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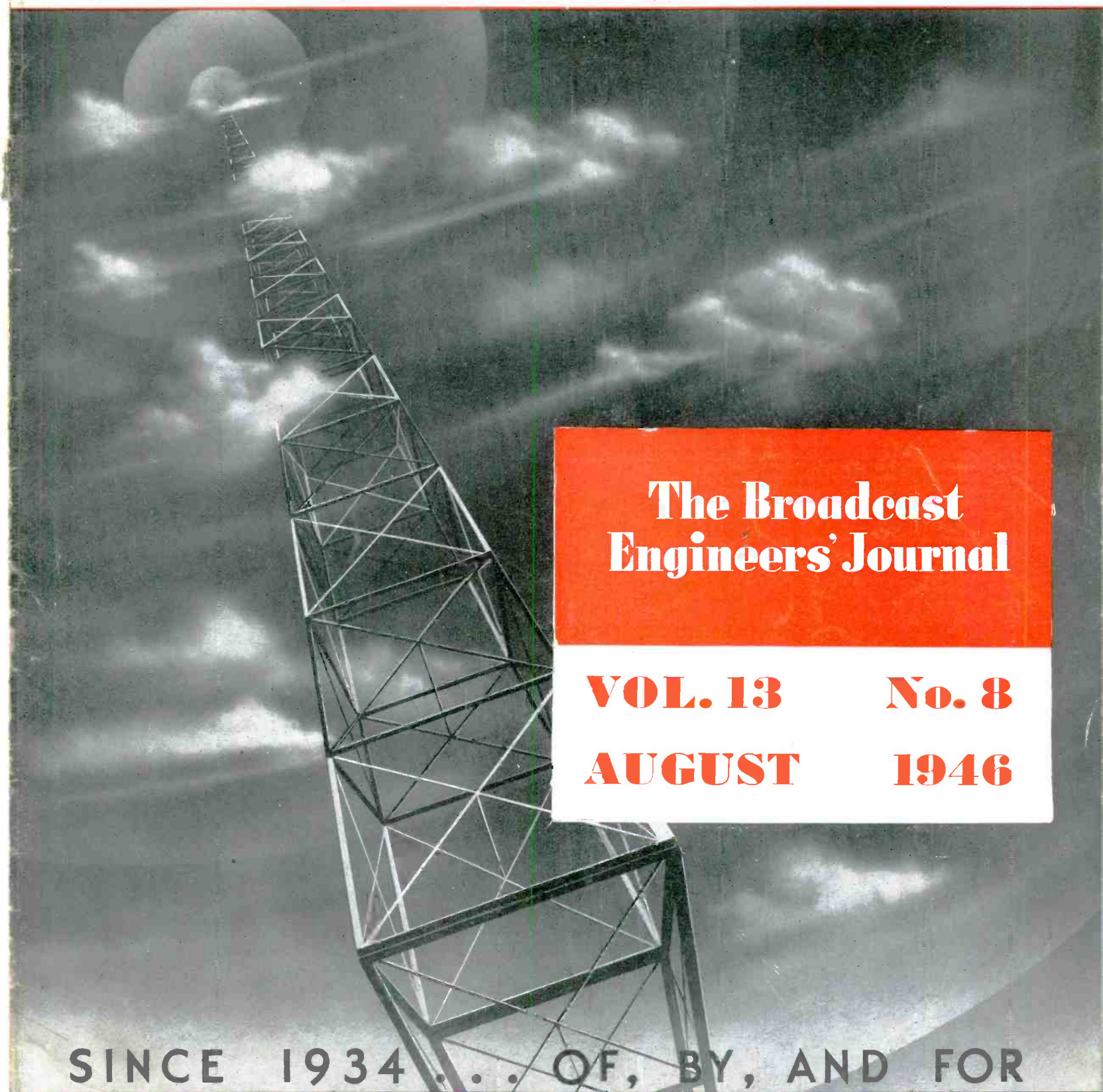

The Broadcast Engineers' Journal

VOL. 13 No. 8
AUGUST 1946

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THE BROADCAST ENGINEER

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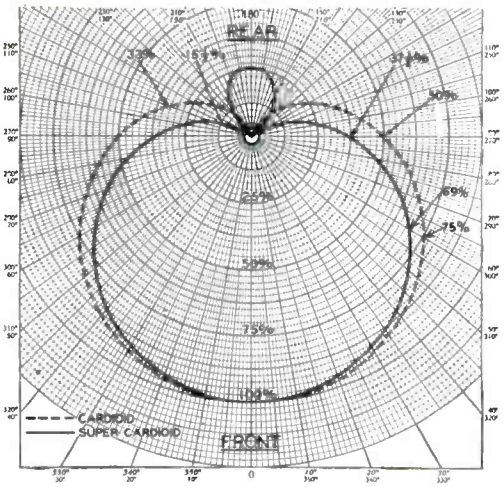

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THE BROADCAST ENGINEERS' JOURNAL

OFFICIAL PUBLICATION OF THE N.A.B.E.T.

Ed. Stolzenberger—Editor

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The Broadcast Engineers' Journal is a privately printed monthly publication issued by NABET Publications. Address all communications to Editor's office: E. Stolzenberger, 116-03 91st Avenue, Richmond Hill 18, L. I., N. Y. Telephone Virginia 9-5553.

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NATIONAL N.A.B.E.T. OFFICE
Room 501, 66 Court Street, Brooklyn 2, N. Y.
A. T. Powley, President

hallicrafters establishes national network of strategically located SERVICE CENTERS

The Hallicrafters Co., Chicago, announces the beginning of a new national network of official service centers to specialize in repair and servicing of all Hallicrafters communications equipment: marine and aviation radio, ham transmitters and receivers. Service centers have already been established at New York, Pittsburgh, Kansas City, Mo., Los Angeles and Seattle. Service at these locations will be equal in every way to that offered by the Chicago factory.

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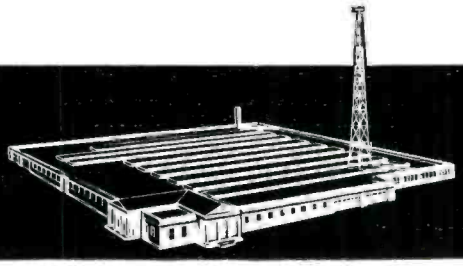
See your local Hallicrafters distributor to learn how and where you can benefit from this new service system. Your high precision Hallicrafters equipment deserves the finest care . . . put your repair and service problems in the hands of specialists: Hallicrafters official service centers.



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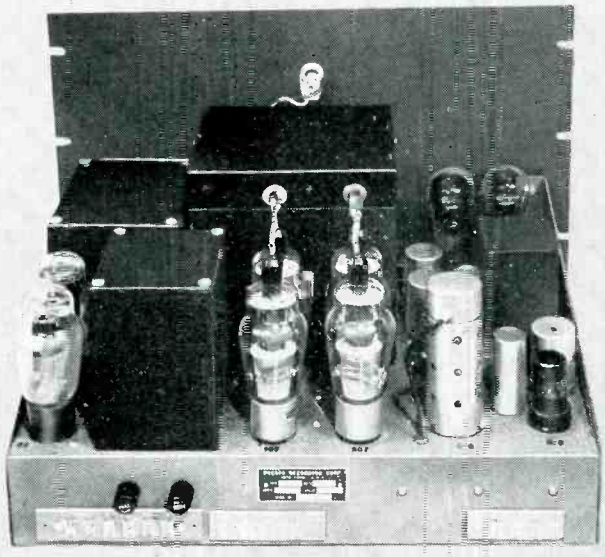

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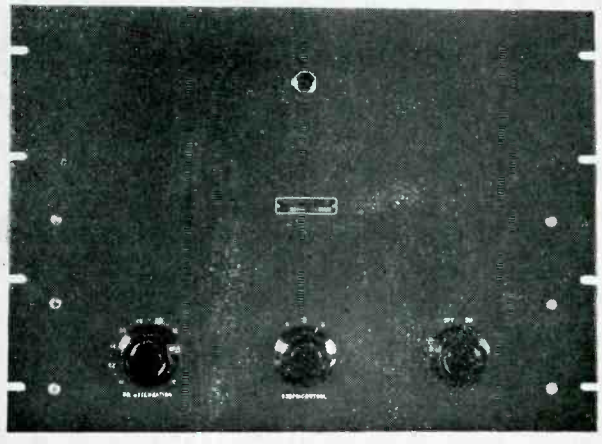

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NABET ACTIVITY

IMPORTANT—President A. T. Powley is tentatively scheduled to leave New York for Los Angeles and San Francisco on August 11th via American Airlines.

NABET ELECTIONS reported since last month—Baltimore Chapter elected C. Edward Jung, succeeding Harry M. Boone; Omaha Chapter elected Mark McGowan, succeeding D. Roy Glanton; Dixie Chapter re-elected J. Willard Dean; Rochester Chapter re-elected Charles Synder: San Francisco elected John R. McDonnell, succeeding Mark Dunnigan; Engineering re-elected R. R. Davis.

EMPLOYMENT SERVICE—Members seeking employment should immediately contact the National Office.

DEADLINE NOTICE—All copy must be *received* in Richmond Hill by the second of the month for the next following issue; copy must be placed in the mail in ample time to be *delivered* by the second. Chapter Chairmen are reminded of the necessity of reading and initialing their Chapter Editor's copy *before* it is submitted for publication.

VICTORIES—NABET has been recognized as the bargaining agent for the NBC Model Shop Engineers. NABET won the case at KYW Philadelphia; ACA had filed an unfair labor practices charge against Westinghouse; with this baseless charge disposed of, certification proceedings begin, which NABET expects to win.

IN THE MILL—Negotiations for the NBC Model Shop Engineers. Negotiations for the NBC Matrix group. Negotiations for the RCA Matrix group. Westinghouse negotiations for the KDKA, WBZ, and WBZA groups still in progress. Negotiations for the WFIL ABCO-Philadelphia engineers. Negotiations for the contract-renewal at WOLF, Syracuse. C. A. Allen is negotiating NABET contracts at WDAN, Danville, Ill., WROK, Rockford, Ill., and WAIT, Chicago. On his return East, Allen will attend the KDKA Pittsburgh negotiations.

DISPUTES—

I.B.€.W. STENCH
or
Big Shot spelled any other way Smells just as Bad!

For the past fourteen years, NABET's Members have had the opportunity to freely discuss and consider affiliation; but NABET always emerges stronger than before. There are two substantial reasons for this.

First, NABET's mature membership considered carefully and well, the good and bad points, advantages and disadvantages of the existing unions, and decided against all of them. Because,

1. None of them were solely concerned with the best interests of the Broadcast Engineer;

2. None were run and managed by Broadcast Engineers;

3. In all cases, the Broadcast Engineers would be greatly outnumbered and out-voted in all matters concerning their own welfare.

The creation of NABET was the answer to these evils, and NABET is still the only answer to these evils — which is the REASON why every day, more and more groups of Broadcast Engineers are joining NABET —

The Only Union That Is Of, By, and For the Broadcast Engineer.

Second, is I.B.E.W.'s Profound Stupidity, Misstatements, and Fundamental Policy of Obstructionist Tactics at the expense of the Public. This is not a generality,—we are going to be quite specific. But first let us assure the witless ones responsible for the so-called guidance of I.B.E.W., that every act of stupidity, misstatement of fact, or other typical I.B.E.W. tactics becomes just another wedge further separating NABET and I.B.E.W., and further strengthening NABET's Membership in their determination against affiliation—particularly against I.B.E.W. and the stench it stands for, and against any other union, who, through tradition and policy, is continually engaged in wrangling, feuding, jurisdictional warfare, and other acts amounting to gangsterism.

I.B.€.W.'s Profound Stupidity, or — LACK-O-VISION!

The televising of the Louis-Conn World's Heavyweight Title fight from the Yankee Stadium on June 19th, 1946, was unique in the history of Television and Prize Fighting. It was unique in that, with the announcement that this fight was to be televised, a third unseen but nevertheless very real contender for public acclaim would also be in the ring. This additional contender was the Television Industry—which our government had announced it hoped would be the springboard of America's post-war prosperity. The actual outcome of the *fight* was of no real importance, but the success or failure of the *televising* of the fight would definitely affect hundreds of thousands of potential technicians, actors, etc., both in front of the cameras and behind the cameras, and billions of dollars of potential capital investment in television plant, equipment, and receivers.

NABET Television Engineers have been very successfully televising remote outdoor and indoor events since April 30, 1939, when they televised the late President F. D. Roosevelt at the opening of the New York World's Fair. NABET Engineers have been televising one to three major field pickups a week FOR YEARS, including baseball, basketball, football, wrestling, boxing, etc., very successfully. To the NABET Engineers, the Louis-Conn fight was another important public event, which they handled in the same, routine, meticulous and technically perfect manner.

As anticipated by the NABET Engineers, the fight was picked up, relayed, and broadcast to the American Public in sixty-mile radii of New York, Schenectady, Philadelphia, and Washington, D. C., with perfection. The public acclaim, clamor, and general "we want more" is now a matter of record,—substantiated by sportswriters, critics, persons important in business and public life, and the trade and lay press.

NABET is proud of the part it played in bringing the Louis-Conn fight to the American Public via television, and through this event, to bring about the earliest possible widespread public acceptance and useage of television, and with it, more jobs, and through more jobs, greater prosperity for all.

While NABET Engineers were putting their every effort into this broadcast, the IBEW was discovered to be crawling like snakes, stealthily approaching and converging upon the NABET Engineers and their employers, making every effort to PREVENT the televising of the fight! The IBEW made every effort to interfere with and OBSTRUCT the broadcast through veiled threat, coercion, suggestion that they could be bought off (another IBEW tradition), innuendos about pulling the power feeds, and a melodramatic last-minute demand that I.B.E.W. handle the television equipment for the pickup!

It is ridiculous to even suggest that at the very last moment, the IBEW men could have stepped in and replaced a competent team of NABET Engineers; further, under these conditions, it is very dubious whether the IBEW men could have handled the assignment in a manner that would have been a credit to the Television Industry. While we have no quarrel with the technical competence of the CBS television engineers, it is a matter of record that operationally, the NABET television engineers have many more years of experience in the art of mobile and field television pickups, and that therefore this important television broadcast—pivotal to the whole future of television—if handled by I.B.E.W. men would at best have been inferior to the performance of the NABET Engineers.

This incident is typical of the IBEW; it is indicative of IBEW's total disregard and disrespect for the public, and the public service to which all of radio is of necessity dedicated. This incident points up the only policy and procedure that the IBEW has ever been able to understand: COERCION!

Of course, at the very last minute, all of the IBEW's threats and demands vanished into hot air, and the NABET Engineers went through with their contract obligations, and did a commendable job.

The IBEW's only purpose was to prevent if possible, or at least interfere by any means or device with the successful televising of the Louis-Conn fight.

It is regrettable that the CBS television engineers were forced by IBEW policy into the disgraceful position of impeding and

harassing the industry that is paying their salaries. The IBEW certainly doesn't deserve the support of any competent television engineers within its membership. IBEW's policies and methods can hardly be said to attract decent citizens. NABET Engineers regard the very thought of IBEW affiliation as a reflection on their professional standing.

The IBEW, a so-called labor union of Americans, attempting at every turn to thwart and impede this new television industry which holds promise for many new jobs in the manufacturing, sales, distribution, installation, and servicing of television equipment and receivers, and countless jobs among the technicians, artists, announcers, and other personnel required in television programming, has VERY SERIOUS IMPLICATIONS.

The A. F. of L. stands charged with approving and fostering these willful and malicious acts of the IBEW of the A. F. of L. If the A. F. of L. is not a party to the planned sabotaging of the American Television Industry, it will immediately call for a full-dress public hearing of the IBEW's un-American activity, and expel those guilty and responsible. At the same time, the A. F. of L. will seek out those in the A. F. of M. who are ALSO retarding and attempting to delay, impede, and obstruct the American television industry through their arbitrary refusal to permit musicians to participate in television programs, under penalty of expulsion from the A. F. of M. Those responsible for this planned sabotaging of television must be brought out into the light and expelled from the A. F. of L.

I.B.E.W.'s Misstatements and Fundamental Policy of Distorting the Truth and Deliberately Misinforming its Members
or
A Question Answered by NABET President A. T. Powley

In a recent issue of "Radio Broadcast Engineer News," published by Local 1212, of IBEW, I note an article on Page 2 entitled, "Past and Present, or Two Incidents." This article is full of misinformation and untrue statements which follows the pattern of IBEW information and propaganda to its members.

Local 1212 is beefing about losing the election at Muzak. They claim that NABET members are suffering because of low wages and working conditions. NABET has just completed negotiations for a new contract with Muzak,—working conditions and wage increases which were dictated by the members themselves. I have heard no complaint from Muzak employees regarding suffering due to working conditions or wages. Top scale at Muzak is $96.92 per week.

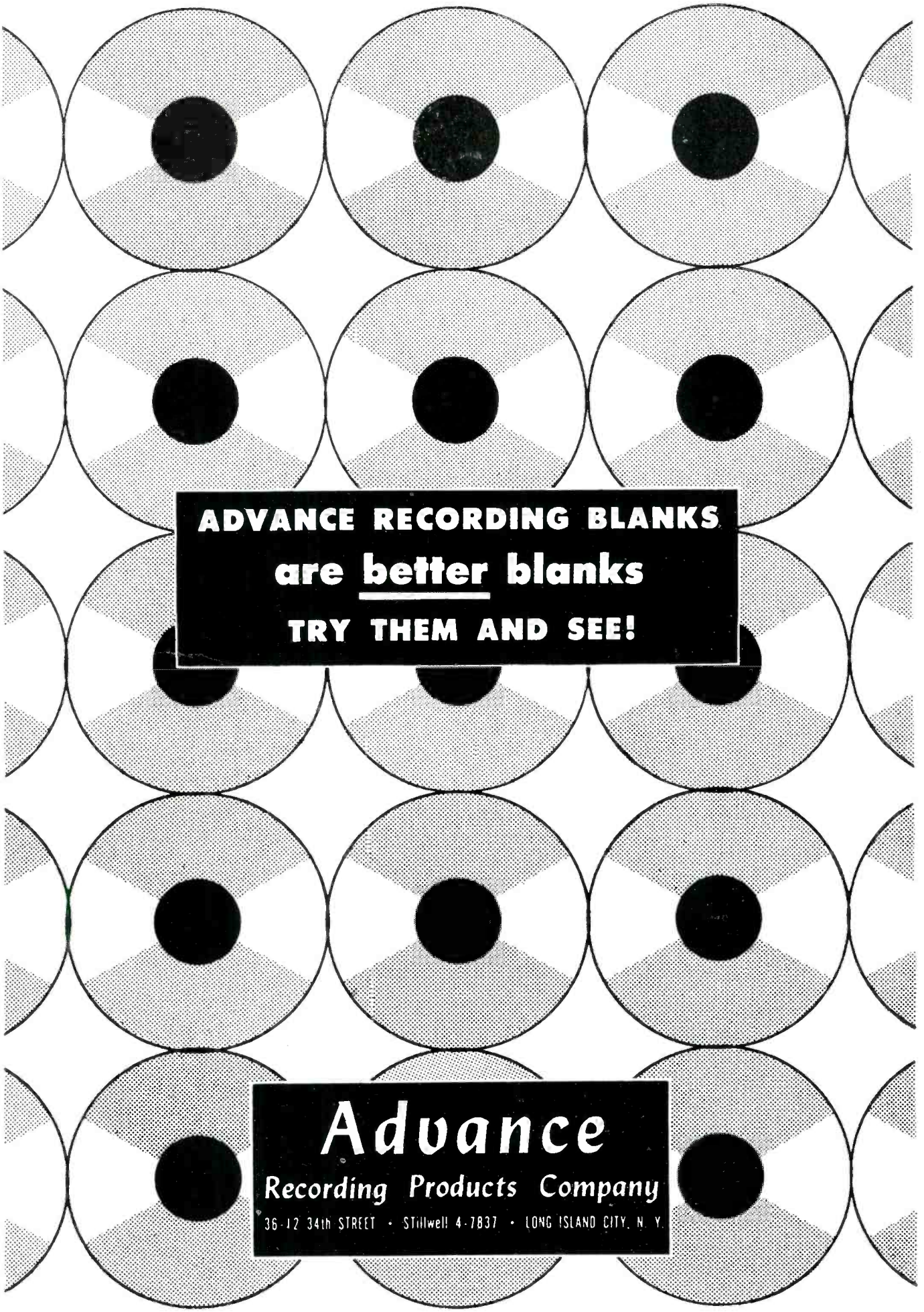
If conditions existed as stated by IBEW, they had an opportunity under the National Labor Relations Act to ask for a new election at the termination of the last NABET contract. No effort was made by IBEW to petition for a new election.

This unsigned article further states that Muzak and WOR made NBC and ABC recordings during the NABET strike. As a matter of fact, all feeds from NBC and ABC were refused by our members at WOR and Muzak. However, there were recordings made for NBC-ABC during the NABET strike. These recordings were made by the Empire Recording Company, whose employees are members of Local 1212, IBEW.

Some time ago, NABET petitioned for certification of the employees at WOV. After the petition was filed with the local Board, it was learned that IBEW was also interested in WOV. IBEW now claims that we are asking for their withdrawal from the case. This is another false statement;—we are asking that an election be held to determine the proper bargaining agent. ACA and IBEW refused to go along on a consent election, thereby continuing to prolong the case, thus keeping WOV members from a new contract. Hearings on this case have just been concluded and the trial examiner has taken it to Washington for final decision. During these hearings no representative of IBEW made an appearance or showed any interest in the case.

The IBEW article concludes with the statement, "Our well-informed membership is continually asking when the merger of NABET and IBEW is going to take place." I am happy to inform the well-informed membership of IBEW that the IBEW-NABET merger will never take effect. If and when we decide to affiliate with the A. F. of L., it will be with a charter from the IATSE, who have promised us better than a Class "B" rating.

A. T. POWLEY, President, NABET.



Degenerative Feedback Amplifiers

By J. H. Platz*

A DEGENERATIVE feedback amplifier is one in which a portion of the amplifier output is introduced into the input of the amplifier in such a way that the net grid input voltage is reduced, thus resulting in a reduction of the overall gain of the amplifier. This practice is also known as "Negative Feedback" or "Inverse Feedback." The reduction of gain is a disadvantage that is offset by a number of advantages. The exact nature of the advantages depends on the means by which the feedback signal is obtained. In many applications of multi-stage amplifiers the aim is to produce a given voltage or power output without exceeding certain limits of amplitude, frequency and phase distortion. Often the requirements as to distortion are so severe that extra expense and complexity of construction are warranted if the desired results are achieved. Hence, if degenerative feedback will improve the characteristics of the amplifier its application may well be worth the extra expense and trouble even though more stages will be required to give the desired amount of amplification.

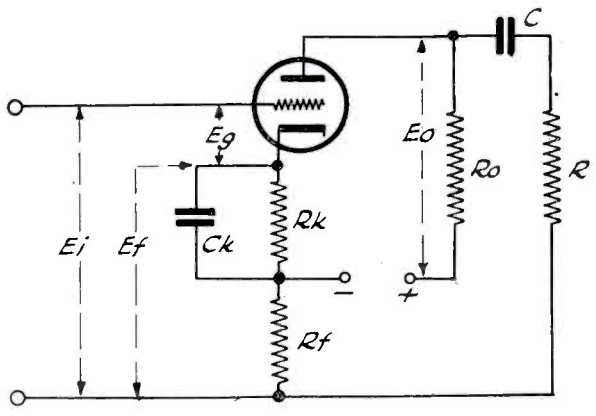


Fig. 1. Simple amplifier circuit illustrating the basic principle of feedback.

There are two types of degenerative feedback: (1) "voltage feedback" in which feedback voltage is obtained from a voltage divider across the output of the amplifier and (2) "current feedback" in which the feedback voltage is obtained from voltage developed by current flow in the output circuit. Voltage feedback will be taken up first.

A simple example of degenerative feedback is shown in the single stage amplifier of Fig. 1. In this circuit the feedback voltage is introduced into the input circuit by means of the voltage Ef developed across Rf. The cathode bypass Ck is assumed to provide perfect bypassing of Rk at all frequencies. If the condenser C is assumed to be so large that voltage drop and phase shift through it are negligible and if R is assumed to be much greater than Ro (so that the load impedance into which the tube works is substantially Ro) it will be seen that resistors R and Rf in series act as a voltage divider across the output of the tube. Then the feedback voltage Ef = Eo [Rf/(Rf+R)]. Suppose the gain of the stage (without feedback) Eo/Eg = 20, that Ef = 2 volts and that Eg = 1 volt. Under these circumstances Eo will be 20 volts. Since a portion of the output is impressed across Rf out of phase with the input Ei, the total voltage Ei necessary to produce 20 volts at Eo will be Eg + Ef, or a total of 3 volts. In other words, Ei must be great enough to overcome the feedback voltage Ef and provide the necessary 1 volt at Eg. The overall voltage gain of the amplifier has thus dropped from 20 to 20/3 or 6.66.

Suppose that for some reason the voltage gain Eo/Eg dropped to a value of 10 at a certain frequency. In order to develop 20 volts at Eo, the voltage necessary at Eg would be 2 volts and the necessary voltage at Ei would be Eg + Ef or 4 volts. Now the overall voltage gain Eo/Ei has dropped to 5. It will be seen that while the gain of the amplifier without feedback was reduced by 50%, the overall gain dropped by only 25%. Thus the feedback will tend to "iron out" irregularities in the frequency response of an amplifier. Any noise generated in the amplifier stage will tend to cancel itself out since a portion of it will be fed back to the input out of phase with the original noise in the amplifier.

The general expression for the gain in a feedback amplifier is:

$$Afb = A/(1 - AB) \qquad (1)$$

when

A = amplifier gain without feedback.
Afb = amplifier gain with feedback.
B = Ratio Ef/Eo + Ef, using notations of Fig. 1.

In the case of the amplifier of Fig. 1, when the amplifier gain without feedback was equal to 20, the above formula will also result in an overall gain of 6.66 with feedback. The feedback voltage Ef is out of phase with the input voltage and the quantity B is therefore considered to be negative. Consequently for the example of Fig. 1, the expression (1) becomes

$$Afb = [20/1 - (20 \times -0.1)] = 20/(1 + 2) = 6.66$$

Further examination will show that when A is very great, Afb will be essentially the reciprocal of B.

All of the foregoing has assumed that the feedback voltage would be truly negative, i. e., 180 degrees out of phase at all frequencies. In the mid-frequency range this is essentially true but we have seen that resistance-coupled amplifiers show increasing phase shift at both ends of their useful range. Since the feedback voltage will consequently be shifted from a true 180-degree relationship, the net grid input voltage becomes the vector sum of Eg and Ef. Ignoring —for the moment—the natural 180-degree phase shift in a vacuum tube, the maximum phase shift in a single resistance-coupled stage is 90 degrees. Thus the degenerative loop within a single stage can not contain any in-phase component since the maximum overall shift, including the tube

Fig. 2. Effect of feedback on frequency response of a typical amplifier.

– – – – – Gain/freq without feedback.
——— Gain/freq with feedback.

* Control Supervisor, NBC Chicago. See "Audio Amplifiers—Some Basic Considerations"—by Platz, August, 1945, BEJ, and "Video Amplifiers—Some Basic Considerations"—by Platz, October, 1945, BEJ.

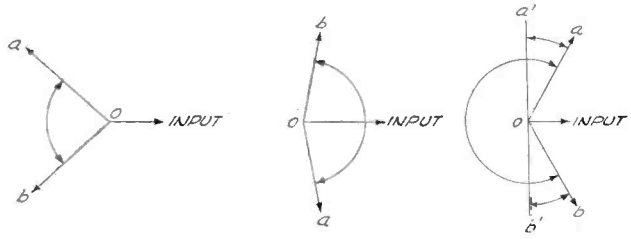


Fig. 3 (A) First stage (B) First and second stages (C) All three stages

Showing progressive range of phase shift in a three-stage amplifier in which each stage has a phase shift of 180° (in the tube) plus and minus 40°. In (A) the total phase shift varies over an 80 degree arc from 140 to 220 degrees. In (B) the overall arc is 160 degrees from 280 to 420 (or 60) degrees. In (C) the arc is from 60 through 300 degrees and includes sectors aa′ and bb′ which have components in phase with the input.

shift, is from 90 to 270 degrees. In transformer-coupled amplifiers, however, the maximum phase shift within a single stage can easily reach a point where considerable in-phase component will exist. If the transformer is resistance-loaded to the point where resonance effects are eliminated, this in-phase component will not exist. Therefore the feedback ratio B must be considered as a vector quantity. A detailed analysis of the various possibilities under this consideration is beyond the scope of this discussion. Some general statements can be made, however, and readers interested in a more rigorous discussion are referred to any one of numerous texts and handbooks which go into more detail on the subject.

At both ends of the useful frequency range of a given amplifier gain gradually drops off and at the same time phase shift varies from the mid-frequency condition. As has been shown previously, degenerative feedback will tend to hold the gain more nearly constant over the useful frequency range. As frequency is extended further into the low gain region, a point will be reached beyond which degenerative feedback can no longer have appreciable effect in maintaining constant gain and so the gain drops off rapidly. A typical case showing this effect is shown in Fig. 2.

If at any point on the solid curve of Fig. 2 phase shift results in an appreciable in-phase component of feedback voltage, the resultant positive feedback may result in peaks of gain in the normally low-gain region and in extreme cases will even result in oscillation. This condition can easily exist when the feedback loop includes more than one stage and this places a practical limit on the number of stages over which a single loop of degenerative feedback can be applied. As an example of such a condition, assume an amplifier of three stages and that phase shift in each stage varies plus and minus 40 degrees. The overall phase shift—including tube shift will vary from 140 to 320 degrees out of the first stage, from 280 to 420 degrees out of the second stage and 420 to 660 degrees out of the final stage. Subtracting 360 degrees, the output phase shift will be from 60 through 180 to 300 degrees. The phase shift in successive stages is diagrammed in Fig. 3. Any phase shift between 60 and 90 degrees or between 270 and 300 degrees will include a component that is in phase with the input voltage. If the in-phase component is of sufficiently great amplitude it will, as stated above, support oscillation. If not of great enough amplitude to support oscillation it will cause sharp peaks of excessive gain at the extreme high and low frequency limits of the amplifier. The amplitude of this in-phase component is determined by the amplifier gain at the frequencies involved and by the percentage of feedback. It is a common practice in multi-stage feedback amplifiers to include one stage with sharp cutoff in order to remove the frequencies which may show some in-phase component in the feedback voltage.

Degenerative voltage feedback also results in an apparent reduction of output impedance. If the terminating load of the final amplifier in a feedback loop is reduced, it will tend to reduce the voltage output. However, the amount of feedback voltage will also be reduced and gain will be brought back to near the original value.

Amplitude distortion will cause a distorted wave to be fed back to the input of the amplifier where it will tend to "buck out" the original distortion.

Thus voltage feedback will result in reduction of amplitude and frequency distortion, a reduction of internal noise and an apparent reduction of output impedance. These are accomplished at the cost of somewhat reduced gain.

The outstanding example of current feedback is an amplifier with unbypassed cathode resistor. The feedback voltage is developed by current flow through the cathode resistor, hence the designation as "current feedback." Current feedback is similar to voltage in some respects but entirely opposite in other ways. Current feedback will not improve frequency response because the circuit elements which limit frequency response are outside the feedback loop. Current feedback tends to increase the apparent output impedance of an amplifier because it tends to maintain a constant output current regardless of the value of the terminating load impedance. Under this condition output voltage will vary quite linearly with variations in load impedance. This, it will be remembered, is a basic condition involved in the design of video amplifiers.

A few examples of degenerative feedback circuits are shown. The circuit of Fig. 1 can be completed by the addition of a normal value of grid resistor from the grid to the lower end of the feedback resistor Rf and it then becomes suitable for use in resistance-coupled amplifiers. Transformer coupling can be used by connecting the secondary of an audio transformer across the input terminals of Fig. 1. This, however, puts both ends of the secondary winding above ground and sometimes leads to hum pickup difficulties.

Fig. 4 shows an arrangement wherein the output transformer is included in the voltage feedback loop. This results in an apparent improvement of the output transformer characteristics. Of course, polarity of the feedback signal must be correct or positive feedback and oscillation will result. The circuit of Fig. 4 can be modified to correct for peaks of excessive low frequency response which are caused by resonance in loudspeakers or other output load devices. A series resonant circuit inserted in the feedback loop can be arranged to provide more feedback and resultant reduced gain at the undesired resonant frequency. If accentuation of either bass or treble is desired, a condenser or inductance alone can be inserted in the feedback loop to reduce feedback at the low or high frequencies respectively. The amount and slope of attenuation can be controlled by variable resistors in series with, and also parallel to, the reactive elements.

Voltage feedback over two stages is shown in Fig. 5. Here the feedback is applied to the cathode circuit of the first stage. R1 is common to both the cathode circuit of the first stage and the feedback loop from the second stage. Actually both current and voltage feedback exist simultaneously. R1 serves as one section of the voltage divider across the output

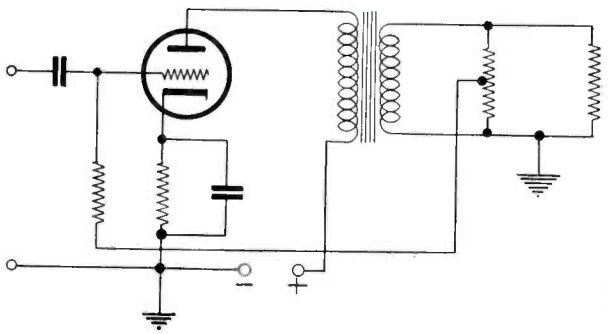


Fig. 4. Degenerative feedback circuit which reduces distortion resulting from output transformer.

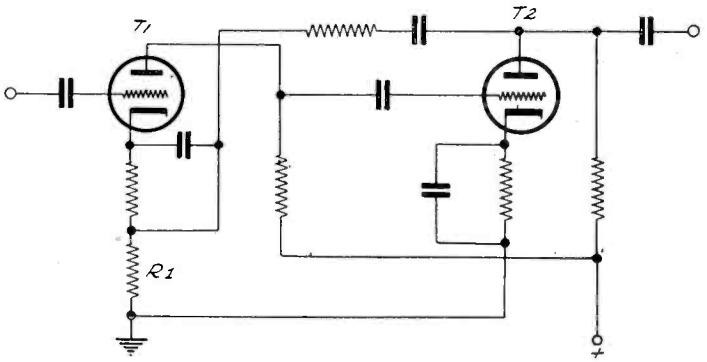


Fig. 5. Typical circuit for voltage feedback over two stages.

of T2 and at the same time causes current feedback within the first stage.

There is an almost endless variety of possible feedback circuits and uses for them, but space permits only a few typical examples. The interested reader can evolve modifications to suit his particular requirements.

CATHODE FOLLOWERS

There is one special feedback "amplifier" which is coming into increasing popularity because of its peculiar properties of impedance transformation and low distortion. Consider first the normal amplifier circuit of Fig. 6 (A). If T1 is a 6J5 and RL is 1000 ohms the gain can be determined by substitution of appropriate values in the formula.

$$A = gm\ Rpar$$

in which Rpar is the parallel combination of rp, Rl and Rg (of the following stage). Since Rg will be very high in comparison with 1000 ohms we can ignore Rg but the plate resistance of a 6J5 is 7700 ohms so it must be considered in arriving at the value of Rpar. Carrying out the operation,

$$A = .0026 \times 888 = 2.3$$

which isn't very high gain.

Now if Rl is moved to the cathode circuit as in Fig. 6 (B) it becomes a cathode bias resistor as well as load resistor and the battery bias of Fig. 6 (a) can be shorted out. Also since the load resistor is in the cathode circuit and is unbypassed it provides degenerative current feedback—in fact 100% degenerative feedback. The gain with feedback will be

$$Afb = A/(1-AB) = 2.3/[1-2.3(-1.0)] = 0.7$$

and the "gain" will actually be a loss since only .7 of the input voltage will appear at the output terminals. However, there are characteristics that become apparent as we examine the circuit which bring out its usefulness. It should be realized that the output to input ratio of .7 holds only for the particular conditions chosen for this example. The result obtained in this case is, however, quite representative as the output can never be equal to or greater than the input and rarely drops to as low as half the input voltage.

Examination of the behavior of the circuit of Fig. 6 (b) reveals some unusual features of the circuit. First, consider what happens to plate resistance rp. As before, the gain of a stage is equal to the product of gm multiplied by the parallel combination of rp and Rl which has been previously designated as Rpar. In this case gain and gm are known so

$$Rpar = A/gm$$

and from this Rpar is found to be 268 ohms. Since it consists of Rl (1000 ohms) in parallel with rp, it appears that rp takes on a new value in the cathode follower which in this case turns out to be 366 ohms. The normal rp of a 6J5 is 7700 ohms. It can be shown by mathematics that the apparent (or effective) rp in a cathode follower is equal to $rp/(\mu + 1)$. From this the effective rp of a 6J5 as a cathode follower is 366 ohms which checks with the value previously determined.

Using 366 ohms as rp, 1000 ohms as Rl and .7 as the gain, we can investigate the effective amplification factor μ. Using the formula

$$A = \mu\ Rl\ /\ (Rl + rp)$$

and solving for μ we get

$$\mu = A\ (Rl + rp)\ /Rl$$

Substituting the above values of A, rp and Rl we find

$$\mu = 0.7 \times 1366\ /\ 1000 = 956\ /\ 1000 = .956$$

Actually it can be shown that the effective μ is equal to $\mu/\mu + 1$ which figures to be .952 and checks closely with .956 as determined above. Since values of rp, μ and gm are listed to only two or three significant figures it can not be expected that calculations by various methods will check out absolutely.

So it is seen that as far as voltage amplification is concerned, the cathode followed is not actually an amplifier and also that it appears as a low impedance when "viewed" from the load. These characteristics are not in themselves of any particular value but some useful ideas can be developed from them.

Referring again to Fig. 6 (b) it will be seen that unlike a normal amplifier, the output voltage in the cathode follower is in phase with the grid input voltage. We have seen that in one representative setup the output voltage is about 70% of the input voltage. This leaves only 30% of the input voltage impressed across the grid-cathode tube terminals. With such a reduction in applied voltage, AC current flow through the grid-cathode capacity will be reduced to 30% of what would flow if the entire input voltage were to be applied to the tube. This reduced current flow causes the grid-cathode capacity to APPEAR to be less than it actually is. Likewise any grid to cathode resistance, such as Rg in Fig. 7, has only a portion of the input voltage across it and consequently, it too, appears to be different than it actually is, in this case appearing as a higher resistor. With reduced input capacity and increased input resistance the cathode follower has a very high input impedance. The following formulae apply:

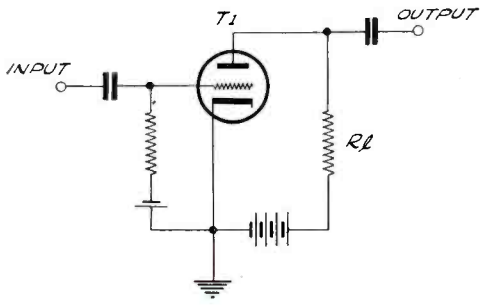


Fig. 6 (A) Low gain amplifier stage.

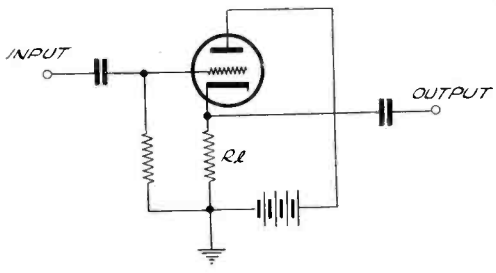


Fig. 6 (B) Cathode coupled amplifier stage (cathode follower).

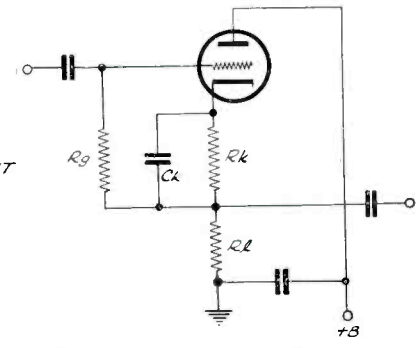


Fig. 7. Practical cathode follower circuit.

Equivalent Input Capacity = (Actual Grid-Cathode Capacity X Egk)/Ein. (2)

Equivalent Input Impedance = (Actual Grid-Cathode Impedance X Ein)/Egk. (3)

when:

Ein = voltage at cathode follower input terminals.

Egk = actual grid-cathode voltage (which is equal to Ein minus output voltage).

Carrying the thought further it is obvious that for a given input voltage the greater the voltage across Rl the less the apparent input capacity. Thus if Rl is increased to 20,000 ohms, the voltage across it rises to 94.3% of the input voltage. The remaining 5.7% is across the grid-cathode terminals of the tube and the apparent input capacity is only 5.7% of the actual grid-cathode capacity. However, the load resistor in a simple cathode follower such as is shown in Fig. 6 (B) is also the cathode bias resistor and 20,000 ohms is an excessively high value of cathode resistor for a 6J5 in class A operation. Negative input peaks would be almost completely clipped with such high cathode bias. This is—in fact—the basic idea of the so-called "infinite impedance detector." To get class A operation with a high value of load resistor in the cathode circuit the circuit of Fig. 7 can be used. In this arrangement the functions of cathode bias resistor and load resistor are separated. Rk is of suitable value for Class A operation and is bypassed by Ck. The output voltage still appears across Rl 180 degrees out of phase with input voltage and 100% negative feedback still exists. The apparent input capacity and input impedance will be very low.

The circuit of Fig. 7 has been used for interstage coupling in video amplifiers. The low input capacity permits a higher value of load resistor in the preceding stage thus permitting as much as 25% more gain. Of course a part of this is lost in the cathode follower itself—in this case 5.7% of the input—but 94.3% of 125% is equal to 118%, an 18% increase in gain.

As a result of its high input impedance, its excellent isolation between input and output, and its low output impedance, the cathode follower is frequently used as an input stage for oscillographs and other test instruments. Along this same line, a cathode follower stage is often placed at the end of a flexible cable and used as a "probe." Its high input impedance results in little, if any, shunting effect on equipment under test. On the other hand, its output is of such low impedance that the shunting effect of any reasonable length of cable will be negligible.

Actually, of course, a cathode follower used at the end of a probe operates merely as an impedance matching device. There are other uses along this same idea in which the cathode follower is greatly superior to an impedance-matching transformer. In the first place, the cathode follower will work all the way from audio frequencies to quite high radio frequencies. Furthermore, the ordinary impedance matching transformer shows a voltage reduction by a ratio of 1/A, when A is the square root of the impedance ratio and is always greater than 1. Thus, for example, a 100 to 1 impedance matching transformer will deliver an output voltage equal to one-tenth of the input voltage. A cathode follower will, on the other hand, deliver an output voltage of from 60% to 90% of the input voltage. From this it is apparent that the cathode follower does give a POWER gain. All of the foregoing applies to the cathode follower as a step-down impedance matching device.

It will be noted that condensers have been shown in the output circuits of cathode followers in Fig. 6 and Fig. 7. The purpose of the condensers is, of course, DC isolation. If the output is fed to a low impedance load it is entirely probable that the series output condensers will cause some phase and frequency distortion. Whenever possible the ultimate load should be connected directly in the cathode circuit of the tube. Another difficulty which occasionally arises in cathode followers is the result of cathode to heater leakage in the tube. Obviously tubes used for this purpose should have very good insulation between cathode and heater.

There is an almost endless variety of uses for cathode followers. In addition to uses previously mentioned, they are often used as microphone pre-amplifier to line matching "transformers," as power amplifiers for feeding deflection circuits of magnetic deflection cathode ray tubes (and this DOES require power), for feeding low-impedance RF and video lines and for circuit isolation when voltage gain is either unnecessary or undesirable.

ANTI-RADAR

By Jordan McQuay

Radar Jammers Used Against Germany and Japan Disclosed to Public for First Time

A FIVE-POINT anti-radar operation ordered by Gen. Eisenhower and executed by British and American planes and ships completely bewildered the German radar system along the Normandy coast on the night before D-day in June, 1944, while the Allied armies moved silently across the channel.

Called the greatest military hoax in history, only now—nearly two years later—have some of the details of the five-point operation been revealed. These were labelled Operations Taxable, Glimmer, Mandrel, ABC, and Titanic.

Under Operation Taxable an entire RAF squadron dropped thousands of bundles of chaff or "window"—thin metallized strips of paper—over an area of 96 square miles and well removed from the actual invasion area. Planes flew in a continuous box formation, circling tightly, and moved slowly toward the west coast of France. To German radar sets in France, the huge moving mass appeared to be a convoy of ships approaching the coast. And it is now known that the ruse worked perfectly, while the actual invasion forces were miles away.

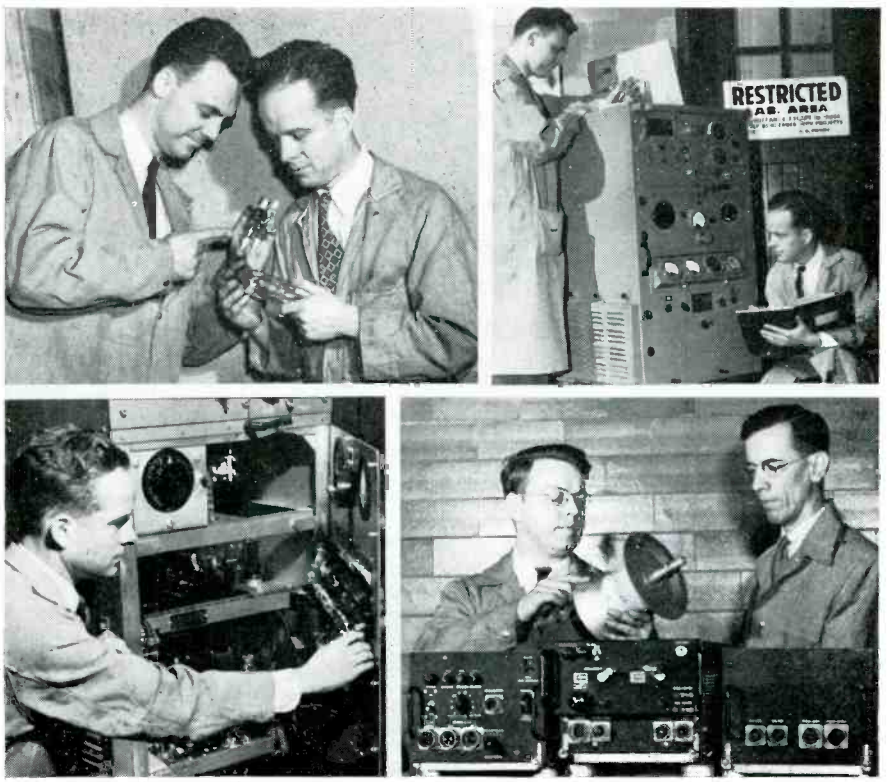
Special radar jammers were installed in slow, low-flying bombers as part of the same anti-radar operations the night before D-day. The type AN/APT-4 (shown in figure 1) was one of these highly mobile jammers that splattered the French countryside with extraneous and confusing radar signals designed to bewilder the Germans. This equipment, developed by the Radiation Laboratory at Cambridge, Mass., was manufactured by General Electric for use by the Army Air Force.

Shipborne anti-radar devices also were used before and during the D-day invasion. One type of Navy jammer—the type TDY-2—was especially effective. This was the equipment which enabled the U. S. S. Texas and other warships of the fleet to stand off shore, within range of German radar-controlled batteries, and cover effectively the landings of our troops on France. The Nazi fire-control system was completely demobilized by electronic action of such jammers.

The TDY-2 depends for much of its effectiveness on the G-E CW magnetron. And the equipment (figures 2 and 3) was constructed by General Electric according to specifications of the Radiation Laboratory at Cambridge, Mass.

The same type of jammer was used against the Japanese with equal effectiveness all during the last year of the war in the Pacific.

The CW magnetron (figure 4) was developed by G-E originally for the Navy in one afternoon in October, 1944. A few days later copies had been made of the original model and installed in jamming equipment. Navy transport planes picked up the complete order for TDY-2 equipment from the G-E Syracuse plant and flew them directly to the Philippine Theater—where they were sorely needed to jam Jap radars just installed in Jap torpedo bombing planes.



Top left (Fig. 4): The CW magnetron, designed and developed by General Electric, is the heart of the radar jammers used by the Navy and the Air Force. Engineer L. M. Ewing (l.) points to a production line magnetron. Engineer J. W. Downie (r.) holds the original CW magnetron which was designed by G-E according to Navy specifications in one Saturday afternoon in 1944. Ten days later, mass-produced magnetrons were in radar jammers en route to the Pacific. Top right (Fig. 2): General Electric's radar jammer, the TDY-2. Engineer L. M. Ewing (l.) inserts G-E designed and developed CW magnetron in the jammer, while Engineer J. W. Downie makes a reading from the dials.

Bottom left (Fig. 3): Interior view of Navy's TDY-2 radar jamming equipment. Engineer J. W. Downie swings back door of this General Electric wartime development. Bottom right (Fig. 1): G-E Engineers A. J. W. Rhodehamel and A. P. Heymann discuss merits of the antenna in front of the AN/APT-4 airborne radar jammer. Unit in center is heart of the equipment, powered and controlled by the G-E CW magnetron.

We dedicate this page to . . . .

Charles W. Phelan ~ David J. Moloney

as a tribute to their loyalty and devotion to duty in the execution of the offices of Treasurer and Assistant Treasurer of this Journal continuously since 1940. Their recent resignations were regretfully tendered and received,—brought about through an increase in their other duties and responsibilities.

—Ed Stolzenberger.

Charles W. Phelan

Charles W. Phelan is a native New Yorker. He became interested in radio in 1912, and obtained an amateur license in 1914. He was graduated from the Rockeville Center High School in 1917, and attended Pratt Institute during 1918; he then completed the radio course at the old RCA school, and obtained his commercial radio operator's license in 1919. Phelan went to sea as a radio operator, visiting many foreign countries. After several years of this valuable experience, he joined the New York Telephone Co. in 1923, in the machine switching division, eventually becoming a switchman after passing through various circuit schools. He obtained his first position in broadcasting in 1925 at WGBS, New York City, and joined the NBC Engineering Department on Dec. 23, 1926, and was assigned to WRC at Washington. In 1928, Phelan transferred back to NBC's New York studios in the Maintenance Group. His ability was rewarded when, in 1930, he was appointed Maintenance Supervisor, and he has held this position to date.

Mr. Phelan has been a member of NABET and its predecessor, ATE, since its inception in 1933. With an administrative change in the Broadcast Engineers' Journal in 1940 (then the A.T.E. Journal) Phelan's unquestioned integrity made him the unanimous choice as the Journal's Treasurer.

David J. Moloney was born and educated in Dublin, Ireland, where he served a five year apprenticeship in the electrical engineering business. Following his apprenticeship, he was engaged in considerable construction work in England, Ireland, and Scotland. Moloney came to the United States in 1923 and joined the Westinghouse Electric & Mfg. Co. as field engineer for ten years, covering construction and installation of Railroad, Marine, Power Station, Industrial, and Broadcast equipment. The broadcast installation covered the WJZ Bound Brook, N. J., and NBC—711 5th Avenue Studios in New York. He joined the NBC Engineering Dep't, Audio Maintenance, in 1933, and for thirteen years he has kept an "eagle eye" on the power equipment and precision clock system. In recognition of Dave's experience in the construction field, he was transferred in March 1946 to the NBC Audio-Video Facilities Group, as Construction Engineer. His first major assignment has taken him to NBC-Hollywood in July, 1946, for approximately six months, where he will be field representative in connection with the building of new studios and recording equipment.

Mr. Moloney has been active in NABET (and its predecessor, ATE) affairs for years, holding the positions of Councilman, Chairman Entertainment Committee, Election Committee, and Assistant Treasurer of this **Journal** for the last five years.

David J. Moloney

News from BALTIMORE

By Alex. Beauchamp

ELECTIONS were held in Baltimore, and out of seven elective offices in the Baltimore Chapter, only three constituents remained in office. The newly elected officers are as follows: C. Edward Jung, unseated Harry M. Boone, for Chapter Chairman. WFBR Councilmen are, Wm. R. Hoos, replaced Robert Briele (Studio) and Robert Sherrer, succeeded Ed. Jung (xmitter). WCBM Councilmen are, Henry R. McNally (studio) and Albert C. Goldbach (xmitter). WITH Councilmen are, Francis V. Gudice succeeding Al. Hedrick (studio) and Otis R. Beauchamp (xmitter).

When the new chapter Chairman took office, he immediately appointed: Fred M. Himes Secretary-Treasurer, retiring W. D. Kelly; Alex Beauchamp, as associate editor of the Journal, succeeding Bill Hoos. Bob Briele and Larry Taylor were appointed reporters.

I have been waiting to hear from the WCBM reporter, but as yet nothing has come through. So, I guess we will have to go to press without WCBM.

Bob Briele has done a good job in rounding up the news at WFBR. He informs me that Jolly Picket and his new gang appeared on WFBR, Saturday, June 15th. With him was Elmer Lutmann and his accordion, of WOW, Omaha. He sez Hi to his friends there, and that Miss Loretta Dundis of the Yearbook is even lovelier than her picture.

Ralph Bennett, Se, NBC, NYC, visited WFBR Saturday, the 15th, and sat in on a show in studio "A." (Busman's holiday).

Stover's car is in the news again. This time, a Chicago Gangster tried unsuccessfully to steal it. He was apprehended after he had broken one window. All the ignition wires were torn out after he found the car would not start. Ed reports car did not start due to defective fuel pump. This is the third difficulty he has had with this Plymouth in the past year. Let's hope it is the last.

Congratulations to Miss Doris Pollack, of our Commercial Dept., who became Mrs. David Schindler this month.

Raymond W. Baker, Esq., resigned his position as Program Director at WITH to take up his new duties at WLEE, in Richmond, Va., as asst. manager. Wm. Walace Ashley has been appointed to succeed Mr. Baker.

Dave Connors, WITH Announcer, is vacationing in Hollywood, Cal. Your Ed. is looking forward to having an interesting interview with Dave, on his return. Jim Crist, WITH Announcer, has returned from Florida, where he spent half of his vacation. Robert Parks, studio Te at WITH, is back at the old grind, after spending his vacation galavanting around the country in his flivver. Gil Boehl is now on vacation and it's my turn next. But being incapacitated with a Green-street fracture of the lower peddle extremity, there's not much chance in getting away from home plate. I hope by the time your postman delivers this, yours truly will have the foot out of the cast and will be able to get around without the aid of crutches.

DIXIE NEWS

By D. Gordon McCrary

Joseph W. Stephenson, whose picture appears with this article, was born in Rocky Mount, North Carolina, May 13, 1903. The radio bug got him along about 1916 or 1917, when he became interested in spark transmitters and crystal receivers. Between this time and 1922 he was busy with school and ham radio. From 1922 until 1930, most of his time was consumed with making a living at electrical work, selling and servicing receivers, and, of course, in his spare moments there was a little ham work at W4AFV. In 1930 he left Rocky Mount, N. C., and went to work at a broadcasting station in Richmond, Va. After about ten years with the company in Richmond he went to work for the Federal Communications Commission as monitoring officer in the Radio Intelligence Division. Two years later he worked with Pan American Air Ferries in Miami, Fla., as radio navigator. In September, 1943, Joe accepted a job with WPTF as transmitter engineer and he is still around. Joe has a very unusual hobby in that for the past two years he has been raising "Bob White Quail" on a small scale and has been fairly successful. In most of his projects you will find some old radio equipment. . . . In his Quail brooders you will find hovers made from the aluminum bases of records. . . . Heating units made up of ohmspun resistors, and thermostats made up of a micro-switch and ether wafers. Joe says this makes a very efficient electric hover. All of his quail eggs are hatched in an electric incubator. His plans at present are to release the quail raised this year on the farm at the WPTF transmitter site. . . . The bird hunters of the staff should have pretty fair shooting this Fall. Congratulations are in order to Joe as he is a very recent grandfather!

JOSEPH W. STEPHENSON

Engineering Chapter News

Audio-Video Facilities, Radio Facilities, Technical Services and Development Group

By C. B. Berglund

MORE office space has been provided in Room 517 with the removal of the stockroom to the Maintenance Department. Some of the old partitions were removed and new ones added, also desks and working centers re-arranged so that now the occupants of Room 517 have roughly twice the floor space than previously. The installation of fluorescent lights over the drafting tables plus additional telephones have also contributed to improved working conditions for the boys.

Further space changes are in progress at NBC, notably the moving of the Engineers' Lounge to the old Recording Room, thus providing a space for the Construction Shop. The Model Shop is being shifted to the 6th Avenue Building to permit expansion of the Development Group facilities.

Dave Maloney, who recently transferred to the A-V group, is now in Hollywood where he will supervise electrical construction for the two new studios and recording plant being installed at Hollywood and Vine. Good luck, Dave!

William A. Poulson, a new member of the A-V group, may be located in the Construction Shop these days. Bill studied at Ohio State University in 1942 and then was engaged in electronic and development work at Yorke Safe and Lock Co., Bell Telephone Co., and Curtiss-Wright Corp., before coming to NBC. Bill has a first class Ham license and hopes to have his rig on the air shortly. Mr. and Mrs. Poulson and their one-month-old son are now residing at South Orange, New Jersey.

Another new member of the A-V Construction Group is Elmer J. "Dusty" Dustin. Elmer's schooling includes Thiel College and Harvard University. He has a rich and varied background which

includes experiences with some of the old time auto, airplane, and radio manufacturers, namely: Pierce-Arrow, Curtiss Airplane, Thermiodyne Radio, Freed Eiseman Radio, Freshman Radio, and Thomas Edison, Inc.

Following later employment with ERPI and RCA Photophone, Elmer enlisted as a Lieutenant in the Navy in June, 1943. As a member of the Naval Research Lab., Airborne Radio and Radar Division, Elmer participated in combat service throughout the Philippines, the Admiralty Islands and Japan. As a result of missions completed in the South Pacific Area in strikes over enemy territory, Elmer was awarded the Air Medal and citation by the Commander Aircraft, Seventh Fleet. Elmer was discharged as a Lieutenant Commander in November, 1945. He comes to NBC after a short interval with RCA. Welcome to our midst, Dusty!

Coming all the way from KPO, NBC outlet in San Francisco to join the Development Group in New York, is none other than Ralph Kennedy. Ralph has a splendid background for this type of work, having obtained a B. S. degree at San Jose College, an M. A. and E. E. at Stanford University, also served as chief engineer at KRE, Berkeley, California, and held engineering positions at KROY, Sacramento, and KQW, San Jose. His experience also includes research and development work at Hewlett-Packard Company, teaching at Santa Clara University, and graduate research at Stanford University. Welcome to New York, Ralph! The Kennedys have been fortunate enough to find a place to live and with their 2½ year old son, reside in Blauvelt, New York.

The Radio Facilities boys on the tenth floor are still busily engaged in preparing data for the clear channel hearings. New men in this group include Arnold Ewert, Victor Bary, and Earl Chubbuck, all having transferred from New York Operations.

Arnold Ewert came to NBC in 1937 after completing six years of radio and electrical work in the Navy Submarine Service. When our country's defense was stepped up in 1941, Arnold was called to duty in April of that year, as a Reserve Naval Officer. For 16 months, Lt. Commander Ewert was Communications Officer for Naval Communications on the continent of Europe. After serving a total of 56 months to the day, Arnold was honorably discharged and returned to NBC in November, 1945. Arnold's eleven years of active duty in the Navy now ties with Bill McMillan's record.

From Studio Operations (1942-43) to the Radio Group, comes Victor Bary, having completed 30 months of service with Uncle Sam, at the Naval Air Technical Training Center, Corpus Christi, Texas. Victor is a graduate of Columbia University (B. A. 1938) and the R.C.A. Institutes. His background is proof that truth can be more interesting than fiction—whether it be stranger or not! He was born in Russia and came to the good old U. S. A. at the tender age of eleven. His linguistic accomplishments include fluency in Russian and French, as well as his native tongue. The story doesn't stop there, for "Vic" is a member of the N. Y. Athletic Club's undefeated polo team which hopes to compete in the 1948 Olympics in England. That means three places for "Vic" to currently "keep the ball rolling"—with the Radio Group at N.B.C., on the polo field, and at home in Teaneck, N. J., with his two year old son. Welcome back, "Vic"!

Earl L. Chubbuck, B. S. (E. E.) Syracuse University, 1940, and formerly chief engineer of the University's radio station, came to NBC in May of that year. He was first assigned to duty at the short wave listening post in the Press Room and later became a studio apprentice. In February, 1942, he left NBC and became a Signal Corps inspector at Philadelphia, where he remained for 8 months. Still on the move, Earl left for Northwestern University in November, 1942, where he taught courses in Electronics and U. H. F. at the Reserve Corps School. Uncle Sam put his finger on Earl in September, 1943, so he left for points in India and Siam where he was in charge of a radio maintenance team. Earl was discharged in April, 1946, and is now back at NBC in the Radio Group. With his wife and 8 months old son, Earl is making his home in Manhattan.

Hudson Chapter News

By Jim Carter

AS USUAL, Recording comes through with their material for this column. Boy, oh boy, is it appreciated. Well, here we go.

Congratulations to Mr. and Mrs. R. E. Lee on the arrival of a new Recording engineer, weighing in at 7¼ lbs. on June 13th. We are waiting for the cigars, as Donald Stewart's dad is on vacation.

Silent Bart Simpson returned from his vacation and still remains mum. Jack "The Coat" Carney, is enjoying the scenery along the Delaware Water Gap. Cy Getter is commuting from Long Beach for the summer. Frank Ennis will vacation at Moosehead Lake down Maine; he will take a schematic of Studio 16 console along with him, need I say more? When you boys meet a dark, obese engineer down in Recording, we want you to recognize him as our own "Candy Boy" Jones. Frank Ennie made his many Lewis-Conn fight guests identify their seats from Charts in Chinese. Some friends that boy has. Fred Sperr spent most of his vacation preparing to move into his new home. Congratulations, Jim McInery, on becoming Councilman for Recording. Jim succeeds Ray McEntee at this post and we don't know a better man to carry on Mac's fine work. Geo. Corey's daughter, Betty, had a party for her classmates last week and a certain Western Star was invited but sent his regrets via a recording. Geo. enjoyed it even more than Betty. Paul Baldwin, official "Fish Peddler of Fire Island," says the situation is getting almost out of hand, with the meat shortage, etc. Doug. Hawkins. replete with both suits and wife and son, Philip, off to South Hampton for that well earned vacation.

Recording hasn't anything on our Studio group with proud Johnnie and Myrtle Garlinger, the Mom and Pappy of John Charles, weight, 7 lb., 3 oz., height or length, 21 inches, date, June 6th. Johnnie, you and brother Lee can put on a "Diaper changing contest."

Because of an error in the date (last issue) apologetically we copy the following. Mrs. Albert Grabo, requests the honour of your presence at the marriage of her daughter, Alma Marguerite, to Mr. Paul Arthur Reveal on Saturday, the sixth of July, nineteen hundred and forty-six, at four o'clock, Grace Presbyterian Church, Montclair, New Jersey.

Another good soul gone off the deep end, Don Williamson, married May thirty-first to Marie Stien, secretary for International Paper Co. Honeymoon at Babcock Lake, Petersburg, N. Y. Returned to work June 25, working all night duty. Marie must have had an in with McLean as Don is now on the evening trick.

Ed and Ruth Scatterday returned from honeymoon flight of 7,000 miles. Spent week in Mojave Desert taking beautiful color pictures that turned out tops. Yesterday, combination first month's anniversary and birthday when questioned re: wedlock said, "Yeah Man." We're all happy and pleased to welcome back Miss Margaret (Peg) Morris from a long, serious illness. Also from main office Miss Nancy Frisch being married Saturday morning, Sept. 21st, to Thomas Balfe at St. Catherine of Senna in St. Albans, L. I. Both attended school there.

No word from "Fisherman Wm. Boher" M/C, and Gertrude, vacationing at Chatham, Mass.

Ted Kasna needs a (window-pane-stretcher) and an "oak-stain-erases" to solve his latest decoration problem at home. That's okay though he's also redecorating his "dog house" just in case. Max Urlass had his sea-bag all packed and ready; Max holds a reserve commission in the Maritime Service. Ed. Conklin has been raising the roof; really he did put a beautiful new roof on the home. Also built a garage under the house with a long driveway. Pretty handy man to have around. Dick Borner claims to be getting back in shape playing soft ball; didn't think you ever got out of shape. Last but not least, "Major" Brazee looking mighty happy and getting real fat, now that Mrs. Brazee has arrived from England a short while ago.

That's that for now. 73. Jim.

P. S. "The show must go on" isn't just an expression, Al Nilson, F/E, had his leg sewed up after he finished his Remote, accident occurred shortly before "Air Time."

CAPITOL HEADLINES

By L. A. McClelland

HAROLD YATES, TE, NBC's Potomac River whaler, is still on the beach. His twenty-six foot Steelcraft Cruiser (plug) for which he has been waiting so patiently, finally arrived. However, due to its condition (it looked like one of the Atom Bomb test fleet at Bikini) he refused to accept it. Better luck next time.

"Daddy" Terrell (WRC Supv.) has been taking a ribbing about something lately. Easy on him "Patty," or is he kidding you?

In last month's BEJ. Harold Thomasson was erroneously reported as being a First Lieutenant. Your Washington Rep was not at that time aware of his elevation to Captaincy. Both apologies and congratulations are in order.

Sam Newman (W3HN) had the good fortune to be able to tie up his business (broadcasting, that is, son) with pleasure (amateur radio, what else?) at time and a half. Through the medium of ham radio, he brought to NBC listeners an eye witness account of the damage wrought by the recent Pennsylvania flood. The eye witness was an amateur radio operator of Safe Harbor, Pa. While Sam's amateur enthusiasm is still at its usual peak, his operations on the high frequencies have of necessity declined,—caused by his transfer to the New York television group.

There is a new educational program under way in Washington radio circles. The Kerry Blue Terriers of Messrs. McCollom, NBC SE, and Arcner, WRC baritone, have taken up a branch of mathematics new to them . . . the terriors . . . multimplication, to be exact. We'll let Winchell break the news!

Messrs. Weaver, Simmons, Rogers, Newman, and McClelland, all of the Washington NBC engineering staff, have been temporarily transferred to New York television in a combined training summer relief assignment. The men in the group are as confused as the present Washington staff are overworked.

It is understood that WMAL, the Evening Star station, has been given the green light by the FCC for Television and FM CP. The transmitter site is in the vicinity of American University, one of the highest spots in the Washington area.

Inasmuch as your correspondent has been transferred to New York, for the time being at least, it will be increasingly difficult for him to gather dirt concerning Washington, and has, therefore, resigned this assignment in favor of one of the on-the-spot Washingtonians. That's all there is from Washington at this time.—L. A. McClelland.

This Report Comes to You By Way of . . . SAN FRANCISCO

By Jack Van Wart

WE OF the San Francisco Chapter would like to introduce our elected and appointed officials. Our Chairman is John R. McDonnell. Last year Mac was the ABC studio councilman and delegate to the San Francisco Interunion Radio Council. Mac appointed Russ Butler as his Secretary-Treasurer, so Russ is the only incumbent to continue in office, except, of course, Elma Oddstad, who graciously consented to continue as Recording Secretary. NBC engineering studio-field group elected C. T. Stevens their councilman. Syd Blank was elected to council the ABC studio-field men, appointing Vern Harvey as his alternate. At KGO the councilman is George Erwin and at KPO it is Wendell Seward, while way up at Dixon the man is Mr. Dold. Last, but not forgotten, is E. E. Jefferson, who with his alternate, J. A. O'Neil, represent the supervisors group.

The members in a secret ballot vote decided to suspend general meetings during the vacation period and instead to hold council meetings.

At this writing we are still awaiting the promised visit from our esteemed President, Mr. Powley. It has been rumored that he is going to stop by on his way back to N. Y. from Los Angeles. We are eagerly awaiting his appearance.

The studios resembled somewhat of a bug-house during the A-Bomb Party in the Pacific. Recording and studio was manned 24 hours and were kept jumping, day and night. A few of the less fortunate were assigned to "D" and "E," which are the NBC and ABC Special Events studios respectively, and had to put in quite a few consecutive hours selecting one or the other of the ten nemo jobs normaled to short wave Pacific circuits.

The recent streetcar and bus operators' strike caused a few of the fellows to revert to the wartime car pool arrangement. Some had to get to work an hour or so early in order to get there at all.

The most interesting vacation of any attempted by our members was that of Oscar Berg, Maintenance Supervisor. He flew to Seattle and then took a boat to Alaska where he visited his son, Jack, who is a Marine. He hasn't returned at this writing so will report the details next time.

In a preceding paragraph I mentioned the S F Interunion Radio Council. This Council was conceived by Jim Moser, a newswriter for ABC, and a member of the R W G (Radio Writers' Guild), and its purpose is to coordinate the activities of all unions whose members work in the radio industry. The Council consists of an elected or appointed delegate from each of the interested unions and their function is to present grievances of any of the unions and to make recommendations as to the action to be taken. The unions involved are the RWG, NABET, AFRA, AFM, IBEW and ACA.

Those who were on vacation in July were Mark Dunnigan, George McElwain, Charlie Kilgore, George Dewing and Bob Shover. Those who are away this month are Cliff Rothery, Jim Summers, Andy Mitchell and Sam Melnicoe.

Mark Dunnigan has finally been converted and bought a home in Mill Valley in Marin County leaving the East Bay to shift for itself.

OMAHA NEWS

By Bob Rudd

Omaha's New Chairman

AS STATED in the July issue, the Omaha Chapter had its elections the last week in May, and new officers were elected for the coming year. Mark McGowan is the new Chapter Chairman and received a two-thirds vote of approval. He succeeds D. Roy Glanton who has been the head of the Chapter since its inception in 1942. Mr. Glanton has served faithfully and well and declared his desire not to seek office again. Roy has guided the Chapter through plenty of headaches and everyone concerned is grateful to him for the hours of labor he spent in the Union's behalf.

Mr. McGowan comes well qualified to handle the office for he is an old timer in the radio field as well as a fraternalist and a good business man. Mac is one of the best known radio men among the broadcast and ham fraternity. He is a 32° Mason and recently completed a university course in Public Speaking and English at the University of Omaha.

His hobbies comprise Ham radio (his call is WNZ), photography, and he is a committeeman with the Boy Scouts of America. The Omaha and KODY group feel they have a good choice in Mark McGowan and pledge their full support for the coming year.

Things and Stuff

Chief Engineer Bill Kotera arrived home from Washington, June 3rd. Mr. Kotera spent a month there assisting the FCC in high power survey work.

Al Maller now has over forty hours of flying time to his credit and is now entitled to his private pilot's license. Well, what are you waiting for?

Paul McDonald is again back on the job after an illness that confined him to the hospital for a month. Paul is an old timer with

WOW but left the station in 1943 to do his bit in the war effort as a research engineer. Best of luck, Paul.

Dick and Katy Peck have bought themselves a home. A lot of looking and a G. I. loan did the trick. They also have acquired a mighty fine looking car. Best of luck, kids.

G. Flynn is busy putting up an X-H array for ten and twenty meter operation. With his 600 watts he really ought to put out a sig. G's frequency on ten is 29.000 K.C. How about some of you NABET boys giving him a call?

Bob Rudd had his tonsils yanked out June 5th. Don't believe them when they say: "Oh, it doesn't amount to much, it's just a little uncomfortable for a few days." Bah! My neck was sore for three weeks!

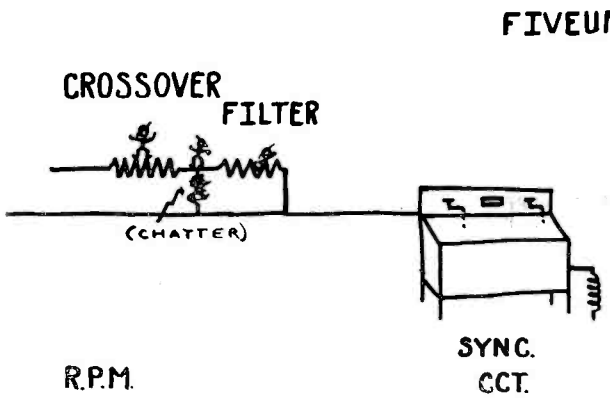
Transmitter Super. Roy Glanton has been getting out on ten and works em right and left. In between times he manages to do considerable maintenance work on the BC rig and the three or four acres of shrubbery and lawn.

Tech Director Joe Herold took to the microphone on June 7th in order to explain to the listening public, the difference and the advantages and/or disadvantages of AM and FM. There have been a lot of confusing statements made concerning FM in these parts and his talk certainly cleared them up. Atta boy, Joe!

Vital Static

Birthday greetings to Beuford Eaves. The day is Aug. 29. Greetings are also in order for Louis DeBoer (Omaha NABET Sec'y-Treas.). His birthday is Aug. 10th. Guess the rest of the Dead-Beats arrived at other times, so that's all for this time.

Fifth in a Series of Humor Sketches from the NBC N. Y. Recording Group



I sit in heavy concentration,
The deadline's tomorow—no recompense
For the life of me no improvisations
Of a kind that could possibly make sense.

Reminds me of our Editor
Requesting at 11:29:45
A show to be "cut" at "30"—
Such scrambling to put up a "side."

The engineer's temper was seething,
Harsh words he did bandy around;
Came MCD's pert remark of the evening,
"Were you caught with your patches down?"

—R. P. M.

One of the MCR engineers submitted the following bit of teletype humor, in order to spread the laffs around a bit, sort of share-the-wit, doahn't chu neow, old boot . . .

HR WEAF GA
This is NY1-39
Did you get three chimes at 100AM
Make that PM
No only muffled Chime
Was it the Third Chime
Only one Chime came through muffled at low level
Was it the first, second or third
Only one OM
End

ABOUT ROCHESTER

By Don Anderson and George Wilson

REMEMBER when we (Certain States Excepted) were cursing the cold weather and our shrinking or non-existent fuel supplies? Well, brethren, the chill is now off and the heat is on, but good! Now it's that awful . . . phew . . . wipe . . . mop . . . heat we talk about. The home insulation boys are out in force, finding business and then coming around to stuff the walls and things with shredded rock (wonder if the rock shredders have any family resemblance to the breakfast food shredders?) The weeds in the gardens are jumping up in glee, with emphasis on the up. A fellow can't even find those lovely (the seed man said) tomato plants, let alone force his way through the jungle to do his weeding.

AND WHEC——

With the summer weeks well under way (weigh?) the WHEC engineers are really making every day of the three weeks' vacation count. So, for the present, the news is mostly about those who have been away, those who are now away, and those who are looking forward to going away. (Seems like that oughta cover at least most of 'em). Craig Williams, W8MYT, has been doing a number of things, such as improving the output of the stuff which puts his call letters on the air, enhancing the beauty of his new home, and taking numerous side trips to nearby lakes and other scenic spots. (What does the man mean?) Walt Lynch is piloting his car on a rambling western tour, and as Walt is a very young bachelor, anything could happen. When he left he said something about, "making like a traveling salesman," whatever that means. George W. Wilson—that's me, I'm writing this stuff (from WHEC, that is; DA)—will be taking to the air for the very first time to spend a bit of time in Detroit and in Atlanta (hmm, class re-union, hey? I'm Sing Sing, '34 myself—DA) visiting a few old faces long unseen. Howie Mouatt, our worthy Sec.-Treasr., will be climbing the mountains and swimming in the lakes up in the northeast corner of the state. Of course, I use the plural of mountain and lake advisedly, because Howie will probably sit at the base of A mountain on the shore of A lake, puff stoutly on his pipe, and try to determine why fish go for worms, other fish, and artificial lures. Al Keltz, W2TXB, hasn't said much about his vacation plans, so we'll save that for the next issue. Al probably works out on ten meters more than any of us, and together with the attractive Mrs. Keltz who has a ticket, his rig gets a real workout every day. Her call is W2WOW: we like the WOW part. Their three year old son, Jimmie, finds the basement ham shack the best place in the house to play in, so he now has a dummy key and mike and yips out some lusty CQ's and does an exact imitation of everything his Dad does. Dick Sanderl, W8WMB, is free to spend his vacation without worrying about things to be done around home. He has just completed a one man construction job on his garage and driveway. He raised the garage eight inches, put in a concrete foundation (not for ladies, evidently —DA) and floor, and laid on a shining new black-top driveway. Now he can take his family into the wilds of Canada and really enjoy life. Burt Allis recently received new call letters—W2FBD—and he likes his new call so much he's going to use them from a job he's built into the trailer which is to carry the Allis family through the Southern Tier of New York State. Maybe if we use a direction finder we can locate his favorite, and as we understand, choice camping spot. Ed Schum, W8CNT, is back at the transmitter to take over while the others are on vacation and, we are happy to say, will remain with us permanently. Fran Sherwood,

W8NCM, our Transmitter Supervisor, is about the busiest man on the staff these days. Why? The construction of our new 5000-watt job is moving along fast and there's plenty to do seeing that nothing is missed in the erection of the buildings, the towers, and the many other well-known details. We'll have more to say about the new transmitter in the following months. Leo Enright is still fussing around with his model airplanes. We haven't seen one fly as yet, but that doesn't worry Leo. The important thing right now, sez he, is to apply a perfect paint job—but we wouldn't know about such things. And right now let us take a bow to Ed Lynch (brother of Walt), our illustrious new Control Room Engineer—yessir, the boy is phenomenal! The reason for all this fanfare is that Ed has not made the usual fluffs one expects from a new operator, such as wowing xcriptions, playing 33 1/3's at 78, turning on the wrong mike, and hitting the net when we're supposed to be local. In other words, shall we say that he has never been caught with his platters down? Yes, we've said it, and we're glad!! And that's that from WHEC. (And veddy complete, I calls it—DA).

One of those radio things: announcer Bob Turner, reporting a local night ball game, ". . . and there he stood at the plate, all ready to crack the first ball pitched right out of the park, when Boom! the lights go out!" Swelp me, on the heels of that utterance the lights at the transmitter and the transmitter go out due to a momentary power failure! That's accuracy for you; too good if you ask me!

Speaking of by-laws, our National Constitution has it that each Chapter should have copies of the other Chapters' by-laws, as well as copies of all contracts entered into on behalf of NABET. This seems like a cussed good idea to this writer but as yet the only one seen here in Rochester is Washington's. What say, gang, shall we swap copies of such things, as the Constitution requires? And when?

The last thing of importance on the docket is to welcome to the WHAM fold two new men, A. Carleton (Curly) Green (CR) and Earl Zimmer (TE). Here's to a long and pleasant friendship.

If all of this is printed, we'll know that anything is possible, like the scientists say. We'll peer into the cleaner bag again between now and next issue to see if there hasn't been some more dirt collected.—CUL. News of WHAM and WHFM next month.

AF Gain Along the MOHAWK

By J. W. Gagne

(DB No. 2)

AGAIN the ear drums are sounding along the old Mohawk as we go to press with the latest dirt herd up this here way. It has been plenty hot (the weather, that is) and humid in the old valley the latter part of June but the gang is getting used to it by now. Have had a few severe thunder showers but so far the transmitter gangs report nothing unusual. Keep those fingers crossed fellars!

The WGY studio gang saw plenty of action in the line of remotes and net feeds during General Electric's Air Research Demonstration held Friday and Saturday, June 22nd and 23rd.

Friday's initial start was made by a broadcast locally, featuring a three-way communication set-up between GE's flying lab on a B-29, three jet-propelled P-80's, and a control location atop the State Office Building in Albany. Dick Putman, our recent returnee from the service (Navy) handled the controls at Albany, receiving all airplane sigs on 135 mc approximately, on Army SCR 522 gear and feeding same through to master control at the WGY studios. Roy Stigberg and Bob Vadney did most of the master control operations including recordings and switching.

Later that afternoon Frank Boudreau, Dick Putman, and Roy Stigberg headed for the Oaklahoma Race Track at Saratoga, New York, and covered the landing of four helicopters carrying celebrities from the Schenectady airport bound for the Grand Union Hotel at Saratoga for Friday night's big banquet. Later, after putting on the feed bag, the boys covered the after dinner speeches from the hotel. Your scribe held down master control back in Schenectady that night.

On Saturday, June 23rd, several network pgms. originated here. First feed came at 12:05 P. M. whence for ten minutes a description of the take-off of the first jet air mail was described. Boudreau marched around with a pack transmitter on the field. Marce Reeds held down the controls up in the control tower. Stigberg again on master back at the studio tearing around with patch cords in both hands and mouth!

NBC covered the flight of a P-80 from New York to Albany and Schenectady made commemorating the historic flight of Glenn Curtis back in 1912. Curtis took a little over two hours to make Albany from New York. The P-80 made the same trip in 16 min. and 20 secs. The first five minutes originated in New York where the start was described. WGY took it at 335, and until the P-80 passed Albany, all feed came into master from Putman on the portable remote amp atop the State Office Building in Albany. Here, first fed through was Howard Tuppers' description of the P-80's flight from a B-24 circling over Poughkeepsie. Ben Gruer described the P-80 as it passed the State Office Building in Albany. At various intervals, contact was made with Capt. Martin L. Smith, pilot of the jet-propelled P-80, as he flew from New York through Albany to Schenectady—this feed being handled by Putman at Albany. Pickup finally tossed over to the Schenectady airport where the landing of the P-80 was described. Here again the "buddy boys" Reeds and Boudreau handled the remote controls.

Side lighting the Air Research Demonstration was Herb Kohl's unexpected over night stay at Stewart Field, at West Point. Herb flew down in an Army Douglas Transport to handle the controls for a pickup describing passage of the P-80. This pickup was cancelled and Herb spent the night until he could be flown in a C-47, at the officers' club. Says Herb—"Had a good time, anyway, and realized a long life ambition to have one on the club ever since my Marine Corps experience!"

Saturday, June 23rd, was also another big day for us here at the WGY Studios. "Saturday Showcase" program for NBC net feed originated here—just our luck to have all the excitement come at once hi! This music show was handled by our well seasoned female operator, Ruth Wallgren. Ruthie's only remarks were—"Although it was my first net program, I didn't get the shakes till it was all over—and brother did I shake!" All kidding aside, Ruthie, those who herd will agree it was a mighty fine job all around.

The June romance season produced two engagements here—Fran Ahearn and Connie Snyder received their "sparklers"—the two lucky boys being Roy Stigberg on controls here, and John Hall from GE's Research Lab. Connie plans to start leading a double life the 4th of July—Fran—well we don't seem to get any info as yet, but you people watch this column—we'll have it or bust! Congratulations to all of you and best of luck for the future. (WGY did pretty good for itself this month of June, eh, wot?)

Jean Dunn left the staff and is now with Steinmetz Home project. Although the work is a little more regular and systemized—Jean says she misses the old job. Good luck, Jean, and keep a'listening.

Edith Hoffman, that first class op from Pennsylvania, just back from vacation. Spent most of the time at Muncy, Pa., and a few days at the Jersey Shore. Where's all the tan, Edde?

Your scribe has been running up to the Saratoga "Trot Track" quite too much to cover the Harness Racing for WGY and WGFM. One night we go up in the Mobile Unit, another in a Jeep, and another a station wagon—the other night the local officer of law and order wanted to know when we were going to bring in a Greyhound bus!

And now, from that place that is "simply" out of this world—the South Schenectady transmitters—we hear the following:

Friend Cummings is looking for a house, waiting for a car, taking life easy, and brushing up here and there! What a racket!

Howard Wheeler spent his vacation camping up around Blue Mountain Lake in the Adirondacks—Wheeler the great out door man—ah!

Ralph Baker reports—"since my rear end ain't so good, my car that is, I'm planning not to travel too far—gotta be careful till we get it fixed up—the car in general that

is"—see me about a good "Ford" Ralph—sell mine cheap.

Beulah, the canine mascot, and a recent mother of five, reports that one transmitter engineer ran off with one of the litter. "I got a good notion it's the guy what lives up by the Y but ah ain't sure yet"—says Beulah, "but when ah is I'll tear him from seat to seat." (Editor's note—your scribe knows no one but Tom VanAlstyne who might be in that neighborhood, but Van says he "don't know nuthen.")

The Bass season opened July 1st, so the Messers. Barnes, "Big Nick" Nickle, Morey, Baker, and Vert—anybody else we overlooked?—are at it again. The boys go out any old time from daylight to 3 a. m.—not unusual to be a rowen around on Saratoga Lake and run smack into some of these fishermen from the transmitter at 3 or 4 o'clock in the morning. I suppose some of youse wants to know what we are doing out on the lake at that hour—fishen, if you want to know, Bub!

From the Television and FM transmitter gang (WRGB, WGFM) atop the Helderberg Mtns., we hear that Charlie Lewis is on vacation over in Maine and Eastern Mass. Ty Schumaker reports—"doin' nothing but woiken" Ken Durkee—well—it's a long story but we ain't got any news from him so that cuts this down to the end—how about it, youse guys—get after one of your gang to get something in to me for next month. OK?

Before we shut up shop for this issue, your scribe tried to get or finagle some news out of the Tele Studio gang. We got Paul Adanti on the fone and all he had to say was that Jack Shea was out to dinner. Well, I never thought of asking about Hort Mosher or Keith Mullenger, the new addition—in fact there must be quite a few we would like to get a line on. So what say youse people up there—appoint one of your tribe to send me some notes and stuff. OK?

Well, heap big white mans say we gotta move wigwam so—we go get papoose to shake leg and move. We move too—so for now—as white mans say—so long guys—me be NBC en you next moon. Your scribe—Joe Gagne.

CHICAGO

By Hjorth

HASTEN to add that next month, Don Fitch, will be permanent associate editor. My doing the column this month only, is the result of my associating with the associate editor who is vacationing somewhere in Michigan.

You'll like Don Fitch's style and you'll like Don Fitch if you ever have the pleasure of meeting him. This tall, red-headed Texan came to Chicago in '42 to enliven radio from WOAI, San Antonio, Texas. His folks are in Goliad, Texas, but his nice wife and numerous children are here in Chicago with him. When the action foto was taken in the midst of Don's one-man water drinking contest, his surprise was expressed vociferously with choice Texas made cuss words, that are

DON FITCH

only used when one Texan is cussing another Texan, me being the another.

Now for a bit of the doin's from this jumping off place to Hollywood. June is the month for weddings but to most of us that is but a sweet memory, so instead we'll announce the aftermath of that day we said "I Do," and with fanfare proudly present Miss Donna Leslie Pierce, seven pound, fifteen ounce daughter, born Saturday morning, June 22nd, to Mr. and Mrs. Curt Pierce. Also William Anthony Lato arrived Sunday, June 23rd, to be with his sister, Sandra, and brother, Jim, Jr., "Bill" weighed eight pounds, two ounces and was welcomed by Mildred and Jim Lato of ABC. Apologies for any other new arrivals not announced, but being in Field, I don't hear as much news as when I was wed to the soap operas.

Mary Trottner, Harry Maule, Art Cunningham, Bill Beeson and new vacation reliefer, "Chuck" Flotte, have no statements to make or rumors to confirm. They are all still single.

Seeing Harry Maule's name recalls to my mind that just last week patient Harry completed a batch of windscreens that are far in advance of any ever designed or built by former field member Casbean (Cabasin, now N. Y. television). Built three types of windscreens known as tens, twenties and thirties and you use the one closest to the wind velocity encountered. A pinwheel is furnished for this measurement. Now, Harry is exerting superlative effort and will soon announce a hurricane model. Harry sez that sewing these things together has certainly taught him to mend straight.

While struggling through a book on harmony last week on my half hour lunch period (so I, too, will know what a D seventh is), Art Cunningham remarked that he started a course in harmony at Penn College located at Oskaloosa, Iowa, to gain a much needed credit but gave it up and made the one point in cross country running instead. Somehow missed the sequence in thought.

Have a letter appointing me to a committee to investigate cost of facilities for a Chicago NABET outing, including families. Not having heard from the Chairman of this committee, I ask him, "When and where the hell do we meet?"

Vern Mills, of Control, phoned just before he was leaving for his vacation and said he had made the first 80 meter contact with a NABET member in New York. Worked Lenore Conn, wife of Joe Conn, W2NAZ on CW. Joe Conn, formerly of Chicago, is in television, . . . up to his neck. Vern (W9BGI) sez he worked them 10:30 p.m., Saturday, June 15th. Ed Holm stated he had contacted a N. Y. NABET member before that, so you two fellows fight it out.

Chicago friends of new editor Don Fitch have suggested titles for his column. A few are "Itch with Fitch" or "Pitch with Fitch" and there have been others ending in "Itch."

Note that Casbean of the New York Cabasin's, managed to get his bald pate in two out of two New York photos in the June issue. Wonder if he has related any tall tales about his days at KFYR, Bismarck, N. D?

George Maher, successful agency producer, has taken on Mercury Records in Chicago.

Alan Scarlett overheard staff guide girl replying to tourist's query about the word Orthocoustic, "that is something used to stick the labels on with."

Field Group holding another election for councilman. Five members with ballot count resulting in five candidates. No collusion there? Frank C. (for chum) Schnepper, was re-elected chairman by a large majority, T. G. Bombaugh for the WENR transmitter, E. G. Squires for WMAQ transmitter, D. R. Fitch for NBC Day studio, Joe Alusic for ABC Day studio, Frank Golder for Supervisory and L. H. Bartrum for Traffic and Communications. Others next month by Fitch.

Recently Chicago had a scrap drive to be rid of the obsolete and antiquated equipment. Many items were eagerly bid on by flourishing hams, for example Al Otto was high bidder on a 5 KW Federal arc transmitter at 35c and Bill Cole, after fighting off frenzied bidders, proudly carried home a loose coupler complete with galena crystal and Murdock headphones with a decoherer for emergency use at 7c, but, the most amazing story to come out of this project known as "parting-with-the-junk" was the way Marshall (Joe for short) Rife, bid by bid, play by play, fought off all other bidders and paid a fabulous price (note: no camera has yet been developed that is capable of

MARSHALL RIFE

taking a picture of Marshall Rife paying a fabulous price for anything), for a structure that has fond memories for every member of the now present or the past members of the Chicago Field Group. With tears in our eyes and throats choked with unexpressionable emotion, we lovingly stroked the timbers of the one piece of portable field equipment that was most dear to our hearts. Tenderly and quietly, as pallbearers of a close friend, Frank Schnepper and Curt Pierce assisted by Marshall Rife and his son, carefully placed the remains of their dear departed in the van and weakly waved a farewell to the G&%$**D*%&$* Big Booth. Marshall and his son carted the thing, in a rented hack, to the Rife Estate (two and a half acres of wooded land, birds, bees, flowers and mosquitoes) at Deerfield Park. By so doing, Marshall Rife has gained anew the respect and admiration of his fellow workers for his gain is also our gain. May lightning never strike its tar paper roof. Amen.

INTRODUCING

By Ken Martin

KEN MARTIN

KENDRICK MARTIN. Born at Ontario, Malheur County, Oregon, November 4th, 1911. Left the webfoot state at the tender age of two but too late—webfeet had already set in. Traveled and schooled over most of the far western states. Completed grade and high schools at Hot Springs and Las Cruces, New Mexico. Entered Wallace Radio Institute, Oklahoma City, Okla., 1928, obtaining 2nd class tel and tel license following year.

Participated in construction of KGFF, Alva, Oklahoma, now transferred to Shawnee, and engineered all 100 watts of it. In June of 1929 shook the dustbowl for San Francisco—fogbowl. From 1929 to 1934 became a victim of the seafaring life, commencing as junior op on the trial horse of all—SS Harvard. Thence coastwise, intercoastal and Soupac runs on just about every hungry ship in the book (I think!) H. F.

Alexander, Edwin Christenson, El Dorado, Kewanee, Admirals Farragut and Watson, Sierra, Yale, Point Gorda, etc., etc., and winding up with Point Brava. Ship names most West Coast boys will recognize as bottoms mostly scrapped by this time.

Abandoning the briney in 1934, operated as Byrd Expedition II contact man and marine coastal station operator at Mackays KFS 1934-35, handling beaucoup traffic for Exped. with SS Jacob Ruppert from the time she passed CZ and maintaining skeds with KFZ Little America until Expedition disbanded at New Zealand on return. When the Expedition was over, so was the job! Worked point to point for Mackays HB office in San Francisco, thence to RCAC point to point 28 Geary from 1935 to 1943—after 8 years in the salt mines and a short tour at Press Wireless, cast lot with KGO on February 1, 1943—with never a moment of regret.

Current curriculum for KGO Transmitter, have been active union supporter since the early days of ARTA. Withdrawal card from ACA prior NABET membership.

Now residing in East Oakland almost within rock throwing distance of KGO transmitter on ½ acre of weeds, rock and clay that annually provides plenty of exercise in wresting victory garden produce from the bosom of an actively resentful earth. Sole support of 2 scotties, 1 collie, 20 chickens, 50 canaries, 9 pedigreed persian cats and an heterogenuous collection of parakeets, pigeons, doves, finch, cardinals, cockatiels and guinea pigs. Contributions gratefully acknowledged.

Married to a partially tamed, blonde Alabama Rebel, Lorene. No relation of Claghorn's. Only son Julion, now radio officer SS Council Crest overseas Soupac and Europe. Papa's training saved the draft board a headache and provided an interesting, if not too remunerative and promising career for Junior in following papa's footsteps.

Perhaps I should have warned you at the beginning, but it was nice meeting you, anyway. 73.

Crystal Ball Dep't

The Journals addressed to the following are undeliverable by the United States Post Office, for the reasons stated by the Post Office on P. O. Form No. 3547, as follows:
Clinton McElroy—Denver—moved.
R. W. Grammes (Hollywood)—moved.
E. E. Nickels (San Fran)—moved.
Andrew Mitchell (San Fran)—moved.
R. M. Bayne (Chicago)—moved.
W. A. Poulson (Engineering)—moved.
H. Berger (Hudson)—moved.
C. M. Emerson (Washington)—moved.
C. W. Smith (Cleveland)—moved.
F. H. Sperr (Hudson)—moved.
A. C. Ewert (Engineering)—moved.
N. C. Youngster (New York)—moved.
D. E. Irwin (Cleveland)—moved.
Vernon L. Harvey (San Fran)—moved.
W. T. Pooler (New York)—moved.
Bill Speed (Dixie)—moved.
R. L. Gondek (Rochester)—moved.
—*ad infinitum*—ED STOLZENBERGER.

Now It Can Be Told

By Jordan McQuay

First Radio Equipped Bus

The nation's first radio equipped bus is now in operation experimentally on lines of the Washington, Virginia, and Maryland Coach Company — according to G. E. engineers who supplied the FM radio equipment being used. Installation followed receipt of the first permit issued by the FCC for such a type of service.

The equipment is of a type developed for wartime emergency communications and now being used by police departments. A 250-watt G.E. FM transmitter installed in the bus company's headquarters building serves as the control point for bus operators reporting incidents of emergency nature. Principle aim: to improve transportation.

* * *

One of the most carefully guarded secrets of the war was recently made public with the announcement that the United States developed and perfected a jet-propulsion airplane turbine.

For over two years a select group of scientists and engineers labored in quiet secrecy in Schenectady, New York, to perfect this startling new development in aviation.

Without fanfare or publicity, three English engineers came to this country to assist in the original jet-propulsion experiments. They were quartered in small hotels, and were moved from time to time so their continued presence would not excite curiosity. During those early days of development probably less than 50 persons knew of our interest in this form of aerial locomotion.

And the same secrecy was extended to the visit of Flight-Commander Frank Whittle, English inventor of jet propulsion, who flew to this country and worked here for four months with less than a dozen persons knowing about it!

* * *

A story going the rounds in Washington relates the troubles of a conscientious bureaucrat who was continually engulfed by mountains of red tape. In despair he moved his desk from one office to another, unable to find cooperation, unable to surmount the obstacle of precedent.

Finally he moved his desk and files into the Men's Room, where he installed his office and apparently was content. When asked why he chose such a place for doing his work, he replied:

"This is the only place in the building where people have the slightest idea about what they're going to do next."

* * *

One sad soldier wrote his girl friend every day for four years — just as he'd promised. On his return to the U. S. A. he found that she'd married the mailman.

* * *

One evening during the Tunisian campaign, a Signal Corps company bivouaced close by an Arab settlement. One platoon proceeded to the mess line — leaving several primed hand grenades in the grass near their tents.

Two curious natives purloined the grenades, believing them to be some new species of nut. Unable to break open the "nuts" with their bare hands, they attempted to crack them with large rocks.

As the only native survivor later explained, the result was hardly worth the effort.

* * *

The war was over. And the long string of Chinese refugees wound through the hills — on their way home. Before the sentry of an American outpost, an aged Chinese merchant dropped his pitiful possessions to rest a minute. The old man was stooped and weary, his face scarred from many whip lashes.

"Those Japanese!" he said, shaking his head. "Terrible people! Disgusting!"

The American nodded. Then waited with anticipation for the Chinaman to tell of some hideous experience, some torture, some terrifying atrocity.

"Do you know," said the ancient, adjusting his broken spectacles, "those Japanese don't have a word for radio — and have to use ours."

* * *

One of the war's oddest casualties happened to Private Herbert Sather, a radioman. After fighting through the Sicilian campaign and the landings in Normandy without a scratch, he was sat on by a cow. Sather explained with some embarrassment that the grazing heifer tumbled into his foxhole by mistake; he used no radar beam.

* * *

Thought While Dozing at a Radio Audition

Most men can tell by looking at a girl what kind of a past she is going to have.

What's New?

By Jordan McQuay

ELECTRONIC principles akin to those used for radar are being adapted by the Army Signal Corps for the development of a "sensory aid" which will enable blind persons to probe their surroundings by means of a light beam and "feel" the location of all obstacles within a radius of 20 to 30 feet. Both distance and direction of objects can be determined with this device, now under extensive development at the Signal Corps Engineering Laboratories at Bradley Beach, New Jersey. Set comprises a nine-pound case the size of a loaf of bread which a blind person will carry in one hand, and a short wire connecting the case with a single earphone. Device utilizes a pulsed beam of light which is projected from the front of the case and is reflected by any object it encounters within the 20- to 30-foot radius. Reflections are detected by a photoelectric cell within the case, causing coded signals to be heard in the earphone. In use, the device is turned from side to side "scanning" a clear path for the blind person; little practice would be required for such a person to find their way readily along crowded sidewalks or through a room strewn with furniture. The system is in the development stage, and is far from perfect — another six to eight months expected for further improvements. But in its final state it will represent a tremendous boon to the blind.

* * *

The same diminutive radio tubes that were used in the V-T proximity fuze radar set are now being adapted for extremely small, compact portable radio sets. Pocket radios no larger than a package of cigarettes are expected to be commonplace within the next two years, according to officials of at least two radio companies: Sylvania Electric Products and Emerson Radio. They'll be used with tiny hearing-aid receivers. And the entire sets *with batteries* will weigh only a few ounces. You can hear all about John's Other Wife's Other Husband while walking to work, waiting for a streetcar, or riding a bicycle.

* * *

First full-scale Canadian installation of radar for commercial airport use will be at Stevenson Field in Winnipeg, according to information released by Trans-Canada Air Lines. Radar will be used for traffic control, blind landings, and other general purposes. Of particular use to air controllers will be the PPI scope display — Plan Position Indicator — recording all aircraft within a 90 mile range of the airfield.

* * *

Then there was the recording engineer who tired of life and committed suicide by cutting his throat at 33 1/3 — outside in.

* * *

Proposed new DuMont television camera for studio televising will have some ingenious features, according to Herbert T. Taylor, Jr., director of equipment sales. Main feature will be an electronic viewfinder, providing a televised picture identical and simultaneous with the iconos ope image. DuMont's camera will be highly mobile, extremely flexible. Mounted on a dolly, camera head can be raised as high as eight feet above the floor level and lowered to three feet above the floor level — all movement electrically controlled with motors.

* * *

After a ten-year hitch as radiop "on the boats" followed by over 20 years as master control engineer, a certain gentleman decided to retire. He took his life savings and bought a delapidated saloon, boarded it up very tightly, and then proceeded to redecorate the interior according to his own taste.

Several weeks later, residents of the area congregated outside the tavern and called inside.

"When're you going to open up, Milt?" shouted one of them. "We want to patronize your place!"

"Open up?" bellowed a voice from the dim interior. "I'll never open up! I bought this place for myself!"

The 1946 Winter I. R. E. Meeting

Summaries of Technical Papers, Alphabetically by Authors' Names, Continued from the June issue

By Ed Stolzenberger

No papers are available in preprint or reprint form nor is there any assurance that any of them will be published in the Proceedings of the I.R.E. and Waves and Electrons, although it is hoped that many of them will appear in their pages.

69. Duplex Operation of Independent High-Power Oscillators for Induction Heating.

W. C. Rudd
(Induction Heating Corporation, New York, N. Y.)

In the production of high-frequency power for induction heating, it has been found advantageous to use multiple oscillators for the production of powers beyond that of a single unit. The problem involves the interconnection of two independent tank circuits in a manner such that the output frequency of the two units is the same and in synchronism. In addition, the total loan must be shared equally by the two power supplies. The paper describes the electrical problems involved, together with their practical solution for the production of powers of 40 and 50 kilowatts, using two 20- or 25-kilowatt oscillators.

41. Design Considerations in Broadside Arrays.

John Ruze
(Signal Laboratory, Evans Laboratory, Belmar, N. J.)

The various factors considered in the design of broadside arrays are discussed, and their effect on antenna bandwidth as determined by pattern deterioration are mentioned. Mutual impedance between antenna elements and means of establishing a desired current and phase distribution are detailed. Various methods of lobing a broadside array with magnitude of secondary lobes and bandwidth are discussed. Several designs will be detailed, such as the antenna system used on the SCR-270 and the AN/CPX-1.

26. A Frequency Modulation Altimeter for Meter and Light Indication and the Automatic Altitude Control of Aircraft.

R. C. Saunders, Jr., Irving Wolff, W. R. Mercer and J. C. Smith
(RCA Laboratories, Princeton, N. J.)

28. An Automatic Visual-Indicating Radio Direction Finder.

Aldo Scandurra and Samuel Stiber
(Evans Signal Laboratory, Belmar, N. J.)

Radio set AN/TRD-2 is a Signal Corps development designed to provide a portable and mobile direction finder giving instantaneous indications and automatic sense. This direction finder is unique in that the instantaneous indication on the oscilloscope is a single line generated from the center of the screen with a length proportional to the signal strength and the angular position of which indicates the direction of arrival of the signal without sense ambiguity. An additional feature is that noise and modulation are almost completely eliminated from the visual indication.

18. Electrooptical Characteristics of Television Systems.

O. H. Schade
(RCA Victor Division, Harrison, N. J.)

Optical and psychological capabilities of the human eye determine the performance standards for television systems.

Significant values for image detail and contrast, the electrical channel width, and signal-to-noise ratios are derived from the threshold visibility of picture detail and random brightness fluctuations.

Optical requirements and processes of developing electrical signals in television cameras for monochrome or color transmission are examined to establish relations and comparative values for signal-to-noise ratios and the required light flux.

15. Sight and Sound on One Carrier.

Kurt Schlesinger
(Columbia Broadcasting System, New York, N. Y.)

The fundamental aspects of audio and video multiplex operation are outlined, and a description of the various forms of multiplex modulation is given. Theoretical and experimental considerations of performance characteristics are considered. There is a detailed discussion of transmitter and receiver circuits and a discussion of results of recent tests.

59. Equivalent Circuits for Wave-Guide Structures.

Julian Schwinger
(Radiation Laboratory, Massachusetts Institute of Technology, Cambridge, Mass.)

Waveguide structures can be completely and rigorously described by equivalent lumped constant circuits. It is the purpose of the lecture to show how typical equivalent circuits are constructed by employing the special symmetry of the situation, to demonstrate that much qualitative information can be obtained from the form of the circuit even without knowledge of the values of the circuit constants, to discuss how the values of the circuit constants can be directly measured, and to indicate the procedure of the theory in calculating the values of the circuit parameters in their complete dependance on frequency and geometry.

81. Discriminators for Frequency-Modulation Receivers.

S. W. Seeley
(RCA Laboratories, New York, N. Y.)

Many of the aspects of frequency-modulation detection, including the new amplitude insensitive discriminators, will be discussed.

16. Ultra-High-Frequency Television Transmitters and Antennas.

Robert Serrell
(Columbia Broadcasting System, New York, N. Y.)

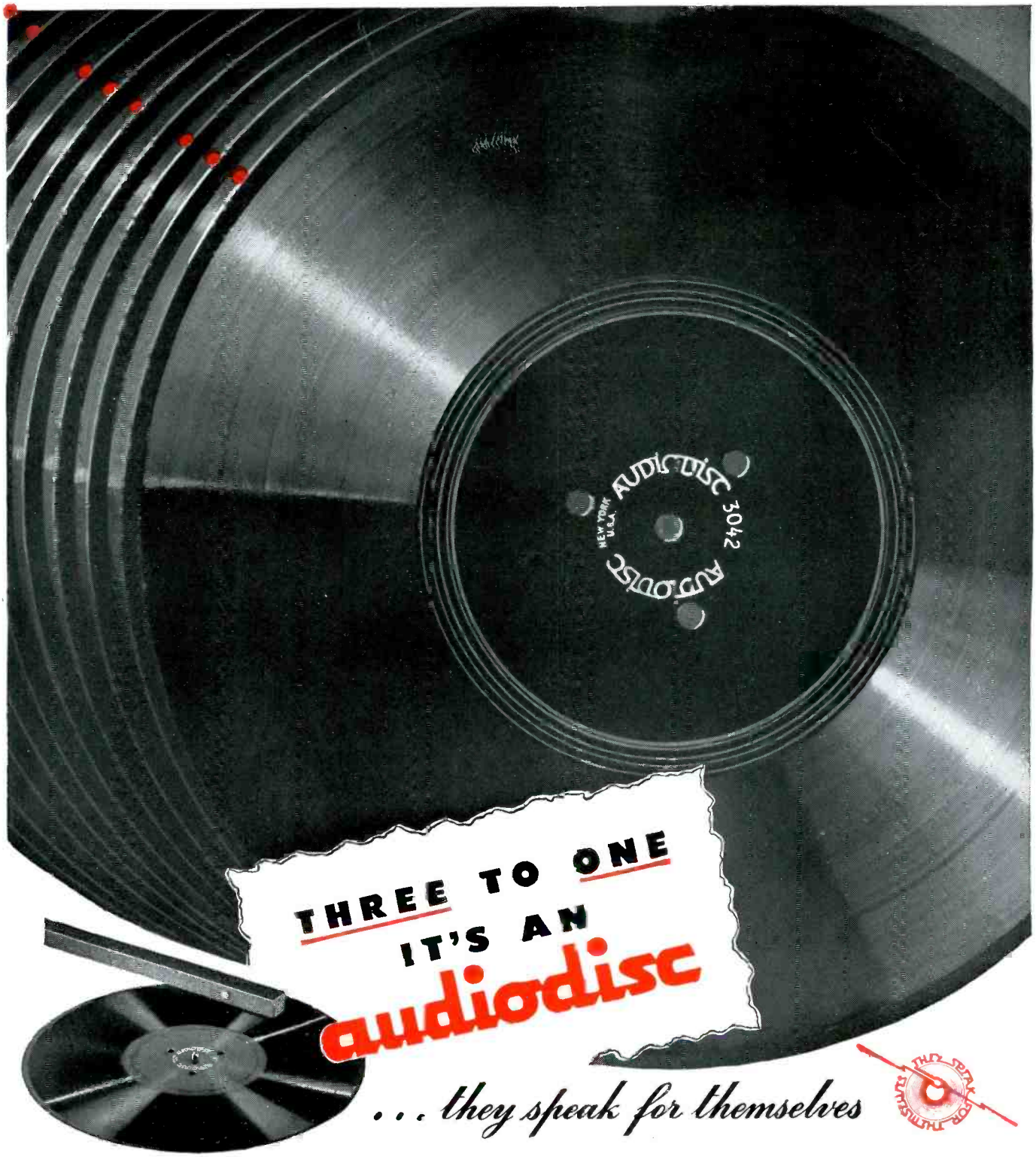
Ultra-high-frequency television transmitters of several types have been developed and built in the Columbia Broadcasting System laboratories. These transmitters, embodying tubes developed during the war, utilize a 10-megacycle modulation bandwidth. The design and performance of these transmitters and of wide-band antennas used will be described in detail. Also, some results of experimental ultra-high-frequency broadcasts will be discussed.

78. Measurement of the Angle of Arrival of Microwaves.

W. M. Sharpless
(Bell Telephone Laboratories, Inc., New York, N. Y.)

This paper describes a method of measuring the direction from which microwaves arrive at a given receiving site. Data which have been collected on two short optical paths using a wavelength of 3¼ centimeters are presented to illustrate the use of the method. Angles of arrival as large as ½ degree above the true angle of elevation have been observed in the vertical plane while no variations greater than ± 1/10 degree have been found in the horizontal plane. More recent work, using a lens-type scanning antenna operated at a wavelength of 1¼ centimeters revealed that, at times, as many as four distinct transmission paths were present simultaneously on a 12.6-mile circuit. Simultaneous meteorological soundings were made near both terminals of the circuit.

(Continued Next Month)



THREE TO ONE IT'S AN audiodisc

. . . they speak for themselves

IN THE BROADCASTING STATIONS throughout the nation, when a live program is recorded for broadcast—when an off-the-air program is recorded for rebroadcast—when recordings are made for clients or for rehearsal and audition purposes—when recordings are made for reference files—in fact when any recording work is done, Audiodiscs are used three to one.

This outstanding preference for Audiodises has been recently confirmed by a double-check survey covering 400 radio stations. Approximately half these stations were called upon and reported the actual number of discs used—Audiodiscs and others. The remainder reported by letter stating the proportion of Audiodiscs used to all other makes. In the first group the Audiodisc percentage was 81, in the second 78%.

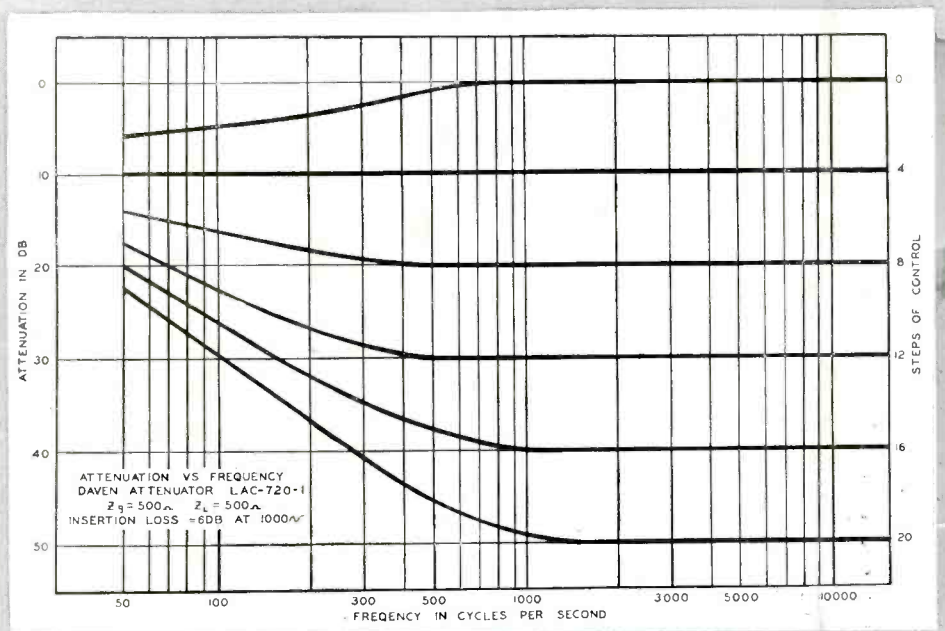
Since first produced, these fine discs have consistently maintained those qualities required in the increasingly important work of radio recording. Thus Audiodiscs have gained their place of eminent leadership in the field of sound reproduction.

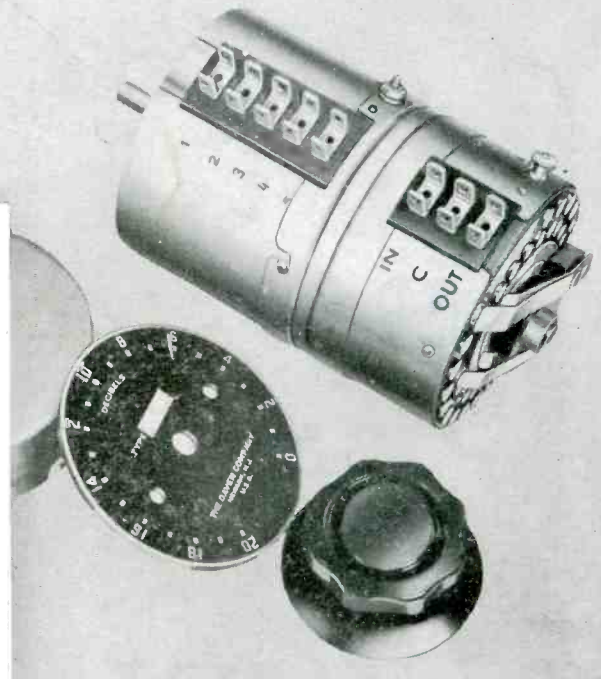
Audiodiscs are manufactured in the U.S.A. under Exclusive License from La Societé des Vernis Pyrolac—France.

AUDIO DEVICES, INC., 444 Madison Ave., New York 22, N.Y.

NEW DAVEN TONE COMPENSATING ATTENUATOR

TYPE LAC-720-1—This network, developed at the request of leading sound engineers, is designed to attenuate the musical spectrum to follow, very closely the perception sensitivity curves of the human ear. Base frequencies suffer smaller loss than the middle or upper registers . . . without rendering a false or "pumped" response.





By connecting the control from the IN, OUT, and COMMON terminals into the circuit, the attenuator functions in accordance with the illustrated curves. However, by externally wiring the 5 additional lugs, this unit can be converted to a straight ladder of 2.5 DB per step with a flat frequency response. By selecting several combinations of these terminals, a whole family of curve characteristics can be obtained to meet the user's individual requirements.

As always we welcome suggestions or comments from engineers in the industry, not only concerning this unit, but any special "family of curves" to meet individual needs or requirements.

Primary applications are in:

- **Quality reproduction of wired music** for restaurants and public gathering places
- **High fidelity broadcast monitoring amplifier controls**
- **Deluxe, custom-built home receivers**
- **Psychological testing and experiments in hearing perception**
- **Research and development in the study of music appreciation**

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