and high stability over long periods of time.

FIGURE 6
"RAYLEIGH DISC" FOR MICROPHONE CALIBRATION

Beat Frequency Oscillator, TMV-35-C

Figure 8 illustrates a beat frequency oscillator which produces output flat to within 1% over the frequency range of 20 cycles to 1,200,000 cycles. When it is considered that the highest frequency available from this type instrument in the past has been 10,000 cycles, this range is far in advance of requirements for some time to come. The instrument is invaluable in the communications laboratories, physics laboratories, and research laboratories where a high precision instrument covering a continuously variable wide frequency range is needed. The instrument incorporates two (2) radio frequency oscillators, two (2) buffer amplifiers, a detector, two (2) audio amplifiers, and an output stage. The variable capacitor em-

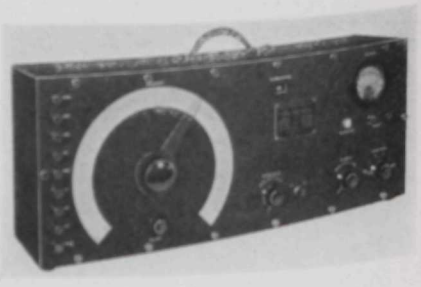


FIGURE 8
BEAT FREQUENCY OSCILLATOR TYPE 35-C

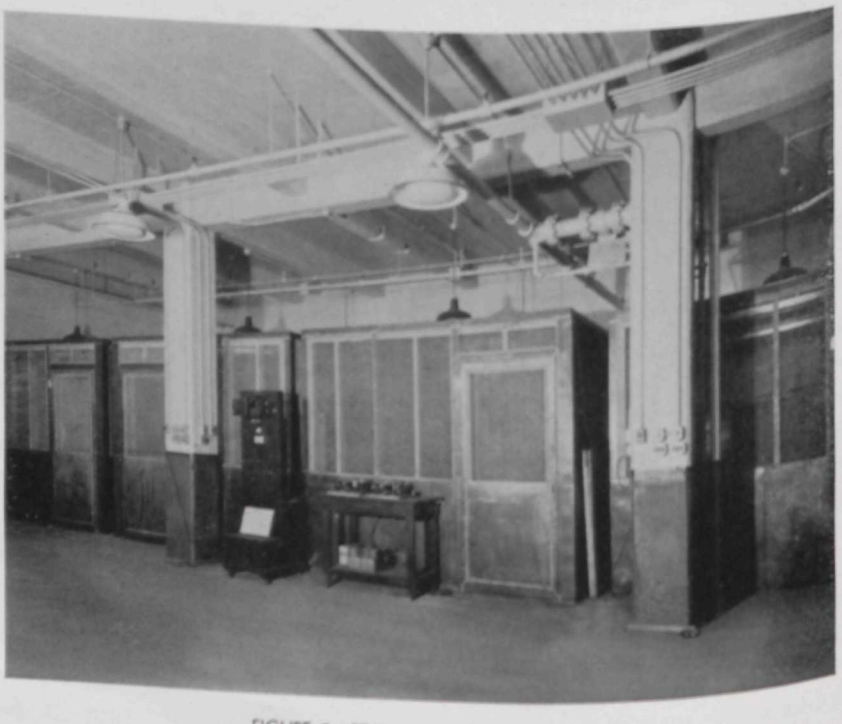


FIGURE 5—STANDARDS LABORATORY

ployed incorporates a special stator shield and carefully designed rotor plates to insure a five (5) place logarithmic scale. Maximum output is 45 volts when worked into a resistance load of 50,000 ohms or 25 volts when working into a similar

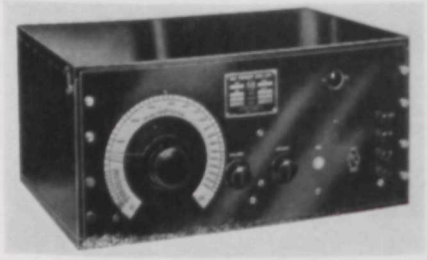


FIGURE 9
BEAT FREQUENCY OSCILLATOR TYPE 52-B

load of 5000 ohms. Total harmonic content is approximately 3% and the drift about ⅓ cycle per minute.

Beat Frequency Oscillator, TMV-52-B

Figure 9 illustrates another beat frequency oscillator specially developed for audio frequency use and to obtain all characteristics of high quality speakers, amplifiers and networks used in broadcast and sound

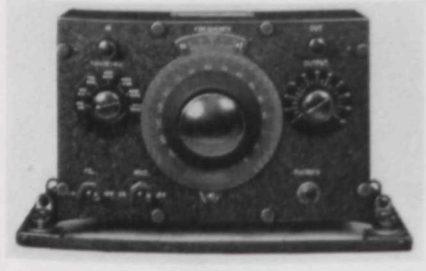


FIGURE 10
FREQUENCY MONITOR TYPE TMV-76-A

pictures laboratories. The instrument incorporates circuits which are conducive to low distortion, and was described in the last issue of *Broadcast News*.

Frequency Monitor, TMV-76-A

Figure 10 illustrates a Heterodyne Oscillator weighing approximately 5 pounds incorporating seven (7) carrier frequency ranges which can be supplied between 200 kc and 30 megacycles. A special temperature compensated tuning capacitor is employed insuring high accuracy of frequency setting with changing temperature conditions. A highly stabilized oscillator is employed which minimizes the change in filament plate voltages and the effect of load variation is negligible. The second tube is incorporated which may be used either as a detector or modula-

FIGURE 7
SIGNAL GENERATOR TYPE TMV-18-C

tor and the uniform compactness of the instrument makes it ideal as a monitor for all communication service and development laboratories.

Heterodyne Frequency Meter, TMV-53-A

Figure 11 illustrates a highly precision instrument covering a range of 90 kc to 10,000 kc with straight

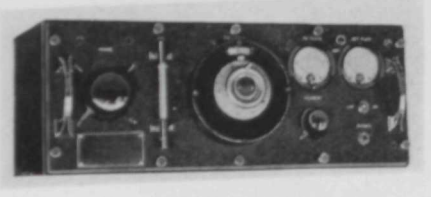


FIGURE 11
HETERODYNE FREQUENCY METER TYPE TMV-53-A

line frequency calibration and incorporating a thermometer to compensate for temperature effects.

Sound Meter, TMV-26

Figure 12 illustrates the RCA Victor sound meter consisting of a velocity microphone, vacuum tube amplifier, detector microammeter,

FIGURE 12
SOUND METER TYPE TMV-26

and calibration standard. The instrument is invaluable for the study of noise by automotive and aircraft manufacturers and others interested in vehicles of transportation such as bus, railway, and steamship companies. The instrument has also proven valuable to manufacturers of refrigerators, air conditioning equipment, fans, blowers, elevators, conveyor sysrems, and is ideal for the study of both mechanical and electrical machines. The

FIGURE 14
UNIVERSAL VISUAL TEST EQUIPMENT TYPE TMS-36

range of the instrument is from 20 decibels (a very quiet room) to 120 decibels (the roar of a powerful airplane motor).

FIGURE 15
FIELD INTENSITY METER TYPE TMV-21

Universal Visual, TMS-36

Figure 14 illustrates an instrument which provides a visual image for the study of electrical circuit characteristics. Manufacturers of radio and electrical parts are now

using this instrument to check induction coils, capacitors, and tube circuits. The instrument covers a frequency range of 40 kc to 1500 kc, and delivers R. F. output from 0 to 1½ volts. It can be used to test

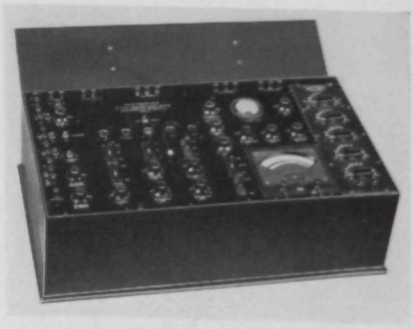


FIGURE 16
PLATE RESISTANCE AND MUTUAL CONDUCTANCE METER TYPE VE-8

coils from 50 to 120,000 microhenries and capacitors from 5 mmfd. to 10,000 mmfds. Limits may be varied from 2 to 20% and provision is made for measuring a wide range of input impedances. The instrument shows a true picture of the resonance curve of the circuit and clearly illustrates the effect of any changes, and is therefore valuable for classroom demonstration in technical schools and colleges, and for analysis work in laboratories.

Field Intensity Meter, TMV-21

Figure 15 illustrates an instrument for measuring the field strength of broadcast transmitters and is in-

FIGURE 17
SIGNAL ANALYZER TYPE TMV-48-A

valuable in obtaining data on "station coverage." This meter is vastly different from former designs which required a truck for transportation. Mounted in a single small case this meter can be easily carried about by one man and quickly set up anywhere. It has a field intensity range of 20 microvolts per meter to 3000 millivolts per meter and covers a frequency range of 550 kc to 4500 kc.

Wire Test Equipment, TMV-69-A

Figure 13 illustrates a wire test instrument which is now in use by wire manufacturers, and on incoming inspection by those who require the wire which they purchase to meet standard specifications. The equipment indicates number of breaks per inch, total length of wire, and other standard data generally covered in wire specifications.

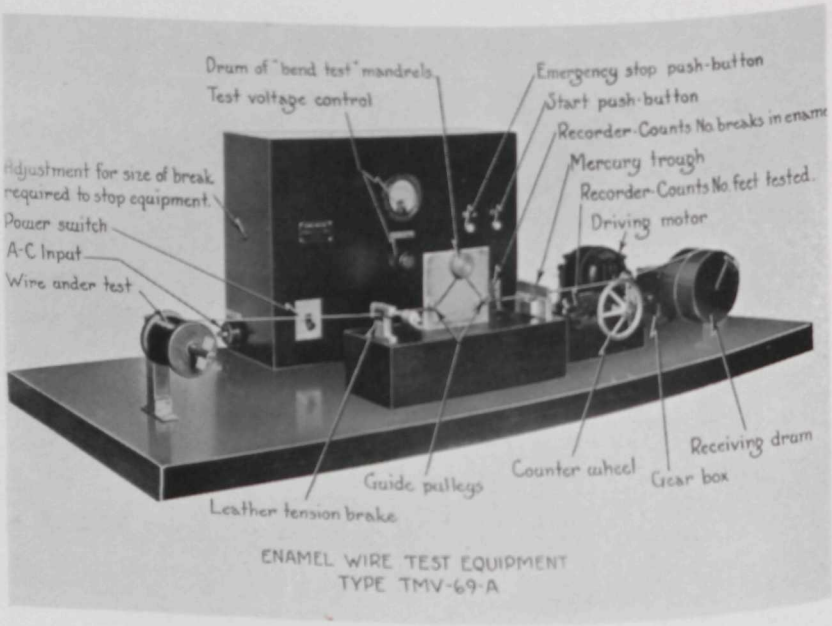


FIGURE 13—WIRE TEST EQUIPMENT, TYPE TMV-69-A

Voltage Analyzer, VE-14-A

This instrument may be used to obtain a complete analysis of a complex wave by segregating and measuring the voltage at the fundamental frequency and each of its harmonics. The specified frequency to be measured is selected by the Heterodyne principle and the resulting beat frequency obtained is fed through a tuned amplifier detector arrangement and measured on an output tube voltmeter. The instrument will measure output voltages as small as 0.25 millivolts and has an accuracy of 2% over the frequency range of 60 cycles to 10,000 cycles. The instrument is especially useful in analyzing hum components, filters, ripple voltage, rectifier plate supply, and maximum output for giving distortion. It may also be used for separating the various components of complex electrical waves and for measuring the harmonic content of oscillators, etc.

Standard Signal Analyzer, TMV-48-A

Figure 17 illustrates an instrument for separating and analyzing the various components of a modulated signal. From such analyses the energy in each component can be determined and the necessary information regarding frequency and phase modulation, amplitude modulation, percent modulation and modulation distortion can be obtained. The signal analyzer consists of a selector system, a detector, Heterodyne Oscillator, and highly selective intermediate frequency amplifier employing a piezo electro quartz crystal. The components of the signal to be analyzed are selected by Heterodyning the incoming signal (by means of a local oscillator) to produce a resultant intermediate frequency which is then selected and amplified by the I. F. amplifier and measured on a tube voltmeter. Modulation frequencies as low as 200 cycles and spaced from the carrier by the same small amount (200 cycles), can be accurately measured and the presence of frequency modulation detected.

The standard instrument covers the broadcast range but additional coils to cover other ranges can be supplied.

FIGURE 18
STANDARD MICROVOLTER TYPE TMV-47-A

Standard Microvolter, TMV-47-A

Figure 18 illustrates an instrument which may be used with a small oscillator to produce accurately known R. F. voltages and which was developed primarily for use in checking and calibrating both laboratory and factory signal generators or receiving test systems. It may also be used with a modulated oscillator to provide a means for accurately determining low radio frequency voltages. It is equipped with a plug-in inductor to cover the

FIGURE 19
DIRECT CAPACITANCE METER TYPE VE-5

broadcast range but other coils can be supplied for covering other ranges. A set of plug-in resistors are supplied which afford output signal of from 1 to 10,000 microvolts.

Direct Capacitance Meter, VE-5

Figure 19 illustrates an instrument for measuring the direct inter-electro capacitance of receiver type vacuum tube within the range of 0.0004 mmfds. to 14 mmfds.

Plate Resistance and Mutual Conductance Meter, VE-8

Figure 16 illustrates an instrument designed to measure the static and dynamic characteristics of all types of receiver tubes. It has a mutual conductance range of from 300 to 3600 micromhos and may be used to measure plate resistance or impedance up to 5 megohms.

While space has permitted only the barest description of the instruments pictured in the illustrations, the writer hopes this article will give the reader an insight into the specialized line of precision equipment developed by RCA Victor Company, Inc.

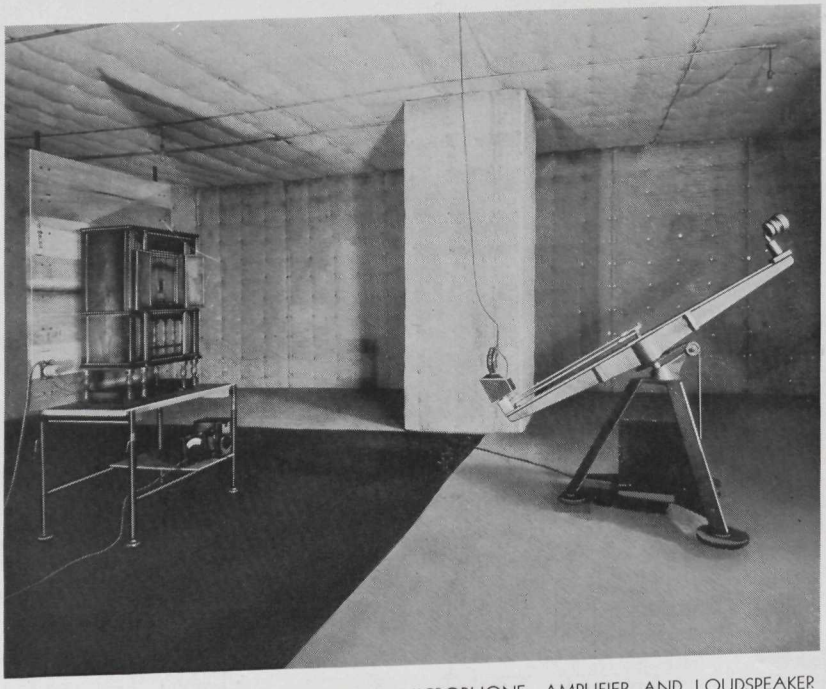


FIGURE 20—SOUND PROOF BOOTH FOR MICROPHONE, AMPLIFIER AND LOUDSPEAKER TESTS

DID YOU KNOW?

(Continued from page 35)

That the system of radio tube designation, such as the symbol UV prefixing a number, used by practically all tube manufacturers but just now discarded for the new method, was originated by George H. Clark, for RCA, modifying the elaborate system he had previously installed for the United States Navy?

That the business of R.C.A. Communications, Inc., consists primarily in maintaining direct international radiotelegraphic services from the United States to Central and South America, Europe, Asia Minor, Africa and the Far East?

That seven million of the radio receivers now in use are obsolete, according to Radio Retailing?

That the governments of India, Siam, Iraq and Cuba have shown recognition of R.C.A. Institutes' training by defraying expenses of students from the respective countries enrolled at the Institutes' New York resident school?

That there are in use in American homes nearly five million more radio receivers than were in service when the "depression" began in 1930?

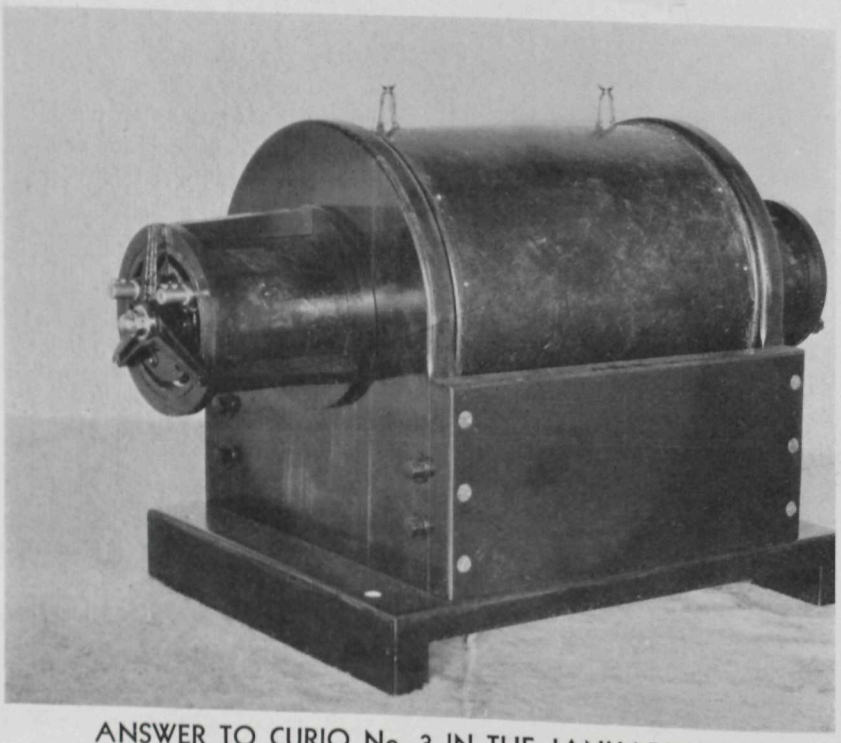
That of the 232 licensed women radio amateurs in the world, 190 are in the United States?

That each instructor of R.C.A. Institutes had for a period of years or more, been successfully engaged in the activity of the subject he now teaches?

WHAT IS IT, OLD TIMER?

CURIO No. 4—CAN YOU IDENTIFY IT?

Look for the answer in the next issue of "BROADCAST NEWS"



ANSWER TO CURIO No. 3 IN THE JANUARY ISSUE

You've heard of the shop foreman who jacked up the whistle to drive the locomotive out from under it? Well, the curio in our last issue was a stationary clip, with an inductance which could be revolved so as to meet the clip at desired points—thus tuning the antenna circuit. It was called a "Helix," and was equipped with a radiation ammeter.

The device belonged to the vintage of 1904, and found temporary popularity both ashore and afloat in the days when a radio was a "Wireless Telegraph" and when an automobile was a "Horseless Carriage." Again we wish to credit J. M. Sawyer with having contributed this relic to our columns.

BALTIMORE POLICE RADIO

(Continued from page 20)

no rotating machinery is required.

The output of the transmitter is fed to the antenna by a two-wire transmission line. The antenna span is supported on one end by the building and on the other end by an 85 foot spliced wooden mast adequately guyed. In the center of the span the vertical down-lead is connected to the transmission line. This construction permits the active part of the antenna to be kept well away from buildings and also provides a good ground connection.

The automobile receivers are the standard RCA Victor Police Superheterodyne operating with dynamotors for plate supply. Twenty cars have been equipped, but additional receivers are on hand for spares and for additional cars.

A systematic program of education of the public is being conducted to familiarize citizens with the radio service. It is interesting to note that on the first night that test alarms were transmitted a hold up was reported and the details were broadcast. Sergeant Taylor was in a cruising car at the time and arrived at the scene of the crime in less than a minute after it was reported. Unfortunately the citizen had waited ten minutes before telephoning the police of his hold up and this delay had permitted the criminal to make a get away.

With close cooperation between citizens and the police, second story men and stick-ups will find Baltimore a very unprofitable place in which to operate.

Hog Caller Shoots the Works

Fred Patzel, Who Won National Contest, Blows Out More Than $200 Worth of Tubes.

(The following is quoted from the World-Herald of Omaha, Neb., by permission of the publishers)

FRED PATZEL, AT WJAG

Norfolk, Neb., Feb. 13 (AP).—If any person thinks Fred Patzel, Madison, who won the national hog-calling contest several years ago, has lost any of his technique he will get a negative answer from Frank A. Weidenbach, chief engineer of radio station WJAG.

Announcer Karl Stefan, in order to give a little atmosphere to market reports, asked the champion to suddenly break forth into the yodel that brought him national fame.

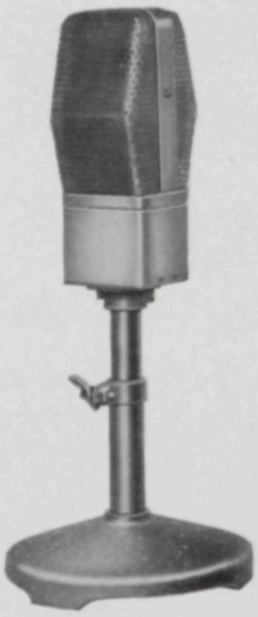
The famous calls were so loud they overloaded the broadcasting lines and "blew out" more than two hundred dollars worth of tubes. The station was off the air three minutes until spare tubes could be inserted.

Engineer Weidenbach didn't know the champion was to strut his stuff and had not made adjustment.

"Pride Goeth Before a Fall,"— And Sometimes After

DURING some recent tests in the sound studios at "Radio Headquarters" the talented vocal artist "Ramona," who is frequently featured by Paul Whiteman's Orchestra, and who plays her own piano accompaniments, was trying out the new Velocity Microphone. Some of the RCA Victor staff engineers were endeavoring to convince Joseph Erico, Paul Whiteman's technical man, that the Velocity Microphone is ideally suited for use with road shows. Frequently, when the orchestra is playing on the stage of a large theatre, and especially when solo artists are introduced on the Paul Whiteman program, it becomes necessary to use "Sound Reinforcing Equipment," or in other words, loudspeakers and amplifiers actuated by microphones placed close up to the performing artist.

While the demonstration equipment performed admirably during the above mentioned test, it seems that Mr. Erico was rather dubious concerning the ability of the new Velocity Microphone to withstand the hard knocks and abuse which might be expected in trouping with a road show, and after he expressed this opinion, it remained for the RCA Victor representatives to convince him otherwise.



SPECIALLY DESIGNED VELOCITY MICROPHONE FOR "PUBLIC ADDRESS" SERVICE

The Velocity Microphone was placed on a temporary stand at the right of Ramona, who was seated at the piano while she sang and played her own accompaniment. It was demonstrated that by simply rotating the Velocity Microphone from left to right, it was possible to obtain just the right mixture of piano and voice, thus obtaining the correct musical balance. Quite by accident, one of the assistants tripped over the microphone cable and, without warning, the microphone was capsized in the middle of this performance, crashing to the bare floor with a resounding whack, which was reproduced through the loudspeakers.

This accident proved to be a lucky stroke of fortune, for although the Velocity Microphone case was badly dented and twisted, the mechanism within was quite unaffected by this unusual treatment and the demonstration proceeded, using the same microphone without repairs or adjustment. The quality and performance of the Sound Reinforcing Equipment continued as clear and faithful as before the accident.

Needless to say, Mr. Erico was convinced that the Velocity Microphone can "take it" and that it is probably better suited for trouping than any other types which have been used in the past for this strenuous service.

WSYR CONTROL ROOM (COURTESY OF SYRACUSE HERALD)

News from Foreign Fields

Further RCA Victor broadcasting installations are being made in foreign countries.

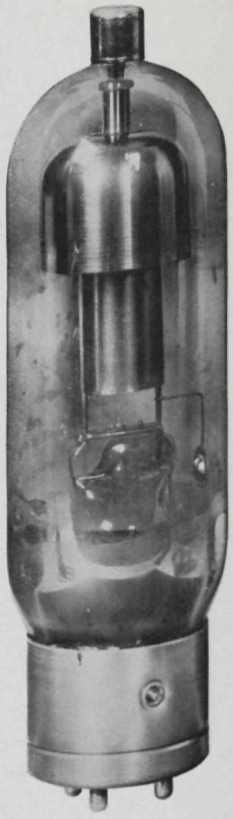
The first of these is in La Paz, Bolivia and consists of a 10 kilowatt broadcast transmitter, which will operate on 600 K. C. This set is similar to the WWL installation in New Orleans. In addition to this 10 kilowatt set a short wave transmitter is also being installed. Its output is 1 kilowatt and its operating frequencies will be 6080 and 13500 kilocycles.

In Havana, Cuba, the Heraldo de Cuba is installing one of the standard model 1001C one kilowatt broadcast transmitters. It will operate on 1100 K. C.

Both these installations are progressing rapidly and the three sets will probably be on the air before our next issue.

A NEW MERCURY VAPOR RECTIFIER

RADIOTRON UV-872-A
TECHNICAL INFORMATION SHEET
HALF WAVE RECTIFIER

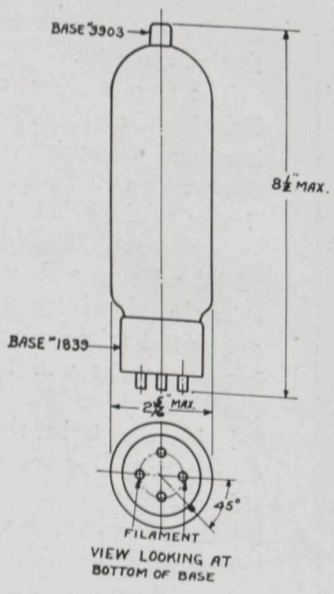


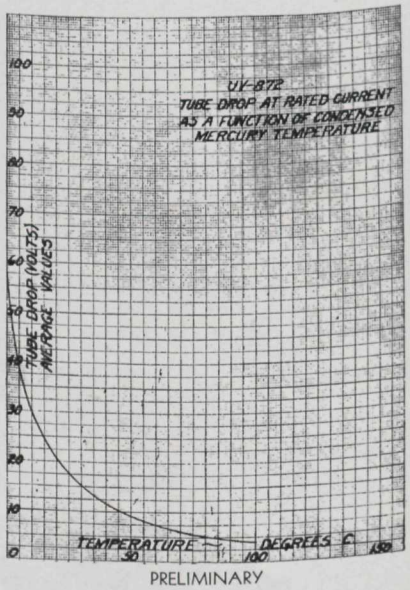
UV-872-A

GENERAL

Main Use	Half Wave Rectifier
Number of Electrodes	2
Filament	
Voltage	5.0
Current—Amperes	6.75
Type	Coated
Maximum Peak Inverse Voltage	10000
Maximum Peak Plate Current—Amperes	2.5
Approximate Tube Voltage Drop	10
Maximum Overall Dimensions	
Length	8½ Inches
Diameter	2 5/16 Inches
Type of Cooling	Air
Socket Type	UT-541 and clip

As tubes are used under many widely different conditions these figures should not be used for design purposes without confirmation from the manufacturer.





PRELIMINARY

THE PLANT THAT SETS THE PACE FOR THE INDUSTRY

Form 8015 Ph4 10¢ 4/3