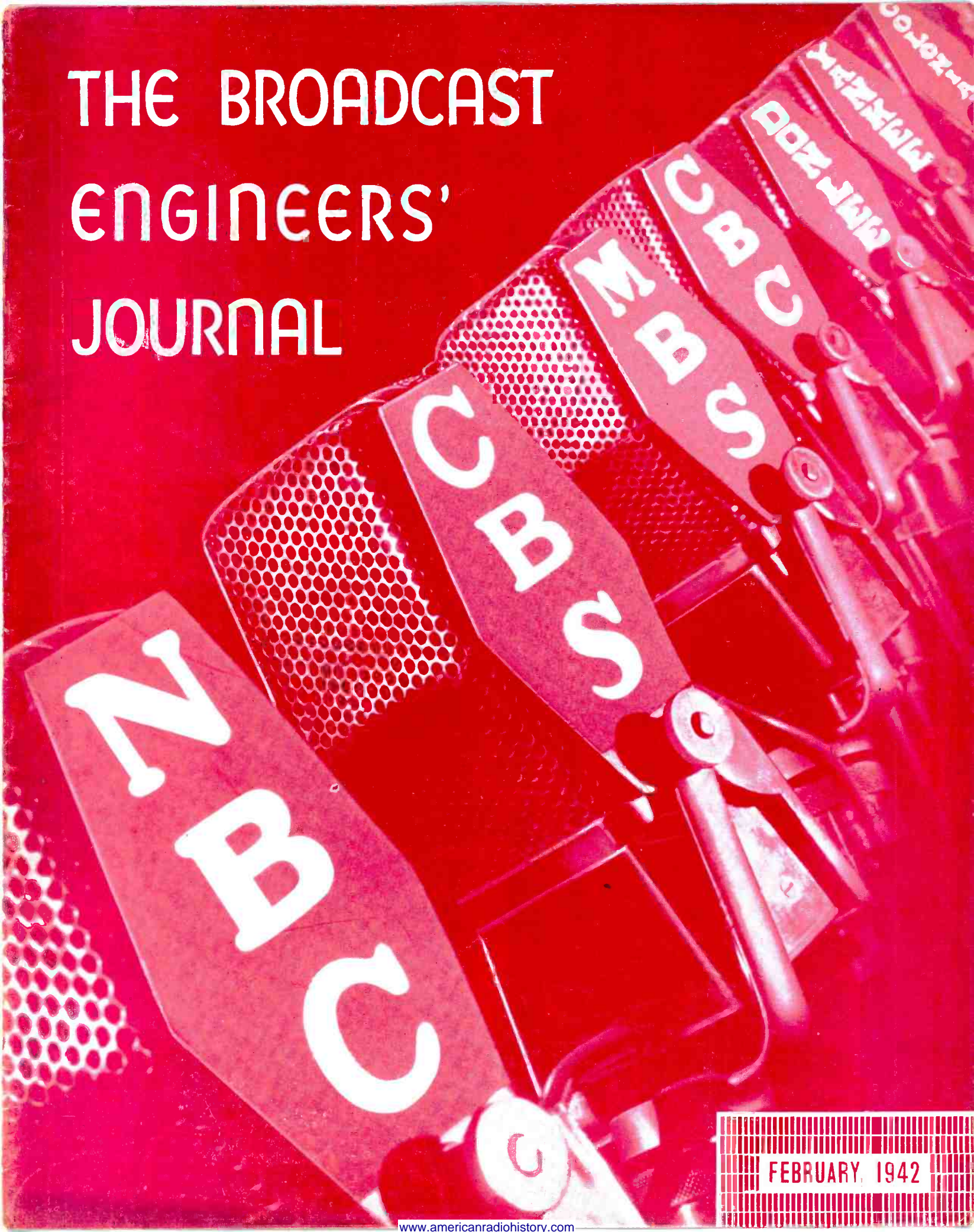


# THE BROADCAST ENGINEERS' JOURNAL



FEBRUARY, 1942

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# THE BROADCAST ENGINEERS' JOURNAL

Volume 9, No. 2



February, 1942

## TABLE OF CONTENTS

	Page
Ceramic Art Distinguishes San Francisco's Broadcast Headquarters.....	2
San Francisco News.....	3
International Broadcasting in National Defense.....	4
Radio Saves Pacific Clipper.....	11
Technical Press Review.....	14
On the Airialto.....	16
Washington News.....	17
Modern Communications Equipment.....	19

## THE BROADCAST ENGINEERS' JOURNAL

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# Ceramic Art Distinguishes NBC's San Francisco

**T**ODAY, San Francisco is in possession of one of the most outstanding pieces of creative art that exists in the decorative field. Outstanding because it represents the birth of a new process established in the ceramic field. Such is the distinction of the huge tile mural which adorns the main facade of the new N.B.C. building rapidly nearing completion here, and this sentiment is voiced by practically every one who views it.

Saturday, January 17th, 1942, saw the unveiling ceremonies with an impressive program leading up to the climatic moment when the huge veil obscuring the public gaze from this modern masterpiece was slowly lowered. The reaction was spontaneous; a moment of silence during which the large crowd was critically absorbing the intricate details, and then a roar of approval as they began to fully comprehend the ceramic miracle which they were beholding. Truly, N.B.C. may well be proud of another "first", in the suggestion and development of this most beautiful mural.

When officials of the National Broadcasting Company first talked of a new structure in San Francisco and worked out preliminary elevation sketches, it was decided that a mural would be a most appropriate and most attractive feature for the exterior design. Challenged by the necessity of creating something new, something different, something that had never been dreamed of before, artists and artisans devoted their imagination, their genius and skill to the task of designing and building the greatest mural in the history of radio broadcasting.

Spectacular in its proportions and coloring, this magnificent panel gives both dignity and distinction to the new N.B.C. Building at Taylor and O'Farrell Streets. Rising above the beautiful entrance and attractive marquee, the heroic picture, 40 feet high and 16 feet wide, completes an unusual architectural ensemble that is surmounted by a 60-foot pole and the American flag on top of the tower facade.

Participating in those conferences with Al Nelson, assistant vice-president for NBC in San Francisco, were O. B. Hanson, NBC vice-president in charge of engineering, and William A. Clarke, NBC manager of technical services, both of New York; Curtis Peck, NBC chief engineer in San Francisco; Al Roller, the architect, and C. J. Fitzgerald, designing architect of Roller's staff.

After discarding many ideas submitted, Fitzgerald pro-

posed a mural that would portray the unlimited scope of radio broadcasting and its service to all the peoples of the world. It should reveal this world-wide medium of mass communication as the common meeting place of all races, creeds and nationalities and should be a development of the idea that broadcasting finds its material every place, gathers it and then distributes it to every corner of the globe.

Since time began transportation and communication have been the two greatest leaders of civilization. As their speed increased, the world has grown smaller. Today people in the Orient or the Occident, under tropic sun or Northern Lights, are within minutes of each other in their knowledge of important happenings at all remote points.

With these fundamental ideas as a guide, Fitzgerald made his first sketches and began the long weeks of research necessary to the final development of the composite picture. First, the mural must illustrate modern radio and the way it works. Second, mass communication must be interpreted as the method by which any part of the world can communicate with any or all other parts of the world and do it instantly. Bringing these two factors together harmoniously was the difficult problem.

At the bottom of the panel, the creative artist laid out symbols of radio, a human hand turning a dial, some condensers, tubes, a dynamo for power, a stop watch for the time element, insulators, a chart, transmitter tubes, thermometer, wiring symbols, a microphone and other apparatus.

Above he began assigning spaces to the figures representing the typical peoples, the beneficiaries of broadcasting. Still he had not brought the two together.

Then his fertile imagination conceived the idea of oscillograph waves radiating from the radio set to all parts of the mural. These pictures of sound waves brought all races to radio and carried radio to them. It was the device that solved his problem.

Fitzgerald decided the Oriental peoples should be to the right of the perpendicular waves and the Occidentals to the left. He also planned to place the torrid zone figures at the bottom, just above the mechanical elements, and work to the frigid zone characters at the top of the panel.

Meantime much thought had been given to the best method of manufacturing such a mural and officials of Gladding, McBean and Company produced the solution to this question. While square tile had never been used in just this way or on such a large job or for an outdoor location, they believed the pattern and colors could be carried out practically and successfully by flowing the glaze on white tile or bisques without cutting the six-inch tiles into small pieces for each separate color section.

Only colors obtained from metallic oxides can withstand the terrific heat of the burning, a fact the available colors to his oil painting, Fitzgerald could use. However, after six weeks of matching the available colors to his oil painting, Fitzgerald selected 114 different ceramic glazes which would give the desired effects.

Then came the task of converting the painting into a line or working drawing, full size, and indicating by number the color which must go into each section of every one of the 2,560 six-inch square tiles. This was accomplished by dividing the painting into sections and projecting

This view of building shows relative size and position of mural



# Broadcast Headquarters

a light through tracings of these sections. When the projected image was the correct size on a glass-topped table, the actual working drawing was made from the projected pattern. This was then sent to the Gladding, McBean factory in Glendale, Calif., where the manufacturing process was performed.

This completed, the tiles were shipped back to San Francisco and set in place. It is reported that in all the tremendous detail of work there was only one minor error and one slight mishap. One eyebrow was omitted from a Scottish bagpiper and one tile was broken during the setting. Both corrections were made and the only mural of its kind in the world stands as an artistic expression of a great industry by the creative genius of American artists and artisans. There was a striking panel symbolizing the bigness of this unique and world-wide system of mass communication. There was something new, different, bold, eloquent, something that had never been dreamed of, conceived and created before.

Artists will study it. Laymen will admire it and understand it. Photographers will be inspired by it and everyone will have a new valuation of radio broadcasting after seeing it.

If someone were to catalog the many allegorical figures Fitzgerald had introduced in his picture-story the list would show an Asiatic group with a Chinese Mandarin the dominant figure; the African group with a jungle lion a prominent detail. Elements assembled in another section represent Spain, Mexico and South American countries. There is an American Indian and a cowboy, an English riding gentleman and a Canadian Mountie in the brilliant red coats.

South Sea islands are there as are the Balkans, Scandinavians and a Cossack, Eskimos with their polar bear, penguins, an igloo and totem pole add interest and color. There's a bull fight, a head-hunter, an artist, reindeer, the Scottish piper, flower and dancing girls and dozens of other characters, all brought into one radio world by the magic of the microphone at the bottom of the picture.

## San Francisco News

By  
Frank Barron

**J.** ALLEN O'NEIL, Recording Supervisor, supplies one of the best black-out stories. Appointed air raid warden of his block practically at the point of a policeman's gun, he studied up on his duties seriously, and then proceeded to sleep right through the first two black-outs. The third one, occurring in the early hours of the evening, he dutifully put on his windbreak and made the rounds of his block, admonishing householders about being careless with their lights. Arriving home with that supreme feeling of a job well done he was aghast to find all the lights in his basement workshop blazing merrily, and hurriedly took steps to make the black-out complete.

Incidentally, it is rumored that every time J. Allen heard a bird flap its wings in the dark he could have *sworn* it was the stork.

Harry Jacobs, S.E., planning wedding bells for the first of March, and vacation time has been set accordingly. Harry also wondering what to do with his boat now. Says most of the fun was in building it anyway.

Harold Platt, S.E., recently of Reno, purchasing house down the Peninsula right in middle of regular NBC colony at San Carlos. Hasn't moved in yet but already planning

(Continued on Page Thirteen)



# International Broadcasting in National Defense

By Raymond F. Guy

Radio Facilities Engineer of NBC

**U**NDER the American system of free democratic institutions radio broadcasting was born and has attained its high degree of perfection. Under private enterprise the United States has the greatest number of telephone subscribers per capita, the most efficient and economical telephone system in the world and has led in the beneficent use of telephone communication. American broadcasting has an equally illustrious history.

Need we look further for justification of the American system than the magnificent record of private enterprise in the field of International Broadcasting?

Leading radio companies provide daily service to all important nations of the world. This service is on a par with the best to be had under the government subsidized systems of other leading world powers. We like to think it is better and yet our International Broadcasting service does not cost our government one penny. Such a fine record is made possible, and such a financial burden could be borne only by those great electrical companies and those great networks of American radio stations which have joined together in a common effort to make American radio the best in the world.

Without question American experience and skill in building programs is the finest. Without question America's scientists and engineers are the finest. All of these skills are combined in maintaining and advancing America's position in the field of International Broadcasting, towards the creation of good neighborliness, towards the extension of American commerce to all parts of the world.

What tasks faced our engineers, or language experts and our program builders? They were many and they were complex. Our language experts and our program builders had to know the tastes, the preferences, the aversions, the languages and the language dialects of the peoples they propose to serve. They had to know their tastes in literature, in music, in sports and in commerce. The engineers had to design and construct high powered and intricate radio apparatus and great directive beam antenna systems for the flawless transmission of speech and music. Their's was the responsibility of delivering this flawless

transmission into the proper places thousands of miles over the seas. And they had to do it well enough to insure consistent good reception which would make American programs more attractive and more usable than those of other countries.

All licensees have gladly and spontaneously given their wholehearted cooperation to our government, its agencies and the American institutions charged with the furtherance of the good neighbor policy and American interests abroad. American private enterprise has indeed justified its existence and has done itself proud.

American shortwave service to foreign countries is rendered in nearly three score different languages and dialects. It carries the spirit of American freedom and decency to the unfortunate and oppressed peoples under the heel of the conqueror. It raises within them the hope of a reborn freedom and escape from the wave of terrorism and destitution which threatens the world.

When the venerable grandparent of NBC's present shortwave stations lifted its 40 KW voice for the first time 17 years ago another new servant was being created by American enterprise. For the RCA, General Electric and Westinghouse companies were probing with unsatiable curiosity the newly discovered and amazing possibilities of radio transmission by short waves. Down through the years International Broadcasting has spread around the world to become the voice of Empires, reaching alike the distant firesides of the humble and the mighty. But not all of man's works are beneficent. It remained for the new servant to demonstrate its highest purpose through the freedom of press and radio of democratic free peoples.

For many years NBC has conducted an effective multi-language International Broadcasting Service but with the outbreak and spread of world conflict the value of this service has multiplied in scope and stature. New thousands of letters and telegrams incessantly convey the fact with stirring impact. One cannot but be deeply stirred by those many communications from Europe which express despair and misery, nor can one read their pleas to continue and expand our efforts without more fully appreciating the high patriotic and humanitarian function which has come to be served by

American short-wave licenses. International broadcasting as conducted by our country has become a powerful instrument which has earned the respect and confidence of foreign listeners through the truthfulness of its reporting and the character of its programs.

It has been the writer's privilege to be associated with radio for 27 years and with broadcasting for 21 years. Rarely has there been an opportunity in those eventful times for any form of communication to demonstrate such unique feats as are now becoming accepted commonplaces in international broadcasting. Barely 16 years ago the first rebroadcast from across the seas took place<sup>1</sup>. Scheduled rebroadcasts from the far corners of the earth have since become matters of but casual interest. But only in recent months has the bewildered victim of catastrophe, propaganda, and censorship so fully appreciated the modern miracle of radio which enables him to listen, perhaps secretly, to free stations thousands of miles overseas for frequent and authoritative reports of world events, at times taking place in his own country, frequently at points but a few blocks distant. Many of the writers of letters must take pains to conceal their identities to escape the consequences which would otherwise result from interception. Many of the letters are smuggled out of oppressed countries and come to their destinations by amazingly devious routes.

As a potent instrument for National Defense and a great humanitarian service, International Broadcasting continues to assume increasing importance and stature. NBC's veteran stations WRCA and WNBI in recent weeks have added Turkish, Finnish and Swedish language programs to the German, Italian, French, Spanish, Portuguese and English programs which constituted its language pattern for many years.

Twin 50 KW transmitters, implemented by an impressive array of new high-gain antennas and programmed by the most adept and experienced experts in the world, give a new meaning and significance to the part the NBC stations contribute.

Recently a third station, WBOS, of the Westinghouse Company in Boston, has taken its place side by side with the

1. An International Broadcasting System, Raymond F. Guy, RCA Review, pp20-35, Vol. III, July 1, 1938.

NBC stations to carry NBC-built programs to foreign countries.

A mounting proportion of the program material consists of straight forward news broadcasts for which, throughout Europe and the Americas, there is a large and regular listening audience. In many parts of the world American news broadcasts constitute the best and often the only source of unbiased and complete news. Heavy penalties may be meted out to unfortunates caught listening to such broadcasts in some countries, but there is nevertheless an impressively large radio audience. The mail bags prove it.

As this is being written, during the first week of our formal entry into hostilities, WRCA, WNBI and WBOS operate 24 hours per day during the most favorable listening periods in Europe, Central America and the Spanish and Portuguese areas of South America. The degree in which most favorable listening periods vary is indicated by the differences in time of various areas served by WRCA, WNBI and WBOS.

Standard Time	City	
Noon	in	New York corresponds to
1 P. M.	"	Buenos Aires
2 P. M.	"	Rio de Janeiro and Greenland
4 P. M.	"	Iceland
5 P. M.	"	London
6 P. M.	"	Berlin
7 P. M.	"	Athens
10 P. M.	"	Central Russia

In England the clock is advanced two hours during the summer, contrasting with our own advance of one hour for daylight saving, thus increasing the difference to six hours. Favorite listening hours are from 8:00 to 10:00 P. M. This permits service first to Europe, then to Brazil, then to Western South America, at the favorite hours in each case, because of the differences in time.

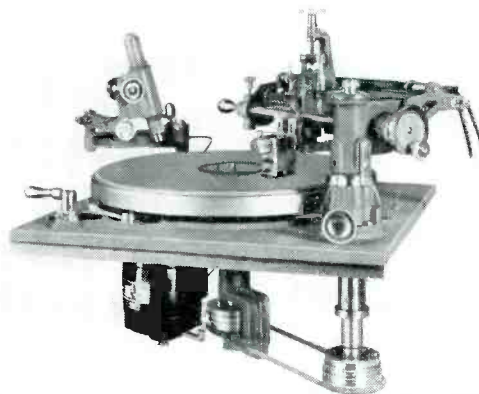
The importance attached to International Broadcasting by the European powers is attested by the fact that Italy directs toward the United States four program hours per day, the British send us about six and one-half hours, the Germans about ten hours and the Japanese about four and one-half hours. In addition these countries also provide service on from one to three frequencies simultaneously to about 20 other countries in many different languages. International personalities have been developed, of whom the best known is Germany's "Lord Haw Haw." Program content covers a broad scope ranging from dance music to learned discourses on anthropology, and has included the reading of the names of new prisoners of war, request programs, question and

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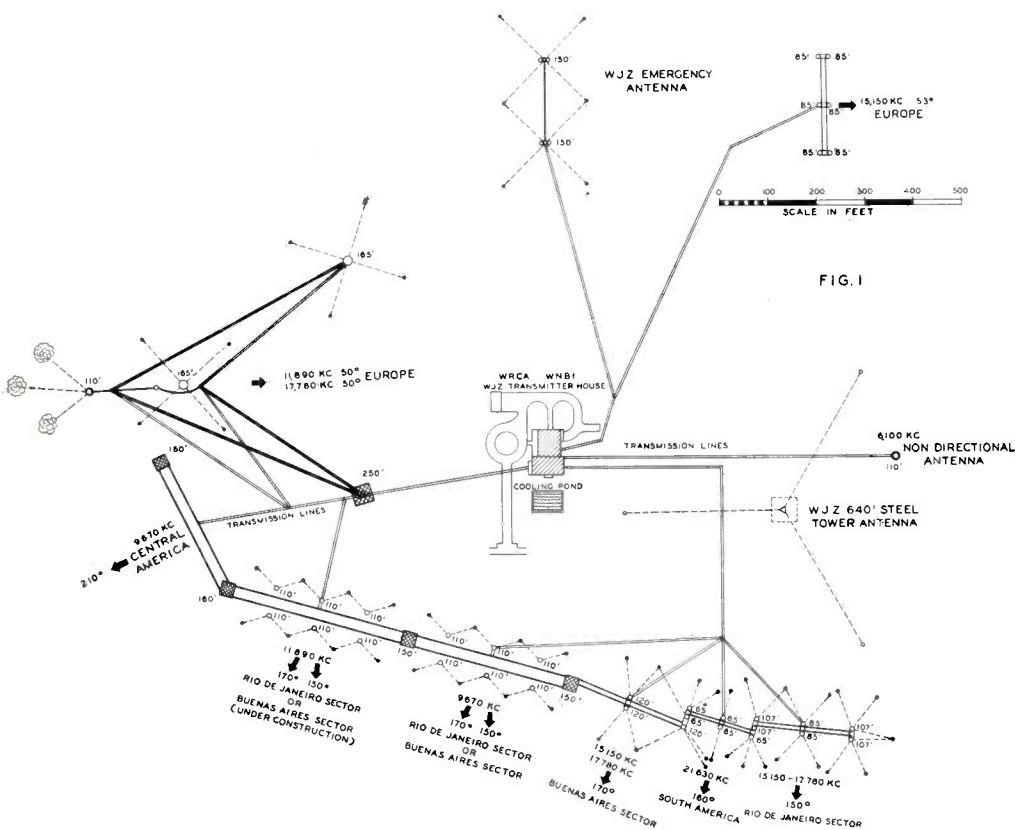


FIG. 1

answer periods, dramatizations of war developments, personalities, etc., etc. One offer by the German government to accept collect Radiograms relating to the German programs was accepted by several thousand listeners in the United States. Despite the vitriolic nature of many of the Radiograms, Germany continues to broadcast to us.

The WRCA-WNBI site shown in Figure 1 is rectangular in shape with the long dimension facing the Latin American countries. This is important because a considerable number of antennas is necessary properly to serve the various sectors within the span of 100 degrees between Pernambuco and Mexico City. The short dimension of this site faces Europe. Fewer antennas will suffice to serve the European sector inasmuch as the span between Moscow and Madrid is only 30 degrees. For Latin America three separate groups of antennas, divided approximately equally across the 100-degree Latin American sector, are required to give service to all areas. The problem presented in covering this great expanse is described in succeeding paragraphs.

#### Antennas — Language Areas

Brazil is unique among Latin American countries in that it is the only one having Portuguese as its native language. In all the remainder of Central and South America the native language is Spanish. Naturally listeners in Brazil-speaking Portuguese, are little interested in programs in Spanish, English or other languages. Conversely, listeners in the

other portions of South and Central America, speaking Spanish, are little interested in programs in other languages. Thus, to broadcast effectively to the two different language areas, individual antennas and separate language services are required. As an example, nightly Portuguese service is provided to Brazil on a 9670 KC beam during one part of the evening and Spanish to the Spanish speaking countries at other times on two other 9670 KC beams. To provide European service on this frequency a fourth 9670 KC beam would be required. It may be seen that to provide service to four basic areas with the most useful of six different assigned frequencies and six different languages, and

do it with the optimum beam pattern, requires an impressive list of antennas.

Before designing a directive antenna the engineer must decide the proper compromise between power gain and beam width because one is, of course, obtained at the expense of the other. A beam broad enough to cover all of South America would have such low gain that it would not provide the signal intensity required to give satisfactory service. The design of antennas of very high power gain presents no great problem. It would be a comparatively simple matter to increase the power gain to the point where a very high concentration of field were obtained in one area at the excessive sacrifice of adjoining areas of importance. Fortunately, the desirable service areas in South America and Europe are such that the optimum beam width is in each case about the same. Therefore NBC has practically standardized an antenna design which was evolved to give optimum performance to Europe and South America. It is the result of many years of experience and observation.

One hundred fifty degrees E. of N. centers on Rio de Janeiro, the middle of the concentration of population of Portuguese-speaking Brazil. It is also almost exactly in the center of the country as viewed over the great circle path from New York. It is natural that 150° should be the direction of a Portuguese language beam and it has been selected as optimum for that utility.

Buenos Aires is not quite so ideally centered geographically, but is the center of the greatest concentration of Spanish-speaking peoples on the South American continent. Considering population distribution, 170° was selected as the optimum angle for the Spanish language

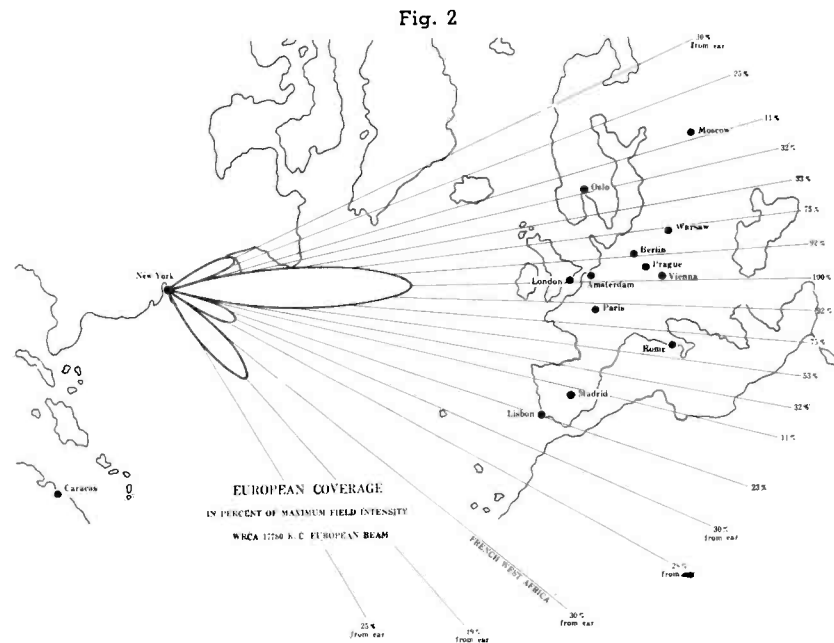


Fig. 2



# NEW SHURE BROADCAST DYNAMIC SUPER-CARDIOID

South American beam. On the theory that one picture is worth ten thousand words, the reader is referred to Figures 2, 3, 4 and 5 which show distributions of field intensity.

European antennas are directed 50° and 53° E. centering on the major European capitals which are quite closely grouped as viewed over the great circle path from New York.

Figure 6 shows the number of persons and radio receivers in the countries of Latin America.

The increasingly diversified type of operations, the nature of cyclic changes in wave propagation, the expanding scope of the service, the growing importance to National Defense, new developments in circuits and circuit elements and increases in the number of assigned frequencies all contribute to the occasional need for new or improved radio facilities. The inventory of directive antennas in use or under construction is shown below. Of this inventory only one unit, the third, is not yet ready for operation. The list of non-directive and comparison antennas is not included.

Unit	Frequency	Language Area	Degrees E of N
1 (S)	9670 KC	Brazil—Portuguese	150°
	9670 "	Spanish	170°
2	6100-9670 "	Spanish—Central America	215°
3 (S)	11890 "	Brazil—Portuguese	150°
	11890 "	Spanish	170°
4 (X)	11890 "	South America	160°
5 (D)	15150 "	Brazil—Portuguese	150°
	17780 "	Brazil—Portuguese	150°
6	15150 "	Europe	53°
7	11890 "	Europe	50°
8 (D)	17780 "	Spanish	170°
	15150 "	Spanish	170°
9	17780 "	Europe	50°
10	21630 "	South America	160°
11 (X)	17780 "	South America	160°
12	15150 "	South America	190°

(S). Steerable  
(D). Dual Frequency Unit  
(X). To be dismantled

## Antenna Power Gain

At least five methods may be used to specify antenna gain, all of them different. All involve comparison of the "unknown" antenna field with the field of some simple "comparison" antenna. If the "unknown" antenna is compared with different types of "comparison" antennas, or similar "comparison" antennas in different positions, the apparent power gain of the "unknown" antenna is different in each case. Some of the methods of specifying antenna gain are described as follows:

1. Absolute directivity. This compares the maximum signal power of the "unknown" with the signal power of a vertically and horizontally non-



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- directive comparison antenna, a mythical one, of course.
2. Comparison with a Hertz doublet.
  3. Comparison with a half-wave horizontal dipole at the same height above ground.
  4. Comparison with a vertical dipole with its center  $\frac{1}{4}$  wavelength above the earth.
  5. Comparison with a horizontal half-wave dipole  $\frac{1}{2}$  wavelength above the earth.

Indicated power gains differ for these methods over a range of more than 60 per cent. NBC prefers, for comparison, a half-wave dipole horizontally polarized and at the same height above ground as the unknown. This method and one other, comparison with a half-wave dipole one-half wavelength above ground, are believed to be most used.

The "same height" method gives the smallest indicated power gain of any, but is the only method which expresses the actual gain of an array over an effective half-wave dipole of optimum height. Selection of the optimum height is another matter.

Figure 7 shows the polar power pattern which has been adopted by NBC as best for the service areas in South America and Europe. The figure shows the two beam patterns for the steerable

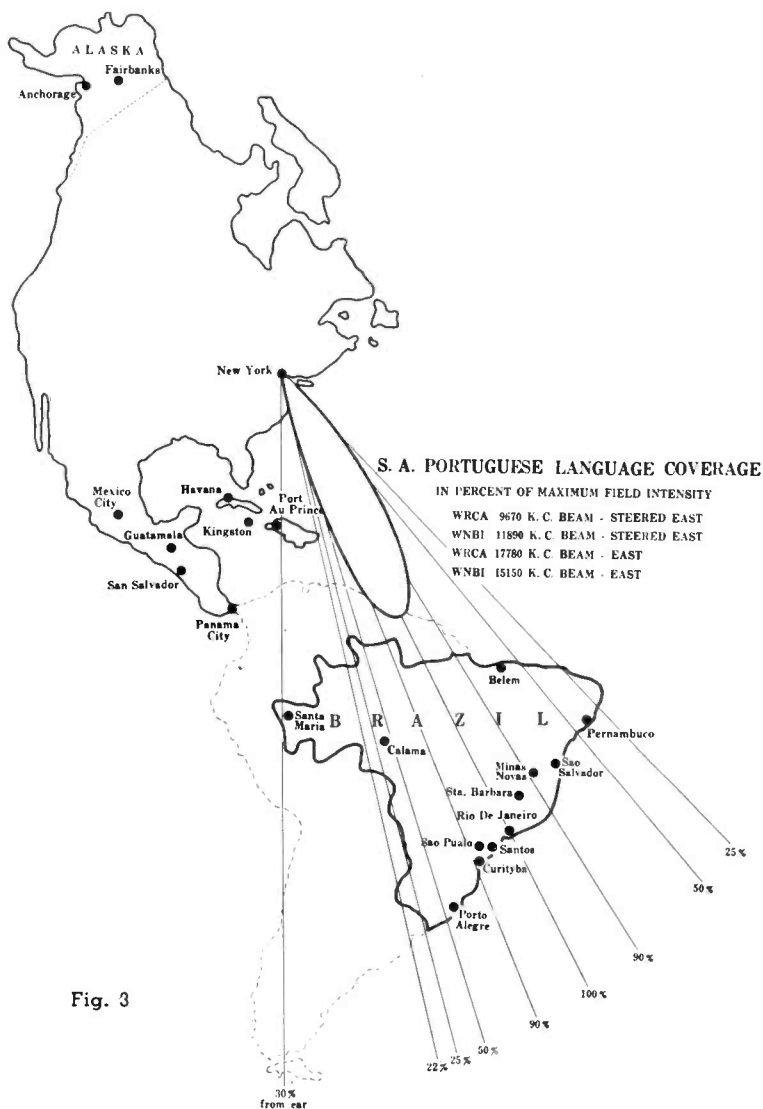


Fig. 3

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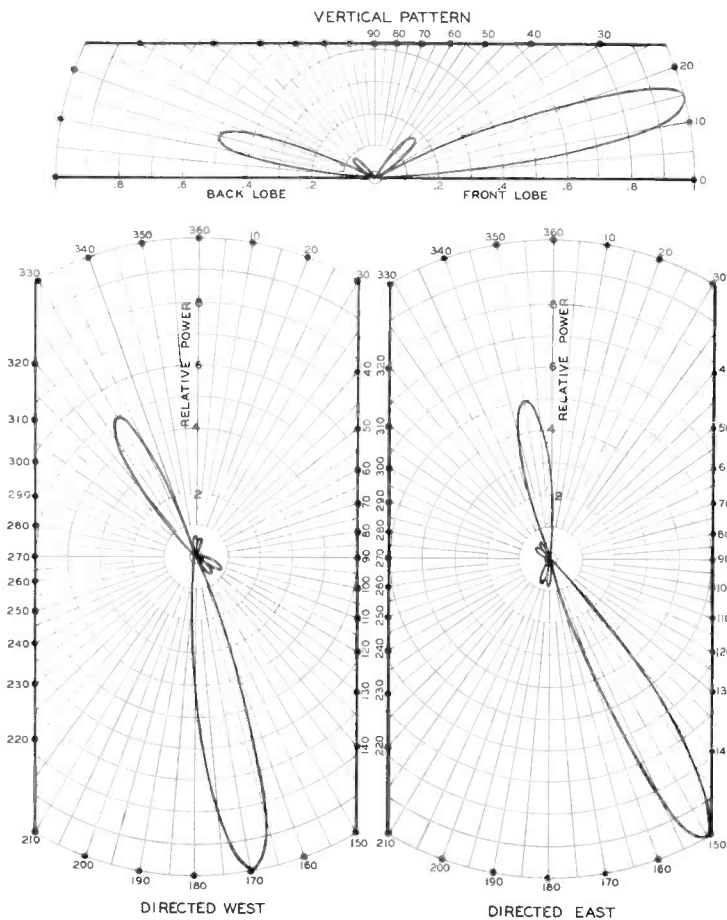
type antenna to be described. This pattern was adopted years ago by NBC after consideration of population distribution, the size of the distant service area, the power gain and other factors.

This pattern is obtained with a broadside antenna having a horizontal width of six half-wave elements, two tiers of such elements being stacked vertically, with a complete duplicate set of such elements to the rear, making a total of 24 radiating elements. The 12 rear elements forming the reflecting tiers are parasitically excited.

#### NBC Steerable and Dual-Frequency Antennas

The most important language areas of South America are centered around Rio de Janeiro and Buenos Aires which are 20 degrees apart as viewed from New York. One of the earliest investigations conducted in connection with new antennas was to determine whether or not a single antenna could be built which could be steered to either of these two language areas. A cost study showed that for the lower-frequency antennas which involve massive supporting structures and

long spans, an electrically steerable antenna entirely satisfactory in performance would be cheaper than the construction of separate antennas for the two areas. The 12 elements which are driven are segregated into three groups, each fed separately, because it was determined that the desired radiation pattern could be obtained by separately feeding three bays. It is desired to steer this beam ten degrees to one side or the other of the center line to serve either Rio de Janeiro or Buenos Aires. This can be accomplished if one outside bay is retarded 75 degrees and the other is advanced 75 degrees with respect to the center bay. The manner in which this is accomplished is shown diagrammatically in Figure 8. The transmission line from the station building divides into three coaxial branches, terminating in phasing boxes beneath the three sets of down leads. The branch to the center down lead is 101 electrical degrees long. The branches to the outer phasing boxes are 386 degrees long. The net result is that the outside phasing boxes lag 285 degrees with respect to the center box. A lagging



	Population	Receivers	Per Cent	Short Wave Receivers
Argentina	13,000,000	1,400,000	11	560,000
Bolivia	3,200,000	50,000	2—	20,000
Brazil	44,200,000	900,000	2	360,000
Chile	4,700,000	197,000	4+	78,800
Colombia	8,700,000	112,000	1+	44,800
Ecuador	3,000,000	12,000	1—	4,800
Paraguay	1,000,000	15,000	1+	6,000
Peru	6,500,000	80,000	1+	32,000
Uruguay	2,200,000	125,000	6—	50,000
Venezuela	3,500,000	102,000	3	40,000
British Guiana	333,000	1,800	1—	720
Dutch Guiana	150,000	2,500	2—	1,000
French Guiana	26,000	—	—	—
<b>Totals</b>	<b>91,000,000</b>	<b>2,931,000</b>		<b>1,160,000</b>

(Above) Fig. 6 (Left) Fig. 7

phase of 285 degrees is equivalent to a leading phase of 75 degrees. Therefore, if all three of the down leads were connected directly through the phasing boxes to the transmission lines, the outside elements would each be advanced in phase 75 degrees with respect to the center box.

It was stated that to steer the beam to the east or west, one outside box must be advanced 75 degrees and the other one retarded 75 degrees. Since, when connected directly through, both outside sections are advanced 75 degrees, it is possible to obtain the desired steering condition by retarding the phase of one or the other outside elements 150 degrees. This is accomplished by inserting by means of specially built high-frequency contactors, 150-degree "building out" circuits which introduce a lag of 150 degrees into one side or the other. The contactors are operated from the transmitter control point in the transmitter building by remote control and are interlocked with the main rectifier in such a way that the rectifier may be shut down, the antenna directivity changed and the rectifier re-energized in one operation. Coaxial transmission lines are used for the 150-degree phasing-out sections and also to connect the phasing boxes to the common junction of the three branches, as shown in Figure 8.

The impedance of the down leads



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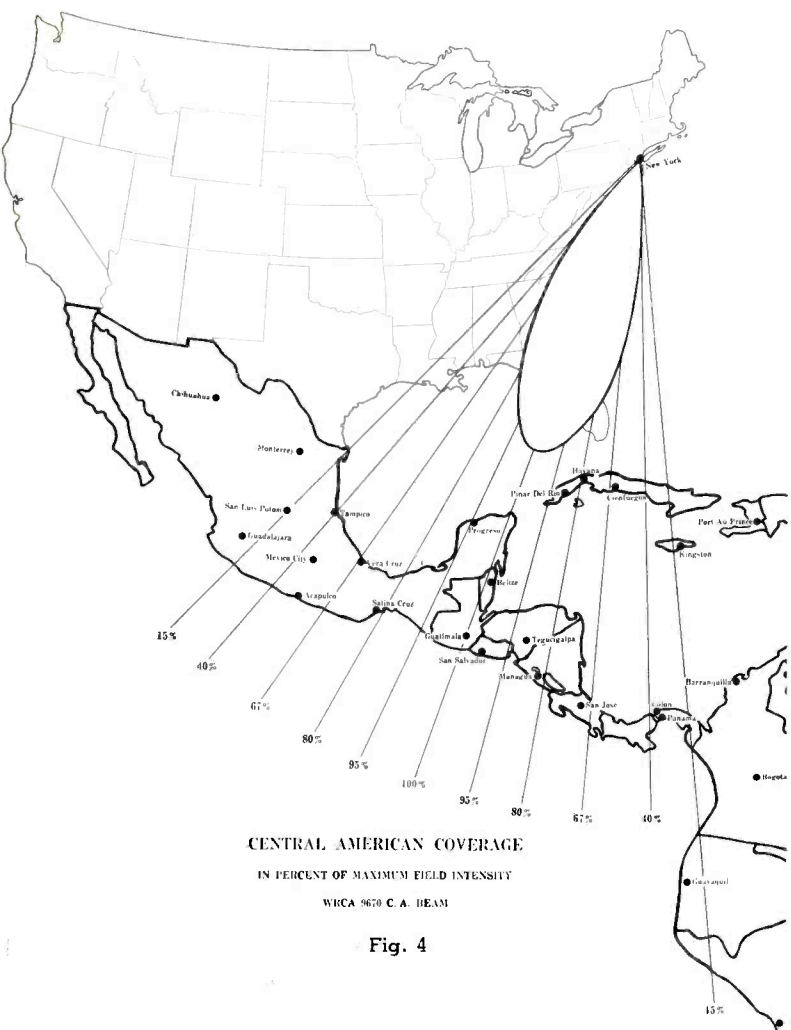


Fig. 4

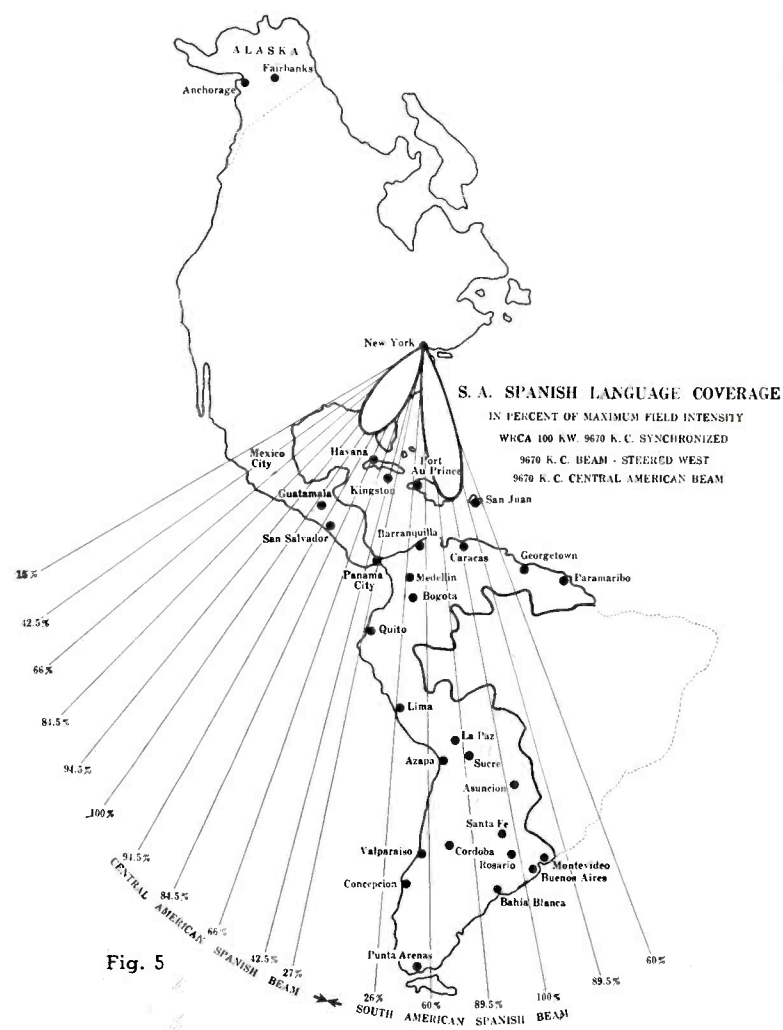


Fig. 5

must be matched to the output of the phasing boxes and this is accomplished by circuit elements adjacent to the relays in the boxes.

The NBC type of steerable antenna has been in daily service for a number of years and has been highly satisfactory. On the higher frequencies in which the supporting structures and spans are smaller, separate antennas are more economical to build. In this connection an investigation was made to see what advantage could be taken of operation of one antenna on two or more separate frequencies. It is possible to properly terminate and operate an antenna on several frequencies, but if they are too widely separated the antenna pattern departs too far from the optimum.

At least two frequencies, not widely separated, may be used on one antenna without a significant change in the directive pattern. As a result of this investigation two antennas, one directed to Buenos Aires and the other to Rio de Janeiro were designed and built so that each could operate on either 15150 KC or 17780 KC.

Figure 2 shows the field intensity distribution, in per cent of maximum,

throughout Europe, when the 17780 KC European antenna is transmitting. Figure 3 shows in the same manner the field intensity distribution throughout Brazil for the east leg of the 9670 KC steerable antenna. Figure 4 shows the field intensity throughout Central America for the 9670 KC Central American antenna. Figure 5 shows the two 9670 KC Spanish beams used during 100 KW synchronized operation. Space does not permit showing patterns for all antennas nor is it important when they are all nearly alike.

Figure 9 shows the type of switch employed, and the only operation necessary, to direct the beam of the steerable type antenna developed by NBC.

**WRCA-WNBI Transmitters**

A block diagram of the WRCA and WNBI transmitters as built years ago is shown in Figure 10. Great flexibility is provided for the operation of two transmitters simultaneously. The frequencies are divided between these two transmitters in such a way that any two adjacent frequency combinations can be used together. Six frequencies are assigned to WRCA and WNBI, 6100 KC, 9670 KC, 11890 KC, 15150 KC,

17780 KC and 21630 KC and they are interchangeable. Dual 50 KW transmitters are available, the WNBI transmitter having one power amplifier and duplicate exciters identical except for the operating frequencies. WRCA is provided with similar duplicate exciters and also two duplicate power amplifiers differing only in operating frequency.

These combinations permit combined operation on two separate frequencies to Europe, the Rio de Janeiro sector, the Buenos Aires sector, or Central America. They also permit operation separately to any two of the four basic service areas. In addition another interesting operating condition has been worked out and has been successfully used for some time as described below.

**100 KW Operation**

Throughout the late evening hours it is desirable to serve all of the Spanish speaking areas of Central and South America, at the same time, with the same Spanish language program, on the same frequency. This could be accomplished by the use of a very wide beam of low power gain, but it would be necessary to increase the transmitter power to make up for the reduced gain of the

(Continued on Page Twelve)

# Radio Brings Pacific Clipper Safely Through War

By Tom Gootee

**R**ADIO OFFICER JOHN D. POINDEXTER of the Pan American Airways had a lot of explaining to do when he finally came home to the "little woman" in Alameda, California — after an unscheduled, unexpected and unexplained absence of only two months. It all started in California back in December. And after a complete trip around the war-rocked world by air, ended early this month in New York.

On December 2nd, radioman Poindexter decided to fly to Los Angeles from his home at Alameda to test some new equipment installed on one of the Clippers. He intended to return on another plane that same afternoon, and even phoned his wife to keep supper hot until he came back. But at Los Angeles he found that the regular officer scheduled to fly that night on the Pacific run was stricken ill — and Poindexter was elected to take over the radio duties on the long trip to Auckland, New Zealand. He hastily cabled his wife that he would "be back in a few days" — but it was a long, long time later until he returned to California, and the Clipper had traversed almost 32,000 miles!

The trip to New Zealand — by way of Hawaii — was uneventful, and the \$600,000 Clipper arrived safely at Auckland on December 7th. By that time the United States was at war with Japan, and all flying schedules in the Pacific were cancelled. The big Clipper was ordered to stay at Auckland until further orders from Pan American. Finally, on December 15th, Capt. Robert Ford received orders to proceed home by the most practical route — meaning (1) the

route that would dodge the areas infested by German and Japanese air and sea raiders, (2) the longest route — with plenty of work for Radioman Poindexter, and the other eighteen members of the crew, and (3) the most secretive route.

Just *how* they proceeded "home" is not disclosed in great detail by Pan American authorities — for obvious reasons. But the probable route from New Zealand back to New York (*not* California) was by way of New Caledonia, some port in northern Australia, Batavia, Ceylon, a port in India, a stop at one of the Bahrein Islands in the Persian Gulf, Khartoum, the Kenya Colony in Africa, an unknown port in French West Africa, Natal Brazil, Trinidad, and thence to New York City. This route follows the equator rather closely.

Although they had many slight "mix-ups" with amazed and perplexed British port authorities at some stops, Poindexter reports that they had no brushes with enemy aircraft or seacraft of any kind. The Clipper flew quite high, of course — and the four Wright twin-row Cyclone engines performed remarkably well, despite all kinds and qualities of gasoline used. The longest single hop was about 3600 miles — across the South Atlantic.

The radio receiving equipment was used almost continually; but not the transmitter. Lack of necessary crystals for the transmitter prevented the Clipper from talking with any of the British and foreign port and army officials — although Poindexter could "listen in" on all the various conversations

(Continued on Page Thirteen)

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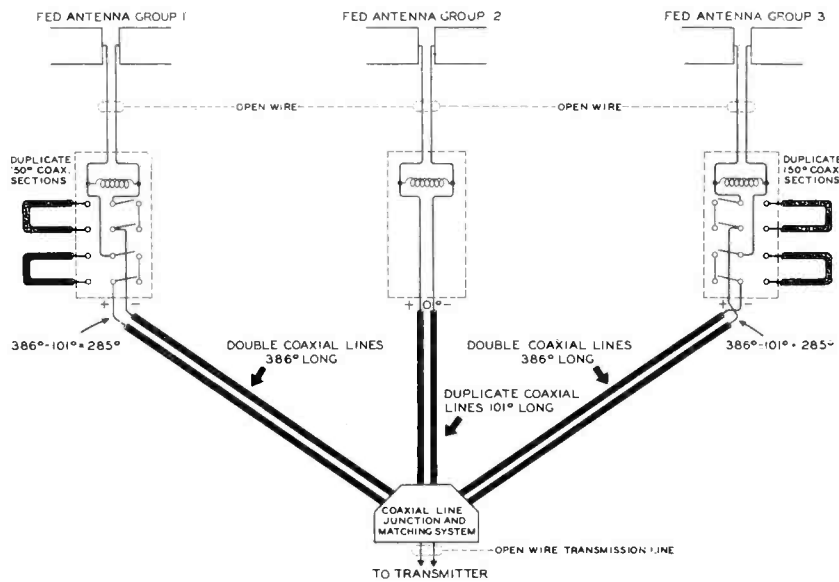


Fig. 8



Fig. 9

## International Broadcasting

(Continued from Page Ten)

wide-beam antenna. The alternate and superior method is the use of separate high-gain antennas serving adjoining areas, each antenna being driven by a separate 50 KW transmitter. The latter method has been developed by NBC and is in daily use at WRCA.

Two 50 KW amplifiers are used simultaneously, one to excite the Central American antenna and the other to drive the west leg of the South American steerable antenna, both operating synchronized on 9670 KC. The beam patterns adjoin to provide service over the vast Spanish-speaking area extending from the Brazilian border to Central Mexico. Successful operation of twin transmitters requires, of course, that the frequencies be exactly synchronous. As may be seen, synchronization is simply and easily accomplished by cross connecting the separate drivers, eliminating one of the crystal units, and driving both transmitters from the other one alone.

The theoretical power gain of the steerable antenna is 24, in comparison

with the gain of a half-wave horizontal dipole. Actual field intensity measurements made in Argentina during alternate transmissions on the steerable unit and the comparison dipole showed that this gain was obtained within about 1DB. Thus, the effective power with 50 KW transmitter output is 1,200,000 watts. The Central American antenna was built with a wide beam to cover the Central American arc of 60°. The requirements for serving this area are different than for South America or Europe. The power gain can be lower in this case to get the required wide pattern, while still maintaining high signal intensity, because Central America is comparatively close to New York. The Central American antenna differs from the other units mainly in that it is three elements wide instead of six. The power gain is about 10 and, as a result, the effective power on this beam is 500,000 watts. Therefore, the combined effective powers on these two adjacent beams is 1,700,000 watts. These beams and

effective powers can easily be made more concentrated, but to do so would somewhat defeat their purposes since it would be at the expense of the beam widths required to serve reasonably their respective areas.

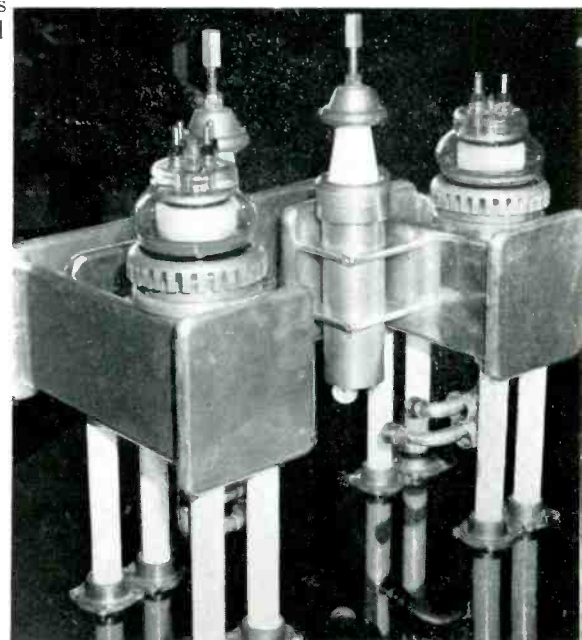
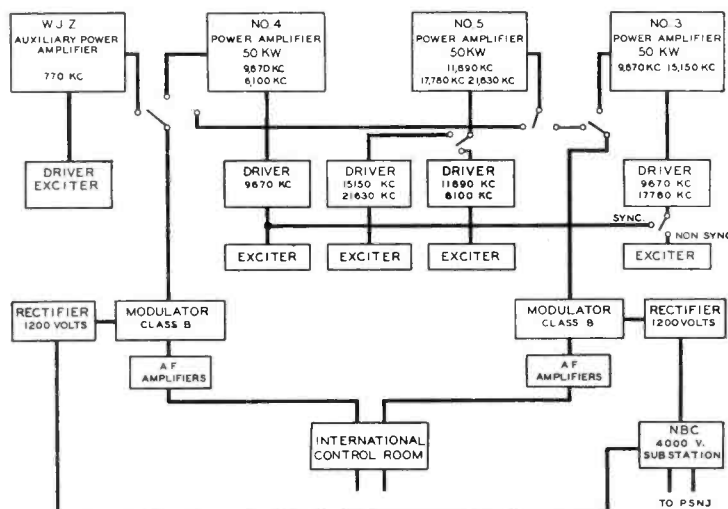
Mechanical design of the transmitters has been simplified by the use of removable shelf-type construction utilizing duralumin frames, panels, chasses, and shelves. For maintenance and repair of the low-power stages the shelves are removable on sliders from the front panels, like desk drawers. Other stages are made accessible through interlocked doors, or perforated screens.

As a result of many years of high-frequency broadcasting transmitter experience, the high level modulating system has been retained as the most satisfactory.

The power amplifier units of these transmitters are of improved design with a view toward greatest efficiency and operating stability. In each case two 880

(Continued on Page Eighteen)

Below, Fig. 10 — Right, Fig. 11



## Pacific Clipper

(Continued from Page Eleven)

provoked by the unscheduled appearance of the unexpected 42-ton Clipper. Several amusing incidents grew out of some of these first arrivals in strange ports—all relating to cases of mistaken identity. It was a little hard to explain the presence of a huge United States seaplane in the middle of the eastern hemisphere.

But probably the most surprised person of all was the control tower officer at the Pan American marine airport in New York—blissfully unaware that any Clipper was expected from *anywhere* early on the morning of January 6th. So he was justifiably startled by the brief announcement from the Clipper's radio: "Pacific Clipper, *INBOUND* from Auckland, New Zealand. Capt. Ford reporting. Due to arrive Pan American marine terminal seven minutes."

And so the long trip was brought to an end: an amazing accomplishment. After the first shock of their adventure had worn off, the members of the globe-circling crew went back to their routine duties. Radio Officer John Poindexter arrived back in Alameda several weeks later—but the supper his wife had prepared some two months earlier was a little cold.

However, he reports, everything has now been patched up. And he is back at his radio work with Pan American Airways, little the worse for wear.

## San Francisco News

(Continued from Page Three)

addition to garage for dark-room, in spite of lumber priorities. Another defeat for the "city vs. suburbanites."

For what reason was a baby crib delivered to the Clark Sanders home recently?

E. E. Jefferson, C.S., fifty dollars in defense bonds richer after attending the big Christmas party. Everybody at least one dollar richer for the same reason.

Bev. Palmer, C.S., regretting he did not purchase that full set of new tires just before rationing set in, but experts in control room convinced him they would rot before time for use. Bev is going to follow all hunches in future regardless.

Cliff Rothery, S.E., working all night and then going home to work in his gardens all day. Should have a very profitable market this year for the many varieties of bulbs he produces with the foreign markets delted.

Mark Dunnigan, S.E., back on the job after several weeks out for rather serious illness.

Tommy Watson, S.E., "Senator" to you, and a perennial batchelor, having unscheduled home-like atmosphere. Back at the Manx Hotel, the building was suddenly converted into evacuee headquarters and Watson says air is always filled with babies crying for bottles and many other things that babies cry for. Contemplates looking around again for more batchelor-like quarters.

J. W. McDonnell, S.E., returns home from night-shift about 8 A. M. Waves to wife as she heads for work. Going to have to be re-introduced unless we lick the Japs soon.

Danny Williams, F.E., with most complete workshop of the staff, running into priorities difficulties on material. Still Dan can get it when the rest of us can't.

Charles Kilgore, C.S., contemplates offering his Belvedere estate to Navy for air observation purposes. Maintains it is only fog-free spot in Bay region.

Wonder if the Japs have succeeded in cutting Journal's communication lines to our transmitter? Haven't heard much from them since war started.

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# TECHNICAL PRESS REVIEW



A digest of leading technical articles in the current contemporary press.

Compiled by: TOM GOOTEE

[In these busy times few engineers can spare the time required to read all the current technical literature. It will be the purpose of this regular feature to provide an index of current technical articles on radio broadcasting and related subjects.—Ed.]

## PROCEEDINGS OF THE I.R.E. (January, 1942)

### Mobile Television Equipment

By Messrs. Campbell, Kessler, Rutherford, Landsberg

The DuMont (portable) Television pickup equipment is described in some practical detail. This equipment is designed not only for extreme portability (for outside pickups), but can also be used to equip a studio (for fixed use) when such permanent operation is necessary. Some of the DuMont design features discussed are: portable and flexible synchronizing equipment, electronic view-finders, oscilloscope monitors, and other facilities of operation.

### A Simple Television Demonstration System

By Jesse B. Sherman

A simple 150-line television circuit—using the type 1847 "amateur" iconoscope—is presented in this article. Of primary use for general demonstration or school-laboratory use, this equipment employs the small type 1847 as

the camera tube, remotely operated from the transmitter control panel. A cable connects the transmitter to the receiving apparatus (a modified conventional oscilloscope). Complete circuit diagrams are given with all circuit values of components. Chief fact of interest is that the total cost of such a system is less than the cost of a commercial iconoscope alone.

### Orthicon Portable Television Equipment

By M. A. Trainer

The recently developed R.C.A. Orthicon portable field television equipment is described. Because of the greater light sensitivity of the orthicon, this equipment fills a need for lightweight apparatus to be used under adverse light conditions (where the artificial or natural light is insufficient for satisfactory iconoscope pictures). Some of the novel features of design are the use of a forced-air-cooled transformer in the regulated power supply, an all-electronic synchronizing generator, gamma control, and keyed diodes for black-level setting.

### Three New Ultra-High-Frequency Tubes

By Cecil E. Haller

The design and development of the new RCA types 815, 826 and 829 tubes are discussed, following an explanation of the tube design requirements and special problems of manufacture of these special ultra-h-f tubes. A well illustrated description of the novel features of construction is given, with application notes and precautions necessary for obtaining satisfactory operation with these tubes.

### Interference Between Two F-M Signals

By Harold A. Wheeler

A very detailed technical consideration of common-channel F-M interference, caused by the reception of an undesired signal in the same frequency channel as the desired signal. The various effects of these two signals on the detector of the receiver, and the use of limiters and of wide-band f-m (to reduce this interference) are discussed.

### ELECTRONICS (January, 1942)

#### Super-Cardioid Directional Microphones

By B. B. Bauer

Many desirable operating and directional properties of the single unit Super-Cardioid microphone (employing the principle of acoustic phase shift) are discussed in this article. The important characterizations of the Shure Brothers Uniphase Microphone are considered—ruggedness, low noise level, good frequency response, axial symmetry of directional pattern, and high degree of directivity—together with some excellent graphs and charts of these properties of the Uniphase.

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### A Mobile 30-40 MC Receiver

By H. K. Lawson and L. M. Belleville

The inability to obtain adequate coverage with mobile equipment employing amplitude modulation (as opposed to f-m) is in practically all cases the result of inferior receiver performance in the presence of heavy ignition interference. The U. S. Forest Service type KU-R receiver described in this article relieves this common condition to a considerable extent. While this receiver will not provide completely noise-free reception, it is comparable to f-m in this respect. A diagram of the receiver is included with the article; and important ramifications of 30-40 Mc receiver operation are discussed from a practical viewpoint.

### A Field Intensity Recorder

By H. W. Kline

A portable Field Intensity Recorder recently developed by the General Electric Company is described. With this device continuous recordings of the intensities of radiated fields from radio transmitting stations (operating on frequencies between 26 and 155 Mc) are possible. It can be operated either fixed or mobile, but can best be used to measure the tapering of field intensity as a function of radial distance from a transmitter.

## COMMUNICATIONS (January, 1942)

### Switching and Preselection

By P. B. Murphy

The recently installed NBC-Omaha network-program (audio) switching and preselection equipment is discussed. Block diagrams of the various relay and control units, without circuit element values, are explained—together with the operation of the equipment.

### THE R C A REVIEW (First Quarter, 1942)

#### Generation and Detection of F-M Waves

By Messrs. Seeley, Kimball, Barco

The first part of this article concerns the development and principle of operation of a Linear F-M Monitor Detector, adaptable for precision monitoring measurements. In conjunction with a mixer and a heterodyne oscillator, this detector is capable of operating at signal frequencies encountered in the usual F-M transmitter. Such a detector makes possible the investigation of other low-distortion f-m devices, such as a generator of f-m waves. The second portion of this article contains a description of a method of producing low-distortion f-m signals—developed with the

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aid of the original linear detector circuit, in conjunction with an audio-frequency wave analyzer.

### Signal-to-Noise Ratio of U-H-F Receivers

By E. W. Herold

The effect of various sources of fluctuation noise on the signal-to-noise ratio of radio receivers is discussed. The relationship between antenna noise and the signal-to-noise ratio is considered, and several coupling suggestions are presented. It is further shown that thermal noise from a wide-band interstage circuit may be made negligible. And calculations for several typical u-h-f receivers are given for 300, 500, and 1000 megacycles.

### The Absolute Sensitivity of Receivers

By D. O. North

A description of a method of rating and measuring the noise in complete receiving systems is given in this article. The proposed rating is advanced as a possible new standardization of receiver sensitivity. In this respect a formula is developed for determining this factor in any radio receiver: its *absolute* sensitivity.

### The Measurement of Television Synchronizing Impulses

By R. A. Monfort and F. J. Somers

This article deals with the measurement of the slope and duration of television synchronizing impulses. Satisfactory operation of all television receivers in the field requires that the wave-form of the transmitted synchronizing signals be held to narrow tolerances. Therefore it is essential that adequate measuring devices be available at the transmitter for quickly and accurately checking the synchronizing waveshapes. Several practical operating measurement methods are described.

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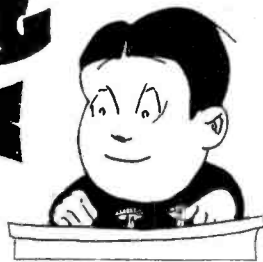
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# RIDING GAIN



# ON THE AIRALTO WITH TON GOOTÉE

**A**LMOST lost among the first war bulletins last December was the brief report that Dr. Frank Conrad, of Westinghouse, had died. And so — in the same comparative obscurity that he had always sought and known — the final chapter in the life of the Father of Radio Broadcasting was recorded. But his name will not be forgotten. He was the first man to broadcast regularly scheduled radio programs; he was one of the first to see the immense possibilities of radio as an entertainment and advertising medium; and from a crude bread-board apparatus he created KDKA, and nursed and built it into a billion dollar enterprise. For more than half a century Dr. Frank Conrad served Westinghouse, the nation, and the world. His memory will never be forgotten by the industry he helped to create.

Philco equipment that once produced metal radio parts is now manufacturing M-48 artillery fuzes in record quantities. Production still continues on small home receiving sets, but most of the Philco plants have long been completely converted to war industry production.

The far-famed radio Quiz Kids don't know *all* the an-

swers. During 1941 they were asked over 1,000 questions — and scored correctly on only 89 per cent. Among other failures, they stumbled over the definitions of a *trapezium* and a *seismic convulsion*, how to call a hog, and how to tell when a baked custard is done. And they also failed to explain how their own program was serviced individual radio station by the network!

Present indications from Washington are that the Government will call upon the radio manufacturing industry to produce over \$1,000,000,000 worth of radio equipment for the armed forces and for home defense during 1942. Some idea of the magnitude of this task may be gained from the fact that the normal, peacetime output of the same industry is only \$500,000,000.

Well over 15,000 letters a week flow into the offices of the CBS *Are You a Missing Heir* Program. But not all of them are concerned with the locating of a missing heir; and not all of them are documents of human misfortune. Some of them are just plain whacky. Here are excerpts from some typical letters: "I wish to know the particulars of your broadcast as I was robbed before I was born and ever since." — "I am writing to you for information regarding myself, or could you tell me where to find out?" — "Will you hunt for my brother? He started out to make a fortune, and the last I heard of him he was in jail."

Cooperating in the national campaign for conservation of rubber, Bing Crosby, that well-dressed man-about-Hollywood, is reported to have quit wearing shoes — doing away with rubber heel replacements.

With the addition of broadcasts in Turkish, NBC's regular shortwave schedule now embraces a total of nine languages: English, French, Spanish, German, Italian, Portuguese, Finnish, Swedish and Turkish — all heard over International Stations WRCA and WNBI.

Not a few radio stations are viewing seriously the possibility of replacing drafted announcers with those of the gentler sex. A number of stations are now engaged in training women announcers for this purpose; many stations now have women announcers on their regular staff — with more to follow.

And speaking of women (as we generally are) it is interesting to note that girls usually portray small boys in radio dramas. Leone Le Dux plays Baby Dumpling in the CBS *Blondie* series; Madeline Lee plays a little boy on the *Valiant Lady* show; Dolores Gillen portrays a lad on the *Mary Martin* show. And most of the infant wailing on the nets is done by adults. Maybe tot actors should start a picket line!

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on Friday's CBS etheriot. While the inflections are the same, the "halloooo" may be that of a wee small piping treble—the voice of Ranse's seven-year-old daughter, Ann, who can outshine her learned father as a mimic.

\* \* \*

"Take it easy, girlie, it's just like talking into a telephone." This advice from an engineer (who shall be nameless) is what saved beautiful Frances Carlon from an ignominious failure during her first performance before a microphone. Miss Carlon, who starred in *The Story of Mary Marlin* when it originated in Chicago and who went with the veteran company when the show moved to New York, probably knows as many engineers in the NBC Central and Eastern Division as any other actress on the air.



\* \* \*

The scripts used on the *Lum and Abner* sketches are models of the same kind of inane antics heard on the broadcast. Written by both boys on the day of the broadcast, the scripts are typed out by Chet Lauck in his own streamlined manner: no commas, and everything spelled phonetically. It's probably the only daily script in radio which is written single-spaced, with no margins at top, bottom, or sides. Only one carbon is made—and there are no mimeographed copies for the producer (or anyone else) to follow. But it all works out to perfection!

\* \* \*

Shortest radio role of the new year is claimed by Nicholas Joy of the "So Big" airshow. Joy was hired after twenty

## WASHINGTON NEWS

By Bill Chew

### "Twas the Night Before New Year's Day"

FROM the caption, one would be led to expect a poem similar to the old familiar one about Saint Nick, but such is not the case. However, I feel that after having read the ensuing article you must agree that there was at least "poetry of motion" on the part of one of the participants. Well, it seems that a New Year's Eve party was being held at the home of Eddie Burg, WMAL Transmitter, on the Blue side, and a goodly crowd was present to help usher in the New Year. Among the late arrivals was one Nick Close, recording, who was introduced around and the party continued on its merry way. Sad to relate, there was one present Nick hadn't met, so he asked one of the boys who the stranger was and was told that his name was Joe Turner, who wrestled at one time. (Ed. Note: Mr. Turner is now about 55 years old.)

Well, it seems that Nick had, at one time, done some amateur wrestling and was now "in the spirit" to check up on Mr. Turner's ability. He walked over to Mr. Turner and remarked, "I understand you can wrestle." Mr. Turner's reply was to the effect he had wrestled some when he was younger. Now here's where the "poetry of motion"

★ ————— 1922 — 1942 ————— ★

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actors had been auditioned for a part that consisted of only a few lines—and lasted exactly one day.

\* \* \*

Anticipating the decline of swing music, several well-known New York night clubs are doing away with their dancing floors—thus making room for an extra table and a chair in the space thus gained.

enters the picture. Nick made a pass and went "into motion" while the "poetry" went to Mr. Turner. Nick picked himself up and went back to Mr. Turner, saying, "Trying to show off before the crowd?" As he asked the question he placed one hand on one of Mr. Turner's shoulders and the crowd had a repeat show. This time Nick had a longer return trip. He walked over to one of the boys and asked who Mr. Turner was and, on being told he was former light heavyweight wrestling champion of the world, Nick said, "Why the h— doesn't someone tell me these things!"

Well, I'm pleased to announce that all turned out well. Mr. Turner invited Nick to come over to his wrestling and boxing arena whenever possible and he would be glad to show him some of the finer points of the art. Better accept, Nick, "a stitch in time, etc."

Bob Chapman, WRC transmitter, is spending two or three days a week doing studio work. "Keep 'em spinning," Bob.

Keith B. (Butch) Williams, Field Supervisor, comes back to the studios occasionally to say hello; he being out of town so much.

Our last chapter meeting was held at the home of Frank Fuggazze, SE on the Blue side, who is one of the

(Continued on Page Nineteen)

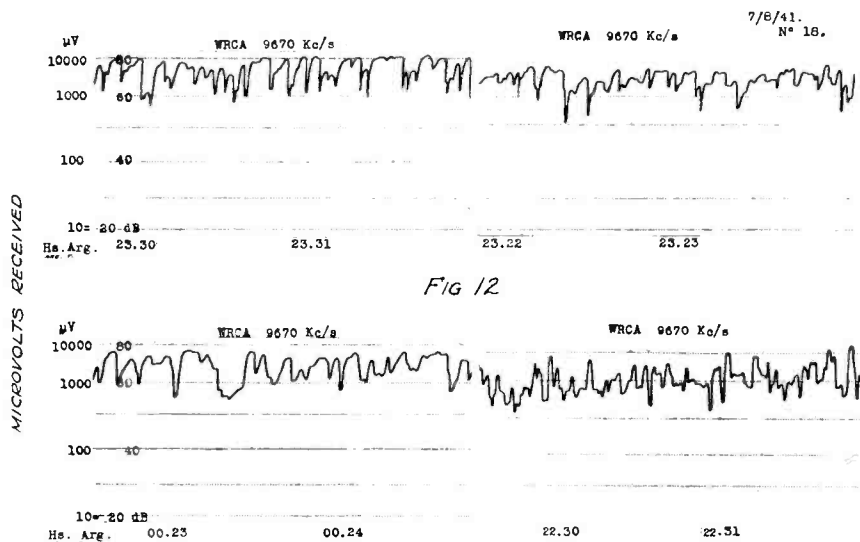


FIG 12

## International Broadcasting

(Continued from Page Twelve)

power tubes amplify the transmitter carrier power to 50 KW. Modulation is accomplished with audio power provided by the RCA 893 Class B modulator unit.

Figure 11 shows the water cooled RCA 880 tube mountings, the output tank circuit tuning capacitor and the neutralizing capacitor arrangement. The variable compressed-air neutralizing capacitors are used in a standard cross-neutralized circuit with excellent stability over the wide frequency range in which the transmitters are used. An air pressure of 150 pounds per square inch has been found ample to provide air-dielectric strength suitable for this purpose. Two blower units are provided to supply sufficient air cooling for the grid and filament seals of each RCA 880 tube by means of three-inch bakelite ducts leading to the tops of the power amplifier tubes.

The compact assembly shown in Figure 11 is built of one-inch solid duralumin plates. All corners and edges are carefully rounded and all surfaces are highly polished. The variable-output tank tuning capacitor consists of a single movable grounded plate which is moved vertically through air dielectrics on each side of the assembly.

The capacitance from each side of the tank circuit to ground is perfectly balanced and stray and minimum capacitance is reduced to a low value. A wide range of tuning of the parallel-conductor tank inductance output circuit is obtained by the sliding plate which is operated by means of gears from a knob on the front panel of the power amplifier unit. Counterweights reduce the effort required to vary the position of the movable plate.

Stability of high-powered, high frequency amplifiers depends upon short direct r-f connections, lumped circuit elements, and simple construction, par-

ticularly if the amplifier is to operate on two or more different frequencies. One of the difficulties in designing equipment of this kind is properly to locate the circuit elements with respect to each other, to minimize the length of the connections, and at the same time provide proper insulation for high-powered operation. Perhaps the most troublesome circuit elements are the neutralizing capacitors. The neutralizing circuit must be insulated for d. c. plus r. f. but at the same time the capacitor itself should be as small and compact as possible. Compressed-air neutralizing capacitors offered an excellent solution. The capacitor is of a type developed and used by RCA Communications, Inc., in high-powered telegraph transmitters and has been adapted to these broadcast units.

The WRCA-WNBI capacitors normally are kept at an air pressure of 150 pounds by means of a small motor-oper-

ated compressor. They have been tested under normal operating conditions on pressures as low as 60 pounds without any tendency to flash-over and have been tested, with normal pressure, at 90,000 volts without flashover. The units are, of course, built to have the proper range of capacitance for the particular circuit in which they are to be used. The variation is accomplished by turning the threaded end rod which varies the length of a copper bellows in the pressure chamber.

Water for cooling the anodes of the RCA 880 tubes is conducted to and from each tube through the parallel-conductor tank inductance, which consists of square bronze pipe. The tank inductance thus forms a part of the distilled-water system so that water is fed into the circuit through the porcelain water coils at a low r-f voltage point.

### Effectiveness of the Service of WRCA-WNBI

NBC programs are daily rebroadcast by member stations of its shortwave network of 92 Latin American stations from Mexico to deep South America. Direct broadcasting is thus supplemented by domestic rebroadcasting, and in one case by a network of domestic stations.

Rebroadcasting of American programs in England is a frequent occurrence, one American commentator having a large daily following through the English network retransmission of his shortwave broadcast.

The following is an example of the effectiveness of the WRCA-WNBI service in Central America. It is a telegram from Tegucigalpa, Honduras. "The broadcast was received in this capital

(Continued on Page Twenty)

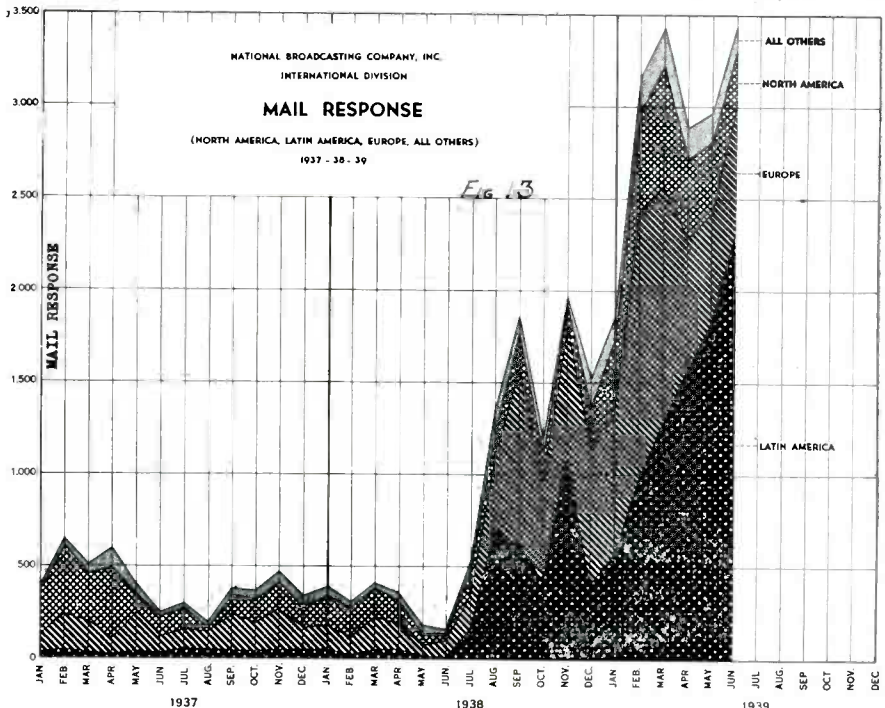
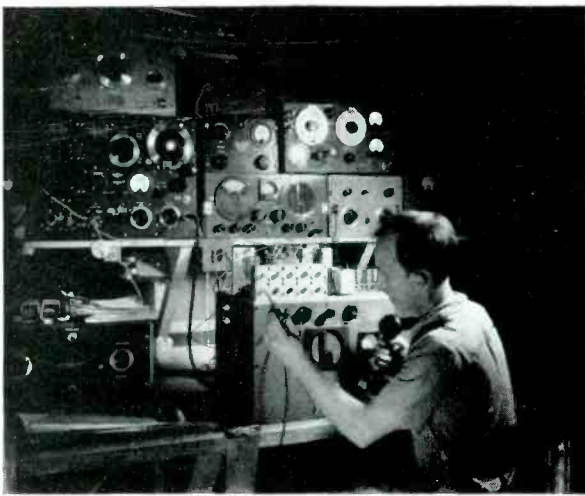


Fig. 13



## Modern Communications Equipment in the Making

**T**HE ACCOMPANYING photo shows one of the reasons why, over recent years, communications receivers and transmitters have been going down in price despite the ever increasing number of circuit and operating refinements which they offer. It shows just one of the several final test positions in the Hallicrafters plant in Chicago where every receiver, transmitter or marine radiophone produced is subjected to a comprehensive operating and laboratory check before it is considered a finished product.

The position shown is equipped for transmitter and radiophone testing. The scope of the tests performed is perhaps best indicated by a list of the precision apparatus with which the position is equipped. On the shelf over the bench are the following: Bottom row, left to right—General Radio 605B signal generator, S-20 receiver for listening tests, Hewlett-Packard 320A distortion analyzer, voltage output meter; next row above—General Radio 583A output meter, special Hallicrafters r. f. output and modulation checker; top—Hewlett-Packard 200A audio oscillator, db meter. At the left on the bench is another instrument designed in the Hallicrafters lab—a 100 kc. crystal frequency standard with tuned harmonic amplifier. With this apparatus every measurable characteristic of the unit under test is precisely checked against performance specifications established by the laboratory and cannot be passed unless it meets these standards. Other positions, each equipped with laboratory test instruments appropriate to its particular function, provide similar facilities for testing the various receiver models, FM equipment, etc. Jointly they include enough precision equipment to stock a half dozen laboratories but the expense of this equipment, and of the test engineers who use it, is considered definitely justified because of the assurance thus gained of effectiveness and uniformity of the products.

It is of interest that such test positions are not depended upon for alignment or general, normal testing. These jobs have been completed before the units reach the final test positions. Their sole function is to look for even the tiniest flaws in operating characteristics and in the performance of this function these engineers provide a double check on both the preceding tests and alignment operations.

It is entirely understandable that under such safeguards mass production methods are being applied to the manufacture of communications equipment, and are producing equipment more capable and uniform as any produced under the old and slower process.

The adoption of such methods by the leading manufacturers has been a break for the hams but even more

important is the advantage offered to the government in the present emergency. With literally hundreds of thousands of pieces of communications equipment needed for installation in everything from a battle wagon to a jeep, Uncle Sam would be in a sorry spot indeed if he had to depend on the production systems of even three years back. Not only can the modern methods provide equipment in the quantities needed—but equipment which is capable of meeting government specifications in every respect; specifications which are among the world's most rigid.

## WASHINGTON NEWS

(Continued from  
Page Seventeen)

minority residing in the District of Columbia. His softly lighted recreation room created a pleasant atmosphere for the business meeting. Being on an early I was unable to remain for the social activities, which were enjoyed by all.

Clarence Allen, SE, says being on twenty-four call keeps him from putting in his spring wheat crop—as if it should go in now!

I would like to take this opportunity to welcome to our midst a new studio man, one Harold Thomasson, formerly with commercial. Take it easy, Harold, you may get "groove-happy" like some of the rest of us.

Since our control room TWX machine has, on occasions, been used for other purposes, leaving control without a cue circuit to New York, it has become necessary to make other arrangements. The circuit controlling a contact printer can now be, when necessary, utilized as a Morse circuit by making certain patches. This has caused most of the studio men to become Morse conscious with the result a practice sounder has been set up and there seems to be no end to the clatter.

## WE HAVE SOMETHING THERE

See for yourself and be convinced that here we have something you've long wanted. Yes, spacious counters, tremendous floor space, and more than ample facilities for displaying and demonstrating all the newest developments of every phase of Radio and Sound Reproduction. So treat yourself to an inspection of this magnificent new store. Come any time. We're open every night until 7 P. M.

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# ARGENTINA LISTENING HABITS

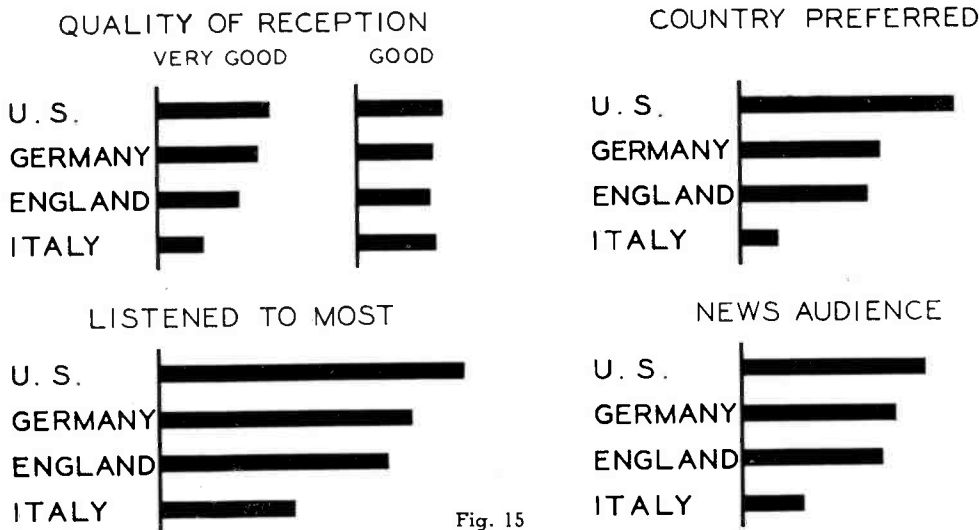


Fig. 15

## Int'l Broadcasting

(Continued from Page Eighteen)

perfectly. The speech has caused a sensation in our country as it did in the rest of Latin America. Rarely have I seen so many people gathered on the plazas where we have had our loudspeakers installed as I saw last night. We can guarantee that in our country there were many thousands of people who listened to the Spanish version of the presidential speech (Fireside Chat to the Americas) which we might add was very well read by your announcer."

NBC broadcast the President's speech direct to every one of the American republics and to Europe. Stations in the 20 Latin American republics and in Puerto Rico rebroadcast the Spanish and Portuguese versions which were given from Radio City simultaneously with the English broadcast from the White House. The speech was rebroadcast by the British Broadcasting Co. and Italian, German, and French translations were beamed to Europe on the regular times assigned to those languages.

The following is an example of the technical character of the 9670 KC signal received in Rio de Janeiro from the steerable antenna. Reception was on a common receiver with six feet of wire for an antenna.

WRCA — 9670 KC	
Carrier strength	Very strong
Fading — Depth	Very slight to slight
Rate of Fading	Very slow to slow
Interference from other stations	None
Static	Very weak
Background noise	Very low
Transmitted noise	None
Degree of modulation	High
Quality	Excellent
Overall rating	Excellent

Figure 12 shows a sample of recordings of WRCA made in Argentina. The voltages indicated were obtained at the

receiver input terminals from an antenna having a voltage gain of about 6. Simultaneous noise measurements show that the signal to noise ratio for WRCA was about 54 DB.

Figure 13 is most informative. It shows the response of foreign listeners during the period when NBC initiated its multi-language short wave program pattern and expanded its operating schedules to Europe and the Latin Americas.

Figure 14 shows an analysis of language response over a five months test period during the first half of 1939.

Figure 15 illustrates vividly the service which is being rendered by the leading radio and electrical companies in maintaining America's position in short wave broadcasting. America leads in the Argentine. Need we look further for justification of the American system of broadcasting?

The following letters, in the opinion of your humble scribe, forms a fitting ending to this monograph.

"Berlin, September, 1940,

"German Hour, Radio City, New York:

"It will take several months before you will receive this letter, as an emigrant will take it by way of Russia, Japan and the Pacific to South America so that it will reach you. I can only tell you that many here receive your broadcasts and that the time of your broadcast and wave length is a quietly-kept secret of very, very many. But this is not the object of my letter. We have two big requests to make of you.

"1. Most of our radios have a short wave dial beginning only with the 19 meter band, and unfortunately cannot receive your broadcasts.

"2. Please change the broadcast time of your news period to the end of the hour, as the German Radio Station

broadcasts the news at 8:00 P. M. to which we must listen, so one at least knows the next day, what Dr. Goebbels had to communicate to us, and at 9:00 P. M. the English station comes anyway with the news in German, in that way we would only have to go to the radio once at 8:45 P. M.

"The reception on the large radios is good, but is unfortunately interfered with very often by a telegraph station, which possibly is done here purposely.

"Therefore, German Hour, if possible, use the 31 meter band.

"Many thanks,

"One of many German Listeners."

Mr. R. C. — High official of Brazzaville, AEF: "Your transmission is heard perfectly, clearly, without any noise. I was afraid that with the coming of the storm season here in French Equatorial Africa, and the tornados, the broadcast might not be good. But with the exception of when the storm is right on the city or in the immediate neighboring places, the reception up till now has remained perfect. In these "historic" but particularly distressing days that we are living in again, your impartial and friendly voice is bringing us a light and is a great comfort. I would be especially grateful if you could answer me over the microphone on a Tuesday and at that time send my good news and my affectionate thought to my wife and children in France . . . in the department of . . . from whom I have had no news for three months."

Mr. F N T B, Coquilhatville, Belgian Congo: "As a regular listener of your French Hour, I have the pleasure of informing you that your transmissions are generally very well heard here . . . The NBC should not forget that America is the only country from where millions of people tortured by anxiety and grief wait for a few bits of truth and a little light. Don't lend yourself to any propaganda, no matter how subtle it may be! Be concise, impartial and sincere if that is still possible! You will then fill a humanitarian duty and you will have the gratitude of all intelligent people in the world who understand the French language."

### ANALYSIS OF MAIL RESPONSE BY LANGUAGES

JAN. - MAY INCL. 1939

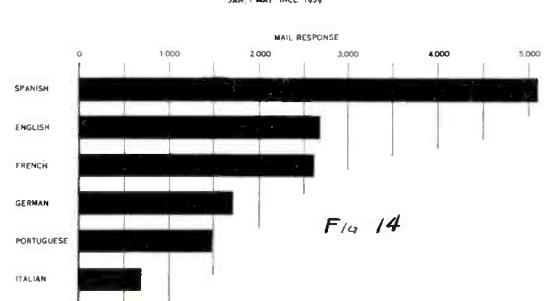


Fig. 14

# WHO'S WHO ON THE BLUE

## Key People of the Blue Network Company, Inc.



**MARK WOODS—President**

Mark Woods has an unusually broad background in Radio. A network broadcasting executive even before the formation of the National Broadcasting Company, he played an important part in NBC's financial and operative policies from its inception, as administrative officer, vice president, and treasurer.

A company is *people*. We haven't room here to introduce all the 500 men and women who make up the newly formed Blue Network Company, but we'd like you engineers to meet the officers and principal department heads. Young in years, but old in radio, they and all the people of the Blue are enthusiastically building up America's second oldest network, on progressive, public-spirited principles of service to the nation.



**LUNSFORD P. YANDELL**  
Vice President and Treasurer



**KEITH KIGGINS**  
Vice President in Charge of Stations



**PHILLIPS CARLIN**  
Vice President in Charge of Programs



**DON E. GILMAN**  
Vice President in Charge of Western Division



**EDWARD R. BORROFF**  
Vice President in Charge of Central Division



**GEORGE MILNE**  
Chief Engineer



**E. P. H. JAMES**  
Director of Publicity and Promotion



**FRED M. THROWER, JR.**  
General Sales Manager



**EDGAR KOBAK—Executive Vice President**

Edgar Kobak takes office with a unique record of executive experience behind him, both in radio and in other fields. When not yet thirty he had become vice president of McGraw-Hill, and since then has served as NBC sales vice president, advertising agency executive, and vice president in charge of Blue Network sales.



A Radio Corporation  
of America Service

# Gateway to the <sup>New</sup> "Radio Age"!

**C**ONFIDENT that the future of radio will be greater even than its past, the Radio Corporation of America has laid the cornerstone for the world's foremost center of radio research and pioneering—RCA Laboratories at Princeton, N. J.

The main section of the Laboratories will open in 1942, dedicated to the service of mankind through increased usefulness of radio and electronics to the nation, to the public and to industry.

Radio has marched hand in hand with progress in electronics. The magic which created electronics—infinitesimal particles of electricity—lifted radio out of its mechanical era...took wireless out of the spark gap and sealed it inside the vacuum tube...took television off the me-

chanical scanning disc and put it in the Iconoscope.

In this hour of history RCA Laboratories fittingly symbolize our faith in the future—that science will blaze new trails in the unexplored wilderness of the electronic sciences through radio research.



## RCA LABORATORIES

A Service of the Radio Corporation of America, Radio City, N. Y.  
Other RCA Services: RCA Manufacturing Company, Inc.  
Radiomarine Corporation of America—R.C.A. Communications, Inc.  
National Broadcasting Company, Inc.—RCA Institutes, Inc.

*Main section of the new RCA Laboratories under construction at Princeton, N. J. This section will open in 1942. Inset shows the Laboratories as they will look when completed.*

