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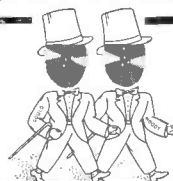
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Broadcast engineers from coast-to-coast have said that "no better instantaneous recording blank was ever made". We back them up with our unqualified guarantee that "Black Seal" are as good as, if not superior to, any other blanks that you have ever used.

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# THE BROADCAST ENGINEERS' JOURNAL

Volume 9, No. 9



September, 1942

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### THE BROADCAST ENGINEERS' JOURNAL

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... Look to **NBC's Radio-Recording Service!**

Today's audiences want *up-to-the-minute* programs . . . and stations and advertisers must keep pace with their interests.

NBC Radio-Recording Services *do* keep pace—in both NBC **THESAURUS** and NBC Recorded Programs. We keep our fingers on the pulse of change . . . the changing tastes of audiences, the changing problems of advertisers.

For today is *no time to be behind* the times!

"FLYING FOR FREEDOM," for instance—NBC Recorded Program—tells the authentic story of the Royal Canadian Air Force, in thrilling dramatic episodes that take the listener from first training flight to actual combat over enemy territory. The story revolves about four young representatives of the United Nations in the RCAF—an American, a Canadian, an Englishman and an Australian.

NBC **THESAURUS**—"The Treasure House of Recorded Programs"—too, is kept up-to-the-minute. Recent releases include the "Bombardier Song" sung by

Thomas L. Thomas accompanied by Allen Roth and his orchestra—music from "Bambi" played by Sammy Kaye and Dick Jurgens . . . complete timely musical programs like "America Marches," featuring the world-famous Goldman Band . . . and many other equally up-to-the-minute features.

Noteworthy are the recent *Thesaurus* special Feature "Dividends" which have provided subscribers with a series of programs titled "Freedom's Fighting Men"—interviews with war heroes visiting in the U. S. after daring exploits on various fronts—RAF flyers from Libya—an Eagle Squadron pilot—British Army and Naval heroes of the Commando raids on Vaagso, Norway and St. Nazaire, France, and others.

Write for complete information on NBC Radio-Recording's *timely* programs!

\* \* \*

**THE NAME YOU WILL REMEMBER**—NBC's newest recorded program—biographies of the world's famous people of today, keyed to the times.



Dr. Edwin Franko Goldman and the Goldman Band record marches and patriotic music. Thomas L. Thomas, baritone, sings the stirring "Song of Steel."



Hit tunes from "BAMBI," Walt Disney's newest production as played by Sammy Kaye's Orchestra, Dick Jurgens' Orchestra, and Richard Leibert, Organist, were recently released to **THESAURUS** Subscribers.

## NBC Radio-Recording Division

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Merchandise Mart, Chicago  
Sunset and Vine, Hollywood

# Radiation Pattern of the Human Voice

By D. W. Farnsworth

Physical Research, Bell Telephone Laboratories

Because of its importance in the broadcast field, we are happy to have the opportunity to reprint this paper which originally appeared in the August, 1942, issue of the Bell Laboratories Record.

**R**ADIO antennas, microphones, loudspeakers, or any apparatus that either emits or receives radiations has a directional characteristic or radiation pattern, and the determination of these patterns is one of the routine procedures in radio and acoustical work. If the device is to receive radiation, the directional characteristic expresses the sensitivity of the device to radiation coming from various directions in space. If the device is to emit radiation, on the other hand, the directional characteristic expresses the power radiated in various directions. In both cases the sensitivity and power in each measured direction may be subdivided into frequencies or frequency bands. In acoustics, the basic radiator of voice sounds is the human mouth, but strange as it may seem there are no known records of any complete determination of the directional characteristic of speech as it is affected by the

shape of the mouth, head, and body. This situation has now been partially remedied by an extensive study recently made in these Laboratories by H. K. Dunn and the writer.

Perhaps one of the reasons that such a study has not been made before is that it is inherently a much more laborious task than determining the directional characteristics of a loudspeaker or microphone. With a loudspeaker, for example, the characteristic is usually determined for a number of single frequencies, and these are supplied to the loudspeaker from an oscillator giving a continuous tone at constant frequency and volume. There are no other variables but the position of the pick-up microphone, and thus the procedure is comparatively simple. The human voice, however, is a complex assembly of different frequencies at different levels, and in ordinary speech both level and frequency compo-



Fig. 1—Arrangement of speaker and microphone for distribution measurements

sition vary continuously. Moreover, the source is a human throat, which suffers fatigue; it cannot be turned on like an oscillator and run continuously without variation. Determining the distributional pattern of the voice is thus far more laborious and complicated than any of the more usual determinations of directional characteristics.

In securing the spatial distribution pattern of speech, it seemed desirable to average the speech pressures over an interval long enough to insure that the average was typical, and to use as the source of sound a set of words that would be typical of ordinary speech both in the basic sounds employed and in their distribution into syllables. To meet this requirement, J. C. Steinberg devised the following sentences:

"The different speech sounds have been moulded into sentences, such that the consonants and usual compounds occur in the vowel combinations which are met with very frequently in English. For lack of time, it was not possible to

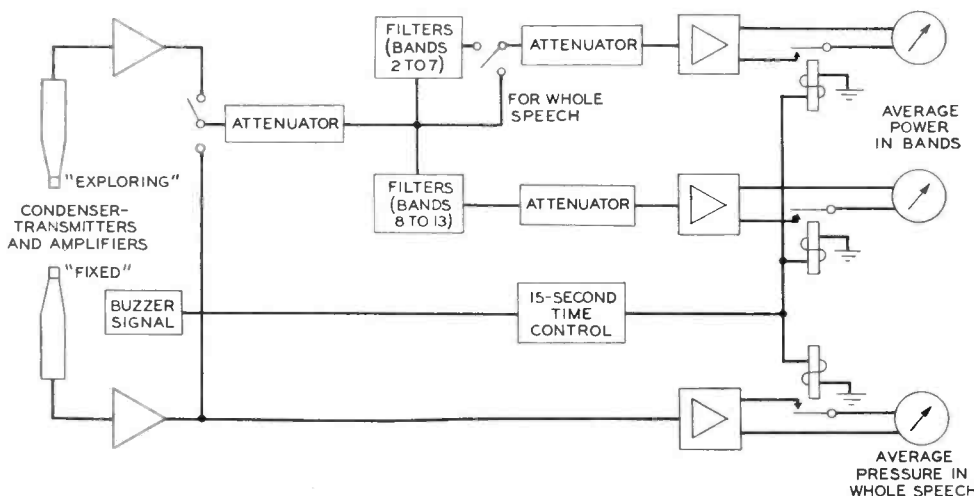


Fig. 2—Block schematic of measuring circuit

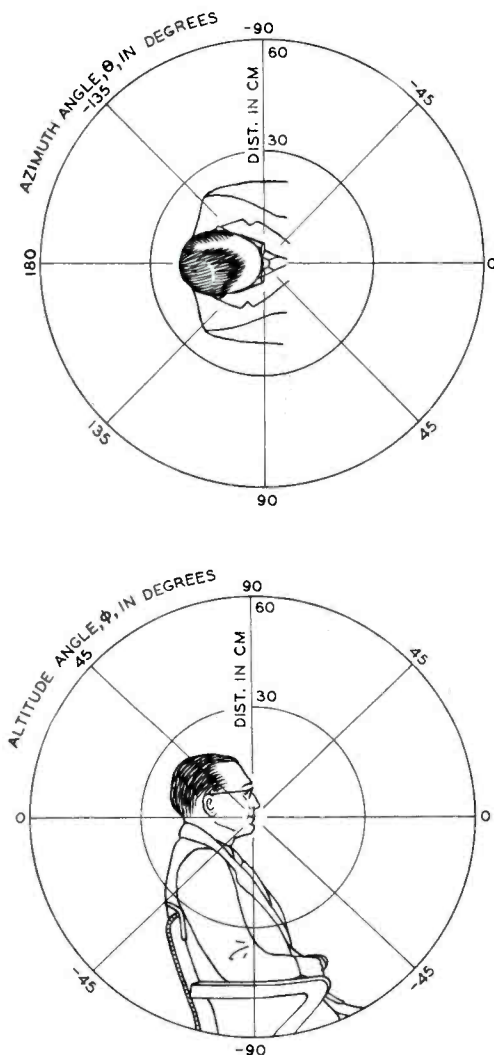


Fig. 3—Positions in space were indicated by three coordinates:  $r$  for radial distance from the lips;  $\Theta$  for horizontal angles; and  $\phi$  for vertical angles

get every group included; although, as is shown quite clearly in the figure, upward of eighty per cent are accounted for. I think nothing else need be said in this place on the subject."

Sound pressure was averaged over a fifteen-second period, which was controlled automatically, and the actual measurement covered usually about the italicized portion of the quotation. The tests were made in an acoustically treated room so that reflections from the walls would not result in readings that did not truly represent the direct radiation from the mouth. Because of these precautions, the results are essentially the same as would have been obtained in an

open outdoor space entirely free from extraneous sounds.

Besides determining the distributional pattern for whole speech, it was desired also to determine it for various bands of frequencies. In some ways, the narrower these bands, the more satisfactory would be the results, but it was finally decided, largely because of the availability of filters, to divide the range of speech frequencies into twelve bands. The lowest three were each one octave wide, and ran from 62.5 to 500 cycles; above 500 cycles, the filters were each one-half octave wide except the twelfth, which was a high-pass filter cutting off at 8,000 cycles. The upper frequency is really set by speech itself, which has practically no components above 12,000 cycles.

Limitation of apparatus and of personnel made it necessary to take readings at only one position in space at a time, and of only two frequency bands. This meant, of course, that measurements would have to be carried on over a considerable period of time, since for each of some eighty positions in space, seven readings were required to cover all the frequency bands and eight readings were taken for each pair of bands to insure that the value used was representative. Including preliminary and trial readings, a total of 5,000 readings was taken altogether.

With such a protracted study, there would be bound to be variations in the test sentences in volume, not only from day to day but for different sets of readings taken on the same day. It was necessary, therefore, to set some reference volume at some fixed position, and to correct each set of readings for departures from the basic value. To make this possible two pick-up microphones were used for each reading; one was an exploring microphone, which could be moved to various positions, and the other was fixed. This latter microphone was fastened to the arm of the chair in which the speaker sat, with the diaphragm at one side and slightly below the speaker's lips, and thirty-two centimeters away. An attached bracket carried a small loop of wire at the end, and the speaker always sat so that this loop

just touched his upper lip. The arrangement is shown in Figure 1.

Both of the microphones were of the condenser type with self-contained amplifiers. They are small microphones with diaphragms only 1.8 centimeters in diameter, but for positions very close to the speaker's mouth, a "search tube" five centimeters long and only three millimeters outside diameter was used. A block schematic of the testing circuit is shown in Figure 2. For each position of the exploring microphone, four readings would be taken for each frequency band and for whole speech. Four for each band were also taken using the fixed transmitter.

Positions at which readings were taken are designated by three coordinates, as indicated in Figure 3. One of these, designated "r," is the radial distance in centimeters from the front of the lips; another is the horizontal angle " $\Theta$ " measured from directly in front of the speaker in either direction around to

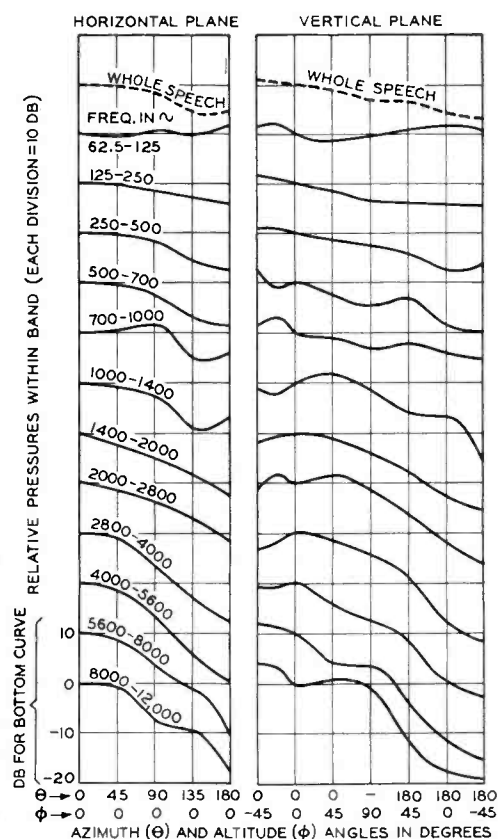


Fig. 4—Relative speech pressures at 60 cm from the lips as  $\Theta$  varies, at the left, and as  $\phi$  changes, at the right



## Lt. J. R. DeBaun

**J**AMES RUSSELL DEBAUN was born in 1907 on a farm in Kansas. Like most of us, the radio bug bit him while attending school in Texas, and after completing high school he was faced with the choice of staying on the farm or making his own way in the world; he chose the latter, and acquired much varied experience in the surveying and construction fields. In 1926, De Baun felt an urge to get into railroading, was employed by the Missouri Pacific Lines where he stayed until the general business depression



Lt. J. R. DeBaun

of 1932 forced him to seek another field. His latent urge and interest in radio made itself felt, and he entered the New York school of the R C A Institutes. When he had completed the R C A course, the National Broadcasting Company was in the process of moving from its old 711 address to Radio City. DeBaun applied and received employment as maintenance engineer, a position he creditably held until 1937, when he was transferred to the television development project, where he was active in the development and improvement of Sync generators, as the television art progressed upward to its present commercial standard of 525 lines. During the period from 1935 to 1938, DeBaun attended New York University Evening Engineering. Since June, 1942, due to a coincidental cessation of television activity at NBC and the lack of qualified instructors at RCA Institutes, DeBaun had been assigned by NBC as advanced television instructor at the NY school, a position he creditably handled until recently, when he was commissioned a senior grade lieutenant in the USNR.

DeBaun was active in the affairs of NABET, and was at one time secretary of the Engineering Chapter; we are proud of his determination and ability, and sincerely look forward to his return to our active ranks.

## Capitol Punishment

By Gordon I. Henry

**T**HE Blue Network's outlet, WMAL, moved into the offices formerly occupied by RCA on the Mez floor of the Trans-Lux Building. NBC studios and engineers doing the Blue pick-ups yet, however.

John H. Hogan, the Florida lad, had quite a farewell gathering at his home in Kensington, Maryland, before leaving for Dartmouth as a Lieutenant (JG) in the USNR. The Army Air Force captured 6' 4" L. A. McClelland and made him a First Lieutenant. Dan Hunter made quite a gap in the Engineering Department—he is now doing research work at Columbia U for the duration. The Navy commissioned A. R. McGonegal a Lt. (SG) from the WMAL transmitter group. The Washington N.A.B.E.T. Chapter keeps Bill Simmons so busy shopping for farewell gifts that Bill is casting a wistful eye towards 1301 G Street and may blossom out in uniform just so some one will get the job of picking out an appropriate gift for him.

Washington N.A.B.E.T. authorized the purchase of a \$500 War Bond way back in May, which was duly bought and paid for, but in our quiet way nothing has been said about it in this journal. How many other Chapters have purchased bonds? Get behind the War Bond drive and put that treasury surplus to work for Uncle Sam.

Bob Brooke needn't think he has a monopoly on unusual weather; Washington had seven inches of rain in a twenty-four-hour period.

John Rogers doing so much night recording he's gone groove-happy; stole one of the auditing department's best figures when he married Miss Marion Day—best of luck.

Don Cooper, operations supervisor, and Keith "Butch" Williams, field supervisor (bet Patty misses those cigars), spending vacation time at Sunken Meadows, Virginia, looking for "Old Smokestack," the big bass that evaded their efforts for several seasons.

Al Powley doing the Command Performance at the National Theatre wonders if anyone is left in Hollywood.

Have to finish my automatic enthusiasm suppressor for the drummer in the Navy Band, so 73 until next month.

## Hallicrafters Awarded Army and Navy 'E' Citation

The Hallicrafters Company have been notified by Under Secretary of War Robert P. Patterson that they have been awarded the Army and Navy "E" Banner, according to an announcement by W. J. Halligan, president of Hallicrafters.

The company was complimented in Mr. Patterson's notification letter for the "high achievement attained in the production of the war equipment."

"The high and practical patriotism of the men and women of The Hallicrafters Company is inspiring. Their record will be difficult to surpass, yet the Army and Navy have confidence that it was made only to be broken."

Formal presentation of the "E" Banner was made Wednesday, September 9th, at the Hallicrafters Main plant where Army and Navy officers made the award. Chicago civic leaders and State officials were present.



# Radiation Pattern of the Human Voice

(Continued from Page Five)

ings may be taken at  $-90$  degrees, that is, directly below the lips, the pressures straight downward are greater than either at  $-45$  degree or  $0$  degree for all frequencies below 1000 cycles.

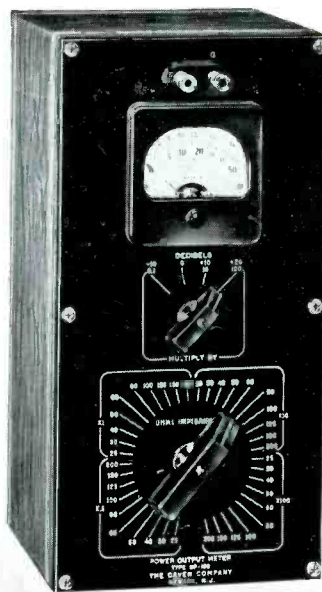
Data of this sort are very useful in guiding the placing of microphones, since they show the region over which all frequencies are present in about their true relative proportions, and the amount of equalization that would be required in other locations. A study of these curves shows that a microphone could be placed at any horizontal angle up to about  $75$  degrees and at any vertical angle from  $-45$  degrees to  $+90$  degrees without the necessity of equalization.

To confirm these conclusions, listening tests were made in which two other positions were compared with a position in front of the speaker. One of these was 60 centimeters directly above the lips, the forward transmitter being at the same distance, and listeners in another room could switch between the two transmitters. After equalizing the two circuits for loudness, the listeners could not distinguish between the two transmitters. When one of the transmitters was placed directly behind the speaker, however, there was a marked loss of the higher frequencies.

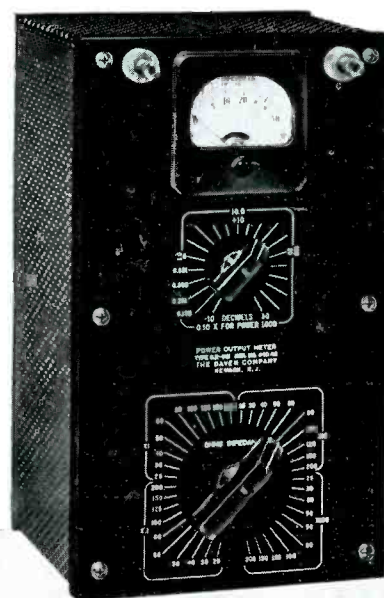
Another advantage of these data is that they may be used for calculating the total voice power, and also the total power in each frequency band. It is possible to integrate speech pressures over the entire surface of a sphere having its center at the speaker's mouth by assuming that the pressure in each direction represents the average pressure extending halfway to the next position line in both directions in both horizontal and vertical planes, and by using a suitable constant to calculate the total emitted power. The error in this basic assumption is probably within the accuracy of the test data. The results of these calcu-

(Continued on Page Fifteen)

The Broadcast Engineers' Journal — September, 1942 **7**



TYPE OP-182



TYPE OP-961

## DAVEN OUTPUT POWER METERS for Accurate Measurement of Power and Impedance

### OP-182

Convenient meter reading is provided in this compact, space-saving OP-182 Output Power Meter. It is admirably suited for many power and impedance measurements, such as determining actual power delivered by an audio system to a given load, characteristic impedance or load variation effect on an A.C. source.

Terminal impedance remains essentially resistive over the audio frequency range of 30 to 10,000 cps. Impedances from 2.5 to 20,000 ohms in 40 convenient steps are available.

The indicating meter is calibrated from 0 to 50 mw., and from 0 to 17 db. Zero level at 1 mw. Four ranges of full scale readings from 5 mw. to 5 watts, and from  $-10$  to  $+37$  db. are provided by the meter multiplier. Accuracy within 5% at midscale.

The DAVEN catalog lists the most complete line of precision attenuators in the world: "Ladder", "P" type, "Balanced II" and Potentiometer networks—both variable and fixed types—employed extensively in control positions of high quality program distribution systems and as laboratory standards of attenuation.

Special heavy duty type switches, both for program switching and industrial applications are available.

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Power ranges cover from 0.1 mw. to 50 watts in steps of 0.1 mw. Indicating meter is calibrated from 0 to 50 mw., and from 0 to 17 db., with a 1 mw. zero level. A 20-step multiplier extends the meter power reading from 0.1x to 1,000x scale value, and the db. reading in steps of 2 db., from  $-10$  to  $+30$  db., with full scale at  $+47$  db. Accurate within 2% at midscale.

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# Behind the Mike

By Con Conrad

**A.** L. HOCKIN, Blue Network engineering department, has been called to active duty with the Navy Aviation Radio; he reports as a senior lieutenant. His first duties will take him to Corpus Christi, Texas.

E. L. Bernheim, NBC engineering department, Chicago, Illinois, has been called to active duty with the Army. He reports to an Army post near Baltimore and has been assigned to duty with the Chemical Warfare Service. Ed has been with the Chicago office of NBC for over eleven years.

John Gibbs has been promoted along with his graduation from officers' training school to the rank of second lieutenant. This took place at Scott Field, Illinois. John hails from KOY, Phoenix, Ariz.

Gordon Fraser, a studio operator with the Canadian Broadcasting Corp., has joined the Royal Canadian Air Force.

Edward L. Myers, WHN, New York, has taken up

active duty with the Coast Guard. We are informed that his engineering post will be open to him on return.

J. H. Platz, NBC control room supervisor, Chicago, Illinois, along with his other duties, is teaching radio to men in the enlisted reserve. Con Conrad, your editor and NBC control room supervisor at Chicago, Illinois, also doing same. Course these men are teaching is the Pre-Radar, and they are teaching under the direction of the U. S. Army Signal Corps at the Illinois Institute of Technology.

Carl Campbell, CBS Hollywood engineering staff, has been inducted into the Army.

Dick Kulp has been added to the staff of WTTM, Trenton, New Jersey; along with this addition is also the name of Bruce Carter.

Cliff Miller, of the KOY, Phoenix, Ariz., staff, has joined the Army Air Force as a second lieutenant.

Bob Montgomery has joined the control staff of WBIG, Greensboro, N. C.; along with this addition comes the announcement that Harold Smith has been promoted to chief control operator.

Sam Cook has been added to the staff of KOY, Phoenix, as a relief engineer.

Raymond Kelly, summer relief engineer for the NBC

(Continued on Page Fourteen)



C. C. Horstman, engineering head for the Blue in Chicago, congratulating A. L. Hockin, one of his studio engineers, as he is about to leave for duty with the Navy. G. F. Kemp and R. C. Bierman, other BLUE studio engineers, look on and admire the gold braid. Hockin for several years was studio engineer for the NBC, then transferred to the Blue, and has had many years of varied radio background. After school, Hockin earned his living as a drummer, with radio as a side line and hobby. The lure of radio was very strong, so leaving the hectic life of a musician, he entered the more hectic field of radio engineering, spending several years with the airlines as operator, from there Hockin entered network broadcasting. He had many years experience with regional networks and finally wound up at NBC, later transferring to the BLUE. His varied background of radio and aviation qualified him for the commission as full lieutenant in the Navy, in Aviation Radar



A. L. Hockin, studio engineer for the Blue Network in Chicago, having received his orders from the Navy, is ready to leave the office and on his way to Corpus Christi, Texas, when he encounters E. L. Bernheim, studio engineer for NBC, Chicago. Both are congratulating each other, since Bernheim has just received his orders from the Army and is to report for duty near Baltimore, Maryland, as a captain

# Cleveland Engineer Cheats Death

**J.** J. FRANCIS, Cleveland Control Supervisor, has listened to several hundred script shows each year for the past several years. He thought he knew all the answers, but he willingly admits that he was wrong.

J. J. and Mrs. Francis had the following experience recently, which we quote from the *Steubenville Herald-Star*:

"Battling a strong undertow for more than an hour, near Brown's Island, after their cabin yacht lost its propeller key, Mr. and Mrs. J. J. Francis, Cleveland, Ohio, escaped drowning in the swollen Ohio River Wednesday night in one of the most breath-taking episodes of the Ohio, in which the U. S. Coast Guard played a prominent role.

"The swirling currents upset the yacht, plunging Mr. and Mrs. Francis into the water after they tried desperately for forty-five minutes to escape the undertow. Mrs. Francis swam to shore as her husband clung to the boat. He was rescued some thirty minutes later by U. S. Coast Guardsmen stationed in Steubenville.

"The couple had been cruising above U. S. Lock 10 about 6:30 p.m., when the key which holds the propeller and shaft sheared off. The boat went out of control and drifted over the dam which spans the river from the Ohio side to Brown's Island at Route 7, below Welsmar Inn.

"Caught in the powerful undercurrent, the boat was dashed back and forth by the currents like a stick of wood. Motorists and several persons at Welsmar Inn noticed the plight of the boaters and rescue squads were immediately mobilized.

"Toronto police rushed to the scene and an SOS was sent to the Coast Guard in Steubenville. Hundreds of spectators gathered along the Ohio shoreline to view the struggle.

"Mr. and Mrs. Francis exercised extreme coolness during the crisis, and this is believed by rivermen to have saved them from drowning. Rescuers were unable to hitch lines to the bobbing and weaving boat, and after thirty minutes of effort the yacht overturned.

"Mrs. Francis swam to the shore, where she was removed to Toronto City Building. When the Coast Guardsmen arrived Mr. Francis was still battling the undertow, clinging desperately to the boat. He was rescued at 7:55 p.m., and rivermen and rescuers commended the Coast Guardsmen for their efficient rescue.

"Aside from exhaustion, Mr. and Mrs. Francis suffered no injuries Toronto officials reported that the couple had their boat stored at the Toronto Boat Club and frequently came from Cleveland to cruise on the river."

If you have not been using or have not yet tried Allied's New Glass Base Discs, a trial will convince you of their merits and superior quality — at no premium in the cost to you. We invite you to try this disc — that is how we obtain new customers. We feel certain that you will

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# TECHNICAL PRESS

A digest of leading

[In these busy times few engineers can spare the time required for the purpose of this regular feature to provide an index of current technical literature.]

## *Proceedings of the I.R.E.*

for August, 1942  
**Aircraft Antennas**  
By G. L. Haller

This paper is a review of the general problem of aircraft antennas used for communication in the frequency range of 2 to 20 megacycles. Fixed antennas, shunt-fed wing antennas, and trailing-wire antennas are discussed and several typical curves of resistance and reactance are included. The icing problem is considered. The characteristics of several types of wire suitable for aircraft antenna are compared. Also included is a description of the army model-airplane set-up for measuring radiating characteristics of various types of antennas under flight conditions.

### **Impedance-Measuring Instrument**

By C. E. Smith

Following a brief discussion of impedance-measuring methods, the theory underlying the operation of this instrument is presented with the development of useful equations. The merit of the scheme lies in the fact that measurements can be made while the impedance is in operation without disturbing the current distribution of the network. Practical arrangements of the parts are then considered along with the necessary adjustments. The paper ends with some results and conclusions.

### **The Zero-Beat Method of Frequency Discrimination**

By C. F. Sheaffer

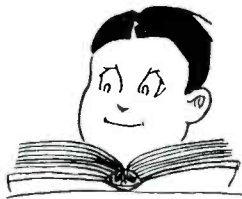
A method of frequency discrimination in which the frequency of balance is determined solely by the frequency of the controlling oscillator is explained. The method utilizes the phase turnover, which occurs at zero beat, between two beat sources when one of the beating signals is dephased by 90 degrees before it is applied to one of the beat detectors. A network is inserted in one of the beat sources which shifts its phase an additional 90 degrees and makes its output a direction function of the frequency. The beats are then amplified and supplied to a balanced rectifier, from which a direct voltage is available which changes polarity with the direction of frequency deviation.

### **Cosmic Static**

By Grote Reber

Cosmic static is defined as electromagnetic radiation which may be detected by radio receiving equipment and which

# REVIEW



By Ed. Stolzenberger

Technical articles in the current contemporary press.

Read to read all the current technical literature. It will be the technical articles on radio broadcasting and related subjects.—Ed.]

has extraterrestrial origin. A highly directive system for detecting and recording these radiations is described and analyzed. Data are given on the variations in intensity of cosmic static in relation to various regions of the galaxy. The effects of interference are discussed. It is suggested that cosmic static is the equivalent of thermal agitation in which all space is the conductor and the input terminals of the detecting equipment are projected by means of an antenna system to some far-distant part of space.

### Transients in Frequency Modulation

By H. Salinger

In a frequency-modulation system a sudden jump in carrier frequency corresponding to a Heaviside unit signal will result in a transient depending on the receiving-filter bandwidth. If this bandwidth exceeds twice the maximum frequency swing, the shape and duration of the transient is shown to be about the same as in an amplitude-modulation system with the same bandwidth; for narrower filters the transient lasts longer. These results are applied to several practical cases. The transient is favorably affected by using an amplitude limiter and by arranging the filter pass band so as to enclose the maximum frequency swing symmetrically.

### The Characteristic Curves of the Triode

By E. L. Chaffee

A method is described by which the entire static characteristic curves for the plate current of a power triode can be deduced from one experimentally determined curve. This experimental curve can be obtained at low power without danger of overheating the tube. Using the same procedure, the grid-current curves and the total space-current curves can be determined. A new log-log chart is described on which the static characteristic curves of a triode are presented by means of straight lines, and two curves giving the division of space current between the grid and plate.

## Electronics

for August, 1942

### Broadcasting Under War Conditions

By J. B. Epperson and B. Dudley

Technical operation of broadcasting stations adversely affected by shortages of equipment (mostly tubes) and well trained technical personnel. Pooling arrangements of spare parts urged in DCB "share the spare parts" program.

### Electronic Welding Control

By H. L. Palmer

First of a series of four articles on present-day practice in controlling welding operations by means of electron tubes. Gives general problems involved in designing controls for resistance welding machines.

### Unsymmetrical Attenuator Networks

By P. M. Homell

A method is given for calculating elements of T and Pi resistance attenuators between different input and output impedances.

### Electronic Switching in Power Line Carrier Circuits

By J. D. Booth

Requirements for electronic switching to provide automatic transmission in both directions in power line carrier systems. Fundamentals are outlined in block diagram form, and an application of this system is given.

### Periodic Wave Form Analysis — Part II

By H. M. Lewis

The concluding part of this article discusses the production of timing axes and wave form control for cathode-ray oscilloscopes by means of amplitude and impedance methods of changing wave form of deflecting voltages.

### Band Pass and Elimination Filters

By H. Hohubow

Graphical solution for constant K filters having dispersive elements simplifies design of band pass and band elimination filters.

### Propagation Constant and Characteristic Impedance of High Loss Lines

By K. Spangenberg

This reference sheet provides a simple and graphical method of determining the important factors of transmission lines which, being constructed of materials of high resistivity, have high series resistance.

### OCD Carrier Current Tests

OCD investigates feasibility of using power lines for distributing 720 kc signals in downtown, urban, and suburban areas for wartime communication.

### IRE Convention

Highlights of the Summer Convention of the Institute of Radio Engineers.

## Communications

for August, 1942

### Broadcast Program Failure Alarm

By Elwin J. O'Brien

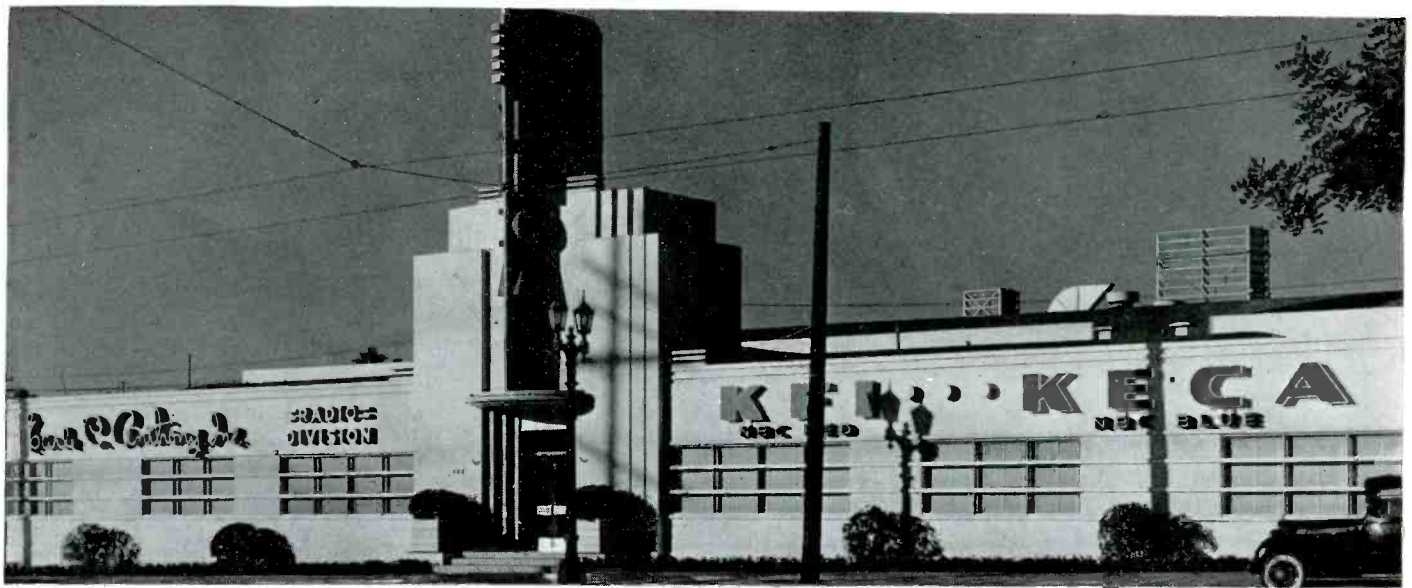
An unusual automatic monitoring device providing a visual-aural alarm when the carrier, program line, or program fails.

### Interference Suppression in A-M and F-M

By Herbert J. Reich

The author presents his analysis of interference suppression in amplitude and frequency-modulation systems, as used by him in instructing at the University of Illinois.

(Continued on Page Fourteen)



## Los Angeles News

By H. M. McDonald

**F**OURTEEN men, about half of the normal complement of the Engineering Department of KFI-KECA, are now in the Army, or Navy, or assisting the National Defense Research Council on projects in various laboratories. Three men are in the Army, three in the Navy, and eight are technicians with the NDRC. Four out of the six in the Army and Navy are commissioned officers, the fifth is taking an officer's training course, the sixth was a private when last heard from but has what it takes and is undoubtedly a non-com by this time.

After months of impatient waiting Lloyd Fritzinger finally received his commission, Lieut. (j.g.) U. S. Navy, and left immediately for the East, where he takes refresher courses, first at Harvard, and then at M.I.T. He writes us that the hours are long and that it's no picnic, but he likes it. "Fritz" received his B.S. of E.E. degree at Kansas State College in 1931 about the same time that Pickett, Compton, Webster, and Mills, now all well-known NBC Engineers, were at that institution.

We knew that smart station wagon which Jim Wright was driving around would land him in the Army. But instead of Jim driving it around for some officer it looks as though some one will drive it around for Lieut. Wright. Jim went into the Signal Corps Reserve. He's "inactive" while he brushes up at San Mateo Jr. College, Stanford U, and the laboratory at the Presidio of San Francisco. Then he becomes "active" and goes to an officer's training school, and perhaps Fort Monmouth.

Carl Estep, at KFI-KECA since 1935, has left our studios

for an NDRC job in the Navy labs at San Diego. He has attended Cal Tech., U.C.L.A., Pacific States U, and recently received a B.S. in E.E. (communications major) degree at U.S.C. He also has teacher's credentials which permit him to teach in secondary schools. Shortly before he left Carl was assigned to record interviews at a local auction room. Upon arrival he found John Barrymore's collection of trophies under the hammer. Many of them were gathered and last seen by Carl when he was the radio operator on Barrymore's yacht "Infanta" (KGOU) in 1930 and 31, and Dolores Costello was the wife of the "Great Profile."

Rex Bettis, with KFI-KECA since 1932, has left to do research work in the laboratories of Gilfillan Bros., long local manufacturers of radio and television receivers.

John Hidy, with us for the past five years, is now at Pupin Hall, Columbia University, perfecting—a thing. John had been our Secretary-Treasurer for the past year and we appreciate the good work he did.

We received an interesting letter from Al Laurent, ex-KFI T.E., now with an Anti Tank Company at a camp in Alabama. Says army life is a pleasant change and describes the camp as four miles wide and eight miles long with two-story barracks as far as the eye can see, each section having its own canteen, theatre, kitchens, church, and at night it looks like a city. The training, while intensive, is not too strenuous and the grub is excellent.

Also a newsy letter from Christensen, ex-KFI T.E., now with NDRC at Harvard. Is gradually becoming cultured, acclimated, and accustomed to a 60-70 hour week. As a

result of one of his many acquirements—a commercial pilot's license—he is now in charge of the Labs flying activities, with a hangar, two planes and twelve men—all in addition to his regular project.

Carl Zint, formerly with KFI, but of late at movie studios, mixing, is now at the Bell Labs, doing research work.

Another ex-KFI man, Carl Brengartner, with the Edison Company until recently, is now a lieutenant in the Navy, presently at Harvard.

E. A. "Gene" Williams, well-known operator, formerly with the Federal Reserve Bank, Associated Oil, Federal Telegraph, KFI, and Dollar President boats for years, is now on the Liloa, a Matson Line freighter. He was in Honolulu December 7th and though only six miles from the heavy action, did not learn what had happened until many hours later.

J. R. Schick is now at KFI Transmitter, after twelve years with RCA Communications, at Bolinas, Honolulu, and Huntington Beach. He has been prominent in Orange County ham activities (W6QLX) for years, especially in 5 and 2½ meter experimental work. He hails from that Oregon seat of learning, Corvallis, and got his degree at Oregon State.

Another new man at KFI and KECA Transmitters is Ted R. Cooper, Jr., who has been with Catalina Air Transport at Wilmington for the past five years, dispatching amphibions at Catalina Island. Prior to that he was with Warner Bros. Pictures at Burbank. He majored in Civil Engineering at the University of Nevada at Reno. He is much interested in the commercial use of ultra highs.

Dick Stoddart, of Hughes round-the-world flight fame, now has a plant on Santa Monica Boulevard in Hollywood, manufacturing Stoddart Aircraft Radios, and doing "all right, thanks."

Among the new men at our studios is Edwin E. Starr, originally from St. Louis, but now a "Californian." His past interests have varied widely, construction, alarm systems, machinery, etc. He got the surprise of his life while riding the Quiz Kids program for the first time a few nights ago, when his nephew Fred Starr of St. Louis was named the most outstanding boy in the U.S. for his contribution to defense work and awarded a gold key, a radio, a war bond, and made an honorary member of the Quiz Kids.

Another newcomer to KFI-KECA Studios is P. T. Crosby, from the Midwest. He has worked bonus wires for the W.U. and Postal all around that section and telegraphed for Armour at Oklahoma City for years. Then the radio bug BIT him and he became one of the best known amateurs in the 5th District. He came out here to visit his nephew, Lou Crosby (announcer on Lum and Abner show), and now radio's GOT him.

The youngest man at the Studios, in both years and seniority, is Richard W. Bull, fresh out of college a year ago. While there he secured a degree in Electrical Engineering

(Continued on Page Fourteen)



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*...restrictions have been cut to a minimum.  
If you are eighteen to nineteen and physi-  
cally fit, you can enlist directly into the U. S.  
Army Signal Corps . . . if you are nineteen  
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some experience in the Communications In-  
dustry and have not received your notice for  
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**the hallicrafters co.**  
CHICAGO, U. S. A.  
*Keep Communications Open*

## Los Angeles News

(Continued from Page Thirteen)

and a Commercial First Telephone license. Since, he has been designing for a local electric motor manufacturer, and also a senior draftsman with Basic Magnesium at Las Vegas.

W. H. Alexander and F. W. Everett have been upped from Studio Engineers to Master Control Supervisors.

Blessed events have made Supervisor Clarence Seamans the fond father of a baby girl, and Transmitter Engineer George Tokar the proud papa of a boy. Chorus all of us: Congratulations, and many happy returns of the day.

Ray Moore is the fire warden in the district around his home in Outpost Estates and he drills his men almost to exhaustion Saturday afternoons. Schedule: 1:45-2:00, drill; 2:00-5:00, refreshments; 5:00-6:00, adjourn, unless insufficiently refreshed.

Bill Erickson, just back from a vacation trip to Seattle, reports that it fairly bristles with guns around there and that there are scads of barrage balloons. Says the dim-outs are more complete there than here.

San Francisco is also apparently more war conscious than Los Angeles, according to Joe Dessert who drove up there during his vacation; dim-outs more complete, sandbags and other precautions much in evidence.

73 till next month.

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## Technical Press Review

(Continued from Page Eleven)

### Motor and Generator Maintenance

By M. C. Cisler

As a General Electric engineer, the author is thoroughly familiar with this subject, and methodically starts with the proper selection of rotating machinery, its proper installation and connecting, care in starting machines, inspection and necessary maintenance at periodic intervals.

### Bell Laboratories Record

for August, 1942

#### Radiation Pattern of the Human Voice

By D. W. Farnsworth

An interesting paper on the procedure and method used to determine the directional characteristics of human speech. Data of this sort are very useful in guiding the placing of microphones, since they show the region over which all frequencies are present in about their true relative proportions, and the amount of equalization that would be required in other locations.

### Behind the Mike

(Continued from Page Eight)

studio staff, has returned to school at Purdue. Ray worked on the Chicago staff.

Louis Tulchin, chief engineer of WBRW, Welch, Va., has taken leave from his duties there to join the Signal Corps.

George Hanna, on leave from the engineering staff of WHBF, Rock Island, Illinois, and now on duty with the Army Signal Corps at Camp Shelby, has been commissioned as a second lieutenant.

Wells Chapin, engineer for KWK, St. Louis, has assumed further duties after having been appointed chairman and radio aide of the WERS for the St. Louis area.

Bob Bitner has taken leave from the engineering staff of WCAE, Pittsburgh, to attend the Navy engineering school.

Stanley P. Guth has joined the staff of WOWO-WGL, Ft. Wayne, Ind.; he replaces Robert Snider, who has joined the staff of KTUL, Tulsa, Okla.

Webster Jones has joined the transmitter engineering staff of KFEL, Denver, Colo. He replaces Dan Sjodin, who has joined the Army.

P. H. Clark, NBC control room supervisor, and now on active duty with the Signal Corps as a captain, has been assigned to a task force operating in the Pacific War Area.

Frank Castanie, assistant supervisor of the engineering department of KMOX, St. Louis, has been commissioned a first lieutenant with the Army Air Force Ferrying Command.



# Radiation Pattern of the Human Voice (Continued from Page Seven)

lations are plotted in Figure 5 in per cent of the total power. This curve shows that for the male voice tested, 80 per cent of the total speech power is in the frequency band from 250 to 1000 cycles;

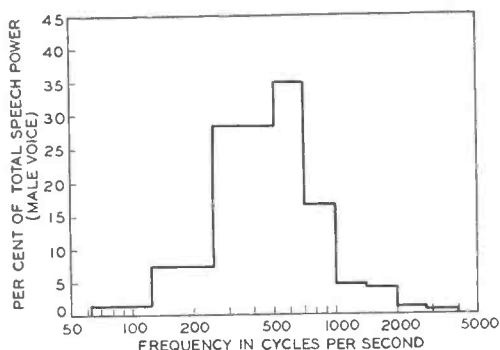


Fig. 5—Spectrum of male speech power obtained from an integration of the test results

that 96 per cent is in the band from 125 to 2000, and that only 0.4 per cent is above 4000 cycles.

Previous to these tests, a common method of estimating total speech power was to assume that the pressure directly in front of the speaker was constant over a hemisphere. A similar calculation made from data taken on these tests

## Some Famous Last Words

"This must be a short-wave pickup."

"I sold the station log to the Saturday Evening Post."

"Just leave your 'phone number. I'll give you an audition, miss."

"It's just a friendly game. None of the fellows ever lose more than 30 cents a night, at the most."

"Can you really rejuvenate old radio tubes?"

"Leaving here okay. Trouble must be at the transmitter."

"I've got a sure thing in the next race."

"Why, sure we're on frequency, R. I.!"

"I won't breathe it to a soul."

"This penny works just as good as a fuse."

"If you try to kiss me, I'll scream!"

— T. E. G.

gives a result 2 db lower than that obtained from the more complete integration. Although the total speech power will vary with the person talking, this difference for the two methods of calcu-

point was calculated for all the frequency bands as well as for whole speech. A curve expressing this ratio for a point 30 centimeters directly in front of the speaker's mouth is given in Figure

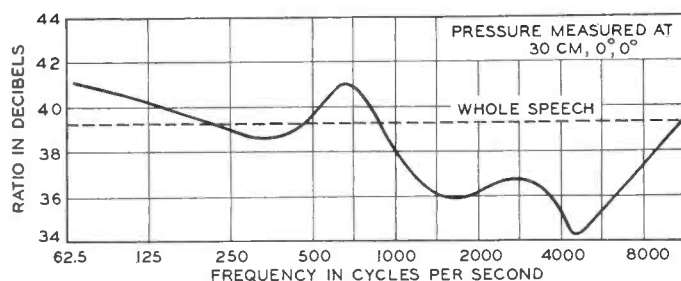


Fig. 6—Ratio of average speech power in total field to the power per square centimeter at a single point

lation should remain constant, and so it is safe so assume that calculations made on the basis of a single reading in front of the speaker have been about 2 db too low.

This ratio of total speech power to the power per square centimeter at one

6. Such a curve may be drawn for any of the points at which measurements were made, but the shape of the curve would vary with the point taken. With such curves available, the total speech power may be determined from measurements made at a single point.



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## BLILEY ELECTRIC CO., ERIE, PA.

**M**R. STOLZENBERGER, our editor, asked me for a short biography of Bert Pruitt. I'm glad he did. I've wanted to put that guy on the spot more times than you could imagine.

Pruitt fell in love with a school teacher several years ago. She fell in love too; so she married and left town.

Pruitt couldn't stand the thought of a broken heart so he took Horace Greely's advice . . . in a Corrigan manner.

After donning a pea jacket at Hampton Roads, Va., he went to N. Y. where he boarded the battleship Mississippi. One look at this floating fortress convinced him that rabbit hunting in Indiana had been small time stuff.

After leaving his fingerprints on beer glasses in Panama, San Francisco, Seattle and Honolulu he decided that he needed something stronger, so he boarded a transport sailing to the Far East.

A Singapore Gin Sling introduced him to the Orient.

He spent the following three years in China, The Philippines, East Indies, French Indo China, The Malay Straights Settlement and Beer Gardens.

In 1926 the radio bug bit him at Manila. The natural result was one year spent at the Naval Radio School at Cavite, P. I.

While attending this school he learned that mosquitos

are educated. According to him they stole his pencils, then wrote letters to our Congressmen demanding a fresh supply of Americans every six months.

After getting his honorable discharge he went back to Indiana. All the girls there were either married, or worried, so he went to the Great Lakes to wheel a freighter.

After two years of this kind of work he decided that radio wasn't so bad after all. He went up for his ticket.

In 1930 he came to WTAM. Shortly after that he got the kind of ticket that never needs a renewal.

Four years later he got a daughter.

In 1942 he got the job of writing this column [— and doing a consistently good job, too. Ed. S.].

\* \* \*

### "Not All Red Faces Set on Indian Frames"

A friend of ours dropped in from the West Coast the other day. He told us this one about two engineers out there. I have forgotten their names so I will refer to them as MacWhit and Flitham . . .

"Calvin MacWhit and Lank Flitham work the night watch out there," began our friend.

Due to the rubber shortage they doubled up on transportation. One night recently they were walking toward Calvin's car which was parked in a dark alley . . .

"The men on the morning watch have all the gravy," Lank said to Mack.

"Yeah . . . they can play golf all . . ."

"Look!" Mack excitedly whispered.

"Where?"

"Over there by my car . . . They're car thieves . . . they're lifting my tires!"

"Yeah!"

"Come on . . . we'll tackle 'em . . . you take the big one."

"OK . . . say . . . why don't you take him?"

"You're bigger than me . . . come on!"

They doubled over like Indians on the warpath . . . Lank took a flying leap and caught his opponent in the back . . . they both hit the ground, but Lank was on top.

Mack made a perfect dive, but his opponent moved to one side . . . Mack shot by and lit in the cinders. A club whistled past his left ear and he came out of the cinders growling like a Boston Terrier . . . "This for you!" gritted the Irishman uncorking a beauty that landed with a thud on his opponent's chin.

"How're you doin?" shouted Lank.

"OK," gasped Mack . . . "I think he's kayoed . . . How're you making out?"

"I've got this jaybird buried in the cinders . . . he's doing a lot of squirming and grunting, but that's all."

"Yell for the cops."

Lank yelled and two policemen came running across the street.

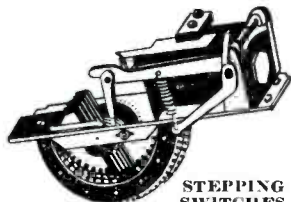
(Continued on Page Seventeen)

## CONTROL APPARATUS by AUTOMATIC ELECTRIC



RELAYS

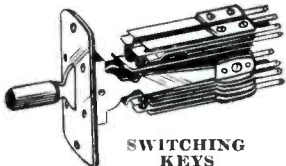
IN AMERICA'S leading radio broadcast studios, Automatic Electric remote control devices are used for the dependable operation of such important equipment as master control boards and announcers' cabinets, for program monitoring and switching, and for other electrical control uses.



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## AUTOMATIC ELECTRIC

TELEPHONE, COMMUNICATION, AND SIGNALLING EQUIPMENT

# Hollywood News

By Bob Brooke

**O**H, I'M 1-A in the Army . . . Guinea Pig Brooke They Call Me . . . All Hands on Pins and Needles About Draft . . . Summer Arrives the First of September . . . More New Men . . . Redecorating Completed . . . Heaviest Fall Schedule Yet . . .

JOURNAL . . . All my apologies to Stoltzy and our loyal readers for no Hollywood column last month . . . Just as we went to press out here I received notice of reclassification from 3A to 1A . . . This coming some months earlier than expected sort of blew all plans to the four winds . . . Hence frantic wires, trips, telephone calls and special delivery letters trying to find myself a job or a commission that would make better use of my fifteen years in commercial radio than packing a gun as a buck private . . . Results I won't mention, but I will say that I became something of an authority on a vague subject, "The Draft," and a still greater authority on a still more obscure subject, "How to Get a Commission" . . . But don't send me any questions because it's probably all been changed by now . . . Yet if you'd like to go quietly nuts I'd thoroughly recommend studying a day's activity in a local draft board or how to get a commission, it's a lot more fun than trying to guess what the level of a comedian's next word will be or betting on the horses . . . If this month's column is more incoherent than usual you'll know why . . . Although right now I'm fairly relaxed waiting for a ruling on my case to see what the attitude of local draft boards to the importance of radio may be . . . So Guinea Pig Brooke they call me . . .

MISC . . . There isn't a lot to report from Hollywood this month . . . Vacations are about over and a tremendous fall schedule is about to start . . . Each year we have thought it couldn't increase but each year it does . . . Ocean fogs pretty well ruined the summer for the beaches and we are getting our first clear hot days early in September . . . De Wolf reports "DeFence" work during his vacation . . . He built an eight-foot redwood fence around his rear yard . . . His daughter Dorothy making the Society columns these days . . . Most everyone stayed home on their vacations . . . With the notable exceptions of Control Supervisors Craig Pickett and Steve Hobart, who visited and inspected the new San Francisco Studios . . . Pick by racing bike no less . . . One-way 430-mile trip took him five and a half days . . . Steve trained up the conventional way . . . Alice Tyler, engineering secretary, planed to both SF and San Diego for her vacation . . . Not so many NBC visitors thru Hollywood this summer and very few foreign licenses around . . .

Well, fellers, I've got to get back to my worrying about the draft . . . 73.

## "It Could Cost More"

By Bert Pruitt

The cost of this war is startling,  
On that we are all agreed.  
It's costing us countless millions  
In fighting the Axis Creed,  
And the cost doesn't end with dollars,  
For today there is more at stake —  
Our armies and navies are fighting  
For peace and humanitie's sake.  
We know that the price that we're paying  
Is less than we'd pay if we lost,  
For the countries the Axis have conquered  
Have tasted the loser's cost.  
The natives of Greece and Holland  
Have learned of true Pagan Hell,  
And the people of France and Poland  
Are paying the price since they fell.  
Though the price to win is startling,  
Americans must certainly know  
That the price to win is a pittance  
Compared to the loser's woe!

## Cleveland News

(Continued from Page Sixteen)

"What's comin' off, buddy?" The policeman spoke to Lank.

"Tire thieves!"

"Let's hava look," said the law shining flashlights on Lank's victim.

"Say . . . what's coming off here?" thundered the policemen simultaneously.

"We caught these mugs . . ."

"Shut up! . . . Get up from there . . . Whatcha mean sluggin' officers?"

"Doing what?"

"Trying to kill policemen . . . LOOK MIKE . . . there's another one over there . . . By jove . . . it's Pat!"

"Cop killers, eh? . . . Well don't try any funny didoes . . . we've got you both covered. What're these guys pulling off, Pat?"

"Well," said Pat, glaring at Mack and Lank, "Tom and I were making our rounds and we saw two tire thieves taking these tires off this car." Pat pointed to two of Mack's tires lying on the ground.

"Are these the thieves?"

"No . . . the thieves ran down the alley just when we were ready to nab 'em . . . They got away . . . Mike and I were getting ready to put these tires back on the car when these two ruffians jumped us!"

# NBC Broadcasts Chicago Blackout

**N**BC was very much in the picture when Chicago observed its first test blackout on the night of August 12. Elaborate plans had been made beforehand to enable various members of the Office of Civilian Defense to communicate between the official observation platform atop the Board of Trade building and the United Airlines plane flying over the city during the blackout.

Bill Cummings took charge of the engineering side of the audio portion from the Board of Trade and Charlie Lyon did the announcing. From this location Mayor Kelly and various other officials talked to representatives of the Office of Civilian Defense that were aboard the plane.



Engineers Royston and Jensen testing NB-31 pack transmitter aboard United Airlines plane prior to broadcast of blackout

Dave Garroway served as announcer on the DC-3, twenty-one-passenger airliner. Engineers Harold Royston and Bob Jensen operated the ND 31 pack transmitter which was used for the program channel from the plane. An S-29 Hallicrafters receiver served as a cue. The signal from the plane was received by Ray Limberg at NBC's receiving location atop the Civic Opera building. At that point is also located WEJH which provided the cue channel to the plane. The completed program was fed to the Main Control Room at the Mart where Engineer Russell Sturgis put it on the WMAQ circuit.



Engineer Russell Sturgis setting up channels for blackout broadcast

The blackout was pronounced a huge success by the defense officials, however there were a few lights still burning that the Army didn't seem to like too well. It was a great spectacle to see millions of lights suddenly grow dim and then vanish altogether. The most impressive part was in watching the sections of street lights go out one by one as if some master mind were blowing them out as candles on a giant birthday cake.

We might mention that we learned something about trailing antennas, but that is another story and will have to remain an Inner Sanctum Mystery.



Engineer Ray Limberg at Opera Building receiving broadcast from United Airlines plane during blackout



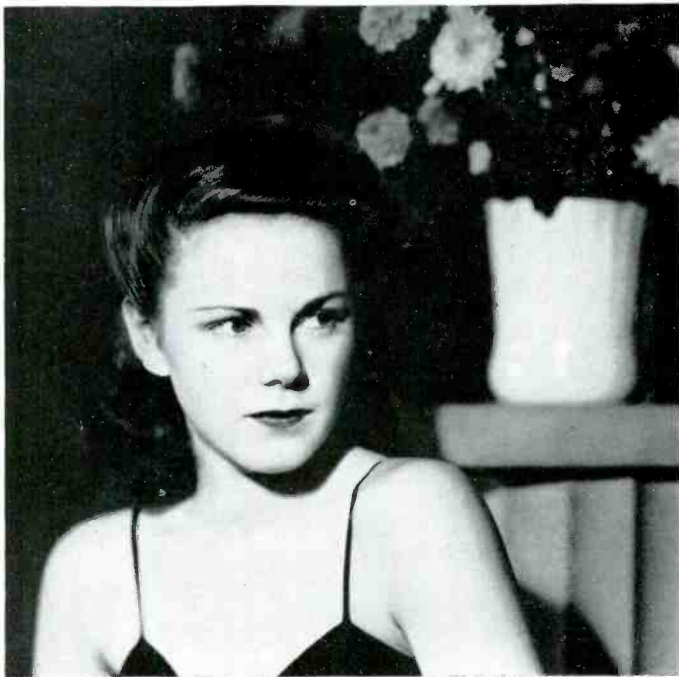


# WEAF Gets a Girl

**K**ATHERINE DONALDSON, of 32 West 10th Street, New York, was named Miss WEAF, winner of the contest launched by Station WEAF on its twentieth anniversary, August 16, to find a girl born in August, 1922.

Miss Donaldson was born in Manhattan August 17, 1922.

Her father's business took the family to Berlin when Katherine was four and she started to kindergarten there. Three years later the family returned to the U. S. and took up residence in Fairfield, Conn., where Katherine attended elementary and high schools. After two years of majoring in drama at colleges in Washington, D. C., and Benning-



**Katherine Donaldson**

ton, Vt., she played summer stock in Cleveland. During the early winter of 1941, she worked in the semi-professional Civic Theater in Washington.

Later Katherine studied with Martha Graham, of the stage, and also took a secretarial course.

Last July the now Miss WEAF, in addition to modeling, was acting as a junior hostess several evenings a week at the Stage Door Canteen. She says her duties were, and are, "spreading charm and being stepped on."

According to her, a substantial majority of service men are jitterbugs. She has decided, with resignation, that she'll have to learn to "cut a rug" with dispatch.

Called for the preliminary judging, with ninety-two other potential Misses WEAF, she reached the semi-finals with seven competitors. Katherine was selected for chief honors by a board of judges composed of McClelland Barclay, artist; Mrs. Sophie Gimbel, designer; John Powers, model agent; Fred Waring, orchestra leader; Dick Leibert, organist, and A. H. Morton, president, National Concert and Artists Corporation.

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### HERBERT LEROY RICE AGENCY

# The Technical Personnel Shortage

## *An Open Letter to the* Radio Broadcast and Recording Industry

During the past few months, our attention has been called to a few scattered cases of **women at the controls** in broadcast and recording studios. It is also a fact that a few small stations have voluntarily closed for the duration, ostensibly because their technicians have gone into the services, and replacements were unobtainable.

But why **women at the controls**? We appreciate that in the entire country there are approximately 100 women "hams" with varying degrees of a speaking knowledge of radio. The ham fraternity has rightfully been proud of their YL operators. However, we are at war, and radio recording and broadcasting are a very real part of the total war effort. All of the normal tension attendant in peace-time broadcast operations has been stepped up many times. In addition to the fatiguing around-the-clock working hours and almost continual split-second operating tension, there also exists the very real possibility of danger to person and plant equipment by saboteurs, who would have easy access to any of the numerous audience programs. Our women, God bless them, shouldn't be called upon for this work until the existing manpower in the field is exhausted, and we are very far from that.

We'll make a conservative estimate that 90 per cent of the broadcast technicians in the country are working under labor contracts specifying a 40-hour work week, with penalty clauses and time-and-one-half for hours worked in excess of 40 per week. The crystal ball tells us that we can increase our trained available man-hours by 20 per cent through the simple expedient of working the staff a 48-hour week, which is the custom in the civil and military services. The simple details of penalty clauses and overtime rates of pay for the extra work day could, we again conservatively estimate, be amicably arbitrated in a very few hours over a cup or two of coffee some rainy morning. It is entirely reasonable to believe that in another year, after the draft has further reduced our available technicians, that the **Additional War Hours Worked** plan could be extended to cover the seventh day, **thus effectively increasing the present technical personnel by 40 per cent!**

There are also other methods of conserving and minimizing personnel requirements; cases exist where an additional man is scheduled to function as "lunch relief"; in certain cases, groups of technicians could conceivably arrange to "eat in", thus conserving one man-day of skilled personnel; broadcasters in a given coverage area could conceivably cooperate, as they do so well in the War Bond and other War Effort work, to stagger their midnight to 8 a.m. coverage, thus conserving manpower, power consumption, and broadcast equipment.

This is only an outline of what can be accomplished in the general spirit of cooperation necessary to win this war.

—Ed. Stolzenberger.





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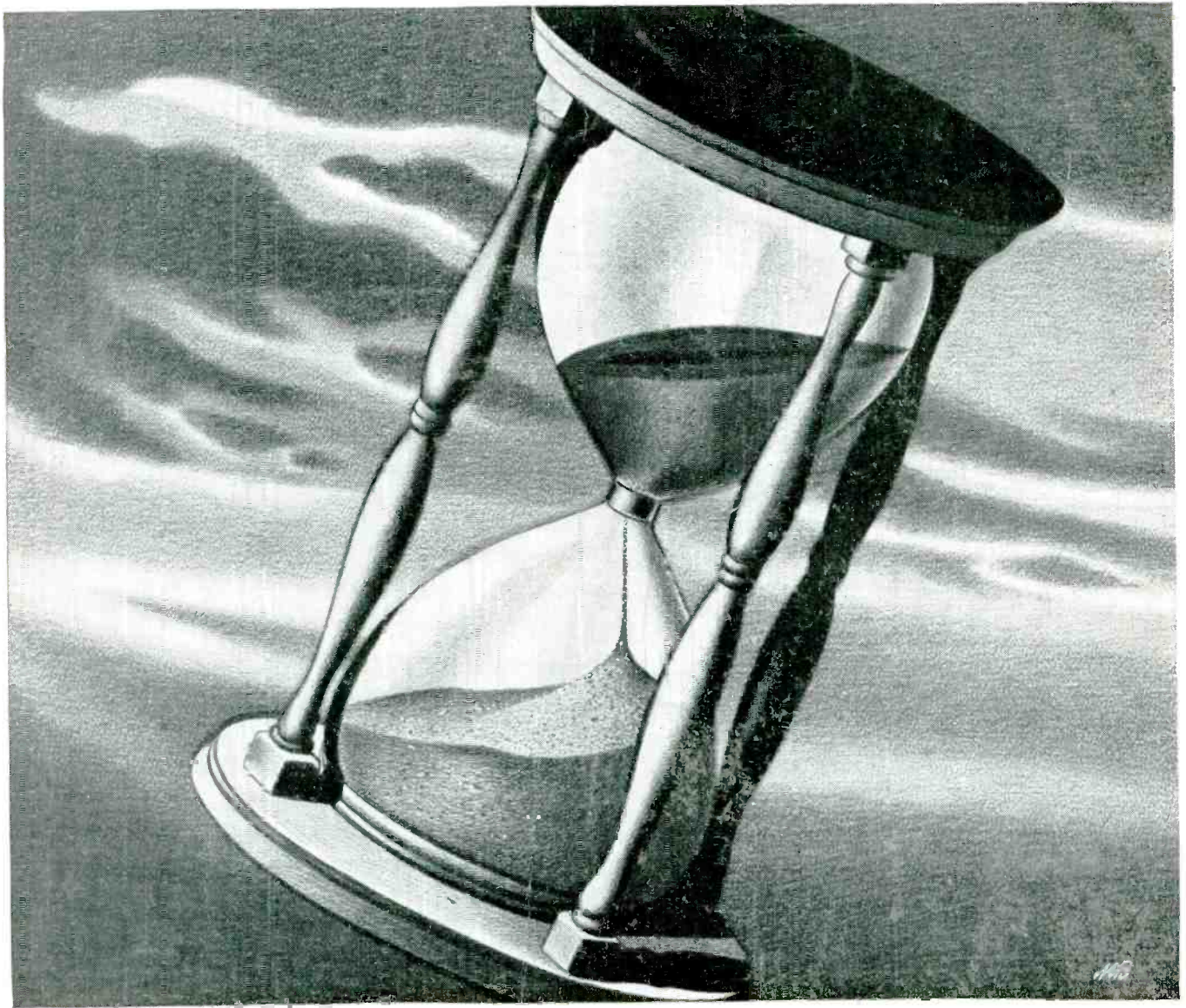
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