BROADCAST NEWS

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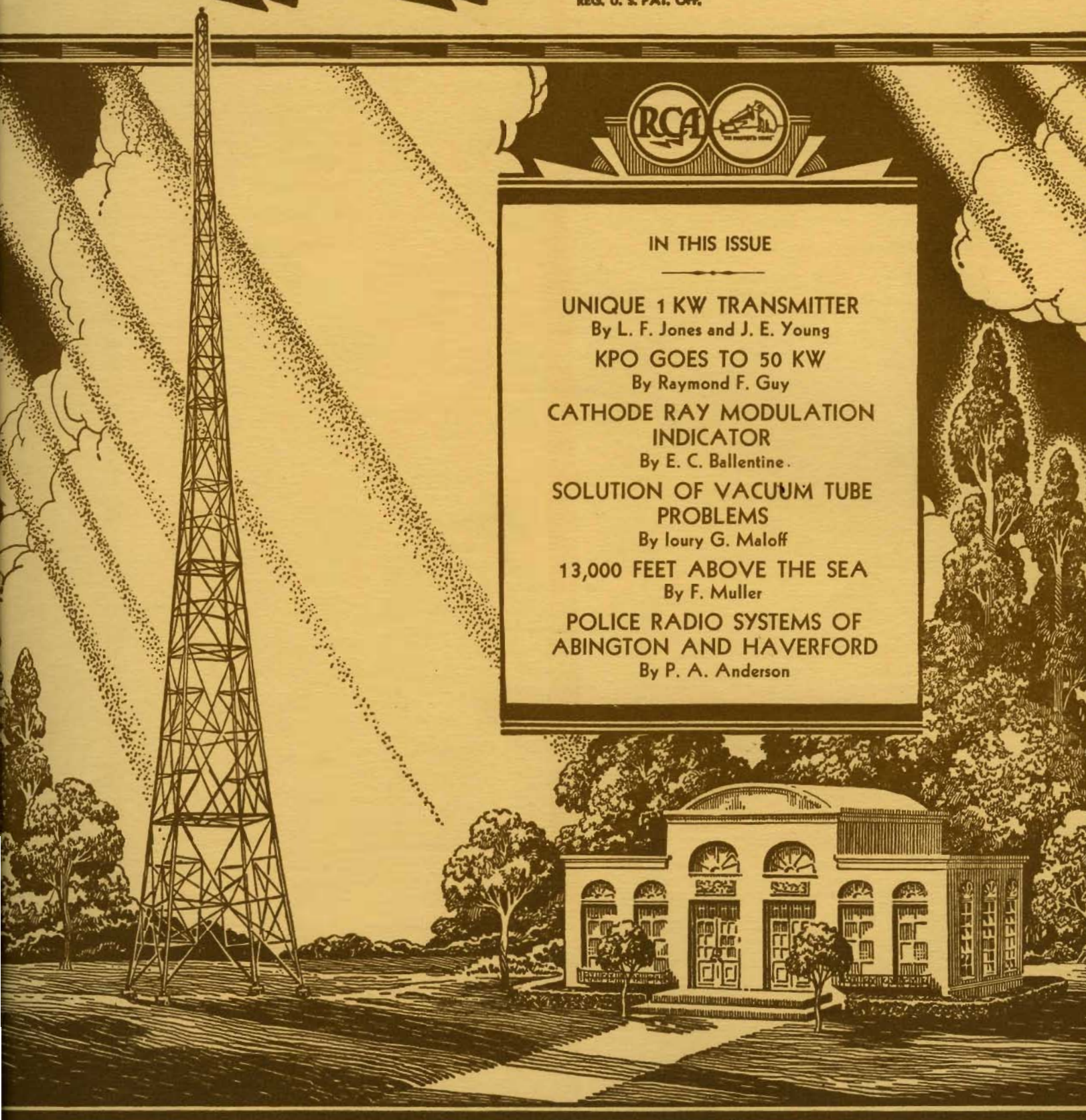

IN THIS ISSUE

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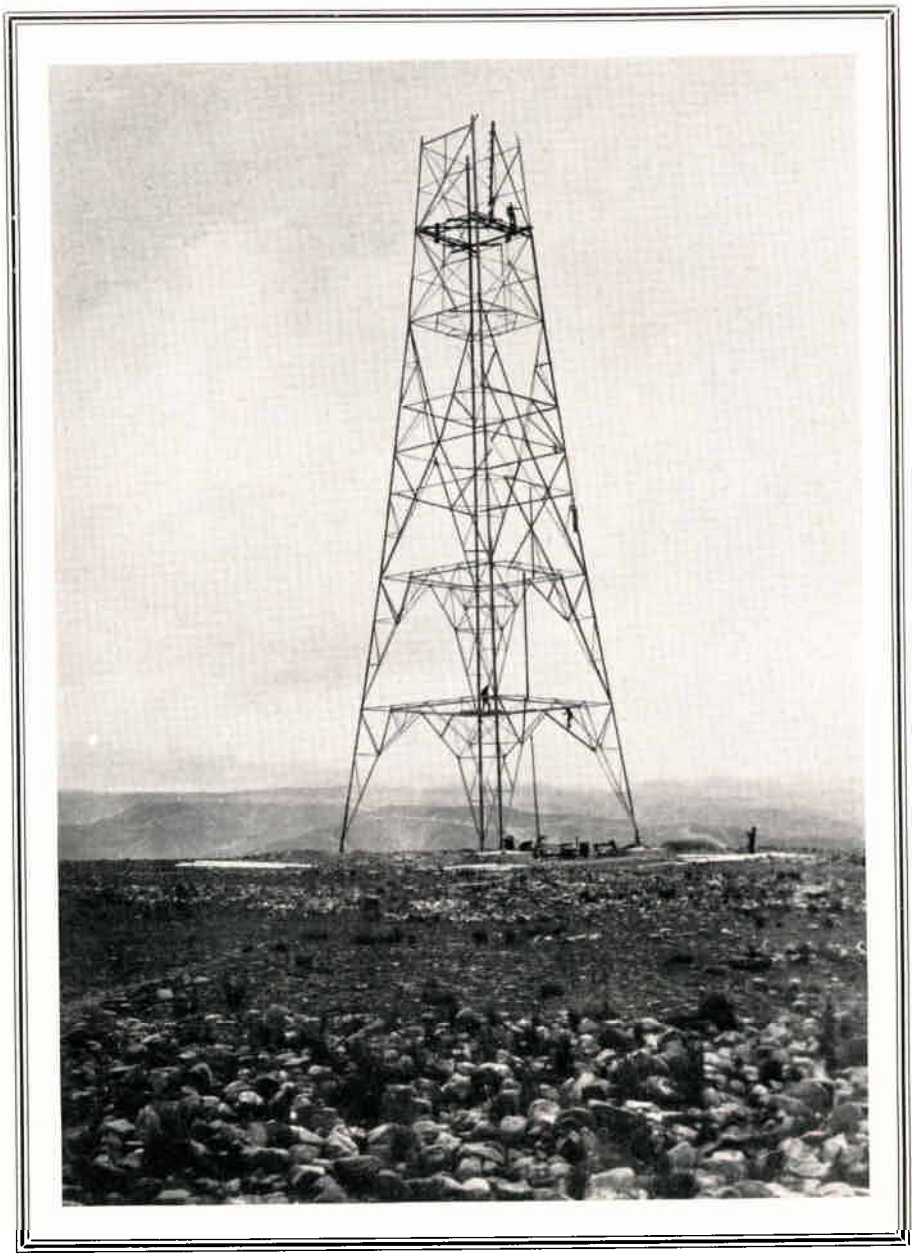


13,000 FEET ABOVE THE SEA
—AND STILL GOING UP

(SEE ARTICLE BY F. MULLER ON PAGE 12)

Published Occasionally and

Unique One Kilowatt Transmitter

By L. F. JONES and J. E. YOUNG, Transmitter Engineers, RCA Victor Co., Inc.

L. F. JONES, RCA VICTOR

FOR years the development and research laboratories of RCA Victor have been studying the performance of broadcast apparatus and have been attempting to make available equipment that would improve the general broadcast system. Over a year ago the specific problem of developing a new 1 KW broadcast transmitter was undertaken. It was obvious that the new equipment should incorporate all the advantages of previous types and that certain new requirements which would soon exist should be anticipated in the design.

Simplification was one aim. Simplification almost invariably results in economy, reliability and higher efficiency. Obviously one major simplification that was needed was the elimination of all rotating equipment.

Another and more important improvement that was carefully investigated was that of improved audio fidelity. The frequency characteristic of RCA transmitters has been entirely satisfactory ever since the first transmitter was sold. Also the carrier hum and audio harmonic content (non-linearity) were entirely satisfactory for the period when the equipment was sold and for several years thereafter. However, the

there are now being made available receivers that reproduce both higher and lower frequencies than heretofore. Furthermore, receivers of even higher frequency range and of even less distortion can be expected in the future. It has always been customary to design transmitters of sufficiently high standards so that they will anticipate, by at least several years, the normal improvements in receivers.

The reproduction by receivers of lower and lower frequencies has made necessary the reduction of carrier hum, especially low-frequency carrier hum, to extremely low values. Furthermore, the extension of the receiver's range to higher and higher audio frequencies necessitates reducing transmitter modulation harmonics to an absolute minimum. This point is very important. Many obsolete or poorly-designed transmitters now in use in this country produce 10 or 15 per cent audio harmonics at normal modulation percentages. These harmonics are not reproduced by most receivers in use today, but they are reproduced by the high-fidelity receivers that are now being offered and, in such cases, the effect on the ear is highly displeasing.

Reduced Input Power

Another objective in developing this new 1 KW transmitter was to reduce the input power required. This point is not of essential importance in transmitters of only 1 kilowatt power, but nevertheless a general aim should be made in radio transmitters, as in all electrical equipment, to realize higher efficiencies.

Considerable attention is also paid to making the equipment unusually accessible, unusually easy to install, and unusually attractive in appearance

Very extensive work was directed toward providing the transmitter

J. E. YOUNG, RCA VICTOR

ing the output signal. It was realized that most transmitters are not properly equipped to monitor outgoing modulation, with the result that certain defects and distortions can creep into the modulation

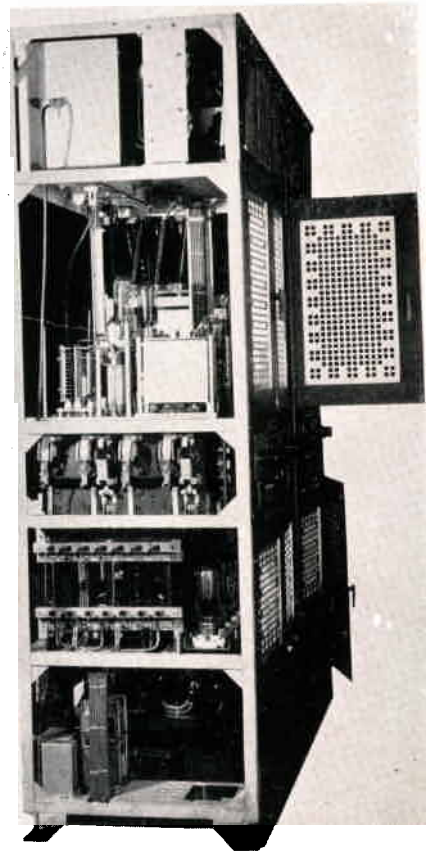


FIGURE 1—TYPE 1-D TRANSMITTER SHOWING

without the knowledge of the operator. First it was considered essential that an actual aural monitor should be provided as an integral part of the transmitter and that the performance of this monitor should be several years in advance of the performance of the best present-day receivers. Thus a new type of high-fidelity loudspeaker utilizing double voice coils separated by a special compliant material and having a reasonably uniform response at the high frequencies is provided. It was, furthermore, considered essential that the operator be able to tell at all times the exact percentage of modulation. This is becoming of increasing importance because relatively small degrees of over-modulation result in serious distortion in the reproduction of wide-range receivers. The RCA Victor Company have previously supplied string oscillographs with many of its transmitters and this was the most satisfactory method for modulation percentage indication that was available. However, the cathode-ray oscillograph has now been developed and its advantages over the string oscillograph are obvious. The cathode-ray modulation indicator not only indicates modulation peaks much more accurately than the old string type, but also is much more conveniently used, since it is quiet, produces an image of adequate size and of adequate illumination, and it operates continuously whenever the transmitter is turned on. It has no critical adjustments and is easily seen even in broad daylight. The tube used has a long life, in contrast with most cathode-ray tubes.

The 1-D Transmitter

After taking into account all the desirable features mentioned above, the type 1-D broadcast transmitter shown in Figure 1 was developed. In this transmitter, all of the advantages of previous designs have been retained and the improved features outlined above have been incorporated. Many of these features are not procurable in any other transmitter on the market today.

The crystal units, supplied in

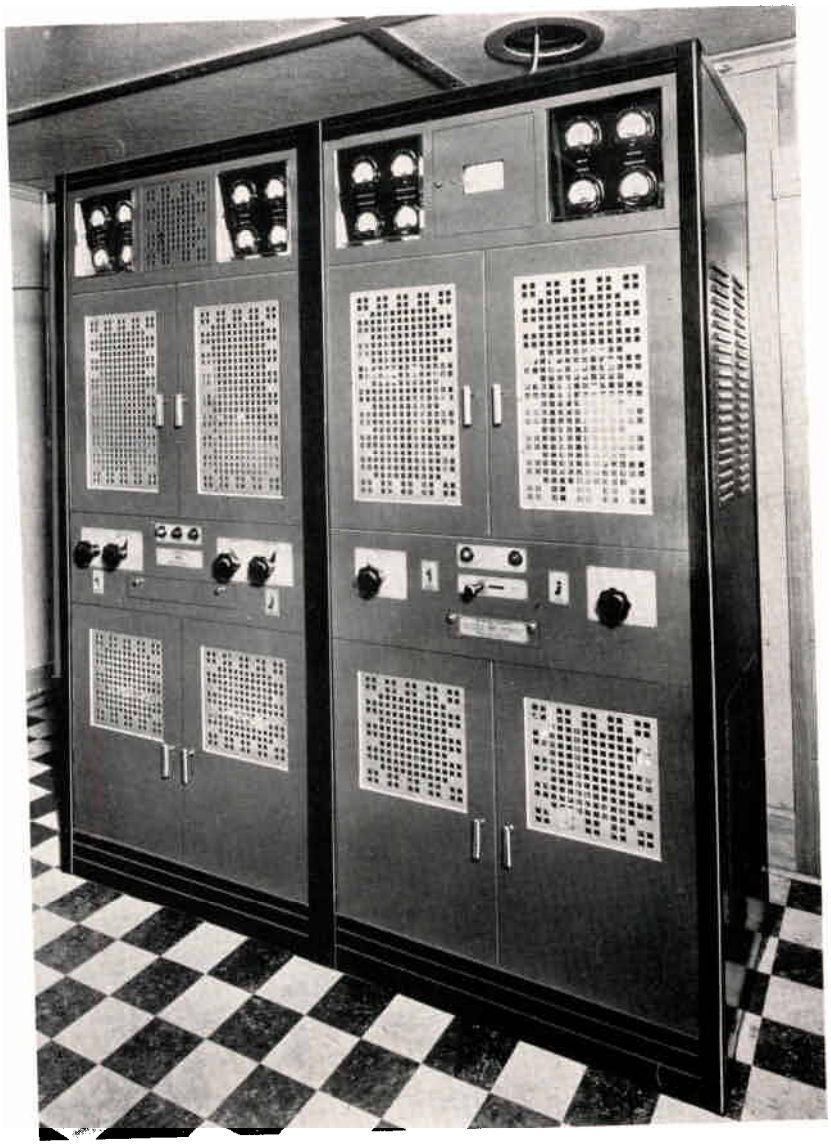


FIGURE 3—TYPE 1-D TRANSMITTER INSTALLED AT **WORC**, WORCESTER, MASS.

These tubes are used because of their reliability and because their indirect heating of the cathode prevents hum and frequency modulation. The second radio-frequency stage employs a UX-865 tube. The third stage employs a UV-203A tube, and the fifth stage employs two UV-203A tubes in a push-pull circuit. The sixth and last stage employs four UV-204A tubes. The UV-204A tube is famed for its reliability and long life.

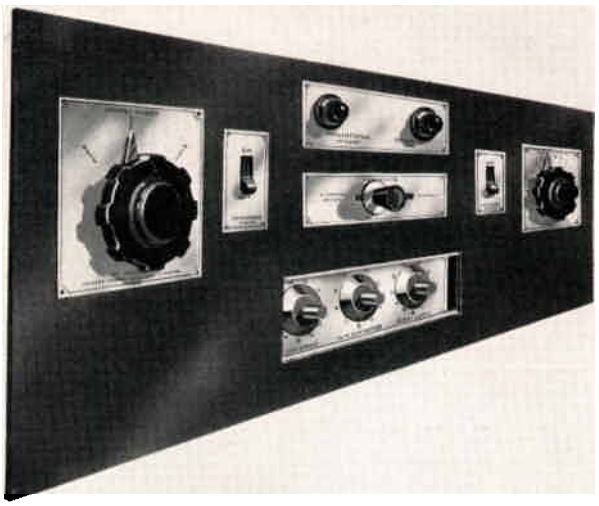
Each radio-frequency stage is tuned by variable condensers. In each stage great precautions have been taken to prevent undesirable couplings and to prevent parasitic oscillations. Each stage receives most of its bias voltage by means of a grid leak, but also receives sufficient self-bias so that, in case the crystal excitation

required to dissipate excessive heat.

The tank coil design in the power amplifier stage has received very careful consideration. Not only is it arranged for maximum efficiency, but an electrostatic shield is provided between the primary and secondary to prevent the coupling of radio-frequency harmonics into the antenna circuit. The efficacy of this shield as an eliminator of r-f harmonics can hardly be over-emphasized. In addition, a harmonic filter is provided between the power amplifier and the antenna to further attenuate the r-f harmonics.

The transmitter may be connected either directly to the antenna or to a transmission line. When a transmission line is employed, the harmonic filter is removed from the circuit. A dummy antenna is provided and it is switched into the circuit by merely shifting a

EXCITER CONTROLS



AMPLIFIER CONTROLS

— FIGURE 2 —

switch on the front of the panel. The antenna or transmission line is completely and thoroughly disconnected when the dummy antenna is in use.

The cathode-ray oscillograph is coupled to the main tank coil. The operation of this type of oscillograph is described elsewhere in this issue under the title "A Cathode Ray Modulation Indicator" and, therefore, will not be described further here.

The first audio-frequency stage employs two RCA-843 tubes in push-pull, Class A. The second stage employs two UV-845 tubes in push-pull, Class A. The third stage is the modulator stage. It employs two UV-849 tubes, operating Class B. The modulator output voltage plate modulates the power amplifier. The audio transformers are designed to be the best possible, regardless of size or cost.

The audio component of the power amplifier plate current is utilized to operate the high-fidelity loudspeaker and a percent modulation meter. Also an audio monitoring voltage is made available in case it is desired to operate an external monitor.

The control circuit is simple and fool-proof. It renders either automatic or manual starting, as desired. All controls which are frequently used are located on the front panel, whereas all others including the tuning controls are located behind small concealed doors or at other appropriate, convenient points.

No wood insulation is used anywhere in the transmitter. Very high safety factors are used at all points. All condensers and receivers, and practically all vacuum tubes, are used well below their ratings.

Due to the use of Class B modulation, the total input power required to operate this equipment under normal program conditions is 5700 watts. This is the lowest power input of any standard 1 KW transmitter in existence. As a result of the very adequate precautions taken to minimize distortion, the overall distortion produced by this equipment is negligible and is lower than that produced by any other 1 KW transmitter tested.

Simplification

The radio circuit has been simplified as far as possible without sacrificing present and projected standards of stability, harmonic field strength, etc. The audio circuits have been simplified as far as possible, consistent with wide frequency amplification, minimum distortion and reasonable input level (zero level). No rotating equipment is used. The cost has been reduced.

The frequency characteristic is, as has always been the case in RCA Victor equipment, substantially flat from 30 to 10,000 cycles. The harmonic distortion has been reduced several percent with the result that it not only is far below the limits specified by the Federal Radio Commission, but it is also low enough to render satisfactory performance from the most advanced types of laboratory receivers. The carrier hum has been reduced to the level of at least 60 db below the level of 100 percent modulation, which is equivalent to a modulation of less than 0.1 percent. This means that in the program as listened to in a quiet suburban home at average volume, the residual hum remaining if the program were cut off would be below the threshold of audibility.

Operation

Figure 2 is a view of the remote tuning dials. These dials connect to the units to be tuned by flexible cables, thus permitting, for the first time, the locating of the units being controlled at the points where they belong electrically, whereas the dials are located where they belong from an artistic and convenience viewpoint. Backlash is prevented by the use of appropriate gears at the ends of the flexible shafts. The controls are concealed behind a small

door so they will not be tampered with by visitors.

Meters

A total of 16 meters is provided. It is apparent that operation is always facilitated by a multiplicity of meters. Furthermore, several of the meters can be switched to a number of points on the circuit, thereby making it possible to read every current and voltage of importance in the entire equipment. Tap-changing switches have been provided on the front panels to permit compensating from line voltage fluctuations of plus or minus 15 percent. The taps are arranged every 2 percent. This feature is considered very desirable since many 1 KW transmitters are located where the power supply is quite abnormal or fluctuates badly. These tap-changing switches can be operated while the transmitter is on the air. It is thus unnecessary to compensate separately the various plate, filament, and bias voltages. The operation of the transmitters is, of course, greatly simplified by the cathode-ray modulation indicator and by the high-fidelity loudspeaker. The accessibility of tubes is a feature of this transmitter. All tubes, including rectifier tubes, are immediately and easily accessible from the front by merely opening the doors.

Appearance

The appearance of this transmitter has received considerable attention. It has pleasing proportions, all general shapes and areas are based on considerations of "dynamic symmetry." The meters are located behind beveled glass windows and are indirectly lighted. All door hinges are concealed, the ventilating louvres on the sides are artistically spaced, and appropriate molding surrounds the transmitter; practically all apparatus within the transmitter is encased in aluminum shields. Practically no wiring is visible from the front of the transmitter. The transmitter is finished in three shades of gray (black for the molding, intermediate gray for the major portions of the panels, light gray for the grilles). The high-

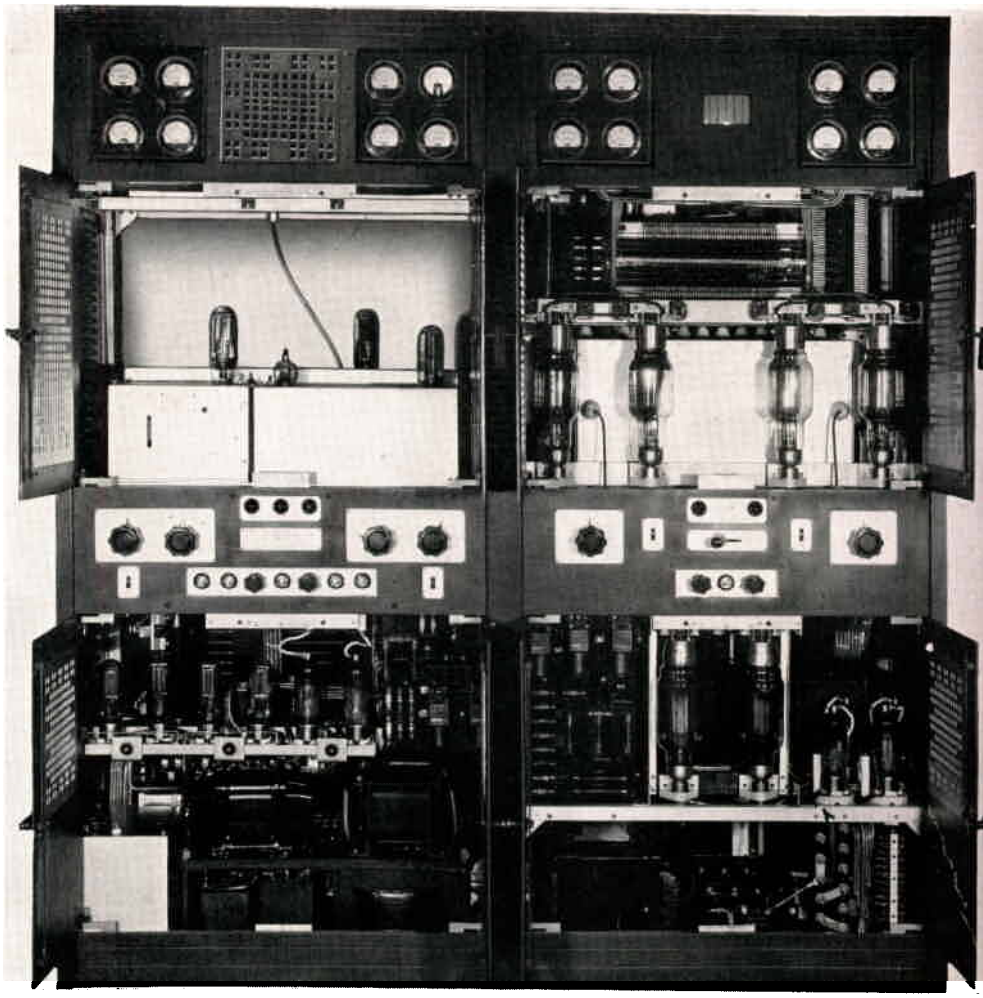


FIGURE 4--SHOWING FRONT DOORS OPEN

fidelity loudspeaker is located behind the upper grille work on the exciter unit and in the corresponding space in the power amplifier there is mounted the cathode-ray modulation indicator.

Mechanical Design

Accessibility has been provided through the use of unusually wide doors. There are no vertical partitions and the transmitter is only 25 inches deep. Crystal oscillators are provided in duplicate and are readily interchangeable. The spare oscillator is kept heated and temperature-controlled at all times. All audio tubes are rubber mounted and all relays are similarly mounted so that the closing of relays will not affect filament life of the tubes. The relays are absolutely quiet. Although complete accessibility to the equipment is possible from the front, the sides and back of the transmitter are readily removable. The controls for the cathode-ray modulation indicator are concealed behind the small door that forms a window for this indicator. All units in the transmitter are marked with item numbers. All fuses, switches and relays are grouped together on Bakelite panels located just behind the lower doors.

Conclusions

It is important to emphasize that this transmitter was designed as a de luxe equipment. It forms an exciter for new 5 and 50 KW equipments shortly to be offered and it, therefore, is designed, in every respect, to conform with the high performance pertaining to 50 KW transmitters. As a result of this consideration and of the many advanced features this transmitter incorporates, there is no doubt that the 1-D transmitter signifies one of the most important advances of recent years in the improvement of the broadcast system.

New Methods of Solution of Vacuum Tube Problems

By I. G. MALOFF, Research Engineer, RCA Victor Co., Inc.

Vacuum tubes are fundamentally non-linear devices, and purely analytical methods for calculating their performance are very involved. This treatise deals with the inverse method of calculating tube performance; "inverse" because it is based on assumption of a certain output for which the necessary input is computed.

The inverse method can be used for computation of wave shape distortion in power amplifiers, with any load in the plate circuit. Another application is in the case of amplifiers required to deliver odd wave shapes in their output. Two examples are worked out, one for each of the above cases.

The inverse method in a somewhat modified form can be extended to computation of oscillator performance. The case of an oscillator with three reactive elements is the hardest of them all and is only outlined in this report. In this case the inverse method is combined with the method of successive approximations.

Some cases of oscillators with two reactive elements lend themselves to solution by method of ISOCLINES. Germans were the first to apply this method to vacuum tube problems. However, it is believed that it has never been described in English literature. An example of solution of a practical problem by the isocline method will be given in the next issue of "Broadcast News."

Although this work has been presented in address form before the Institute of Radio Engineers, it has never been published.

IN a comparatively short time since its invention and introduction into the communication art, the vacuum tube became by far the most important part of any communication system. It went even farther than that. It became a very important component part of almost any utility employing feeble electric currents and all utilities employing h-f currents. Thick books have been written on the subjects of design, performance, and uses of vacuum tubes, and a brand new terminology has been gradually established.

IOURY G. MALOFF, RCA VICTOR

When people talk about a vacuum tube they usually talk about its "constants," such as "amplification constant," "mutual conductance," "plate impedance," etc. Their introduction is due to mathematical analysis of classical type applied to the performance of tubes under various conditions.

In the elementary analysis all tube characteristics are either considered as linear, or the analysis deals only with the linear parts of these characteristics. This analysis is very plain and straight-forward. Unfortunately, however, vacuum tubes are fundamentally non-linear devices, and mathematical analysis of their performance taking the non-linearity into account is always involved and in some cases fails entirely.

To be specific: The complete classical analysis of vacuum tube performance as amplifier, detector, and modulator is involved but possible. It becomes even more involved when dealing with wave shapes having finite discontinuities. For a vacuum tube operating as an oscillator, a complete classical analysis is unknown.

The engineer, however, cannot take "no" for an answer in a great many cases. Neither can he afford to spend a week or two to compute a performance of, say, an amplifier to give a certain wave shape across a given load of given power factor.

One of the well recommended methods for solution of such problems is that of expanding tube characteristics into Taylor's series. For solution of a practical problem the expansion method is hardly applicable because of complications in evaluating coefficients. There is only one way out: the brute force method; and the purpose of this report is to describe some of these brute force methods.

Inverse Method

Any vacuum tube, irrespective of the number of the electrodes, is essentially a three terminal device. When a tube is used either as an amplifier or as an oscillator, usually only three of its electrodes are used for connecting the external circuits. So far as the operation of either tetrode or pentode is concerned, they can be considered as triodes of various characteristics.

The method and its variations described in this report are all based on a very definite property of triodes:

If the plate current wave is known to be of a form:

$$i_p = f_1(t)$$

and the plate voltage wave is known to be of a form:

$$e_p = f_2(t)$$

then for every value of t the grid voltage e_g has one and only one value, which can be expressed as:

$$e_g = f_3(t)$$

An ordinary set of static characteristics of a vacuum tube defines the function f_3. This statement holds true for all positive values of t and also for $t=0$, provided both f_1 and f_2 are continuous and single-valued functions of t. There are special cases in which the above relations still hold even when one of the functions f_1 and f_2 has a number of finite discontinuities and it comes very handy when dealing with problems of odd wave shapes.

The term "static characteristics" is a very misleading one. The fact that these characteristics were statically taken is often taken as meaning that they apply only to d. c. conditions, and that for any a. c. problem a dynamic characteristic should be computed. The latter is not so; a dynamic characteristic of a tube shows the performance of a tube in combination with either a part or the whole circuit into which the tube is working. But the static characteristics hold for all a. c. cases except the very high frequencies of the order of many megacycles, and it definitely states that if the instantaneous voltage on the plate is e_{p1} and at the same time the instantaneous plate current is i_{p1}, then the instantaneous grid voltage has only one value e_{g1} and, besides, it gives the exact magnitude of that value.

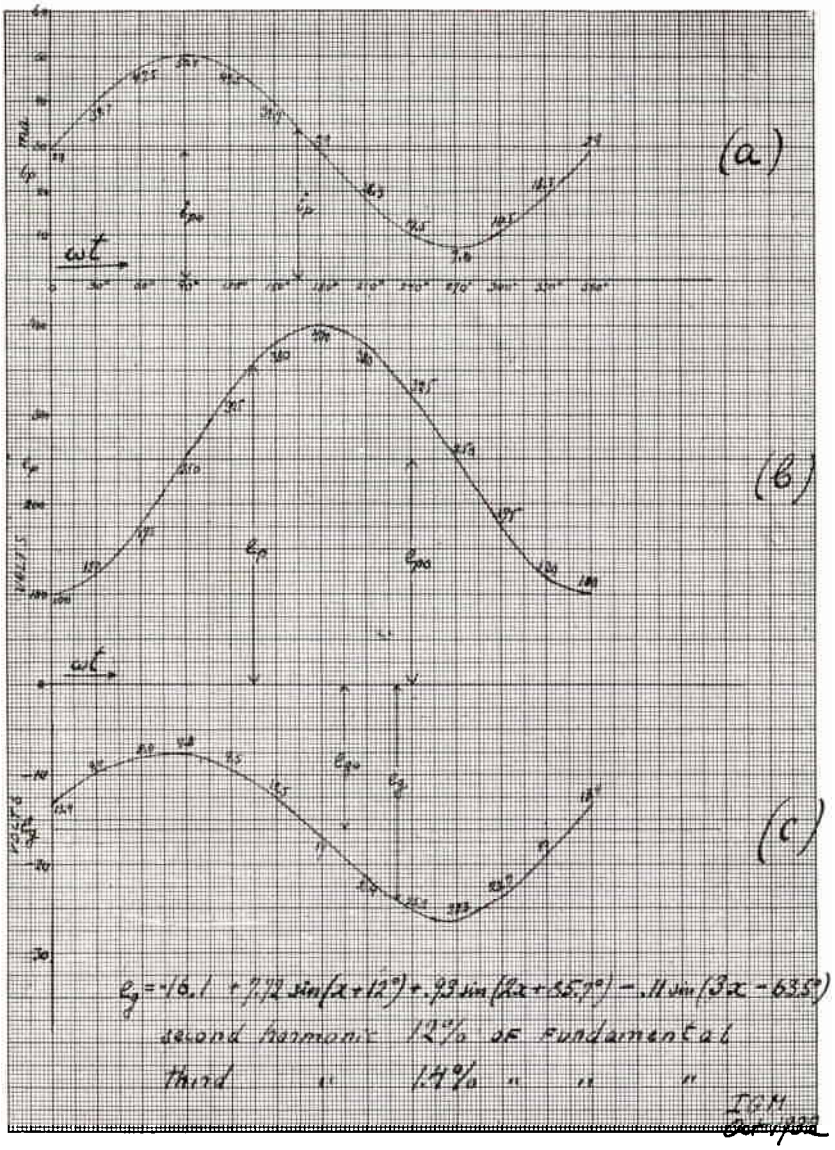


FIGURE 1

This is, in reality, repeating something very old and very well known, but, since on these principles all the methods of tube performance computations described in this report are based, it had to be repeated. For lack of a better name the method will be called the "inverse" method of calculation of amplifier or oscillator performance, because in this method we assume a given output and compute the necessary input. It is just opposite to the conventional direct methods where the output for a given input is calculated.

Distortion Analysis by Inverse Method

Let us first discuss the inverse method as applied to a power amplifier tube working into a given load of a given power factor. Let us take a specific problem:

With normal d. c. voltages applied, a 247 pentode is working into a purely *inductive* load of, say, 7,000 ohms and is delivering, say, 150 peak volts of fundamental frequency to this reactance. Compute the second and third harmonic content in the output wave, and the necessary grid swing. We may stress that we are determining performance of a pentode with reactive load. For resistance load the problem is much simpler.

The problem as stated above is the usual direct problem; nevertheless it can be solved by the inverse method if the following procedure is used.

For 150 peak volts across 7,000 ohms of inductive reactance, the peak current is 21.4 ma. and the effective voltamperes are 1.6. Now assume that the a. c. output current is of the form $i_x = 21.4 \sin wt$. We may state then that the instantaneous plate current in our tube is:

$$i_p = i_{po} + 21.4 \sin wt.$$

where i_{po} is the steady rated d. c. plate current. The corresponding instantaneous plate voltage is:

$$e_p = e_{po} - 150 \cos wt.$$

where e_{po} is the steady rated d. c. voltage. Figure 1-a and Figure 1-b show the i_p and e_p as function of wt.

If we plot the resultant i_p against the resultant e_p we get a perfect ellipse. Let us plot ir right on the so-called static characteristic family sheet and mark the corresponding value of wt right along the ellipse. (See Figure 2.) Now, by remembering the fundamental principle that for any pair of instantaneous values of e_p and i_p there is only one value and a definite value of e_g, we may construct a curve of the grid voltage e_g that will cause the tube to deliver 150 peak volts across 7,000 ohms load. By interpolating between the curves for various d. c. grid potentials we may put next to each value of wt a corresponding value of e_g. Then we can spread it against time as shown on Figure 1-c.

The next step is to analyze the grid voltage wave by any known process. If one has forgotten the standard method he may easily find the second and third harmonic content by trial. In the particular case the standard method of harmonic analysis gives us for the second harmonic 12% of the fundamental and for the third 1.4% of the fundamental of the grid voltage. The 7,000 ohm load will become 14,000 ohms for the second harmonic, and 21,000 ohms for the third.

If now we impress on the grid two additional waves, one of the frequency of the second harmonic of our fundamental and the other of the frequency of the third harmonic, both 180° out of phase, we will have pure sine wave input on the grid and a distorted current and voltage waves in the output.

The percentage of the harmonic in the output is estimated as follows: Since the distortion in the amplification of the second and third harmonics will produce harmonics of the order higher than second and third of the fundamental in question, this distortion can be neglected. Picking a convenient value for the scales used, 100 peak volts across 14,000 ohms will require 7.14 peak ma. The corresponding ellipse will have 200 volts for major axis and 14.28 ma. for the minor. The minimum and maximum instantaneous grid voltages for such an ellipse are −13.1 volts and −19.1 volts, which gives an average peak a. c. grid voltage of 3.0 volts and the voltage amplification factor of 100/3 or of 33. Similarly the amplification for the load of 21,000 ohms is computed to be equal to 50.

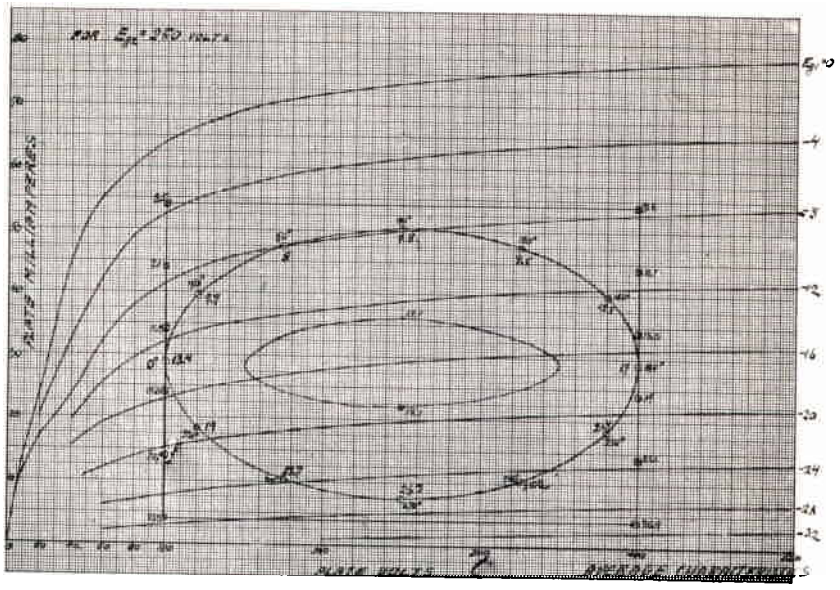


FIGURE 2

The actual amplification of the fundamental is only 150:7.72 = 19.4 and if on the grid the ratio of fundamental to first harmonic and to second harmonic is in proportion of 100:12:1.4, then the same ratio in the output voltage is 100:20:3.6. A good theoretical reason exists, therefore, for using pentodes in push pull to balance out the second harmonic. The peak grid swing is 7.72 volts and the effective sine wave voltage on the grid is 5.45 volts. The exact d. c. bias to keep the plate current at the desired value is 16.1 volts.

Following the above procedure a number of similar problems can be solved.

Case of Odd Wave Shape

The method is especially applicable to problems requiring computation of a grid voltage wave necessary to deliver either a current or voltage of odd wave shape to a reactive load.

Let us consider the following problem.

It is desired to deliver a current wave of even saw-tooth shape to a pure inductive load of three henries. The current is to be of 500 complete periods per second which means 1,000 sharp breaks per second. The total change wanted in the current between two successive breaks is of 50 milliamperes. It is required to find whether a 247 pentode with normal supply voltages on its electrodes is capable of delivering such a wave and, if so, what the exact wave shape of the voltage on grid is required to produce this output.

First let us plot the desired current against time. Directly under it let us plot the voltage across the three henry inductance which constitutes the load in this case. This voltage e_x is found from the following relation:

$$e_x = L \frac{di}{dt}$$

I may remind you at this point what is meant by continuity and a finite discontinuity of a function.

A function is continuous at a point if its limits when it approaches the point from the right and from the left both exist and are equal to each other and to the value of the function at that point.

A function is said to have a finite or ordinary discontinuity at a point if its limits when approaching this point from the right and from the left both exist but are not equal,

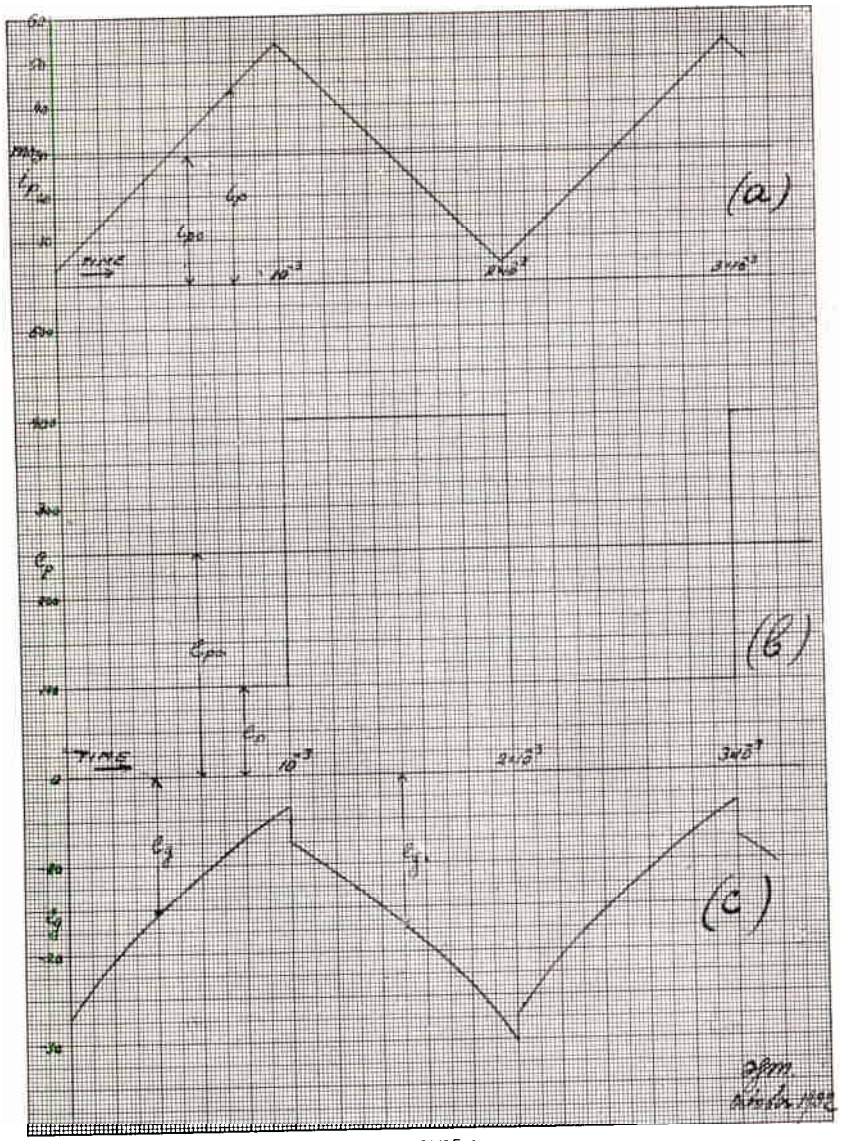


FIGURE 3

or not equal to the value of the function at that point.

We notice then that while the current through the load is a continuous function of time, the voltage across it has finite discontinuities.

Referring to the picture we notice that for the rising current the back voltage across the load is positive, and for the decreasing current through the load the back voltage is negative.

Now we can compute the plate current and plate voltage as functions of time; they are respectively:

$$i_p = i_{po} + i_x$$

and

$$e_p = e_{po} - e_x$$

Their plots are given on Figures 3-a and 3-b. Now if we plot the resultant i_p against the resultant e_p we get a perfect square. If we plot this square over the static characteristic family of curves, we at once get the idea whether the tube can deliver desired output. Looking at Figure 2 we conclude that in the particular case it can.

By going back again to the fundamental principle that for any pair of instantaneous values of e_p and i_p there is only one value and a definite value of e_g, we may construct the wave of the grid voltage which will make the tube deliver the current of the desired shape and magnitude to the load. Then we can spread it against time as shown on Figure 3-c.

The solution is complete and all we have to do now is connect an oscillograph to the grid of our pentode and adjust our circuits until we get the grid voltage of the shape we calculated. The power output then will be the desired value—it has to be.

WSYR Broadcasts Prize Winning Orchestra

THE EAST SYRACUSE HIGH SCHOOL ORCHESTRA RECENTLY WON THE NEW YORK STATE ELIMINATION CONTEST FOR THE BEST ORCHESTRA IN ITS CLASS AND AS A REWARD WENT TO THE "CENTURY OF PROGRESS" EXPOSITION AT CHICAGO WHERE ALTHOUGH THE SMALLEST GROUP IN THE CONTEST THEY WON THIRD PRIZE. UPON THEIR RETURN TO SYRACUSE THE ORCHESTRA WAS BROADCAST OVER **WSYR** FROM THE MAIN BALLROOM OF THE HOTEL SYRACUSE

Did You Know?

By W. S. FITZPATRICK

That a new angle is put on the Dr. Zworykin-RCA Victor Iconoscope discovery by *Scientific American*, which states: "Aside from its television aspect, it may also affect telescopes and astronomy, which suggests that Dr. Zworykin's inspiration may be the forerunner of a junk heap for our best and biggest telescopes"?

That one-tenth of the broadcasting in this country is of purely educational nature? NBC's service in this regard is greater than the half-hundred stations licensed to educational institutions, which devote on an average but 28 per cent of their limited hours on the air to broadcasting by educators. The Music Appreciation Hour directed by Walter Damrosch, a sustaining program now in its sixth season, is an outstanding example of NBC's efforts in educational activity.

There was a Nipper

That the name of the original dog of "His Master's Voice" actually was "Nipper," as occasionally called in some of the RCA Victor advertisements?

That in quoting from *Collier's*: "The quaint little fox terrier at attention before the horn is familiar to more Americans than any other of the world's greatest masterpieces," it might truthfully be imagined that it was a late issue of that famed National Weekly, rather than one of 25 years ago?

That apropos to the recent connection of Honolulu to the NBC broadcasting chain through the facilities of R.C.A. Communications, and the dramatization during Marconi's visit to the Chicago Fair, of his receipt of the letter "S" across the Atlantic, there is interesting romance in recalling the first communication by radio between Hawaii and the mainland? Remarkable for that time, in the year 1908, much of the apparatus used in the construction

W. S. FITZPATRICK, RCA INSTITUTES

of the first high power (10 kw.) station on the islands, was built of materials obtained there. The station was designed and erected by Mr. Arthur A. Isbell, now Manager, Commercial Department, R.C.A. Communications, who sent and received the first radio messages between Hawaii and the mainland of U. S. A. The anxiety and subsequent thrill experienced by Mr. Isbell was not unlike that of the famed "Father of Wireless" in the letter "S" episode.

That prior to the World War the combined business of the entire radio industry was not as extensive in scope as the present field of activity of the Radiomarine Corporation of America?

That press dispatches announcing the selection of Richard D. Watson as radio operator of Byrd's Antarctic Expedition ship, *Bear of Oakland*, carried the line that Watson is a graduate of R.C.A. Institutes? Intimating, no doubt, that Watson is therefore well fitted for the responsible task.

Wireless Stamps

That American Marconi and United Wireless frank stamps, so lightly regarded years ago, have suddenly become valuable to the extent that stamp collectors are offering high premiums for them?

That since inauguration of New York City's Police Radio System last year, the value of stolen property recovered through its use exceeds by eleven times the cost of the radio installation?

That major credit for the wonderful accomplishments through perfect operation of the New York Police Radio System might well be given to the enthusiastic corps of radio men at headquarters? There is admirable cooperation and Captain G. S. Morris has the respect and loyalty of the entire personnel. Although a trained radio expert, Captain Morris is attending at R.C.A. Institutes, determined not to stop until he has become a thorough radio engineer. C. W. Vollmer has held a government radio license many years and is remembered as a radio hero of the *City of Athens* disaster during the war. John McQuade, who has long radio experience, is also furthering his knowledge at R.C.A. Institutes. J. J. Sullivan and C. J. Hilkemeier are former RCA operators.

Steam Driven Oars

That Camden's radio history dating from 1902, and aeronautical history going back to 1834, may be supplemented by still older mention in marine history? The first United States steamboat to carry a man was built by John Fitch and on August 27, 1787, his steam oar boat plied up and down the Delaware River past the present site of the RCA Victor plant, at a speed of three miles an hour. Some of the best known liners of the present American merchant marine were built in Camden at the big ship-building plant located there.

That the observatory atop the 70-story RCA Building has an open promenade 190 feet long and 21 feet wide, made to resemble a ship's deck?

That when transmitting photographs and facsimiles to foreign countries R.C.A. Communications, Inc., accomplishes the amazing feat of keeping the revolving cylinders, thousands of miles apart, in exact synchronism through the use of tuning forks vibrating 810 times per second in thermostatically controlled heat insulated boxes? Accurate chronometers constantly adjusted by radio time signals, are used to check the synchronization to one part in a million.

That 77 types of RCA Radiotrons and Cunningham Radio Tubes are on the market today as against 34 types in the early part of 1931 (and that these varied types are intended to supply every possible characteristic demanded by radio-receiver designers)?

That painstaking accuracy in the manufacture of Cunningham Radio Tubes and RCA Radiotrons is carried to the point where a grid wire one one-thousandth of an inch out of line causes a tube to be rejected?

Mat was *There*

That several national magazines carried the story of the recent awarding of a citation to M. L. Bergin, of the Cunningham-Radiotron sales department, for distinguished service rendered at sea during the World War?

That a forerunner to a new use of radio is seen in the application of New York's street railway and bus systems for permission to equip "trouble cars" with radio?

That according to Radio Retailing, a new RCA Victor book, "What We Hear in Music," is considered "a standard reference treatise on music appreciation"?

That the National Broadcasting Company's new studios and offices in the R. C. A. Building, New York, cover 400,000 square feet of space and that eleven carloads of rockwool for sound-proofing were used?

That during one recent month 24,000 persons visited the New York NBC studios to witness broadcasting of programs in which 6,300 artists appeared?

That 25 broadcasting stations are listed in Manhattan and Brooklyn, with 33 in all in the metropolitan New York area?

When in Town, Stop at—

That New York State's Sing Sing prison is to have a 3-channel radio outlet in every cell as soon as the RCA Victor installation there is completed? There will be three centralized control panels, two velocity microphones and automatic phonograph mechanism included in the equipment. (Radio Engineering.)

That Amos 'n' Andy are now on their fifth year with that still-popular feature over the NBC network?

That when you go up in an elevator in the RCA Building in New York you may realize that no person ever made an ascent in quicker time?

That the every-day use of water in thousands of good-sized American towns does not equal the 2,700,000 gallons daily pumped into the RCA Victor plant at Camden?

That tests made at Harvard showed the effectiveness of teaching is increased 38 per cent through the use of talking motion pictures?

That NBC's New York quarters will have 35 studios and 250 microphone outlets?

Push 'Em Up

That the weight of a solid column of cast iron, ten inches in diameter and the height of the R.C.A. Building, would not furnish the sufficient pressure of 254,250 pounds to press one RCA Victor 12-inch talking machine record?

That there are 12,000 persons directly employed by this country's broadcasting stations, not counting artists or those engaged in the manufacture and sale of equipment, and that the large number engaged in engineering and research work for the big companies, such as NBC and CBS, makes the figure appear to average about 20 persons per station?

That a new "shoe button" tube, smaller than the "Peanut tube" of years ago, has been developed for experimental ultra-short-wave work in the Radiotron Research Laboratory?

That the "problem" respecting radio-equipped automobiles, especially police cars traveling at high speed over bumpy roads, has not caused concern among the better tube and set manufacturers, who already have made sturdiness a part of their production requirements?

—And the Pursuit of Happiness

That a European court recently held that radio "has become such a normal necessity of life that it has to be regarded just as essential as electric light"?

That there is a unique feature in connection with R. C. A. Institutes Home Study courses in that every graduate is offered without charge an intensive practical training period with modern equipment?

That the Superintendent of the New York school of R. C. A. Institutes, William F. Aufenanger, is a graduate of that institution, having taken a course eighteen years ago? Since then Mr. Aufenanger made his mark with International Radio, Marconi and R. C. A. in various fields which eventually led to his becoming Superintendent of the Radiomarine Corporation's Eastern Marine Division, a post he had been successfully holding when the call came to take over the leadership of the school.

That three vessels of the Baltimore Mail Steamship Company, engaged in trans-Atlantic service out of Baltimore, are now equipped with combination short and intermediate wave transmitters of the latest type supplied by the Radiomarine Corporation of America?

That the messages sent and received by R.C.A. Communications, Inc., over its radio circuits travel in a single day approximately 26,500,000 miles, equivalent to 1065 times around the world?

That, knowing the speed of radio, light and sound waves, it is interesting to learn of the Japanese estimate which sets the speed of a water wave at 450 miles per hour?

(Continued on Page 15)

13,000 Feet Above the Sea

By F. MULLER, Export Sales Engineer, RCA Victor Co., Inc.

F. MULLER,
RCA VICTOR CO.

TO THE far flung network of RCA radio installations in all parts of the world, another has been added. RCA Telephone and Telegraph Transmitters, from the humble 200 watter up to the pretentious and costly high power stations, are daily performing their part in local, national and international communication systems. They are to be found in Central and South America, in Europe and in Asia, and they are doing their share in conveying messages to their destination with speed and accuracy.

R C A Broadcast Transmitters, while not as numerous, are equally well distributed over the globe. We have, for instance, already told you about the two recent 50 kilowatt installations in Milan and Rome, Italy, and the 5 kilowatt Transmitter in Caracas, Venezuela.

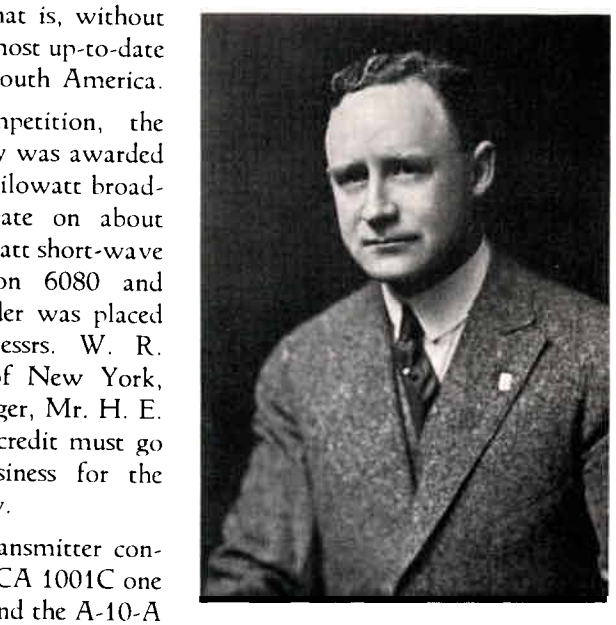
We now take pleasure in reporting another successfully completed station in South America.

La Paz, the capitol of Bolivia, is located high in the Andes range, some 12,000 feet above sea level. About a year ago, a patriotic organization, whose name translated into English might be "The Council of National Defense and Propaganda," subscribed enough funds to provide their country with what is, without a doubt, the best and most up-to-date radio installation in South America.

Against keen competition, the RCA Victor Company was awarded the contract for a 10 kilowatt broadcast station, to operate on about 600 k.c. and a 1 kilowatt short-wave station to operate on 6080 and 15,300 k.c. This order was placed with us through Messrs. W. R. Grace & Company of New York, to whose genial manager, Mr. H. E. Metcalf, most of the credit must go for securing this business for the RCA Victor Company.

The 10 kilowatt transmitter consists of the standard RCA 1001C one kilowatt exciter unit and the A-10-A ten kilowatt amplifier. This equipment is practically a duplicate of the WWL installation in New Orleans. For the one kilowatt set we furnished our ET-3656A short-wave transmitter with a suitable modulator. Similar equipment is used in this country by the Columbia System.

La Paz is located in a large and deep hollow—not at all suited for the location of the transmitters. A station site was chosen on the surrounding plateau—13,000 feet above the sea. Here the transmitter building, the tuning house and four antenna towers were erected. Figure 1 shows the general layout of buildings and towers. The tower at the left is 115 feet high. Behind it are two 300 foot masts and at the extreme right is the small 66 foot mast. The 115 and 300 foot towers



H. E. METCALF, MANAGER
W. R. GRACE & CO.

FIGURE 1—THE RADIO TOWERS, AND A TRAIN LOAD OF MATERIALS COMING UP ON THE RAILWAY LINE OVER THE ANDES MOUNTAINS. THE HIGHEST PEAK IN THE "EL CORDILLERA REAL" RANGE IS CALLED "ILLUMANI," 22,000 FEET ELEVATION, AND LOOMS SNOW-CAPPED JUST BEYOND THE LOCOMOTIVE

FIGURE 3—THE 10 KW RCA VICTOR TRANSMITTER STATION **CP3**

are of the self-supporting Milliken type, built by the Blaw Knox Company. The smallest one was constructed locally—mostly of some left-over rails. We might say here that the erection of these 300 foot towers was the first job of this size ever tackled in Bolivia. At the right is also a freight train bringing up materials and commissary supplies. The snow-capped Andes range provides a very effective setting for this new installation.

Figure 2 shows some of the large crates being unloaded, and in Figure 3, the 10 kilowatt set is shown. Figure 4 shows the big frequency converter which provides 60 cycle current from the 50 cycle power line. Filament motor generator and switching panel are also shown. In Figure 5 we see the antenna tuning house. The foreground shows places left by the digging of the trenches for the grounding system. Normally, the ground wires are buried about 18 inches below the surface, but in La Paz the ground was stony and rather dry during their dry season, and this necessitated laying the ground system more than three feet below the surface. Figures 5, 6 and 7 show the transmitter building and antenna masts in the process of construction.

According to Mr. L. C. Simpson, the engineer in charge of the entire installation, the whole job went along smoothly, although a bit slowly. He had some trouble, however, due to the rarity of the atmosphere. After being himself laid up with mountain sickness when he first got there, he found later that the rare atmosphere had some peculiar effects on the transmitter.

FIGURE 2—UNPACKING EQUIPMENT FROM "RADIO HEADQUARTERS" AT NEWLY BUILT LA PAZ RADIO STATION, IN BOLIVIA.

FIGURE 5—PROGRESS VIEW AT STATION **CP3** AND **CP4**, LA PAZ.

The atmospheric pressure at sea level is 760 millimeters of mercury, but at the location of the transmitter, it is only 340 millimeters. This reduced pressure caused some very peculiar effects. One of the first that was noticed was rather severe arcing in various parts of the 10 kilowatt set, operating at high potentials. Where a spacing of one inch was sufficient at sea level to prevent arcs at 12,000 volts, at an elevation of 13,000

feet, this spacing was no longer sufficient and had to be increased to two and in some cases as much as three inches to prevent flash-overs. Other parts had to be thickly wrapped with insulating material to prevent corona which was prominent before additional insulation was applied.

At 13,000 feet, the water boils at 170° fahrenheit, as against 212° fahrenheit at sea level. This phenomena introduced some difficulties in the cooling system which have since been removed by speeding up the blower motors and by increasing the flow of the cooling water.

Quite evidently Mr. Simpson, the engineer on the job, had some unforseen difficulties to contend with, but

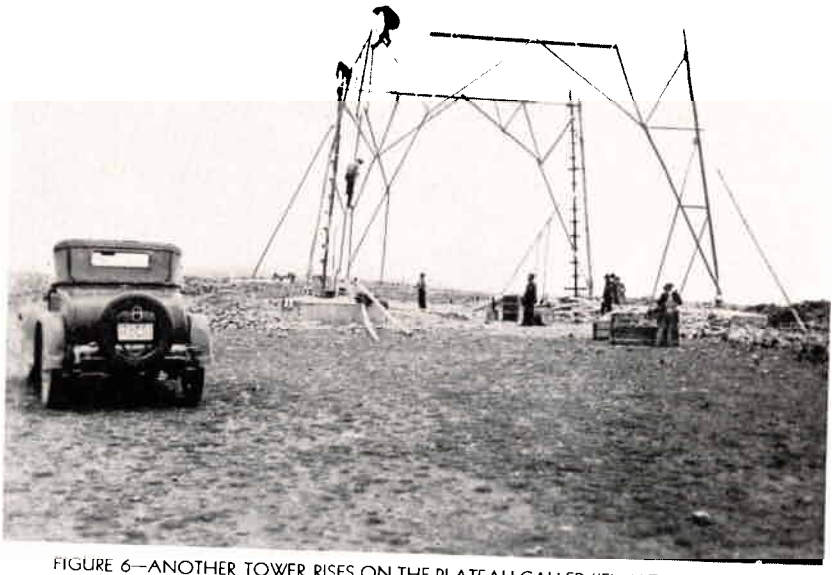


FIGURE 6—ANOTHER TOWER RISES ON THE PLATEAU CALLED "EL ALTO PLANO".—THE HIGH PLAIN.

FIGURE 7—A "DOG HOUSE" IN THE SKY, WITH THE FAMED "ILLUMANI" IN THE BACKGROUND

we are glad to report that both the 10 kilowatt and the 1 kilowatt short-wave stations are operating in fineshape.

The new installation is the most powerful and most modern one in the entire South American Continent. True, there are some other stations rated at 10 kilowatts, but to our knowledge they do not feature such RCA standards as:

Precision frequency control.
Practically flat audio frequency response from 30 to 10,000 cycles.
Full 100 per cent modulation.
Full output of 10 and 1 kilowatts respectively (Unmodulated carrier power into antenna).
Automatic interlocks.
Safety protection for equipment and personnel.
Front of panel metering and adjustments.
Complete monitoring.
Simplicity and ease of operation.

From reports received from Bolivia, the 10 kilowatt transmitter operating on about 500 meters appears to cover most of Bolivia with a very good signal. The 1 kilowatt short-wave transmitter has been heard in the far corners of the South American continent and has been reported from North America and Europe.

Quite recently the National Defense Council has turned over these two stations to the newly founded Companhia Radio de Boliviano, who now own and operate the equipment.

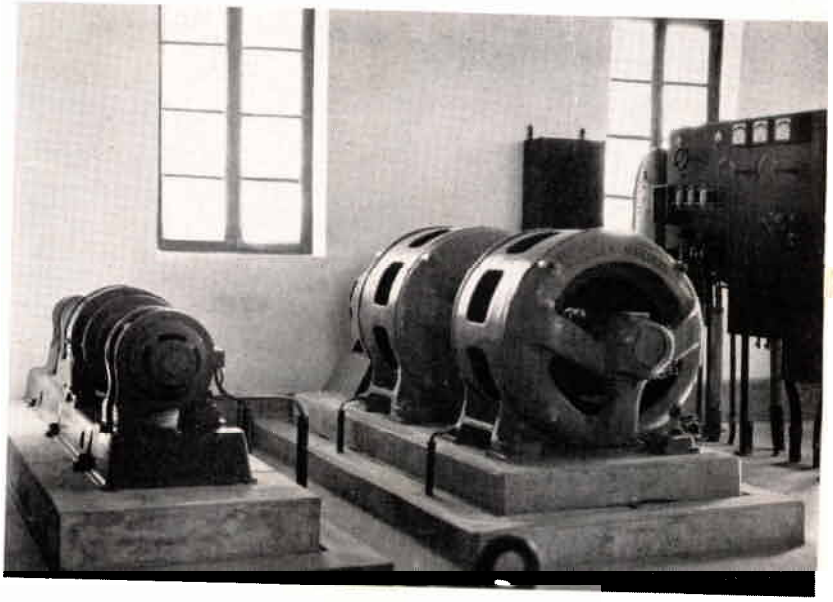


FIGURE 4—THE FREQUENCY CONVERTER

DID YOU KNOW?

(Continued from Page 11)

That station KSO at Des Moines is said to have the largest telephone switchboard in the state of Iowa?

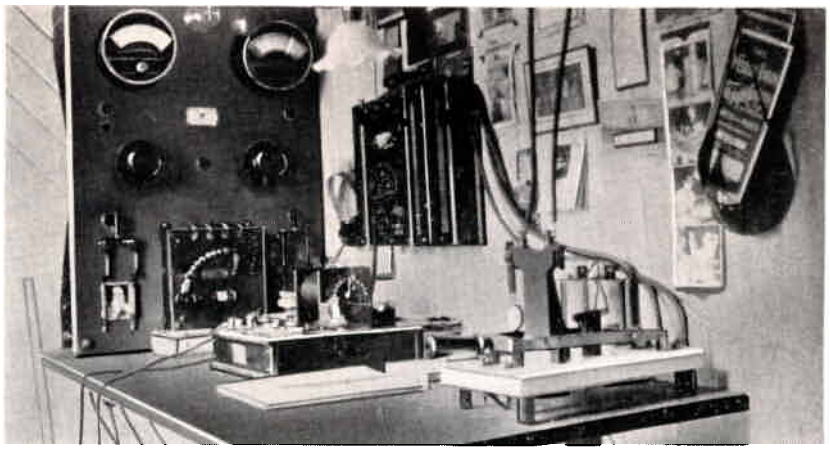
That Thomas M. Stevens, General Superintendent of Radiomarine Corporation at San Francisco, remarked that he knew everything that has appeared on these pages of the past few issues—but just didn't happen to think of them? Here is something he did not know: When they presented that clock to him upon his leaving New York, there was a wrangle over its inscription. A numeral was decided upon after the rejection of "TR," meaning "Time Rush," and "OS," which is a time report. "23" was cast aside, as was "30", meaning "The end." "19," which "requires no acknowledgement," did not fit, nor did "31" because, not being an electric clock, it had no conductor, "9," which means "Give away—rush" was passed up and so also was "1," the old symbol for "Wait a minute' "88" an affectionate amateur term' was not brought up and George Clark was not in the picture, so there were no others, except "73," which was decided upon, and so engraved on the clock, although Mr. Stevens knows he has the best wishes of all. Perhaps by this time he thinks that a more appropriate inscription for the clock would have been the numeral "4," which means "Start Me." "13? TMS"—and this means: "You understand it all, don't you, Mr. Stevens?"

That in the new numbering system for radio tubes—such as 2A3—the first number indicates the filament or heater voltage, the middle letter the tube designation, and the final digit the number of usable elements with external connections?

That one day's supply of coal at the RCA Victor plant—180 tons—would last the average family home twenty-five years?

That the use of more than one speaker on a radio receiver does not noticably increase the current consumption?

(Continued on Page 32)



The Wonders of Wireless

WE are grateful to C. H. Stoup, an ex-ship operator, now chief engineer of Station WIL, St. Louis, Missouri, for contributing the above photograph, taken in 1912.

C. H. STOUP, WIL

Old timers will probably experience a glow of mellow reminiscence upon inspecting this picture closely. Here is a typical sea-going "United Wireless" installation, with slate switchboard at the left, sporting the conventional voltmeter, ammeter, field rheostats and manual starting box for the motor-generator. On the bulkhead at the center of the picture may be seen a good old "Type D" single-slide and double-slide tuner—probably used as antenna loading for the more *modern* loose coupler receiving set (inductive tuner) below it on the table, which boasts the latest "Perikon" detector. At the right on the table is the send-receive transfer switch with two leads running up to the anchor gap and the "loop" aerial. In those days, a "loop" aerial was a wire which started out of the shack and made a complete loop of the distance between the masts, and returned to the wireless shack, the two down leads being insulated from each other for receiving purposes. For sending, an "anchor gap" permitted the energy from the transmitter to arc across into both down leads simultaneously.

Somewhere in this shack, although beyond the range of the camera, there must be a 2 KW "coffin" transformer, of the open core variety, as well as a rack of good old copper-plated glass "leyden jars" surmounted by a helix within which the formidable sounding stationary spark-gap barked forth its messages, to the consternation of the passengers.

Which reminds us of the days when we, too, were pounding brass aboard ship—and a sweet young thing, after spending several brave hours listening to our "line" and beholding our performance, approached the Captain and inquired, "How long do *you* have to serve before you too can become a *Wireless Operator?*" . . . After which we were warned by the Captain to tell the passengers *nothing* about our pesky wireless gadgets.

Operation and Maintenance of a Modern Radio Station

By D. M. STANIER, Chief Engineer—WBZ, Radio Broadcasting Dept., Westinghouse Electric & Manufacturing Co.

The accompanying article is based on the author's acquaintance with the RCA Type 50-B 50 KW transmitter, now in operation at Station W B Z.

WHEN a radio transmitter has been completely installed, tested, and turned over to the operating personnel, the very important subject of station maintenance comes to the fore. Any breaks in program or periods "off the air" prove costly and detract from the popularity of the station. In addition, a large sum of money has been spent for the apparatus and it is usually a costly matter to replace equipment ruined by improper operation or lack of attention. Careful attention to the station maintenance is therefore a necessity and a major problem. It is the purpose of this paper to call attention, briefly, to some of the more important points of maintenance.

A good check on the performance of the transmitter is a primary consideration. This check may usually be obtained by the proper use of a station meter reading chart, and for each hour and day we have an accurate record to which we may refer for information. Practical experience shows that a large percentage of tube failures and circuit breakdowns will make themselves apparent for a time before the transmitter actually goes off the air. In these cases the periodic meter readings will call attention to the trouble which may otherwise escape notice. A good practical method is to have mimeographed or printed forms made up so that they may be carried easily, or clamped to a small board. These forms should list every meter in the station together with the water flow and temperature. Readings should be made every hour and an inspection made every half hour at the time for the readings of frequency and power which are required by the Federal Radio Commission. Any change in these readings, for which a good reason is not evident, probably means trouble which must be corrected. The saying "Forewarned is Forearmed" is most certainly true in this case since when the trouble is centralized before the break occurs, tools and spare equipment may be at hand and valuable minutes may be saved. The addition of a space on the reading sheets for comments, if desired, will be found helpful to the station engineer, as small items are sometimes forgotten. The forms, when completed, may be filed for future reference.

- 3 -

STATION LOG - WBZ (Cont'd)

PANEL E

	Line Voltage			Line Current			Line	P.A.	Ant.	P.A.		Main Rectifier			Water	
Time	1	2	3	1	2	3	KW	Ef	I	Bias		Ef	I	E	In	Out

The graphic meters furnished with the transmitter are also of importance as they produce charts showing continuous readings. Times and duration of off air periods are accurately shown on the charts, and the operation of the transmitter by the personnel is also checked. To be of the greatest value, the graphic meters should be wound regularly, charts inspected, and pens filled if necessary. The charts should also be set for time, and dated each morning so that when the charts have been filed away, they may still be used as an excellent source of information.

Another item of importance is the station rough log. This is merely a book of the "record" type, in which the operators may maintain a continuous log of the station alone. Ideas, requests, notations, records of work done, new adjustments, and the like, should be entered in this book. This form of log is usually entirely technical and has nothing to do with the regular official station log, and is therefore more valuable to the engineer in charge, and to the operators.

One of the more common causes of breaks on the air is the failure of tubes, so a spare tube of each type used in the transmitter should be instantly available for replacement. A neat rack for tubes on the wall near the transmitter fulfills this requirement. When a tube has become defective the operator should not have to spend time looking up tube numbers and selecting a good one, and tubes known to be operative in every respect should be the only ones ever placed in this rack. As soon as a new tube is received, it should be thoroughly examined and tested for filament continuity

RO-106 Radio Broadcasting Dept. Tube Record

Radio Station_____ Month of_____ 19____

Type & Serial	Purch. Order	Date Rec'd	Spare or Service	Date In	Date Out	Total Previous Hours	Hours This Month	Grand Total Hours	Cause of Failure	Replaced by	R.M. Tag	Net Cost per Hour

and vacuum, in which case a violet ray generator may be used for determining, roughly, the hardness of the tube. Blue glow in any type of hard tube denotes gas. Finally the tube should be placed in actual operation in the transmitter for at least one hour and if the tube operates satisfactorily it may be assumed fit to be placed in the spare rack. Of course more than one tube of each type should be kept on hand and after these tubes have been tested they should be stored in operating position on racks in a cabinet or vault. When a tube from the spare rack has been used, a new one should be placed there as soon as possible. Defective tubes, not destroyed, should be plainly tagged as such so as to prevent any possible confusion.

Cleaning Tubes

New tubes and spare tubes do not represent the only consideration in tube maintenance, for the tubes actually in use must be kept clean, not only for good appearance but for better insulation. The anodes of the water cooled tubes also require cleaning and the tubes should be removed from the water jackets approximately once each month and the anodes cleaned by scraping or sandpapering. This will also preclude the possibility of a tube sticking in the jacket when it is desired to make a quick tube change. As long as reasonable care is taken, there is little probability of breakage or other damage. Spare gaskets should always be near at hand to be used, if necessary, when tubes are to be changed.

The weekly reversal of tube filament connections when D.C. filament power is used will be found to be an advantage as the life of the filaments will be prolonged. The filament connections should also be checked for clean surfaces and good tight connections at the time of the reversal. If a space in the daily log is allotted for a notation of the filament position, a periodic reversal will be assured. The filament voltmeters should be checked monthly with a standard meter to certify the filament voltage. If automatic filament voltage regulating equipment is provided, the regular attention to the bus voltage should not be relaxed. As with all mechanical equipment, there is always a possibility of defective operation and tube burnout.

It is always desirable to know the exact life of the tubes used in the transmitter and here a tube record chart may be used. The chart should cover one month and should show the tube style and serial number, date in service, date out of service, hours of life, and any necessary comments. The daily hour life may be conveniently obtained by readings of the hour meters furnished with the transmitter. Also, there are special meters available now which connect directly to the filament terminals.

The subject of vacuum tubes leads us to consider the cooling system for the water cooled tubes, and this is one of the units of the transmitter which must be watched carefully. Clogging of water lines, leaks, or almost any cooling system trouble means a fairly long period off the air, which is a costly matter. The kind of water to be used is usually determined before the transmitter is installed and once decided upon usually does not represent any real problem of maintenance. If analysis of the local water supply shows that the conductivity lies within a safe range, which is given by the transmitter manufacturers, it may be used in the cooling system. If the analysis of the water shows it to be unsatisfactory, then distilled water must be used, but in any case there must be a frequent check on the water actually in use. The hose insulated water columns used on some transmitters allow considerable leeway in water conductivity so that it is possible to use the same water over a fairly long period of time.

Checking Conductivity

A comparative check of conductivity can be made easily by connecting a 250 milliampere meter in series with the high voltage supply to the unit to be measured. By disconnecting one filament lead of each water cooled tube in the unit, and applying the plate voltage, the leakage current through the water columns may be read. A reading of new water may be used as a standard. This is of course only a rough check but will be found useful. When the conductivity becomes too great, or the water appears rusty colored, the water should be changed, and the reserve tank cleaned and flushed out. Excessive conductivity hastens the process of electrolysis of the brass pipe connections to the hose, and in addition to the wearing away of the connections, a hard substance is formed which causes plugging at these points. If the brass connections are well leaded where they fit inside

(Continued on Page 22)

KPO Goes To 50-KW

By RAYMOND F. GUY, Radio Facilities Engineer—NBC

STATION KPO, the West Coast veteran of the National Broadcasting Company, in the not distant past left the 5-KW ranks and became the first NBC operated station to go to 50-KW in the far west, and the fifth to use RCA Victor 50-B transmitters. Originally a San Francisco 5-KW station located on Hales Brothers Store, KPO now performs its daily functions near Belmont, California, approximately 17 miles along San Francisco Bay toward Palo Alto.

RAYMOND F. GUY, NBC

The new site, behind dikes, is almost ideal for the purpose. But a few hundred feet from the bay and actually below high tide level, clear on all sides for three miles of flat lands, and with a direct send off to San Francisco and all important environs, transmission is excellent. For many miles in three directions the attenuation is so low that it approaches an inverse distance signal, due to the salt water, which introduces the lowest transmission losses of any medium over which radio waves pass. This happy circumstance represents one of the brighter sides of life.

A. H. SAXTON, DIVISION ENGINEER OF NBC's WESTERN DIVISION, SHOWS **HELEN MUSSELMAN,** PRETTY BLONDE SINGER AND ACTRESS, ONE OF THE LARGEST TUBES IN THE NEW **KPO** TRANSMITTER

The transmitter building is a new NBC type, designed for KPO and all future 50-B transmitter installations, including KOA, Denver, construction of which is now under way. It is referred to as a "standard building," but may be modified in an architectural sense to harmonize with the surroundings in different locations. Excavated basements, generally used, have been dispensed with for better lighting, lower cost and to eliminate drainage requirements which under some conditions can be troublesome. The lower floor contains garages, rotating and general power machinery, batteries, storage space, heating plant, water cooling system for the 862 and 863 amplifier stages, and a kitchen. The upper floor contains the transmitter proper, control room, office, shop, storage space, locker-room, and an additional room which can be used for sleeping quarters or storage.

The building is of reinforced concrete and is fireproof throughout. The oil filled transformers and reactors are mounted in fire-proof vaults with oil scuppers. The building rests on approximately 90 heavy wooden piles which were necessary due to the character of the ground, which is filled in.

The spraypond-heat interchanger cooling system is used for the transmitter cooling system, although a standard outdoor radiator and blower is provided and may be used as desired by manipulating a few valves and switches. Generous cooling capacity is built into the systems

JOSEPH W. BAKER, OPERATIONS SUPERVISOR OF NBC's WESTERN DIVISION, COMPARING LARGEST CONDENSER IN **KPO** TRANSMITTER WITH THE SMALL ONE HE HOLDS IN HIS HANDS—ALL FOR THE BENEFIT OF **RITA LANE, ANN CHASE,** AND **HELEN MUSSELMAN,** THREE OF NBC's LOVELY STARS

which is automatic in operation to keep the jacket water temperature in predetermined limits. Wide changes in ambient temperature produce negligible changes in the 15,000 gallons of pond water, and by the same token, very small variations of distilled jacket water temperatures are obtained.

As at all NBC 50-B transmitters, the graphic recording meters were removed from their usual position in the power panel and mounted on one of the adjacent steel panels forming part of the circular transmitter layout. The quartz crystal oscillator circuits are so arranged that both crystals may be oscillated continuously, so that in the event of forced changeover, the spare is at a stable temperature, including the small amount of heat generated in the crystal itself through its operating losses.

An emergency antenna of simple construction is provided so that in the event of failure of either the tuning house apparatus, main antenna, or transmission line, operation may be continued with about 70% normal field strength. The emergency antenna was made slightly less than 90 degrees in length so that no series condenser would be required. Changeover is made by means of switches which make it possible to couple the 5-KW stage into the main antenna or the 50-KW amplifier, or the 50-KW amplifier into either antenna. Such changes may be made in a few seconds.

A clear view of the transmitter and its associated operating desk is possible from either the control room or office through double glass windows. Duplicate volume indicator meters, loudspeakers, and synchronous clocks are provided in the control room, office, and on the transmitter control desk.

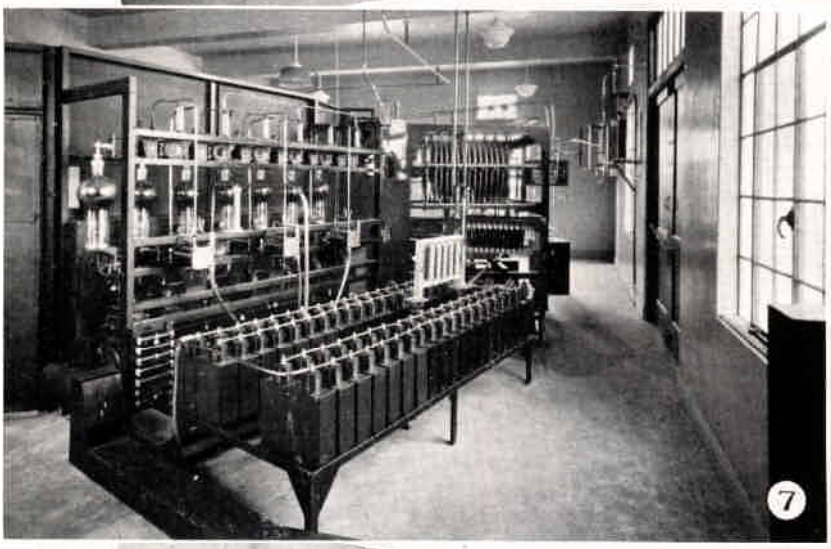
The antenna tuning house is equipped with fireproof units, with a very large factor of safety against arcover, and the tuning house and transmitter desk are connected by a simple telephone system for use during adjustment periods. The towers are mounted on connected concrete foundations designed to withstand earthquake shock. A well-known rock fault passes the station roughly ten miles away on the opposite side of the bay.

The frequency response characteristic is very uniform and is similar to previously published data on the 50-B transmitter. The reduction of distortion products and carrier noise has been carried considerably further than is ordinarily considered satisfactory, however. Spurious radiations of harmonic frequencies have been reduced to values much below the requirements, and beyond the second harmonic are in general too low to conveniently measure.

Fortunately, the San Francisco area is so laid out that at the new site exceptionally uniform coverage is obtained with no so-called "dead-spots" which actually are presumed to mean field strength "islands" and "shadows" caused by obstructions of one form or another, or interference patterns caused by waves arriving via two paths and, through phase differences, producing reductions in amplitude.

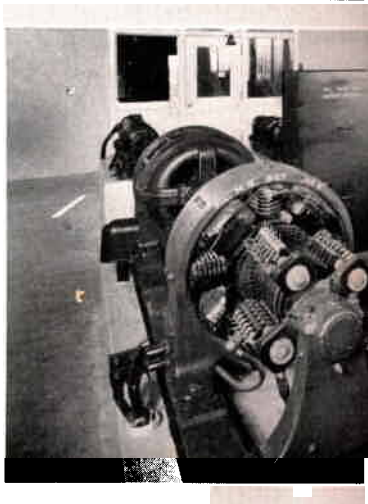
The transmitter needs little introduction to readers of these pages. Duplicate quartz crystals excite two UX-865 screen grid amplifiers which in turn excite a UV-860 screen grid amplifier. The output of this stage saturates the grid of the modulated UV-849 amplifier which is followed by the UV-863 balanced Class "B" amplifier, and the UV-862 balanced Class "B" amplifier. The audio-frequency system consists of the low power control room units, followed by two UV-211 stages and the UV-849 modulators, two in parallel. High voltage is obtainable from a UV-857—6 tube rectifier.

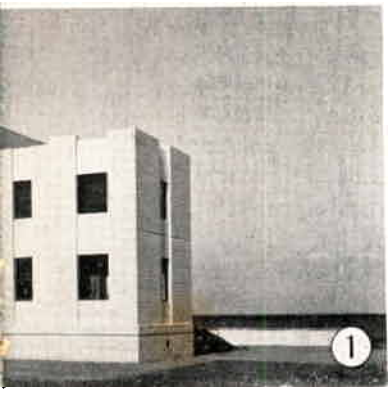
(Continued on Page 24—other Pictures on Pages 90 & 91)



VIEWS IN

1. **KPO** MAIN TRANSMITTER BUILDI
ADOPTED BY NBC.
2. REAR VIEW MAIN TRANSMITTER BU
P. G. & E. COMPANY POWER EQUIP
3. DUPLICATE PUMP EQUIPMENT AN
CALIFORNIA. IN THE BACKGRO
FACTURING DISTILLED WATER USED
4. ROTATING POWER EQUIPMENT. I
GROUND COLUMN LEADING TO
5. ROTATING POWER EQUIPMENT. 6
7. REAR VIEW OF MAIN 50,000-VOL
9. C



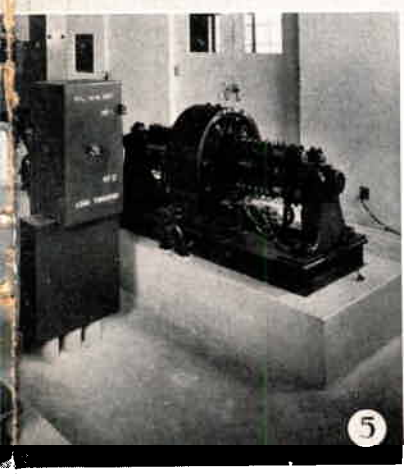


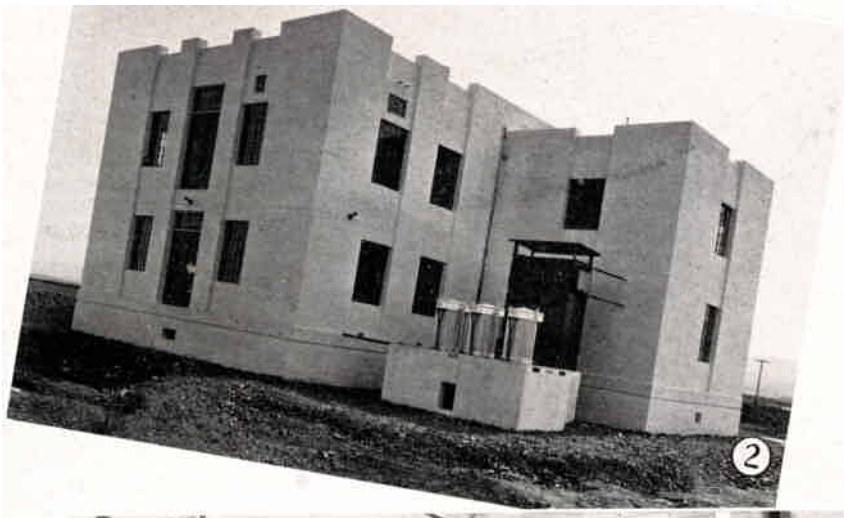
ABOUT KPO

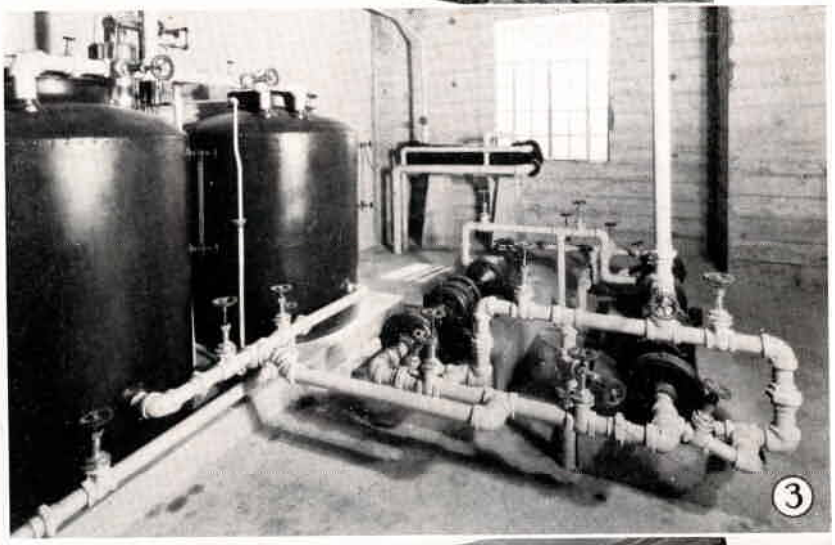
FIRST OF A "STANDARDIZED" DESIGN

SHOWING WATER COOLING TOWER AND

STORAGE TANKS AT **KPO**, BELMONT, FT, IS THE DISTILLING PLANT FOR MANU- LING TUBES.
BACKGROUND IS SHOWN THE STATION OND FLOOR.
ATE PUMP EQUIPMENT AND SWITCH RACK.
R UNIT. **8.** MAIN TRANSMITTER ROOM. ROOM.







OPERATION AND MAINTENANCE

(Continued from Page 17)

the water hose, these effects are greatly reduced and inspections need not be made so frequently. However, even with a good water supply and leaded connections, all hoses and connections should be removed for cleaning and inspection every four months, but this inspection should be made oftener at first to make sure of the proper length of time. Particular attention should be paid to the hoses and they should be replaced immediately if any fault is observed. It is always a good plan to have several hose splicing connections on hand in case of a break in the hose. If not already installed, some form of direct reading flow meter is a desirable addition, and a slow plugging of the water piping or hoses will make itself known in time for the trouble to be remedied.

Checking Thermo Devices

The inlet and outlet contact-making thermometers should also be checked at the regular inspection time with the remainder of the cooling system. They should be checked for correct readings and operation in shutting down the filament supply in case of water trouble, and the entire protective relay circuit should be tested frequently for satisfactory operation.

The mechanical upkeep of transmitter equipment represents a large portion of the station maintenance, and of this part, the rotating equipment is most important. Bearings, commutators, and brushes all deserve special consideration. Most failures in equipment of this sort are due entirely to lack of attention, and could be prevented by a thorough periodic inspection. Motor generator sets of the ball bearing type need only an occasional greasing. This very fact is responsible for improper care in many instances, as the greasing is so infrequent that it is sometimes carelessly forgotten. Sometimes this fact is so impressed on the mind of the maintenance man that he greases the machine too often, just to make sure. The excess grease works through to the commutator and brushes and may also leak to the floor or machine mounting. When the grease gets to the commutator, a poor contact is obtained which causes fluctuations in output. Frequently the brushes become gummy in the brush holders and are not free to ride on the commutator. These points are especially true of the exciters for the bias and filament generators, but there is no excuse for such happenings if the maintenance work is done well and by an experienced man.

It has been found, over a considerable period of time, that a little grease once each month is adequate, and it would be helpful if, once each year, the bearing covers were removed and the bearings cleaned with gasoline and repacked. This is because, after a long period of time, the grease tends to harden around the caps, preventing easy access to the grease as it is put into the well.

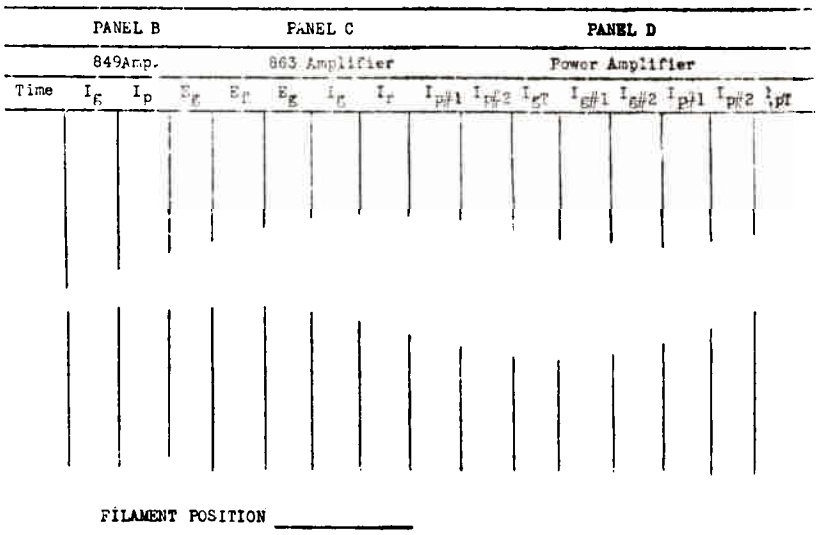
Most of the other bearings in the standard equipment are oil bearings and need no attention other than a twice a month inspection, filling the oil reservoirs, as needed, with a good grade of oil.

All switches in the station should occasionally be greased lightly with vaseline and all connections checked at the same time. A yearly inspection of oil in transformers and oil circuit breakers may prevent serious troubles in this equipment.

An item of maintenance rarely considered, is the careful inspection of all connections, including terminal blocks. It is most surprising how quickly screw connections will loosen due to vibration, even though they are provided with lock washers. Periods off the air caused by loose connections in the control or other circuits are apt to be long, for the trouble is one of the very hardest to find. If each connection is actually checked by trying a screwdriver or wrench every six months, trouble will probably never occur. Control circuits will not give trouble if proper care is taken. All relays in the station should have their contacts cleaned and be tested for free operation once each month. Time delay relays should be checked for proper timing and each overload relay checked for its operating value of current. Several dry cells, an ammeter, and a rheostat are all that are needed to make the test and tubes or other expensive equipment will be adequately protected if these relays are operating properly. It sometimes seems a waste of time working on these relays since they operate so seldom, but this is where the real danger lies. A relay may stick at the one time it is vitally necessary, ruining costly equipment. The time spent on this item is most certainly worth the while.

An inspection of extra fuses at the same time will be of great help in

STATION LOG - WBZ (Cont'd)



case of a burnout during an operating period. If a complete new set of spare fuses is placed in each fused switchbox, considerable time will be saved, and a small lamp bulb in a weatherproof socket placed near the fuse and switch boxes will be helpful in case of trouble when it is desired to check for voltages at the switches.

Storage Batteries

The station storage cells should be regularly tested for correct voltage of the individual cells while working under full load. They should be kept filled with distilled water so that it is always up to the level specified by the cell manufacturer, and the cells should always be kept clean. The terminals should be covered by a thin coating of vaseline to prevent corrosion. A floating charge, a little greater than the discharge, is usually recommended by the manufacturers for maximum life of the cells. If this is not possible, the cells should be fully charged before each run.

Another very important item of station maintenance is that of proper care of the station audio equipment. First of all, this equipment should be kept very clean by dusting the outer parts and directing a blast of air to the parts which are not accessible for dusting by hand. A small blower is very satisfactory as only a weak blast of air should be used so as not to disturb the wiring. A unit of a home vacuum cleaner with the dust bag removed and the direction of the air blast reversed will make a good blower. Lacking this, a small bellows may be used but it is usually more practical to obtain a good blower since one should be had for cleaning the rotating equipment.

The plate currents, voltages, and bias voltages of all the tubes used should be measured daily and should always be kept at the rated values. The tubes used should be carefully tested once each week by any good means of testing already in use at the station. The bias batteries should also be tested once a week by measuring the voltage with a meter whose resistance is about 100 ohms per volt. Using a higher resistance meter may not give correct information on the condition of the battery since the load may not be great enough. A lower resistance meter may be used but may appreciably shorten the life of the battery. Bias batteries should be replaced at the first sign of less than rated voltage, because batteries whose voltage is lower than normal are often the cause of noisy amplifiers. The base

placed in each DC filament lead will aid materially in reducing noise from this source. As mentioned before, the generator should be kept very clean, and the commutators should be sufficiently undercut and smooth. A hand stone is convenient for smoothing down the commutator but for cleaning, some number 00 sandpaper may be used. The use of commutator dressing compounds is usually not recommended by the manufacturers.

WESTINGHOUSE RADIO STATIONS

Sheet #_____ Date _____

Carrier On _____ Off _____ Carrier On _____ Off _____

Program Starts _____ Ends _____ Program Starts _____ Ends _____

Time	Plate Current Last Stage	Plate Voltage Last Stage	Antenna Current	Frequency Check	Temperature Xtal Box

Operator _____ Operator _____

On Duty _____ Off Duty _____ On Duty _____ Off Duty _____

Note - On reverse side of this sheet make an entry of every interruption to carrier wave giving cause and duration.

pins of the tubes used and the socket contacts should also be kept very clean. Dirty contacts are also a cause of considerable noise, cutoffs, and poor frequency characteristics. All patch cord plugs should be burnished weekly with a good grade of burnishing compound, and occasionally the normals of the panel jacks should be cleaned, as well as the contacts of any line relays which may be in use. Protector carbons for the incoming telephone lines should be inspected frequently and cleaned when necessary.

While mentioning causes of audio noise from station equipment, we must not neglect the audio noises caused by poor commutation of the various generators. To be at all satisfactory, the noise level as measured at the output of the transmitter should be 40 db. or more below the program level. Chokes

In mentioning the above items, considerable has been said about cleanliness of various portions of the transmitting equipment, and it is equally important for the entire station. High voltage insulators are made to a certain size because they are fully needed and any coating of dust has the effect of increasing the leakage of the insulator. All insulators must be kept spotlessly clean. Some of the equipment, such as a copper bus, or feeders, should be polished well to add to the appearance of the station. The various frames should be blown out with air and then dusted. The glass covers for meters can ruin the appearance of the installation if they are dirty. In general, it is necessary to make a complete clean-up once a week, polishing all bright metal parts. When the black portions of the transmitter become

dingy, they should be repainted. A good kind of paint which may be used is a form of enamel which is sold under the trade-name of "black locomotive enamel." The paint produces a gloss black which is very hard and not affected by cleaning or dusting.

Routine Important

If the above-mentioned points are made a part of careful routine maintenance, no failures from the maintenance standpoint should be experienced. However, it is necessary to have a competent operating staff to take full advantage of this, and be able to minimize any periods off air, or to prevent some of these breaks. The operators should have a good knowledge of the equipment, and the theory of their type of transmitter. In many cases of failure of some part of the transmitter, other equipment may be substituted temporarily until repairs can be made. Only a real knowledge of the theory of the transmitter will enable an operator to do this. Each operator should be perfectly familiar with all connections and wiring, in addition to the values of resistance, capacity, inductance, etc., in use at any part of the transmitter. In all fairness to the operators, the engineer when making any circuit changes should furnish the operators with the full information so that they may have a complete understanding of the equipment at all times. Since troubles so seldom occur, and so many different problems arise when these breaks do occur, it is most necessary to review the effect which would be produced if certain parts of the equipment were to fail. By going over the transmitter, a small section at a time, and visualizing the effects shown in case of artificial trouble, a shorter time will elapse before returning to normal operation after real trouble has occurred. Blueprints covering the entire equipment should be instantly available in case of need, and a complete stock of replacement parts which are thought needed should be kept on hand.

Safety First

A number of grounding rods are a necessity for protection when working on the transmitter. These rods may easily be made by using three foot lengths of some good insulating material and having a brass or copper hook fastened to one end. Attached to this hook is six or eight feet of small brass chain. The unattached end of the chain should have a clip so that it can be fastened to some grounded point. If the chain is grounded and the hook hung on the apparatus in question, after all disconnects and switches have been opened, the operator has complete assurance that the equipment is dead. The ground rod in use is also a protection for the workman in case of the equipment being energized by some other person.

The use of a "rough log" book assures proper maintenance if the duty assigned for a certain time is performed, entered in the log, and signed for by the man who has done the work. This method gives a complete and continuous record of maintenance, comments, and general operation. Proper maintenance requires that there be a continuous watch at the transmitting station since the equipment cannot be reached while the station is operating. It is the usual practice to have a man who works on maintenance alone but who has a license for the operation of the station if necessary. Only a good, careful workman should be employed as his work constitutes the mainstay of the station.

This review of the station maintenance problems has only briefly touched on the various subjects which may represent considerably more work than is indicated. Following these suggestions will, at least, aid in setting up a permanent maintenance schedule, operating to the advantage of both station engineer and owner.

STATION LOG - WRZ (Cont'd)

TUBE HOURS		
	TRANS.	RECT.
START		
FINISH		

TIME	REMARKS

KPO GOES "50-KW"

(Continued from Page 19)

The UV-857 tubes are kept at the proper temperature by means of a blower system which may be adjusted during program periods from the front of the transmitter.

A and B batteries for the control room apparatus operate in conjunction with a floating system, the background noise introduced being so low that it cannot be measured with the apparatus ordinarily used for such purposes.

DICK LEIBERT

Dick Leibert, Radio City Music Hall organist, proudly recalls that while he was organ soloist at Loew's Palace, in Washington, one of his most ardent fans was Mrs. Calvin Coolidge. He was engaged from time to time to direct numerous programs at the White House during the Coolidge regime.

Leading A Dog's Life
—At The World's Fair

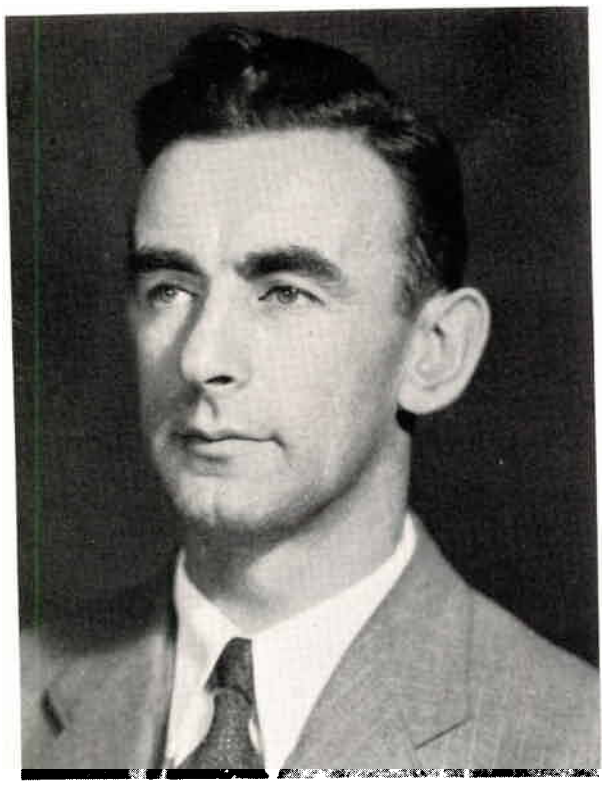
NIPPER, who posed for the original "His Master's Voice" portrait gazing into the tin horn of the early Victrola, is generally conceded to be the most widely known advertising subject in the world. He has been reproduced in many forms, from little salt and pepper shakers for the breakfast table to the mammoth replica at the World's Fair, shown in the picture herewith.

The countless thousands of people who visited the RCA Hall in the Century of Progress will no doubt always remember Nipper, as he sat in the entrance talking to folks entering and leaving the premises. It was only necessary to whistle at him, and through the medium of a microphone and cleverly concealed amplifier and loudspeaker, Nipper would launch forth into his favorite discourse.

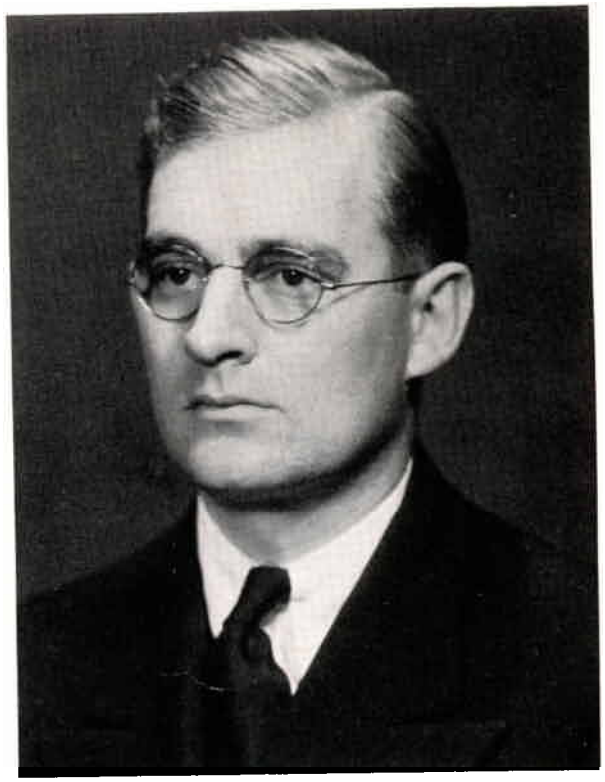
Obviously, the repetition of this feat hundreds of times daily would not have been possible had the ordinary type of phonograph record been employed for the purpose, and for this reason, a special reproducing device employing entirely new art was utilized. The sound waves were applied to a transparent disc by photographic means, and a light ray, scanning this disc, was focussed upon a photo electric cell, which in turn actuated the amplifier and loudspeaker. Thus not only the surface noise ordinarily experienced through disc recording was eliminated, but the element of wear was entirely removed so that by this means a recording may be reproduced over and over indefinitely, always retaining its original clarity.

Nipper apparently made quite a hit, as may be seen by the attention he is receiving in the accompanying picture. What a life some dogs lead!

LET'S GET ACQUAINTED



RUSSEL P. MAY, SALES ENGINEER FOR RCA VICTOR BROADCAST TRANSMITTER AND POLICE EQUIPMENT IN THE EASTERN DISTRICT, ASSISTING T. A. SMITH, WITH HEADQUARTERS IN THE NEW YORK OFFICE.



WILBUR RHODES, SALES ENGINEER, REPRESENTING RCA VICTOR IN THE POLICE RADIO FIELD, COVERING MASSACHUSETTS AND RHODE ISLAND, WITH HEADQUARTERS IN BOSTON.

Broadcasting Personalities

Born in 1896 at Worcester, Mass., Russel P. May moved to Brooklyn, N. Y., at the age of ten, and received his early education in the local public schools, Erasmus High School, Cooper Union and Columbia University.

He entered the radio (wireless) field at the critical time when the invention of the vacuum tube was first beginning to revolutionize the industry. His first year was spent in the employ of Dr. Lee DeForest, during which time he assisted in the development of the first "audion" amplifier and both arc and spark radio telephone equipment. Deciding to pursue his engineering studies, he then attended Cooper Union and later Columbia University.

During the World War, he was ap-

U. S. Navy, serving first at the Navy Yard, New York, and later in the Bureau of Steam Engineering, Washington, D. C. After the War he became associated with the Engineering Department of the Western Electric Company, taking an active part in the development of radio telephone transmitters for use in China—he says "because the Chinese boys had a yen for copper wire, making it impossible to maintain land-line communication for any length of time." In 1922, he started an enterprise of his own which, he tells us, he would rather not hear any more about.

In 1925, Mr. May began his career with the Radio Corporation of America joining the engineering staff of the Technical and Test Depart-

York City, where he maintained engineering contact between the RCA and the phonograph companies which had just been won over to the then new and revolutionary electric recording and reproducing systems, and he subsequently became associated with the sound motion picture development work. In 1928, he was placed in charge of the development work on the 16 mm. sound motion picture equipment, which presented many new and difficult problems. In 1932, the entire laboratory engineering staff, including Mr. May, was transferred to Camden, and for more than a year following, he was engaged in Photophone and Centralized Radio service engineering. He was transferred to the Broadcast Transmitter Section as sales engineer on August 15th, 1933.

MARJI HART,
WHO DELIGHTS **WHB** AUDIENCES

Mr. and Mrs. Earl C. Hull of WKY, Oklahoma City, Okla., recently returned from a vacation trip which included such points as Buffalo, Toronto, Syracuse and the Century of Progress Exposition at Chicago.

MASON KILMER, WHB TENOR,
RADIO AND DANCE ORCHESTRA SOLOIST

Mr. C. B. Locke of KGKO, Wichita Falls, Texas, was recently seen performing some very suspicious maneuvers in the vicinity of the Red River Valley. Closer investigation revealed that his nocturnal expeditions were in the interest of making a field survey of his radio station and not what revenue officers had first thought. Now that Texas as well as Oklahoma, has beer, he is free to sojourn unmolested.

Don Withycomb, Station Relations Manager, N. B. C. in New York, is now a Kentucky Colonel. So is Sol Taishoff. So is Mae West.

Mr. Arthur J. Kemp, who has in the past been Sales Manager of KHJ, has been appointed Sales Manager of KFRC. He succeeds Mr. Hassel Smith who will remain in the Sales Department of KFRC.

Mr. Murray Grabhorn of the KHJ Sales Department has been appointed Sales Manager of KHJ.

Announcement is made of the resignation of Mr. Lou Humason of the selling staff of KFRC.

Mr. R. C. Stinson, the "Super" of WBAP at Fort Worth, Texas, recently spent a very busy afternoon, when Vice-President Garner, Postmaster General Farley and Mr. Jesse Jones arrived in Fort Worth by plane. Mr. Stinson personally installed and handled the remote pickups at the airport and at Shady Oak Farm, where the distinguished guests were entertained that evening by Mr. Amon G. Carter, and between times installed a remote pickup at Arlington Downs where the races started the next day. Although some of the points are twenty miles apart, this was all accomplished within a few hours.

Bill Ellis, veteran operator at the studio controls of WFAA, Dallas, recently returned from a fishing trip in Minnesota. Bill reported a successful vacation, and hopes he can find time to recuperate.

The time of Mr. Frank E. Golder, Technical Supervisor of the Southwest Broadcasting Company, Fort Worth, Texas, has been occupied during the past few months with the installation of new studios for the key station of his network. These studios are in the Texas Hotel in Fort Worth, and when completed will represent one of the most elaborate and modern studio setups in the Southwest.

E. K. Cohan stepped from behind his desk at 485 Madison Avenue recently and into a studio to tell of the plans for broadcasting news from the Byrd expedition in Little America.

STANLEY LUCAS, OF **KFYR,**
BISMARCK, N. D.

It is understood that because of a recent occurrence, WGNY has appointed H. Fiske *chairman* of the station's fire department.

PROF. L. S. KLEINSCHMIDT,
OF **KFEQ,** ST. JOSEPH, MO.

Professor L. S. Kleinschmidt, B.S.A., M.S., formerly in charge of the poultry department at Pennsylvania State College, is now the Director of Research for the Gee Bee Mills Company in St. Joseph, Missouri. He conducts a daily feature of Station KFEQ, entitled "Dollars from Hen Sense."

Karl B. Hoffman has been appointed chief engineer of the Buffalo Broadcasting Corporation.

LORA MONTGOMERY—PROMINENT BLUES SINGER ON THE "**WHB STAFF FROLIC,**" A PROGRAM PRESENTED MORE THAN 1,000 TIMES BY **WHB.**

As most of the broadcasters know, Dr. Leon Levy, president of WCAU, won the Golf Cup presented by *Broadcasting* at the NAB convention.

Mr. H. C. Barth, manager of WSYR, showed promise of taking the honors in the Greenbrier Tennis Tournament until he injured his right arm. It's caused him no end of inconvenience ever since, and we wish him speedy recovery.

Among the early arrivals at White Sulphur Springs were Dr. Levy, I. Levy, Alfred J. McCoster of WOR (and NAB president), Ford Greaves of the Federal Radio Commission, R. G. Soule of WFBL, Paul Segal and George Sutton of Washington. Sol Taishoff, assisted by many of those present, celebrated his twenty-first birthday the first evening.

It was noticeable that very few of the broadcasters sampled the healing properties of the sulphur water. But that's none of our business, of course, we can take it or leave it alone, and we usually leave it alone.

Our society reporter tells us that Frank Marx, engineer of WMCA, cuts a very graceful figure when roller skating in Central Park. We might add something clever about the way Frank Marx the pavement but we've got to go to press now and there isn't time to figure it out.

Robert (Bob) Martin, formerly of KGIR has also been transferred

Since Issue No. 8 *Broadcast News* was published in August, 1933, the following changes have been made in the territorial setup of the Transmitter Section of the RCA Victor Company, Inc.:

Benjamin Adler was transferred and placed in charge of the newly established Southeastern territory, with headquarters at 144 Walton St., N. W., Atlanta, Georgia. He retains supervision of the Southwestern District.

W. H. Beltz was assigned to the San Francisco office and placed in charge of the Western District, replacing C. F. Coombs. In addition, he will handle the Broadcast and Police Sales in Alaska and Hawaii.

S. W. Edwards has been assigned to the Central District as assistant to H. C. Vance.

Russell P. May is assigned to the Eastern District as assistant to T. A. Smith.

The Eastern District, under the supervision of T. A. Smith has been extended to include sales in Porto Rico. BON VOYAGE, TED!

J. P. Taylor, Assistant to I. R. Baker, Sales Manager of the Transmitter Section of the RCA Victor Company, Inc., is sojourning temporarily at the Southwest Presbyterian Sanatarium, Albuquerque, N.

JERRY WILSON,
ONE OF **WHB's** OUTSTANDING CROONERS

M., and would like to hear from all of his friends. We hope soon to have him back with us again at "Radio Headquarters."

Wedding bells! Leo H. Perras, recently transferred from KGIR to KFPY, has joined the MBC (Matrimonial Broadcast Club), having taken Miss Elsie Diller of Butte, Montana, as his bride back in August but the news has just reached this part of the country. Good luck to the new couple, and here's hoping that they will be more prompt in reporting subsequent events . . . if any.

IN WORCESTER, MASS., RECENTLY A PARADE WAS HELD FOR THE PURPOSE OF CELEBRATING THE DEDICATION OF THE CITY'S NEW MUNICIPAL AUDITORIUM, AND RADIO STATION **WTAG** "THE VOICE OF THE HEART OF THE COMMONWEALTH" RIGGED UP THE ATTRACTIVE FLOAT ILLUSTRATED ABOVE. MICROPHONE, AMPLIFIERS AND LOUDSPEAKERS WERE EMPLOYED TO REPRODUCE "PROGRAMS"

Leah Ray -Phil Harris

LEAH RAY, blues singer featured over National Broadcasting Company networks with Phil Harris and his Orchestra, is one of radio's youngest entertainers.

At eighteen, Miss Ray has realized ambitions usually cherished by almost any normal high school or college girl. In addition to her radio success, she has been starred in the movies with Maurice Chevalier, and is known across the continent as "Dimples from Dixie."

Station WTAR at Norfolk offered Miss Ray an opportunity for her first radio experience. It was not until she went to Los Angeles to visit relatives, however, that the opportunity presented itself for her to crash "big time" broadcasting.

Her uncle, Artie Mehlinger, introduced her to Phil Harris, whose band was the current attraction at the

Cocoanut Grove. Harris heard Miss Ray sing, and offered her a contract. That was almost two years ago and since that time Miss Ray has worked with Harris in radio and in the movies.

A brunette with dark chestnut hair, she weighs 123 pounds and is five feet, six inches tall. She is an enthusiastic horse-woman, and offers any amateur a good game of tennis. She loves to swim.

Leah is the only living woman to be a member of the Alpha Tau Omega fraternity, one of the largest national collegiate organizations in the country. She was initiated by the Leland Stanford chapter last year and her ATO pin is one of her favorite possessions.

Easy going as the blues and torch songs that she sings, Miss Ray dislikes temperamental people. She fails to show the nervousness which tradition associates with successful

A Cathode Ray Modulation Indicator

By E. C. BALLENTINE, Transmitter Engineer, RCA Victor Co., Inc.

TO meet the increasing need for careful monitoring of broadcast station output and to insure the high quality of programs now being demanded by a very critical public, a new type of modulation indicator has been developed by RCA Victor Co., Inc., and RCA Radiotron Co., Inc., in which use is made of a new cathode ray tube of the high vacuum type.

To those operators who have patiently cleaned oily vibrators, dirty lenses, and infinitesimal mirrors delicately mounted on slender threads of wire, in the hope of perhaps detecting peaks of over-modulation in their transmitters, the new method of monitoring will be a welcome relief. And to the careful engineer, ever concerned with improving the quality and consistency of his station output, the new instrument offers means for studying wave shape distortion with great convenience. The most momentary surges may be seen easily and in the comfort of a well lighted room. It is only by the cathode ray that an absolutely accurate indication of modulation percentage can be obtained at all modulation frequencies. For the cathode ray tube operates at radio frequencies and is not limited to comparatively clumsy audio frequencies. In fact, the deflecting agent is the radio frequency carrier itself, obtained from the antenna radiation field without the necessity of rectification, and is therefore a true picture of the modulated carrier.

The RCA Victor Type 49-A Modulation Indicator has solved the problem of monitoring percentage modulation by means of a pencil of electrons totally enclosed in a vacuum tube and capable of enormous speeds. The tube, designated as the RCA-904 (Figure 1) has been especially designed for this type of service, in

E. C. BALLENTINE, RCA VICTOR

which reliability and long life are important factors. Many of the tubes previously available have been of the gaseous type, in which inherent short life has prohibited their use for continuous operation. The RCA-904 tube is designed along new lines recently developed, with the result that life expectation has been greatly increased. The tube is designed for plate voltages used in transmitters so that it may be operated from the transmitter plate supply. Only several milliamperes are needed. The only other power supply required is 115 volts AC for the filament and sweep circuit. The various potentials required for the elements in the tube are obtained by means of voltage dividers adjustable from the front of the panel.

The problem of focusing a stream of electrons into a concentrated beam is too involved for discussion here, but it will suffice to say that it is radically different in the hard vacuum tubes than in the "soft," or gaseous tubes previously used. In the gaseous tubes the ionization produced by the electron stream automatically confines the stream to the desired concentration as long as the gas maintains constant characteristics. The effect of temperature and aging, however, prevents reliable operation over extended periods. The high vacuum tube, like modern transmitting tubes, has the advantage of stability and reliability of operation, and the electron stream can be readily focused to high concentration and great brilliancy. This is accomplished by application of the principles of "electron optics," in which adjustable electrostatic fields acting as "lenses," are placed at

FIG. 2 THE CATHODE RAY MODULATION INDICATOR UNIT

suitable points in the path of the beam so that both brilliancy and concentration of the spot may be easily controlled.

There are three front of panel controls associated with the tube elements. One controls the "focusing," another the "brilliancy" and another the "sensitivity." These controls are easily adjusted and do not require frequent readjustment. The amplitude of the vertical "sweeping" is adjustable from the front too.

The sweep circuit of the RCA-904 cathode ray tube uses electromagnetic deflection. This permits simplification of the tube, which naturally results in lower cost. For indication of percentage modulation the vertical sweep is usually operated at 60 cycles. When desired, the sweep circuit may be connected to a different source of frequency such as an audio oscillator. Modulation frequencies that are multiples of the sweep frequency produce stationary patterns. These patterns can be photographed, if desired, by means of an ordinary camera or by the use of a simple plate holder, thus making available permanent records of considerable value.

The type 49-A cathode ray modulation indicator (Figure 2) is designed for either table mounting, or for rack mounting by means of two wing extensions furnished with the instrument. The panel height is 12½" and the width is 19", these being standard relay rack dimensions. The width without the extensions is 16¾". The depth of the unit is approximately 18". The cover of the unit is so arranged that it acts as a complete housing when used on a table and yet may be completely removed for servicing the unit when it is mounted on a rack. A safety switch is provided for interlocking with the transmitter plate voltage control circuits so that when the cover is removed no dangerous voltage will be present. The tube is removable from the front of the panel through a door. It has an effective screen diameter of approximately 5". Figures 3, 4 and 5 show how various degrees of modulation are indicated.

The instrument is provided with a variable tuned pickup circuit designed to cover the broadcast band, and also the police band by means of taps on the coil. The tuning control is adjustable from the front of the panel, as are the three voltage dividers and the sweep circuit potentiometer. The door in the panel is fitted with a protective window on which are marked two black lines and three red lines. These lines are for the convenience of the operator in gauging modulation percentage on both positive and negative peaks. With the unmodulated carrier deflection adjusted to the black lines, 100% positive modulation is indicated when the modulation envelope reaches the outer red lines, and 100% negative modulation when the center red line is reached. Negative over-modulation appears as bright spots in the center line due to overlapping.

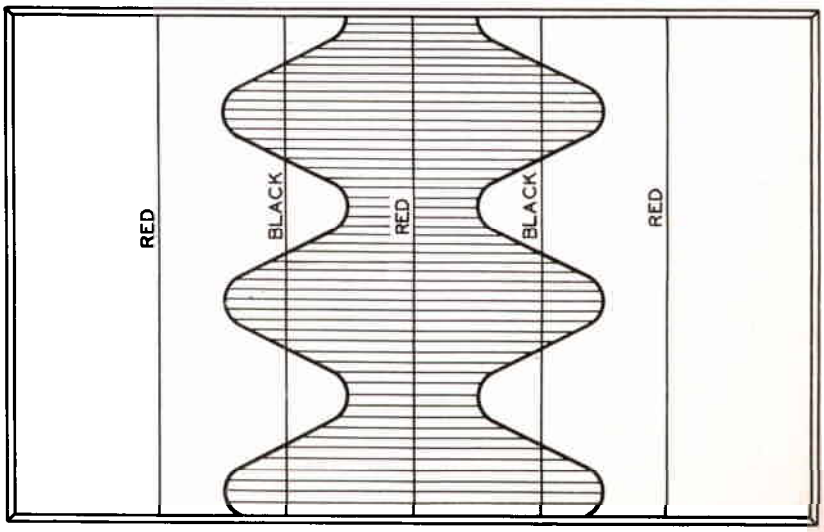


FIG.3 50% MODULATION

The cathode ray spot can be adjusted to a diameter of less than 500 microns (0.5 mm.). When the pattern is adjusted for normal brilliancy, the modulation percentage can be easily read twenty feet away in a normally lighted room. To prevent deflection of the spot by

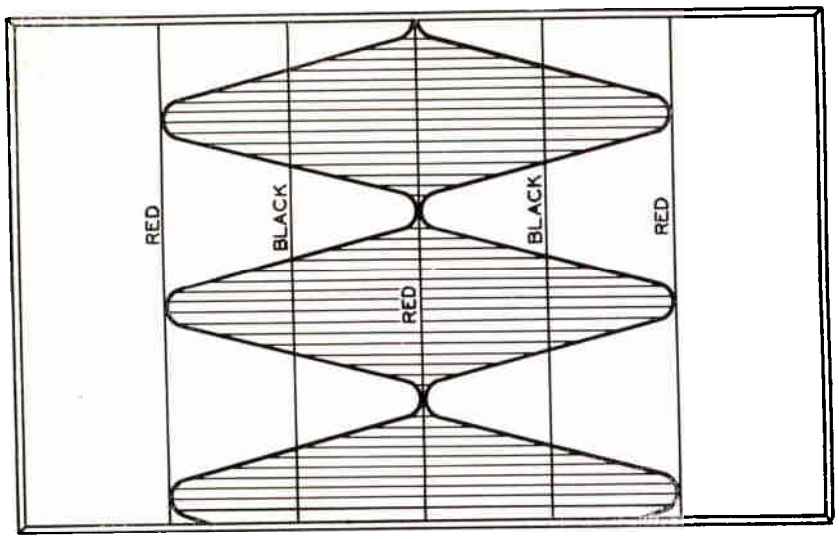
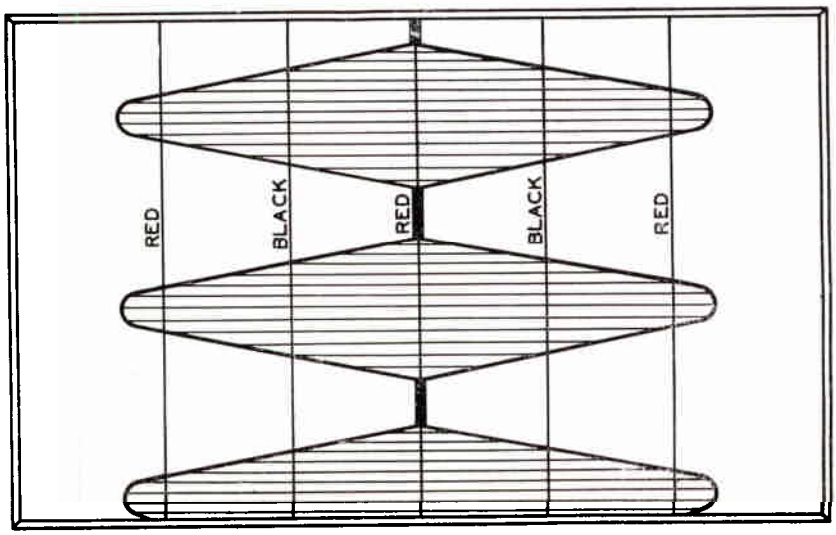


FIG. 4 100% MODULATION

external fields, the tube is doubly shielded and the "electron gun" is triply shielded. An adjustable magnet within the unit compensates for the effects of the earth's magnetic field. For connection to the transmitter high voltage supply there is furnished, for convenience, a length of Packard cable with a high voltage test clip.

One of the chief advantages of the 49-A Modulation Indicator is that it operates directly from the radio frequency carrier and requires no rectifier as was previously necessary for other types of modulation indicators. The amount of energy picked up from the antenna is negligible owing to the low losses in the tuned circuit. This method also precludes the possibility of distortion due to rectification and gives a true visual picture of the antenna output. To those engineers and technicians who are interested in improving the quality of transmission, and to laboratories engaged in research toward the end of improved fidelity of transmission, the Type 49-A Cathode Ray Modulation Indicator should prove a valuable instrument.



DID YOU KNOW?

(Continued from Page 15)

That the most complete radio tube collection in the world, for which several thousand dollars has been offered, is reported as owned by Joseph D'Agostino, assistant plant engineer of NBC at New York? (Chance for George H. Clark, RCA's museum director, to issue a challenge.)

That the twenty-year-old phrase of "The Ambulance Call of the Sea" again was dramatized in real life recently when radio operator Robert B. Foster's call from the *Wild Goose* for medical advice to help an injured seaman, brought the Coast Guard seaplane *Adhara* to the side of the *Wild Goose*, then some distance out on the Atlantic, and after transferring the patient to the plane, brought him safely to a hospital on shore? The seaplane, equipped with radio, had received the call direct and lost no time in taking action, all of which not only upholds the life-saving tradition of the sea, but brings us to today's use of radio on aircraft.

(Continued on Page 39)

ERRATA

In the August, 1933 issue of *Broadcast News*, an error occurred in the "Transmission Line Formulae," appearing on page 26.

It appeared as:

$$K = 100x\left(\frac{1-\sqrt{\frac{4 \times 10^6}{1-(2nf)^2C_2^2Z_0^2}}}{2}\right)$$

and should be corrected to read:

$$K = 100x\left(\frac{1-\sqrt{1-\frac{4 \times 10^6}{(2\pi f)^2C_2^2Z_0^2}}}{2}\right)$$

We sincerely regret this typographical error and hope that we have led no one astray. The original manuscript by Mr. L. F. Jones was correct, but was improperly interpreted in process of "making up" the magazine.

Lew White, "Radio City" Organist

THE son of Herman White, prominent Philadelphia music teacher, Lew White began to study the violin at the age of five. While still a boy he was sent abroad to continue musical studies, learning piano and theory from the German master, Heinrich Pfitzner. Returning to this country, he entered and was graduated from the Philadelphia Music Academy, later studying at Bar Harbor under Ernest Schelling. With the advent of the organ as an indispensable adjunct to the motion picture theatres, Mr. White, quick to see the possibilities of this field, determined to devote his career to it, and commenced this part of his education under Dr. Alexander H. Matthews of the University of Pennsylvania.

Mr. White, upon the completion of his organ studies, secured the post of premiere organist for the Stanley Company of America, being featured as guest organist in the more prominent theatres of the company's chain, and opening its new houses all over the country. It is interesting to note that he played for some time at the Stanely Theatre in Camden, New Jersey, the home of "Radio Headquarters," where he was extremely popular. While associated with the Meyer Davis Orchestras, Mr. White gave concerts in such hotels as the Waldorf-Astoria, New York, and the Bellevue-Stratford in Philadelphia. He has served as experimental organist for the RCA Victor Company, Inc., has made numerous records, has accompanied for such artists as Hans Kindler and Sascha Jacobson, and is writing a series of photoplay music, contracted for by a New York music corporation.

It is this artist's ambition to teach his pupils to meet the requirements of the motion picture theatre, to create true orchestral color, and to interpret Debussy, Herbert, and popular music in a distinctive, modern style.

NEW MOBILE TRANSMITTER FOR NBC

NBC's new mobile transmitter, mounted in a specially built automobile, will be heard over the air for the first time during the ceremonies marking the opening of the National Broadcasting Company's Radio City headquarters, the middle of November.

The car, twenty-two feet long, was built by General Motors to specifications drawn up by NBC engineers. It is capable of a speed of sixty-five miles an hour and is sturdy enough to stand all existing road conditions. It is streamlined and aluminum painted.

The short-wave transmitter which will be housed in the car is now nearing completion under the direction of George Milne, NBC eastern division engineer. It will have a power of 150 watts, three times the strength of the NBC's old mobile transmitter, and a range of up to 100 miles. This will make it possible for the NBC to originate special broadcasts at practically any point in the United States, since there are few places not within 100 miles of a wire line where a pick-up could be made for the networks.

The car has a trap-door over the announcer's seat, next to the driver, so that when desirable the announcer may stand, with his head outside, above the top level of the car, to witness and describe what is going on. On the dashboard, in front of the announcer, is a desk which may be used for a microphone or a portable typewriter.

The new mobile transmitter will greatly increase the field of events which may be covered directly by NBC networks.

WITHOUT A DOUBT

(Excerpt from "Collins Wireless Bulletin" July, 1910)

"The operator at San Francisco (PH) called Key West with his powerful 15 K.W, set, but was unable to get an answer, although he is sure he reached him but that Key West was not trying for any distance work. This is the greatest distance done in the United States, the distance being over 3,250 miles, and overland too."

Terra-Wave

By Pierson A. Anderson, Manager – Police Radio Sales, RCA Victor Company, Inc.

DURING the year 1929 Police Radio really got its start. Law enforcement authorities, ever alert for modern means to combat crime, and to more effectively protect their communities, began to grasp the possibilities of radio as a means of efficient and rapid communication. In the short space of three years it became the fabled "Seven League Boots" and at present over one hundred cities count radio as one of their most effective weapons.

P. A. ANDERSON, RCA VICTOR

The ability of a police department to place one of their motor patrol cars on the scene of any disturbance or trouble in a matter of two or three minutes has proven invaluable. The splendid record of achievement is too well known to need any comments. The Federal Government appreciating the importance of this type of service set aside certain channels for police emergency communication lying in that portion of the radio spectrum classed as "short waves" between 1,572 and 2,508 kilocycles (approximately 190–120 meters).

FIGURE 1—HAVERFORD TOWNSHIP POLICE HEADQUARTERS, BROOKLINE, PA. ANTENNA CONSISTS OF A 92 FOOT SELF-SUPPORTING GALVANIZED STEEL MAST WITH HALF WAVE

Despite the splendid service rendered by police radio it possessed certain disadvantages. The number of channels available was limited and it was, therefore, necessary to operate a number of cities on the same channel. Since transmission at these frequencies carried to considerable distances, a great increase in the number of cities utilizing this service would undoubtedly result in considerable interference. Transmission at these frequencies is also particularly susceptible to static and fading. Shadow effects due to steel structures and large buildings are also unavoidable. In police work we are only interested in covering the particular area served, and in maintaining 24-hour service. In addition hundreds of smaller cities and townships, although desiring to maintain the same degree of effectiveness and efficiency as the larger cities, found that radio was relatively too expensive for general use.

The RCA Victor Company has been making a comprehensive study of that portion of the radio spectrum lying below 10 meters, and three years ago completed an installation for the Mutual Telephone Company in Hawaii of a complete inter-island telephone service on 5 meters. In connection with the development of television, a number of transmitters were built and extensive surveys were made to determine the propagation characteristics of ultra high frequencies. Extensive tests were made in New York and Philadelphia, using aeroplanes, dirigibles, automobiles, boats, and even the subways, and a mass of information was collected. Among the early

commercial developments utilizing these frequencies was the "Transceiver" which was described in the July 1932 issue of *Broadcast News*. The writer has followed these developments for some time with a view to developing their commercial possibilities. It at once became apparent that here was the probable answer to police radio. Fading and static were eliminated; transmission was remarkably free from shadow effects due to steel structures; coverage could be limited practically to the area to be served without interference in adjacent cities, and of still greater importance, equipment could be provided particularly for the smaller cities at a cost of approximately one-third that of the conventional type of police equipment. The requirements of the service were very carefully studied and practical tests were made using laboratory equipment. The requirements were laid down and the problem turned over to the Engineering Department to produce satisfactory equipment for commercial sale. It was determined experimentally that a transmitter having an output of 15 watts would give satisfactory performance in all but the very largest cities, and our first commercial transmitters are of that power. The Federal Radio Commission, always anxious to cooperate in the development of radio, agreed to issue general experimental licenses to determine the feasibility of utilizing ultra high frequencies for such purposes. It then became highly desirable to make some actual installations of this equipment under practical conditions. It is rather difficult to interest purchasers in a radically new type of equipment, which has not as yet been tried and proven. In the vicinity of Philadelphia are located a number of very progressive townships, the police departments of which are operated with the highest efficiency and effectiveness. After certain tests had been made in the field, and the matter discussed with the officials and the Police Chiefs in a number of these communities, Mr. Samuel Siegle, Superintendent of the Haverford Township Police at Brookline, Pennsylvania, readily realized the importance of this development, and recommended to the city officials that such equipment be purchased and installed. The Chief of Police, Patrick J. McKee, of the Abington Township Police at Abington, Pennsylvania, was also impressed, and having confidence in the RCA Victor Company made similar recommendations.

FIGURE 2. HAVERFORD TOWNSHIP POLICE DEPARTMENT. TRANSMITTER IS LOCATED IN CORNER OF ROOM WITHIN SIGHT OF OPERATOR, SEATED AT THE CONTROL BOX

FIGURE 3—ABINGTON POLICE CAR—RECEIVING MESSAGES FROM HEADQUARTERS

The first two commercial equipments to be produced were installed in these two townships some time ago, and have completely justified the expectations of all concerned. The effective operation of this equipment, coupled with its initial low cost and inexpensive maintenance has justified the Sales Department

FIGURE 4—**SAMUEL SIEGLE,** SUPERINTENDENT OF HAVERFORD TOWNSHIP POLICE DEPARTMENT

efforts in this direction, and the two installations to be described below have been followed by other cities, among which are Lower Merion Township at Ardmore, Pennsylvania; Englewood, New Jersey; St. Petersburg, Florida; Miami Beach, Florida; Winnetka, Illinois; Fort Worth, Texas; Port Jervis, New York; Ashland, Kentucky, and a large number of other cities will undoubtedly follow.

Figure 1 shows the headquarters of the Haverford Township Police Department at Brookline, Pennsylvania, and clearly depicts the type of antenna used on this installation. This antenna consists of a self-supporting galvanized steel mast having a dural half wave radiator at the top. This mast is approximately 92 feet high. A voltage-fed transmission line couples the transmitter to the vertical half wave radiator. The Model ET-5004 Transmitter is of the master oscillator power amplifier type, utilizing Class "B" modulation. A control box is provided, containing the microphone and the necessary switches for turning the transmitter on and off, or for operating the equipment in the stand-by position.

Figure 2 shows the installation of this equipment at Brookline, Pennsylvania. The transmitter may be seen in the background, while the control box is located at the telephone switchboard.

The automobile receiver known as the Model AR-5006 is a compact unit containing its own power supply, loudspeaker, and a highly sensitive carefully designed super-regenerative receiver. This receiver is extremely simple to install, and may be removed in a few moments for servicing.

Figure 3 shows the control box in one of the police patrol cars, the receiver itself being mounted under the cowl on the right hand side.

At Abington, Pennsylvania, a wooden pole is used to support a half-wave dural vertical radiator.

In Figure 6 is shown the transmitter and control box at police headquarters, while Figure 3 illustrates the interior of one of the township's radio-equipped patrol cars.

The practical operation of this equipment since its installation has justified every expectation. It is serving effectively and efficiently the area to be covered without interfering with adjacent cities. It has proven to be free from static, fading and dead spots. The signals are received in the cars with the same degree of intensity during the daylight period as after dark.

The results which have been obtained with this class of equipment are leading us into the development of higher powered equipment, to make the advantages of this system available to the larger cities, in order that they too may have the benefit of this new system of police communication.

The name "Terra Wave" was coined by the writer in an attempt to find a name which would be

FIGURE 5—ABINGTON TOWNSHIP POLICE HEADQUARTERS, ABINGTON, PA. ANTENNA

FIGURE 6—ABINGTON TOWNSHIP POLICE, ABINGTON, PA. OPERATOR SHOWN AT THE CONTROL BOX, ILLUSTRATING THE SIMPLICITY OF THE COMPLETE INSTALLATION OF THE MODEL-ET-5004 TRANSMITTER

descriptive of the fact that it operates on an extremely low wave length below 10 meters, utilizing only the ground waves, and perhaps no slogan has caught the eye of progressive municipalities as completely as the one which precedes our publicity on the subject of Police Radio—"Fight the Crime Wave With the Terra Wave Police System."

Englewood, New Jersey, Gets Police Radio System

Complete RCA Victor System Proving Valuable in North Jersey Suburban Area

Chief of Police C. A. Peterson, of Englewood, New Jersey, not only finds the efficiency of his force greatly increased through the medium of the newly installed RCA Victor Police Radio System, but, he tells us, the very fact that the news has gone abroad that Englewood is now equipped seems to have curtailed the activities of the criminals in his area.

Officer J. H. Bellingham, who is in charge of Englewood's Police Radio System, speaks very highly of the performance of their new RCA Victor Type ET-5004 15 watt ultra high frequency transmitter which is located in Police Headquarters at Englewood, and he also endorses the six type AR-5006 Receivers which have been installed in the police patrol cars.

A wooden mast has been installed at Police Headquarters for the transmitting antenna, and the transmitter itself is located in a jail cell which has been converted into a radio station.

The call letters of the Englewood Police Radio Station are W2XES and a frequency of 34.6 mgc is employed.

DEANS OF RADIO

Meet at Chicago

Two little episodes of human interest recently occurred at RCA Hall in A Century of Progress. The first was the visit of Dr. Lee de Forest, famed inventor of the three-electrode vacuum tube, and the second was a demonstration of the heterodyne, given to Miss Jessie Bent, who, as secretary of the National Electric Signalling Co. since 1901, lived through the early days of this device.

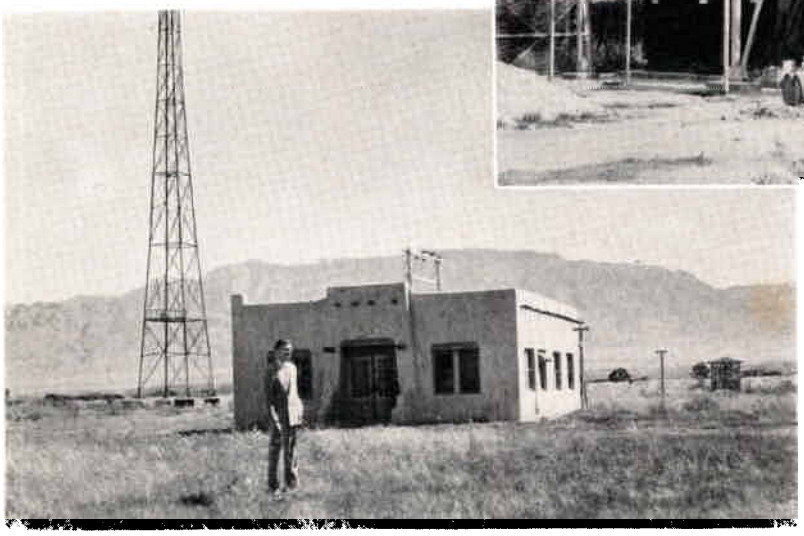
Dr. de Forest was an eager young college lad in the days of the "Old World's Fair" in '93, and got himself a job as chair-pusher, using his spare time to study what passed for the Hall of Science in those days. He looked rather wistfully at the young athletes performing that duty today, and admitted that he doubted if he could qualify for the position again.

The doctor sat for a time in one of the out-door restaurants, recalling the old days of wireless, but after a time grew rather annoyed at the intermingling of loudspeaker noises. "Listen to that boom from the submarine across the lagoon," he complained, "and the one on the other side of us advising us to take a trip on the sky-ride. Then, as if that were not enough, notice the phase-difference between the carillon speaker away across the water and its associate on that pole yonder. I'll be glad to get back to the California hills," he concluded, "where there is a little peace."

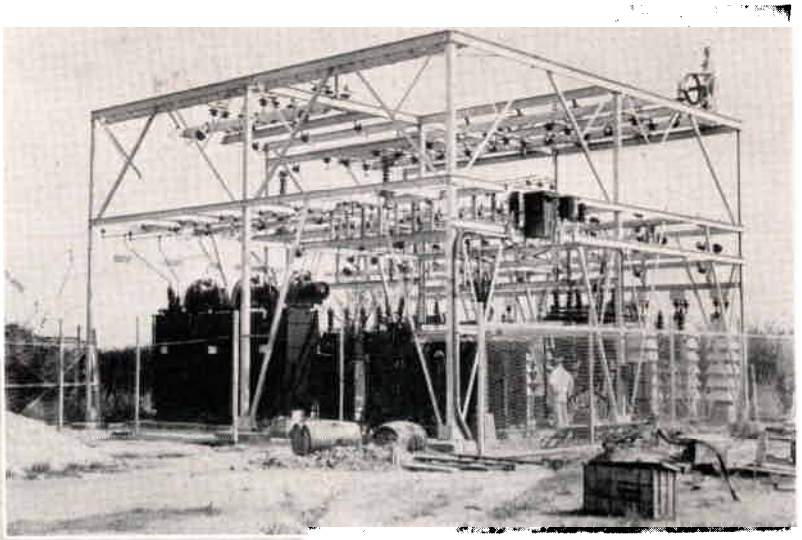
His guest, who had lived through the old days himself, turned to Dr. de Forest and replied, quietly:—"I wonder if you appreciate, Doctor, that it was you and no one else who brought all this noise to A Century of Progress. A loudspeaker by itself is rather a mute device; it is always animated by an amplifier; and it was your invention of the grid that brought such devices into the world. You are to blame, and no one else."

Dr. de Forest bowed his head, and, to the accompaniment of a louder blare from each one of the loud-

(Continued on Page 38)



(BELOW)—**GEORGE JOHNSON**, CHIEF ENGINEER AND MANAGER OF **KOB**, ALBUQUERQUE, NEW MEXICO, STANDING BEFORE THE TRANSMITTER BUILDING



(ABOVE)—**JOE CHAMBERS**, ON TOP OF THE NEW OUTDOOR SUBSTATION FOR THE 500 KW INSTALLATION AT **WLW**

CBS FIELD ENGINEER GETS BYRD EXPEDITION POST

John Newton Dyer, of the Columbia Broadcasting System's field engineering department, has been chosen to accompany the Byrd Expedition to the Antarctic as technical supervisor of the program series to be broadcast from Little America over the CBS network. In addition to his broadcasting duties, the engineer will also be in complete charge of all Admiral Byrd's communication facilities.

Dyer is 23 and a resident of Haverhill, Massachusetts. He is six feet tall and passed the physical examination, to which all who are going on the expedition are subjected, with a rating of 98.2 per cent.

Among the qualities for which Dyer was selected is his wide knowledge of short wave transmission, especially in connection with directional work. The broadcast from Little America will be transmitted to Buenos Aires with the use of a directional antenna. among other courses, at Massachusetts Institute of Technology, and graduated with a B.S. degree in 1931. He did post-graduate work there for two years.

In addition to his technical knowledge and his physical fitness, Dyer has an added qualification in his proficiency with skis. The heavy snows of New England winters have afforded him plenty of opportunity to perfect himself in this difficult method of self-transportation.

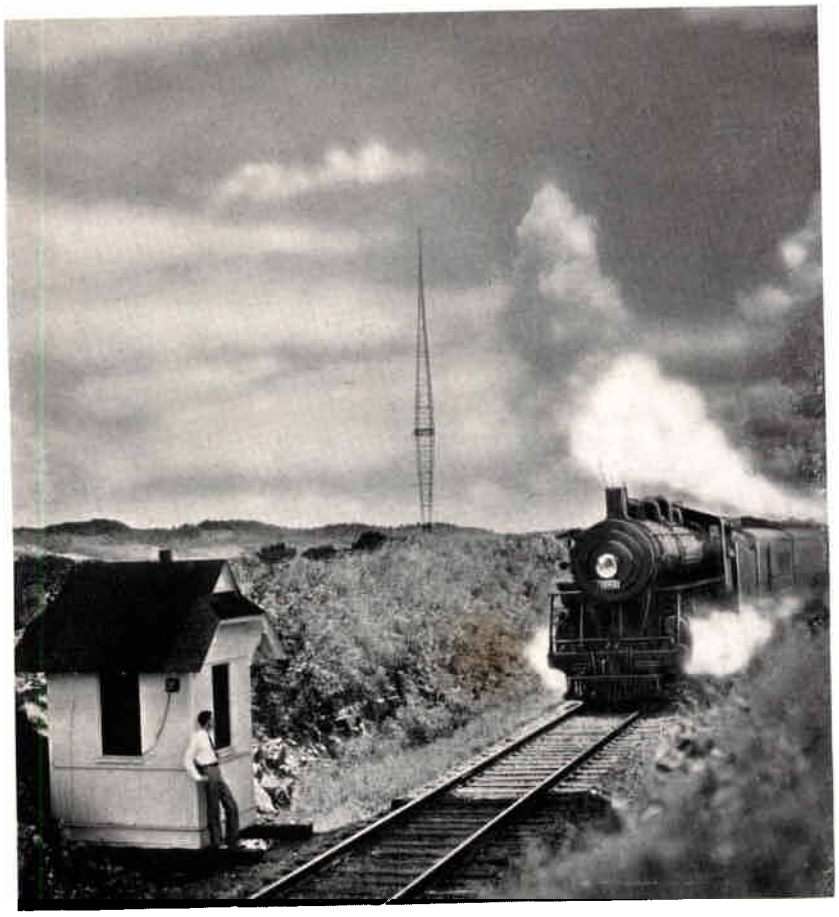
DEANS OF RADIO MEET AT CHICAGO

(Continued from Page 37)

speakers near him, admitted the accusation.

Miss Jessie Bent is today almost the dean of American radio workers. She became secretary to the late Professor Fessenden in 1901, and during all the epoch-making inven- under his guidance she kept the records and prepared the applications for patent. The heterodyne, or "puller-in," as Fessenden first called it, was in her estimation chief of Professor Fessenden's creations, and it she nursed through its early days when tests were many and results few. She heard it work thousands upon thousands of times and she thought she knew a lot about it.

A visit to RCA Hall taught her otherwise. She stood entranced before the cathode-ray oscillograph as it depicted "how every tube in your radio set works." She watched the fine-tooth comb which represented the incoming radio signal change to a coarse comb after it had combined with the local oscillator. "Marvelous, simply marvelous," she said. "If the Professor had only had a device like that in his day, the problem of developing the system would have been much simpler." And undoubtedly she was



"On Time"

A Railroad's Daily Radio Stunt

RAILS click. A long low whistle in the distance, the thunder of a locomotive, followed by the whiz of a crack train, is actually pictured in sound every evening during the week except Sunday, as the famous "Pan American," the Louisville and Nashville Railroad's crack flyer, passes America's tallest radio tower at radio station WSM of the National Life and Accident Insurance Company.

A special shack stands beside the track which skirts the WSM property twelve miles south of Nashville. This shack houses the equipment necessary for the broadcast, which includes the latest type dynamic microphone and remote control apparatus. The rumble of train No. 99 is transmitted by the rails and is heard more than a mile away as the "Pan American" heads south on its way from Nashville to New Orleans. Special equipment has recently been installed so that when the semaphore drops about a mile away from the pickup, a bell rings in the shack. The announcer on duty receives this notification to open the broadcast. A special wire has been installed from the point of broadcast to the train dispatcher's office in Nashville by which an accurate check is made each evening as to the time the Pan leaves the Nashville Union Station. The rumble of the big "Pacific" locomotive is first heard by the radio audience when the train approaches a point about a quarter of a mile north of the transmitter. Then the engineer deftly handles his whistle cord so as to make a tuneful solo of the conventional "two long and two short" blasts as the train passes the shack and fades off into the distance another quarter of a mile or so beyond. WSM's presentation of the passing of the "Pan American" is the first regular feature of its kind to be presented by an American radio station.

DID YOU KNOW?

(Continued from Page 32)

That Paul C. Ringgold, popular executive of the Radiomarine Corporation, who moved—or, as might be said, reversed his residence—from Brook-lyn to Lyn-brook, N. Y., would furnish an odd situation were he to move to Ringgold, Louisiana, especially if that town has a street by the same name?

That Charles J. Pannill, Executive Vice-President of Radiomarine Corporation, was quoted in *Telegraph and Telephone Age* and in *Radio News* as stating that business of the American merchant marine shows indication of renewed activity?

That a tabulation of one month's registrations for R. C. A. Institutes resident school and home study courses placed the average age of students at 27; that several were more than 40 and one was 54?

WAS YOU THERE SOLIE?

CHANGE NOTES

George F. McClelland tendered his resignation as Vice-President in charge of Sales for NBC on October 20th. His resignation was accepted with regret.

For division of districts according to states, see inside front cover.

Post office department and Chicago papers please note: Change of address, NBC, from 711 Fifth Avenue to *Radio City*.

Station Identification Nameplates

For the New Velocity Microphones

IN order to fill the needs of broadcast stations for suitable identification nameplates which will fit the new Velocity Microphones, the RCA Victor Company, Inc., has produced

the cast aluminum plate illustrated herewith. It is so designed as to have no effect whatever upon the performance of the microphone, which is of course an important factor. Many types of nameplates which were tried in the experimental stages had undesirable effects upon the performance of the microphone through shielding and reflection and also through vibrating or "buzzing."

This nameplate is secured to the microphone housing by two screws and the cleverly designed clip at the center. The letters have a suitable satin bright finish so as to photograph well against the solid dark background, which is finished to match the microphone itself.

The nameplate shown herewith is known as "Type A" and is intended for use with microphones in the upright position, as shown. The "Type B" nameplate has the letters applied upside down, with respect to the "Type A," and is intended for use with the microphones which are suspended from overhead.

These nameplates may be obtained from the RCA Victor Company, Inc., Camden, New Jersey, and any desired combination of call letters can be furnished to order.

Those experienced in the broadcasting industry will appreciate the importance of these nameplates, not only in connection with microphones used in the studios where visiting artists are likely to make mistakes of error or omission if the call letters are not constantly before their eyes, but also in outside pickup work where celebrities are frequently photographed at the microphone, and it is desirable to have the station associated with the program properly identified in the photographs, for publicity purposes.

Radio Show Attracts New Talent

At the recent Electrical Exposition held in Madison Square Garden, New York, the RCA Victor Company in cooperation with station WINS provided a very popular feature by arranging auditions in a specially constructed crystal studio, so that ambitious artists might have the opportunity to try their talents both for recording and for broadcasting.

Thousands of candidates visited the studio, and through the medium of monitoring loudspeakers, provided much unusual entertainment to the large audiences gathered about. Much new talent was thus brought to light, and it is expected that several of those who called to perform the "noble experiment" will soon be actively engaged in sound work, either broadcasting, recording, or both. It is more than possible that some of these artists will be the stars of tomorrow, and it is felt that the enterprise was a tremendous success from the standpoint of creating prestige and favorable publicity for the sponsors.

Similar auditions are being planned in connection with other radio shows throughout the country, and it is suggested that broadcast stations use this same idea in connection with local exhibitions.

INBOUND MATERIALS —OUTBOUND PRODUCTS

THE ELECTRIC RAILROAD OF "RADIO HEADQUARTERS" HAS THREE MILES OF STANDARD GUAGE TRACK, AND CONNECTS WITH THE READING AND PENNSYLVANIA SYSTEMS, AS WELL AS WITH DEEP WATER VESSELS AT THE COMPANY WHARVES ON THE DELAWARE RIVER.

Raw materials must be "spotted" promptly at various points throughout the plant, and finished products must be started on their way without delay to meet delivery dates.

The dispatcher, W. R. Jacobs, is a busy man. That carload of mahogany is needed immediately at the saw mill—two "Pennsy" box cars are wanted at the loading platform, but those Reading loads must first be moved out—the Superintendent of the cabinet factory is hollering for that flat car of veneer—and the Engineer of the power plant has just phoned for a couple of empties for cinders.

Motorman "Pat" Cunningham is ready to climb up into the cab of his electric locomotive and get under way as soon as he gets his orders and the signals are cleared.

It's all a part of the industry that throbs day and night through the veins of

"RADIO HEADQUARTERS"