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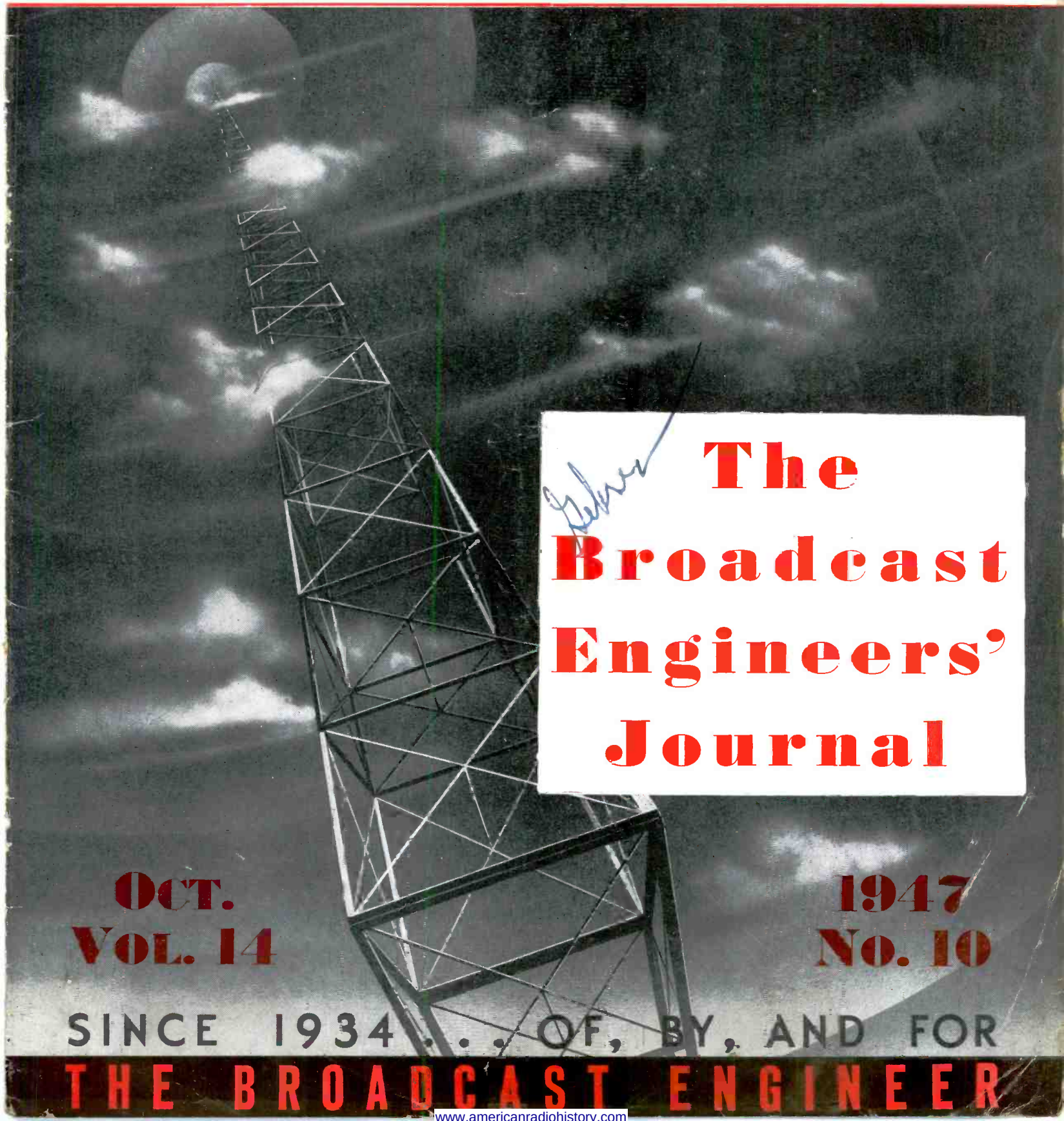

The Broadcast Engineers' Journal

OCT.
VOL. 14
1947
NO. 10

SINCE 1934 . . . OF, BY, AND FOR
THE BROADCAST ENGINEER

A Major Advancement in the Recording Blank Field . . .

10 Year Guarantee

GOULD-MOODY PROFESSIONAL QUALITY "BLACK SEAL" ALUMINUM INSTANTANEOUS RECORDING BLANKS . . . . AT NO INCREASE IN PRICES!

After prolonged research and experimentation, we have introduced technological improvements into "Black Seal" blanks that not only increase the life span, but materially enhance the other fine characteristics of these blanks. And so positive are we of the performance of these perfected "Black Seals" that we've placed an unconditional guarantee of ten years on each one of them.

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You Can't Afford To Be A Recording Isolationist

Whether you're a recording engineer in New York, Burbank or Witchita . . . no matter how well satisfied you are with your present blanks — you can't afford to be a recording isolationist now. Try these new Gould-Moody "Black Seal" blanks. Cut a few. If, for any reason whatsoever, you do not like them, you can return them at our expense.

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THE BROADCAST ENGINEERS' JOURNAL

Ed. Stolzenberger Editor and Business Mgr.

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Volume 14, No. 10 October, 1947

TABLE OF CONTENTS

THE BROADCAST ENGINEERS' JOURNAL
OFFICIAL PUBLICATION OF THE N.A.B.E.T.

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

Errattum Notice . . .

An editorial error was brought to our attention after the September issue had gone to press, relative to the item under NABET ACTIVITY in the August, 1947 issue, page 2 titled: "Status of Nabet Supervisors."

Supervisors as defined in NABET contracts do not fall under the classification of supervisors as defined in the Labor-Management Relations Act of 1947. Supervisors as referred to in the Act are persons employed to act in a strictly executive capacity.

Nabet continues to claim jurisdiction over all supervisory positions in its existing and future contracts.

Labor-Management News . . .

* The RMA Industrial Relations Committee has announced that a fourth RMA Industrial Relations Seminar will be held Nov. 13th at the Stevens Hotel in Chicago. This seminar will deal chiefly with the application of the Taft-Hartley Act to the radio industry.

* The Aug. 1947 Labor Information Bulletin reports the keen competition facing the radio repairmen, and the need for experience; the average repairman who operates his own shop is said to gross over $5,000 annually.

* Bureau of Labor Statistics reports largest increase (15%) in the building trades since 1920. Between July 1946 and July 1947, top union hourly wage scales in the building trades have advanced as follows: Bricklayers, $2.75; carpenters, $2.50; electricians, $2.50; painters, $2.15; plasterers, $3.00; plumbers, $2.81; building laborers, $1.75. This, obviously, is the result of national organization. Show this item to your unorganized brother broadcast and television technicians, and tell them what NABET has done in the broadcast and television field.

Business Trends . . .

* RMA reports that the Radio Industry has put behind it most of the wartime material shortages and is now face to face with the problems of a normal competitive market. . . . RMA has revived and intensified its campaign to reduce or repeal the 10% Federal Excise Tax on radios.

* The "tight" situation that prevailed for radio tubes in 1946, has completely cleared up; 114 million tubes were produced during the first 7 months of 1947.

* The FM-AM set output during the half year was largely in console models although table model production has shown an increase in recent months. A total of 361,689 radio-phonograph combinations, 15,615 straight consoles, and 68,259 table models made up the FM-AM total.

* Following is the monthly breakdown of FM, television, and all radio set production for the first six months of 1947:

Month	*FM-AM*	*Television*	*All Sets*
January (five weeks)	51,318	5,437	1,564,171
February	53,594	6,243	1,379,966
March	67,264	6,639	1,377,269
April (five weeks)	112,256	7,886	1,795,723
May	84,507	8,690	1,316,373
June	76,624	11,484	1,213,142
Totals	445,563	46,389	8,610,644

POSITIVE-GRID U-H-F OSCILLATORS

A NUMBER of important factors influence the generation of ultra-high frequency oscillations necessitating the use of special types of u-h-f tubes. These factors can best be understood by first considering the electronic action of conventional vacuum tubes ordinarily used at much lower radio frequencies.

Such tubes and their associated circuits cannot be used to generate frequencies above 300 megacycles (wave lengths of less than 1 meter) because of these factors or limitations.

As the frequency of operation is increased, the physical dimensions of ordinary vacuum tubes approach those of a tuned circuit. And the *highest* operating frequency as an oscillator is limited by the physical length of the tube leads to the circuit elements.

There is considerable power loss (and thus decreased efficiency) in a conventional oscillator circuit due to skin effect at ultra-high frequencies, the large current necessary for charging condensers, uncontrolled electromagnetic radiation from different parts of the circuit, and various dielectric losses chiefly in the tube envelope and base.

But the chief limiting factor in the use of ordinary vacuum tubes at such high frequencies is the actual *transit time* of electrons within the oscillator tube. At most low radio frequencies, this time of electron travel from cathode to plate can be neglected. But when it is attempted to use ordinary vacuum tubes to generate u-h-f waves, the transit time comes into extreme prominence. It influences the efficiency as well as the frequency limit of oscillations, chiefly through its effect on the input conductances of the tube. It increases the effective grid conductance of the tube, thereby increasing the load on the driving source.

An effort to develop satisfactory u-h-f oscillators—which either minimize or entirely eliminate the above limiting factors—led to the discovery and perfection of several kinds of special u-h-f oscillators, either of the *Barkhausen* or of the magnetron type. Details of the basic magnetron and its varieties have been discussed previously [*B. E. J.*, October, 1944; *B. E. J.*, October, 1946]. And this article is concerned primarily with u-h-f oscillations produced by the *Barkenhausen-Kurz* circuit.

Theory of Operation

This type of u-h-f generator is known variously as the *Barkhausen-Kurz,* retarding field, or positive-grid *oscillator.* It uses a special kind of triode (to be described later) with a tuned circuit connected between the grid and the plate of the tube, as shown in figure 1.

Arrangement of the circuit differs radically from conventional vacuum tube oscillators. The grid of the triode, instead of being negative, is positive with respect to the cathode. The plate, instead of being positive, is at the same potential as the cathode or, in some instances, may be slightly negative with respect to the cathode.

Ultra-high frequency oscillations are generated by making use of the finite transit time of electrons in the positive-grid tube. The operating frequency is largely dependent upon the values of the components of the resonant circuit. However, under certain conditions, the frequency of oscillation (over a limited range) is independent of the external circuit, and depends only on the transit time of the electrons moving from cathode to plate within the triode.

Oscillating action can best be described by reference to the diagram shown in figure 2, where it is assumed that the electrode potentials remain constant in value. The triode used by this type of u-h-f oscillator consists of a cylindrical cathode, surrounded by a coaxial grid structure in turn surrounded by a coaxial collector plate.

When electron A (see figure 2) is emitted by the cathode, it is drawn toward the highly positive grid structure. By the time the electron reaches the vicinity of the grid, its velocity is high and it has gained energy by being accelerated. While electron A conceivably might strike the grid structure immediately, more likely the electron will pass through the space between the grid wires into the region between grid and plate. There, the positive grid still attracts and the negative plate still repels the electron. And these two forces cause the electron to slow down.

As electron A slows down, it delivers its energy to the electric field existing between the plate and the grid. When it has lost all, or almost all, of its energy: it comes to rest for an instant.

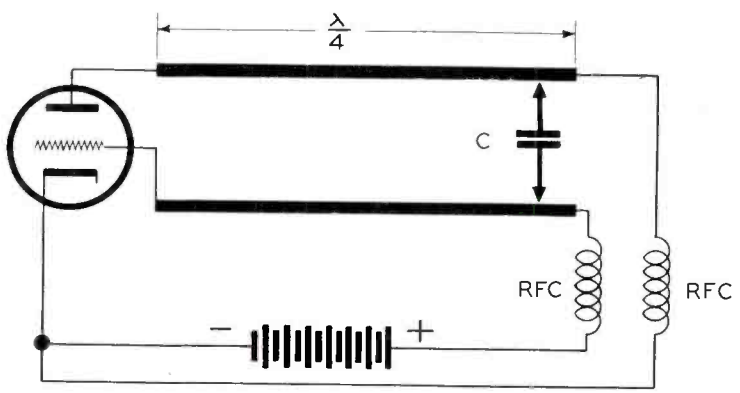

Figure 1—Basic Circuit of Barkhausen-Kurz Oscillator.

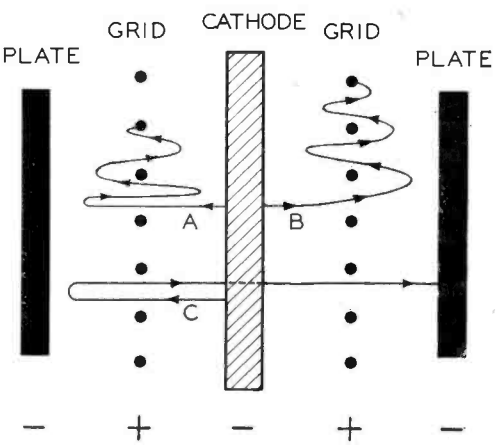

Figure 2—Electron motion in a positive-grid oscillator tube.

Then the attraction of the grid causes the electron to move back toward the grid structure. If it passes through the grid wires, the entire process is repeated.

The oscillating movement of electron *A* continues, but diminishes in value of amount of "swing," until it finally strikes the grid structure.

The motion of electron *B* illustrates another possible path of an electron moving from cathode to grid.

When the motion of many electrons is involved, a "bunching" effect occurs where the electrons tend to crowd each other, slow up, and reverse their motion. This effect creates a negative space charge, which causes further bunching of electrons. Thus a cloud of electrons in any region of the tube tries to slow up other electrons coming toward them, — but tries to speed up those that have just passed. The result is that electrons tend to swing back and forth through the grid-wire structure somewhat in step with one another.

Referring to figure 2, when electrons *A* and *B* were near the plate electrode of the triode they induced their image charge on the plate, by the process of electrostatic induction. This charge is removed when the electrons are remote from the plate. By this electronic action: a voltage appears between the plate and the grid of the tube which varies in accordance with the period of vibration of electrons in the inter-electrode space.

External Circuit

If a circuit resonant to this frequency of vibration is connected between the grid and plate electrodes, an oscillating current will flow as a result of the induced voltage. And a resonant rise in voltage will take place across the terminals of the tuned circuit.

This varying voltage will alternately add to and subtract from the effective grid potential, which is equivalent to superimposing on the steady (d-c) grid voltage a sinusoidal voltage having a period equal to the time required for an electron to move from the cathode to the close vicinity of the plate of the triode.

There are two resulting conditions.

The first occurs when the alternating voltage increases the potential of the grid. Electrons leaving the cathode at that time are accelerated more than normally while in the space between the cathode and the grid—and thus pass into the space between the plate and grid with a velocity much higher than normal. As these electrons approach the plate, the alternating component of the field reverses, causing a decrease in the rate of electron slow-down. The result is that such electrons usually bombard the plate and are removed from the tube, having removed energy from the tuned circuit during their passage from cathode to plate. This action is shown by the path of electron *C* in figure 2.

The second condition occurs when the alternating voltage decreases the grid potential. Electrons leaving the cathode at this time are accelerated less than normally while passing through the space between cathode and grid—and so pass into the space between grid and plate with lower than normal velocity. As they approach the plate, the reversal of the a-c component of the grid-to-plate voltage causes the rate of velocity to decrease more than normally, — and they reverse their direction somewhat short of the plate and continue oscillations about the grid-wire structure. These electrons give up energy to the tuned circuit, since they continually move in such a direction as to oppose the a-c component of the electric field.

Since electrons are emitted at all times, sustained oscillation necessitates that electrons that are emitted when the phase relations are correct for receiving energy from the tuned circuit are removed after only one passage through the grid — while those electrons which are emitted when the phase relations are correct for transferring energy to the tuned circuit remain in the interelectrode space for several oscillations.

Typical Oscillator

The circuit of a typical negative-grid oscillator is shown in figure 1.

The tuned circuit consists of a section of transmission line which is tuned to a quarter-wave length by means of a very low reactance condenser C. Use of this condenser as a shorting bar permits the grid to be held at a high positive potential.

Frequency of oscillation is controlled by the applied voltage and the spacing of the tube elements. Most desirable tubes have cylindrical electrodes; the ratio of plate to grid radii must be greater than 2 but less than 5.

Available power output of oscillations increases rapidly with frequency of operation, since the required positive grid potential increases and also the optimum value of space current. However, the power output of this type of oscillator is relatively low.

The radio-frequency chokes are used to prevent loss of r-f energy from the tuned line.

The Barkhausen-Kurz circuit can be used to generate oscillations in the frequency range between 30 to over 2500 megacycles per second.

Operation of this type of circuit has low efficiency, because many electrons contribute little or nothing to the sustaining of oscillations and other electrons even tend to dampen oscillations.

Non-harmonic oscillations of a somewhat peculiar nature are sometimes generated by this type of circuit. These oscillations are due to parasitic oscillations whose frequencies correspond to the natural electrical periods of the electrodes of the oscillating triode. These are, generally, of longer wave length than resonant oscillations.

Bibliography

A COMPENDIUM of reference material is given below on the general theory, technique, and operation of Barkhausen-Kurz oscillators. These provide the only authoritative sources of technical information, since no individual technical books or publications have been devoted exclusively to this type of oscillator circuit.

The references given are for articles published in the United States and Great Britain, giving the name of author, title of work, volume number and date of each periodical. Omitted have been references to articles published in languages other than English. But it should be noted that the first data on the subject was published in Germany in 1920 by the scientists who originally developed the device: H. Barkhausen and K. Kurz.

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Chipman, R. A.—"Electron Oscillation Characteristics of an Experimental Plane-electrode Triode" *Proc. Phys. Soc.* 47, 1935.

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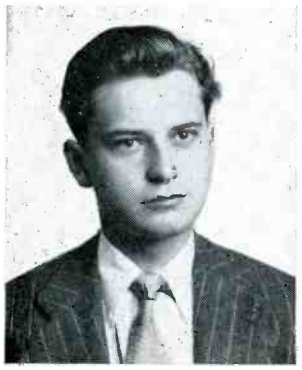


Review of Current Technical Literature

By Lawrence W. Lockwood

Bell Laboratories Record, August, 1947

Frequency Control Unit—by I. E. Fair

An article describing the wartime development of a small crystal for the low frequency range of 200 to 1,040 kc. The small size is made possible by cutting them from the crystal at a different angle with respect to the optic axis and utilizing a trick suspension.

Communications, July, 1947

Sync Generator Frequency Stability and TV Remote Pickups—by W. J. Poch

An Analysis of the Relationship of synchronized generator control and field pickup setups in Television.

Performance Characteristics of the WABD TV Antenna System—by G. E. Hamilton

A report on the results obtained with the 3-Bay superturnstile batwing antenna system recently installed atop a N. Y. City skyscraper.

A Developmental F-M Broadcast Station—by M. A. Honnell

Description of Georgia Tech's F-M station with vertical half-wave antenna. External and internal grounds used to minimize trouble from stray fields and lightning. Transmitter converted from 49.5 to 99 mc.

Low-Voltage Regulated Power Supplies—by F. W. Smith, Jr. and M. C. Thiencpont

Discussion of saturable reactor-controlled D-C supplies with D-C amplifiers and voltage-sensitive bridges which can be used in supply systems.

Antenna Tower Design—by Ralph G. Peters

A review of the features of self-supporting and guyed-wire towers used for A-M, F-M and TV.

Journal of Applied Physics, July, 1947

$TM_{0,1}$ Mode in Circular Wave Guides with Two Coaxial Dielectrics—S. Frankel

Field components for a transverse magnetic wave in a wave guide with two coaxial dielectrics are computed with a typical example given.

The Field of a Microwave Dipole Antenna in the Vicinity of the Horizon—by C. L. Pekeris

A method is developed for determining the electromagnetic field produced by a microwave antenna at points on the horizon and on either side of it.

Proceedings of the IRE, August, 1947

Automatic Frequency Control of Microwave Oscillators—by V. C. Rideout

A method for the automatic frequency control of any type of tunable microwave oscillator is described which utilizes a servomechanism including a wave-guide discriminator circuit, a mercury contact relay, a 60 cycle amplifier and a small induction motor.

Harmonic-Amplifier Design—by R. H. Brown

Two methods are presented for calculating the ideal performance of amplitude-variation-type harmonic amplifiers: (1) Slightly revised form of Terman's analysis; (2) a Graphical method.

Magnetic Deflection of Kinescopes—by K. Schlesinger

This paper investigates some basic principles in the operation of systems for magnetic deflection of television tubes.

Electronic Indicator for Low Audio Frequencies—by A. E. Hastings

An instrument which indicates the frequencies of the components in a periodic complex electrical waveform is described.

QST — August, 1947

Coupling to Flat Lines—by Byron Goodman

Circuit considerations for Matched-line Coupling.

TELE-TECH — August, 1947

Circularly Polarized Waves Give Better FM Service Area Coverage—by T. B. Friedman

Design theory, practical applications and advantages of the principle in reducing effect of reflections and otherwise improving reception.

FCC Studies TV Relay for Inter-City Network Systems

Common-Carrier rates seen encouraging broadcasters to develop own micro-wave facilities—many existing experimental relays capable of expansion.

Wide Band Oscilloscope Amplifier—by C. E. Hallmark and R. D. Brooks

Balanced push-pull direct-coupled stages provides characteristic necessary for square wave analysis and television applications.

How Daytime Skywave Reflections Affect Cleared Channels

Report on long distance broadcast reception in the 550-1600 kc band with the nighttime skywave reflected from the ionosphere.

British Printed and Sprayed Circuits

Electronically controlled machine is fed molded plastic panels and delivers complete circuits with resistors, capacitors and inductances.

Gain Chart for Cathode Followers—by G. Houck

Simplicity of circuits, economy of components, low distortion and wide frequency response give advantages for broadcast use.

Design of Magnetic Tape Recorders—by R. H. Ranger

Frequency response and dynamic range greatly improve through control of size of oxide particles and their dispersion.

Design of Tuners for AM and FM—by L. M. Hershey

Automatic frequency control using dual triode as oscillator and reactance tube corrects for mistuning and drift; pushbutton tuning.

Level-Governing Audio Amplifier

Shortened attack time permits use of maximum compression with minimum degradation of quality, low output distortion and noise.

Audio Engineering — August, 1947

Psycho-Acoustical Aspects of Listner Tests—by C. J. LeBel

A discussion of the factors (physical, architectural, psychological, and electronic) involved in listener tests.

U.N. Broadcast & Public Address Systems—by A. W. Schneider

Describing an elaborate and successful sound installation with accompanying photographs and block diagrams.

Planning a Studio Installation—by J. D. Colvin

This is the second of a series covering broadcast studio installation. The methods outlined are also suited to large public-address projects.

Musical Acoustics—by B. F. Tillson

This is the third of a series of articles on music theory written especially for sound engineers.

Electronics — August, 1947

Frequency Range Preference For Speech and Music—by H. F. Olson

Live talent played popular music and people familiar and unfamiliar to an audience talked. An acoustical filter consisting of movable panels was introduced to cut off response at 5,000 cycles. Results are presented here.

Permeability Tuning of Broadcast Receivers—by L. O. Vladimir

Analysis of permeability-tuned series loop and transformer-coupled loop-circuits. Performance is compared with that of the familiar capacitance-tuned high-impedance type. Coil-winding data for obtaining proper pitch for oscillator tracking are also given.

Effect of Feed on Pattern of Wire Antennas—by D. C. Cleckner

Measured radiation patterns for straight wire antennas of various lengths from a half wavelength to three wavelengths and fed at various points are presented herewith. They show that feed point affects the number, orientation and magnitude of the lobes.

Pulsed Rectifiers for Television Receivers—by I. G. Maloff

Brief analysis of pulsed cascade rectifiers used in television receivers indicates that no component is subjected to potentials substantially higher than those encountered per section.

Wide-Range Sweeping Oscillator—by Eng. Staff, Kay Electric Co.

Single test oscillator covering the bands from 50kc to 500 mc. Basically the circuit is a beat-frequency oscillator using two 3cm klystrons.

Experimental Audio Output Tetrode—by W. S. Brian

Low harmonic distortion is obtained from an output tetrode in which the first grid is made positive, acting as a space-charge grid, and the second grid is used as the control electrode. Tube is little affected by changes in load impedance, and is comparable to a pentode in power sensitivity.

Frequency Response of Magnetic Recording—by O. Kornei

Magnetic properties, physical dimensions and velocity of a magnetic recording medium are discussed and evaluated. Features and performance of electroplated wire and powder coated tape are described.

NABET Employment Service

Due to the day-to-day changes in status and availability of unemployed NABET members, President Powley has deemed it impractcial to publish such a list of names in each issue of the Journal. Instead, each available member should immediately notify the National Office, with copies to his Chapter Chairman, of availability together with brief resume of experience, etc., and notify them immediately of any change in status or availability. The Chapter Chairman for the area, and the National Office, each of whom are called upon to fill vacancies, will thus be kept up-to-date to the mutual advantage of all concerned.

New Reeves Studios

A NEW milestone for recording sound for film, records, radio and television has been achieved in the opening of the new Reeves Sound Studios, the largest independent sound facilities in the east, at 304 East 44th Street, it was announced today by Hazard E. Reeves, President of Reeves Sound Studios, Inc.

The vast range of the new studios will offer complete equipment for sound recording in industrial films, radio transcription, disc cutting, training slide films and television under the direct control of Chester L. Stewart, Executive Vice President and General Manager. Mr. Stewart has been associated with the Reeves Sound Studios since 1939, previously associated with the Harvard Film Foundation.

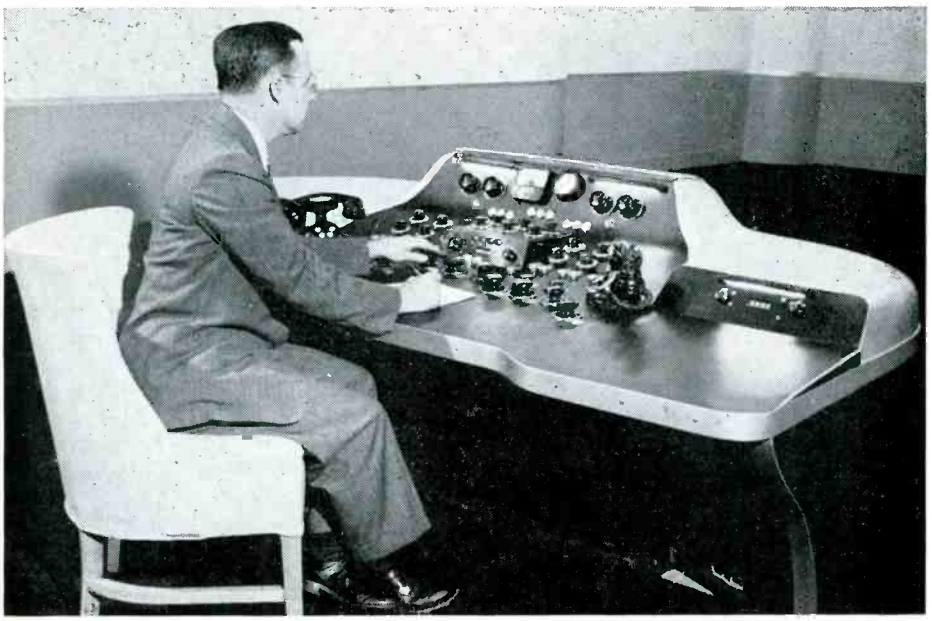
The Reeves Sound Studios have completely remodeled what was formerly the Beaux Arts Institute of Design to include the most modern engineering designs incorporating many sound recording techniques never before attempted. Over five floors of sound stages, shooting stages, band stages, recording and sound laboratories make up this unusual engineering achievement.

Clients will be afforded every aid to facilitate their work through the latest equipment for both 16mm and 35mm operation which includes newly installed units of the latest Western Electric 200mil push-pull density track, and RCA photo-phone. In addition to this wide variety of permanent and mobile equipment there is also the new Reeves Sound 16mm density channel and 16mm recording units available. The general purpose studios, completely engineered by a staff of Reeves recording experts are designed to make possible the finest voice recordings and newsreel type of live mix.

Extensive research headed by Chief Engineer Lyman J. Wiggin was done prior to this by analyzing the newest developments in sound throughout the country for incorproation in the Reeves Sound Studios.

The Reeves Sound Studios were originally established at 1600 Broadway in 1933. During the war years the studios were employed almost 100% in production of training films for the armed services and government agencies. These included everything from the Army Air Forces "Weekly Digest" to individual training films. Among other government agencies utilizing the services of Reeves was the OIAA which served Latin-American countries with a series of informational film documents. In addition films of the State Department, the Department of Agriculture and the OWI were sounded at their former quarters.

The Reeves Console is capable of mixing 8 channels to a single output. Illuminated indicators give console settings at a glance. The very low profile of this console does not block or distort sound as picked up by the engineer.



Hazard E. Reeves, president and founder of the Reeves Sound Studios, Inc.

Biographic Sketch of Hazard E. Reeves

Born July 6, 1906 in Baltimore, Mr. Reeves received his BS in mechanical engineering from the Georgia School of Technology in 1928. He then came to New York and was successively Research Engineer of Columbia Photographic Co., Assistant Chief Engineer of Stanley Recording Co., Sound Director of the Harvard Film Foundation, and Chief Engineer of Standard Sound Co. He founded the Reeves Sound Studios in 1933 at 1600 Broadway where it continued with periodic expansion until the opening of their new facilities at 304 East 44th Street.

After the launching of the studios of which he is the sole owner, Mr. Reeves founded and was the first president of Audio Devices, Inc. and Audio Manufacturing, Inc. During the war he was founder and president of Reeves-Ely Laboratories, Inc., a holding company of the American Transformer Co., Hudson American Corp., Waring Corp., Winsted Hardware Co., and Reeves Sound Laboratories. After selling his interest in these concerns at the end of 1945 he has become the founder and president of Reeves International, Inc., import and export manufacturers and technical consultants, Reeves Soundcraft, Inc., manufacturers of instantaneous recording discs, Reeves Products, toy manufacturers and the Alni Corp., manufacturers of miniature horsepower motors, among other holdings. Mr. Reeves is a partner of Preview Theatre, an associate of Reeves Sound Studios.

NEW! A complete portable recording console THE PRESTO 90-A

Here in one easily portable unit is complete amplifier equipment to produce recordings on remote assignments that equal the best recordings in permanent installations.

Presto 90-A has 3 low-level input channels with mixers, master gain control and variable high and low frequency equalizers.

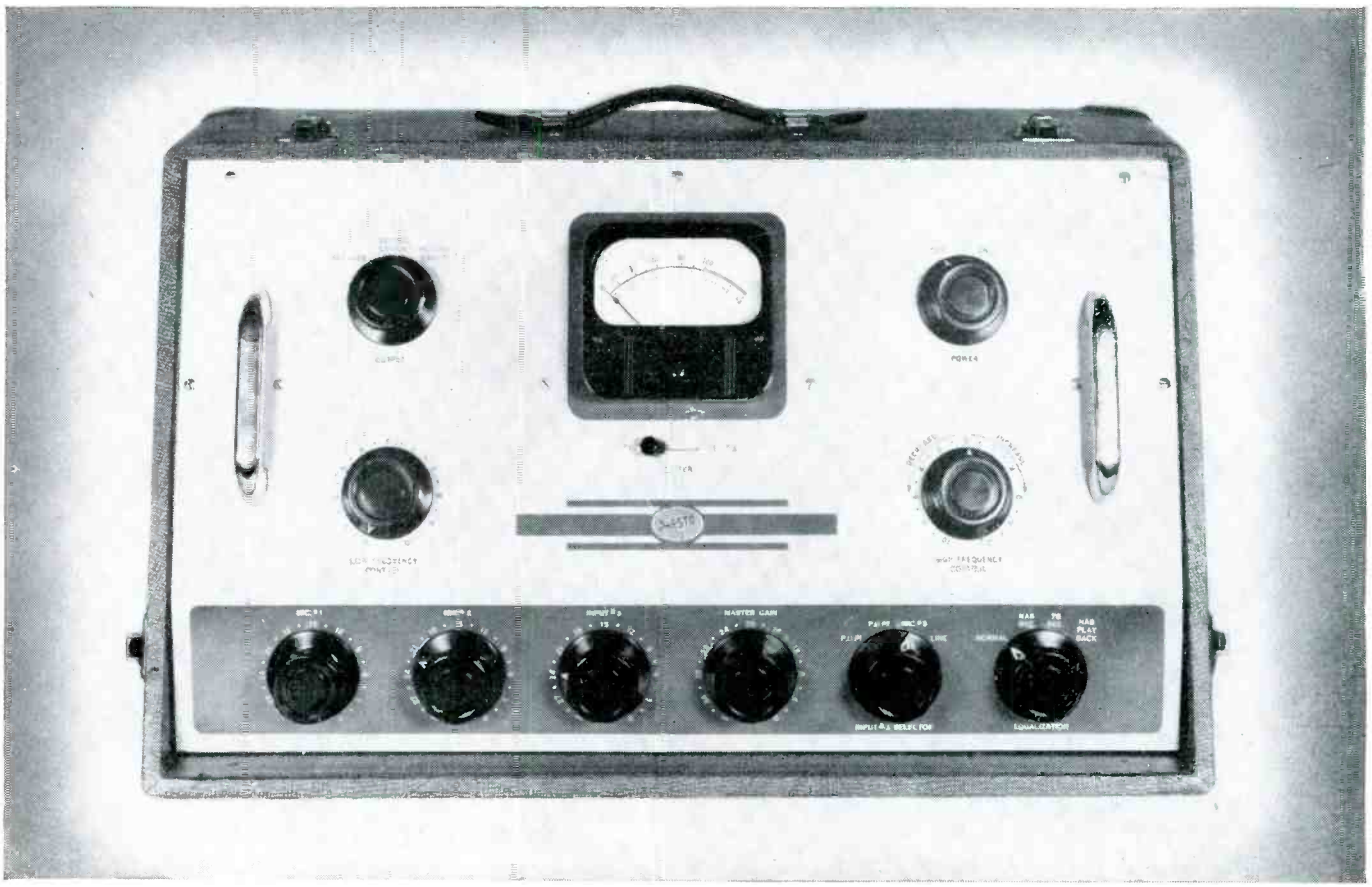
It has four fixed characteristics: flat between 30 and 15,000 CPS...NAB recording...78 r. p. m. recording...playback complimenting NAB recording.

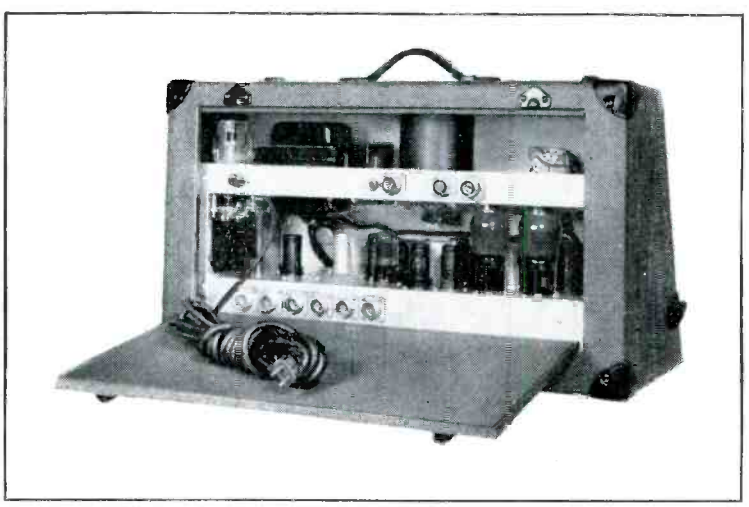
Other features include: line input and output, V.U. meter, switching for one or two recorders, over-all gain—115 db, power —10 watts undistorted.

In quality of parts and workmanship and in flexibility of operation, the Presto 90-A is the equal of the finest studio equipment.

Presto engineers are proud to present this new recording console as a forward step in recording equipment.

Immediate delivery can be made from stock.





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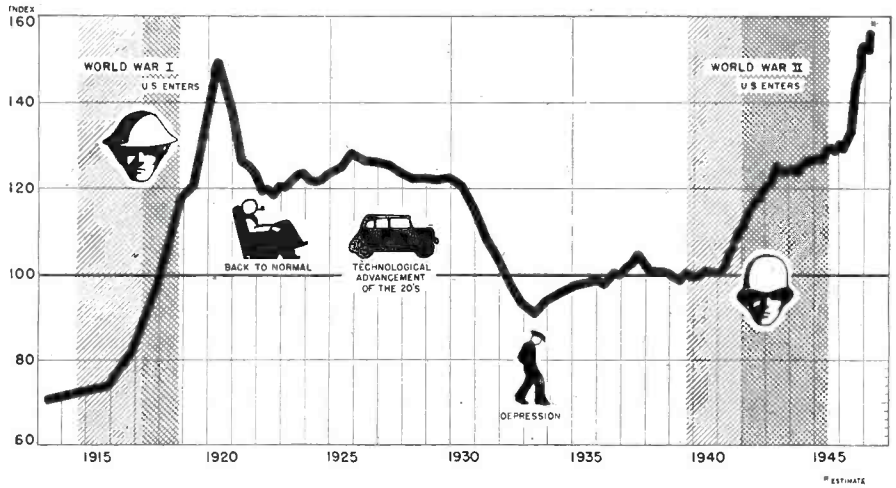


Price Index . . .

The Bureau of Labor Statistics Consumers' Price Index, shown here represents retail prices of living essentials of moderate-income city families, including food, rent, clothing, fuel, light, housefurnishings, and miscellaneous goods and services. It reached a record high of 156.3 on March 15, 1947, after a 20% increase in 12 months.

Model Wage Bill . . .

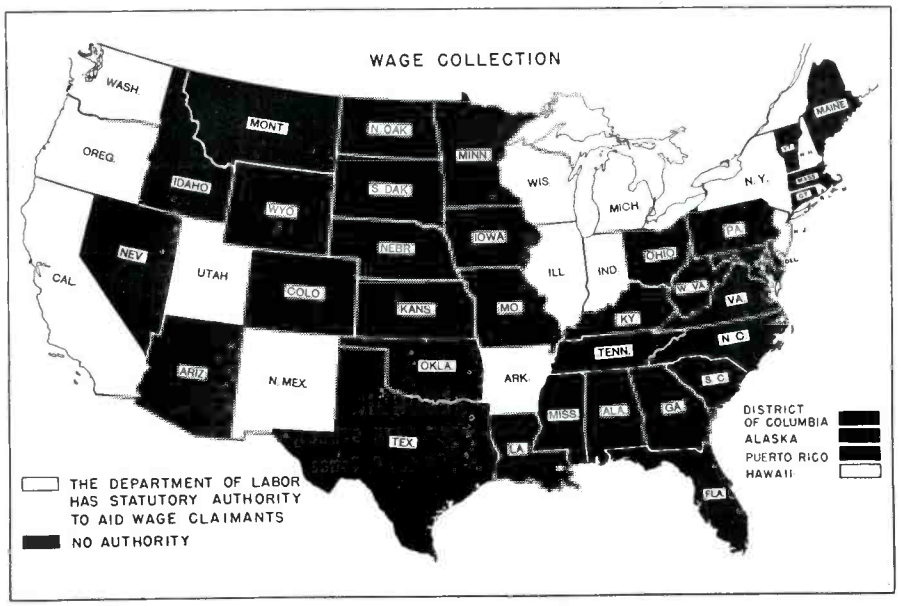
Has been drafted by States; would cover many unprotected workers.

No one questions a man's right to his wages, yet each year many workers are unable to collect wages due them. Fourteen States and Hawaii give their labor departments statutory authority to help workers collect their wages. Most States have laws requiring regulay pay days and certain other standards for wage payments, but few give workers full protection.

A wage payment and collection law designed to give workers the fullest protection against employers who are financially irresponsible, or who cannot, or do not, meet their pay rolls has been drafted by the State labor commissioners. The model bill, endorsed by the International Association of Governmental Labor Officials, the National Conference on Labor Legislation, the American Federation of Labor, and the Congress of Industrial Organizations, would: (1) Cover all workers; (2) require advance notice to workers of regular pay days and place of payment; (3) require pay days at least twice a month; (4) require payment in cash or bank checks easily convertible at full value; (5) require prompt payment of wages upon discharge, quitting, or in case of an industrial dispute; (6) be administered by State labor departments which may collect wage claims for workers by court action if necessary.

The accompanying map shows which States and Territories authorize labor departments to help wage-earners collect their unpaid wages.

Additional information on wage payment and wage collection laws will be supplied by the Division of Labor Standards on request. "Bulletin No. 58," Wage Payment and Wage Collection Laws, contains a copy of the draft bill and gives a summary of important provisions of different State laws. Limited free copies may be obtained from Division of Labor Standards, U. S. Department of Labor, Washington, D. C.



Union Membership . . .

and agreements reach highest point; survey shows strength up five-fold since 1933.

Since the early 1930's the United States trade union movement has increased practically five-fold, rising from less than 3,000,000 members in 1933 to about 15,000,000 at the present time. These over-all figures include somewhat less than a half million Canadian workers who are members of unions with headquarters in the United States. The largest union group is the American Federation of Labor which reports a per capita membership in excess of 7,500,000. The Congress of Industrial Organizations reports it has approximately 6,000,000 members. Unions not affiliated with either the AFL or the CIO—often called "unaffiliated" or "independent"—are estimated to have in the neighborhood of 1,750,000 members.

Figures Based on Union Reports

These membership figures are based upon reports and statements issued by the trade union organizations in their official journals, reports, or convention proceedings, and tabulated by the Bureau of Labor Statistics. There are no official Government statistics covering trade union membership for the United States. Since "union membership" is defined differently by various unions the data for different groups making up the total are, therefore, not strictly comparable. Year-to-year changes, however, are reasonably reflected by the chart showing the trend in total union membership since 1929.

No official Government estimates are available showing the total number of workers in the Nation's labor force who might normally be "eligible" for union membership. In the accompanying chart the employment figure represents average nonagricultural employment in 1946, exclusive of all self-em-

(Continued on Page Eleven)

Commercial F M Transmitter

COMPLETION of the first commercial 50-KW FM transmitter of pre-production design was announced by the Broadcast Equipment Sales Section of the RCA Engineering Products Department.

Employing a new type of mechanical construction, and a specially designed high frequency power tube, the new RCA transmitter delivers 50-KW at any frequency in the 88 to 108 megacycle band.

The transmitter makes use of a unique type of construction in the tank circuits of the power amplifier section. The power tubes are operated in metal-enclosed concentric tank assemblies, which are grounded and form an integral part of the transmitter. Since this housing is at zero potential, it acts as an effective shield and eliminates the need for special guard cages or enclosures, ordinarily required for the protection of personnel from dangerous voltages.

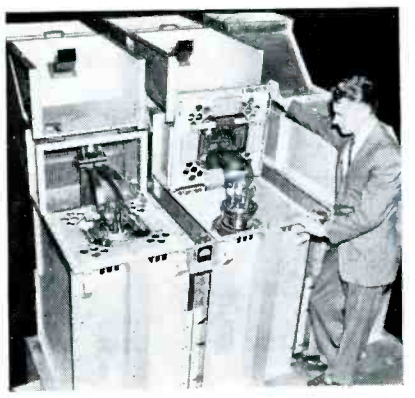
The high-frequency power tube, RCA-5592, developed by the RCA Tube Department especially for the new transmitter, is an air-cooled triode, designed for grounded grid operation. The same type tube is used in the driver and final amplifier stages.

The new transmitter, RCA Type BTF 50-A, employs grounded grid circuits which have certain inherent advantages over the conventional types of circuits, such as greater stability, high efficiency, simpler overall circuits, and most important of all, it eliminates the need for neutralization.

Frequency modulation in the RCA 50-kw transmitter is accomplished in the exciter unit directly by push-pull reactance tubes connected across the frequency determining circuits of the modulated oscillator. This direct modulation process eliminates numerous multiplier and converter stages, resulting in lower noise and distortion levels and lower power consumption. A frequency control circuit of special design instantly corrects any deviation from the mean carrier frequency.

All high power circuits in the BTF-50A are doubly protected by high speed over-load relays in addition to magnetic trip circuit breaker switches. Circuit indicator lamps provide a quick means for analyzing faults such as circuit overload. Full protection from antenna or transmission line failure is provided by a transmission line monitor which automatically shuts down the transmitter when any unwarranted change in signal intensity is detected. An automatic "3 shot" reclosing system will return power up to three times when plate voltage is removed by the operation of the transmission line monitor or other protective relay devices.

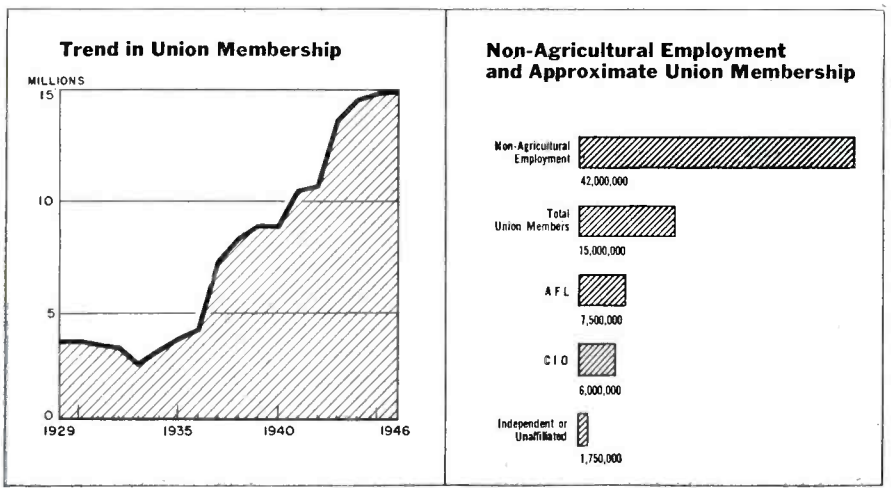
To insure continuous broadcast service, provision is made for antenna cut-back operation, a single control switch transferring the antenna from the final amplifier to an intermediate amplifier, which supplies approximately 8 kw. At the same time, the driver and power amplifiers are isolated, making it possible to service these units in complete safety while a regular program is being broadcast at reduced power.



View of the specially constructed grounded-grid circuits and the RCA 5592 hi-power, hi-frequency tubes.

Constructed of a series of vertical chassis, supported by steel frames and mounted in cabinets of uniform height, the transmitter breaks down into small units for easy installation in skyscrapers or in other inaccessible locations. All units of the transmitter employ dead front construction, with doors in the front panel allowing free access to the low power RF cabinets and the transmitter amplifier section. Viewing windows permit observation of tubes and components during operation.

A new control console is supplied as standard equipment with the transmitter. It contains audio mixing and monitor controls, primary power switching for the transmitter and for the antenna tower lights. If additional transmitters, including television, are installed at a later date, it is only necessary to add extra control turrets and desk sections to retain centralized control of all broadcast equipment at the transmitter site.



Union Trends

(Continued from Page Ten)

ployed persons, domestic servants, and unpaid family workers. This corresponds roughly to what is often called the "organizable labor force" inasmuch as the extent of labor organization among agricultural workers is negligible, as attested by the fact that in 1946 less than 1 out of every 100 farm workers was covered by collectively bargained agreements.

Book Review

Ultrahigh Frequency Transmission & Radiation, by Nathan Marchand. 6 x 9 inches, 322 pages, published by John Wiley & Sons, $4.50.

The author is former Senior Engineer with the Federal Telecommunications Labs, and is an electrical engineer and instructor of broad experience.

The text has been prepared with a view to meeting the requirements of both the practicing engineer in need of self-instruction, and the engineering student approaching the subject thru formal study.

The author has concentrated on basic principles; derivitives and developments discussed lead to results which can be practically applied.

The material for the book was gathered, and the original draft was used by the author as the basis for the ESMWT courses in transmission and radiation given at Columbia University.

Chapter I—Transmission Lines. Coaxial and balanced lines, derivation of the transmission line equations, input impedance of sectional lines, standing waves, transmission lines as measuring devices, and single and double stub matching.

Chapter II—Elements of Vector Analysis. Scalar and vector quantities, vector diagrams, addition and subtraction of, scalar or dot products, differentiation of vectors, divergence and curl of vectors.

Chapter III—Fundamental Electromagnetic Equations. Use of Maxwell's equations, in differential form, in AC form, discussion of Maxwell's equations.

Chapter IV—Plane Electromagnetic Waves. Plane wave solution of Maxwell's equation, Poynting's radiation vector, reflection and refraction of waves, waves in conducting media.

Chapter V—Radiation. Radiated energy, polarized spherical wave, the doublet as a sperical field generator, the induction and radiation fields, radiation pattern, radiation pattern of a dipole, terminated wire in free space, feeding antennas, the receiving antenna.

Chapter VI—Antenna Arrays. Purpose of, directivity, mutual impedance between antennas, similar antennas fed in phase with equal currents, out of phase with equal currents, loop antenna as array, effect of the ground plane, the broadside array, the binomial array, the end fire array, rhombic antenna, parasitic antennas, parabolic reflectors, receiving antenna arrays, taking radiation patterns.

Chapter VII—Wave Guides, Introduction, transverse electric wave, discussion of propagation constant, transverse magnetic wave, group and phase velocity, cylindrical wave guides, attenuation in wave guides, coupling to wave guides, standing waves and impedances, comparison between coaxial lines and wave guides, elements of cavity resonators, horns.

Chapter VIII. Complex Transmission Line Network Analysis. Grounds at UHF, break in the shield of a balanced line—coaxial line, analysis of shielded loop, transmission line conversion transformers, single frequency and wide band conversion transformer.

Tables: Characteristic Impedances of Transmission Lines; Degrees to Radians; Natural Sines, Cosines, and Tangents; Exponential and Hyperbolic Functions; Bessel Functions.

Book Review

Frequency Modulation, by John Rider. 5½ x 8 inches, 142 pages, published by John F. Rider Publisher, $2.00.

This text is not intended as a mathematical or theoretical treatment of the subject. It provides, however, a practical approach and introduction to FM, with special attention given to FM receivers from the serviceman's viewpoint. Chapter I deals with explanations of amplitude vs. frequency modulation; FM band width and percentage modulation. Chapter II is titled "What Happens at the Transmitter" and discusses methods of accomplishing frequency modulation, deviation ratio, and why the FM transmitter has an inherently higher efficiency than an amplitude-modulated transmitter. Chapter III, "What Happens in the Receiver" discusses the limiter and discriminator and their functions, in addition to the "front end" and IF considerations. Chapter IV deals with the transmission of FM signals, Chapter V with FM receiving antennas and considerations, and Chapter VI goes into the servicing of FM receivers. An interesting illustrated appendix is included which explains the clipping action in limiter circuits.

The overall text is well illustrated, achieves its purpose of explaining FM in a practical manner, and is well worth the $2.

From . . .

San Francisco

THE San Francisco Section of the IRE will play host at the first postwar West Coast Convention of the Institute of Radio Engineers Sept. 24 thru 26. According to Dr. Spangenberg, convention chairman, interest is running high and a large attendance is expected at the unveiling of many recent technological advances. We out here will be interested to renew old acquaintainces and hear of their experiences in this or that lab or war sector. Much is planned for the Convention from "arm bending contests at the Cocktail Party," inspection trips, "long hair dissertations," et cetera, to the Big Banquet, again according to Dr. Spangenberg at the last IRE meeting. For more details consult the August Proceedings of IRE.

While we are on the subject of the IRE, Al Isberg, Chief at KRON, the Chronicle FM station, gave a talk on a magnetic tape recorder he designed for the Armed Forces, while employed by Airbourne Instruments Laboratories. Two models were described: one used on airbourne craft, and the other surface-ship-bourne. Both units employed ac bias, and ac erase, much as is done with present commercial models, with the exception that the metal alloy ribbon of 50 mils width was magnetized longitudinally in order to arrive at a very high fidelity over a spectrum of one to 100 kilocycles. The ribbon is maintained in intimate contact with the jaws of the recording head, (shaped much in the manner of the blades of a pair of shears) and travels at the rate of eight feet per second. The endless ribbon is stored on an ingenious mechanical drum system, which allows for continuous recording of 14 seconds.

Most present day commercial models of ribbon and wire recorders magnetize the material in a vertical direction due mainly to facility in handling the magnetic material, as well as simplicity of constructing the recording and erasing heads. Further the requirements of fidelity are not so rigid as was brought out in the talk.

A unique resistance welder was also described for repairing the ribbon in the field, The lecture was illustrated by lantern slides showing the completed models and their representative characteristic curves, together with

some curves by Varga and Petty to confound the "long-hairs" and awaken the slumbering.

Several models of wire and tape recorders were demonstrated by representatives of retailers offering them to the current market, and much entertainment was offered the assembly in the near debate that resulted from the sales talks. The meeting was a success due entirely to Mr. Isberg's organization of a normally cold-fact lecture.

In the department of fun, faces, and full pipes—Dick Parks and Mark Dunnigan off on an air-bourne trip to Portland, Seattle, and Vancouver to do the "What's Doing Ladies" show, and to assist Tony Hutson, NY SE with Town Meeting at Seattle, then home in mediocre dudgeon—"Nuthin happened" (Whadya want, an egg in yer beer? A trip with those UA stewardesses anywhere is enough excitement for most of us old guys). Paul Carson in town doing his Bridge to Dreamland for three weeks on ABC, and also writing the music for the Bohemian Grove Festival. Nice to see you again, Paul. Also saw Andy Andresen using his mixing rings on the "Ideal in Crime" featuring Bill Gargan's mouthings of Ted Hediger's version of the slick-tongued-modern-gumshoe. Long time no see, Ted. "Have I got RF", Stevens, George Dewing and Bob Salle turned in a good performance on their recent hassle with the "Hubbub Club" touring SF Bay aboard the S. S. General Coxe. George told them over the air what he hoped was taking place, while Steve rode gain, with one eye on the transmitter. Bob rode gain shore-side and kept his weather eye on the receiver meanwhile trying to look imposing enough to keep the longshoremen from detuning same.

Seems as tho KGO will get started with FM in the very near future. Some one said ABC expects to operate from present KGO site around Oct. 1. Has the transmitter arrived yet boys? Ken Martin and Sid Blank still showing dogs, and from what I gather, there is quite a bit of social life going along with the dog training. Rothery back from Pyramid Lake dude ranching on vacation and seems to think that with a small stake he could make a living in Reno. Did you say something about baby-sitting, Cliff, for divorcees, or did you have your tang tongled up? Lee Kolm back from improvised vacation with a new Pontiac—looking relaxed. Norm Tapper back also but with a

(Continued on Page Twenty)

St. Lawrence

By Aleen A. Corbin

David Lane lives in a small village (population all of 400 people) called Black River, about eight miles from town. People ask Dave where he's living, and he says, "I'm not living. I'm in Black River." If any of you fellows were in the Fourth or Fifth Armored Divisions, you were probably familiarized with this area via Pine Camp located there. Incidentally, the camp, rendered inactive because of its bad climate and location, has been put on the Army's list of camps to be reopened. Davy is a graduate of St. Lawrence University where he majored in psychology and sociology (he once sang folk songs accompanying himself on a guitar a la Burl Ives in a small radio station "to see how the performers feel and what they are thinking"). He obtained his radio license through home study. Always interested in learning, he is now subscribing to a correspondence course from C.R.I. to augment his knowledge of radio.

Glenn Hall came to us directly from service in the signal corps and a stretch in Germany. Although he hadn't worked at the station previously, he had been in Auburn at the same time Pappy was there. Born in Penn Yan, Glenn threw in with a band composed of his high school pals, and after graduation they started a musical tour of the state (Glenn played a hot alto sax). This didn't last long. Not that Glenn developed a dislike for music. He just felt he'd like to eat at least once a day. His next stop was RCA, New York. One of his friends in service invited Glenn to visit his home in New York, and while there it so happened that he met the friend's cousin, a charming brunette named Anne, who subsequently became Mrs. Hall last year. Now we keep telling them they are expecting Sir Stork. Naturally, they keep telling us they aren't, but nobody pays any attention to them. Confidentially, my spies tell me the arrival is scheduled for January.

William (WANMK) Walck of Pennsylvania, had been with the station since it began, with two interruptions. His first departure from WWNY was to enable him to become a civilian instructor for the Army. He had been back but a short time when the government again extended an invitation to him to join its ranks. This time they gave him a uniform and assigned him to the signal corps. Since his last few months in service were spent at Pine Camp, he started working at the station again even before his final discharge. He says he likes this section of the country very much, and he plans to stay here permanently (no, I don't think his brain was injured in service). Right after he left the service last year he accidentally met Anne Kilburn, a girl he'd known pre-service. I guess I don't have to tell you that she has now added Walck to her name. The other day he said to me, "Gosh, I've been married six months today. It doesn't seem possible. Did that time ever fly by." Whereupon I replied, "Yeah, I know. Tell me how you feel twenty years from now, will you" (Just kiddin' . . . think marriage is wonderful, at least that it's here to stay) . . . Like Glenn, Bill is an RCA alumnus. By the way, he is also transmitter counselor.

Robert (WASCY) Bouchard came to the station about one year ago after being discharged from the Merchant Marine and three years' service. Bob, his pretty wife, Frances, and their new son of two months, Albert Thomas, live at Clayton, and Bob commutes to the transmitter. He passed up training at RCA in favor of a Boston school for his radio education.

Michael Yonkovig was one of the original engineers here. When WMSA opened he was transferred up there. He couldn't stand all that peaceful and quiet living in Massena, so he has come back to civilization. Mike's wife, Bev, was working at WWNY when he met her, and she still does (no kiddin', this place is a regular matrimonial bureau with at least a half dozen couples who met here taking the vows). Mike is a product of RCA, too.

Gee, I almost forgot about Winnie, who, along with Mike and Bill, was a charter member of WWNY. Winnie is a German Shepard dog who was given to the boys almost as soon as the station started. Although strictly speaking she belongs only to Mike and Bill, she has become a permanent fixture at the transmitter, where she lives. The day we attempted to take what may loosely be referred to as photographs, she was wandering around the lawn in front of us, and everyone kept saying, "Get out of the way, Winnie. Lie down like a nice girl." We should have let her get in the pix. Then there would have been at least one interesting face.

Betty Gillespie, one of us control operators, has been at the station almost four years. Two years ago she married Tom Gillespie, who was an announcer here (but a good guy despite the fact), and now their little Tommie is almost a year old. Blond, blue-eyed, and very petite, you'd never guess by looking at her that she was an old married woman.

Gail Branche is a very lovely and brilliant brunette. Although not yet married, Gail is engaged to the fellow she "went steady" with in high school. She has been at the station over three years, almost as long as Betty. Incidentally, Gail was voted the prettiest girl in her graduating class at Watertown High, the school all of us girls attended.

Caroline Ryan's employment at the station has been interrupted on and off for periods of schooling at Syracuse U., where she took a course in their radio workshop. Caroline is still recuperating from the good time she and a sorority sister had during their vacations at Virginia Beach.

If you're curious about me (after reading this far, if you could, I doubt it) I've been at the station two years. Before proceeding further in this line I feel duty bound to apologize for waiting so long to write. You see, it's like this. I was going to the Watertown College Center, an extension which St. Lawrence U. established to take care of the overflow of students, at nights and opening the station in the early (6:15 A.M.) hours of the morning. My homework was sandwiched in between times. I faithfully promise, though, not to let it happen again. Right now I'm up at St. Lawrence here in Canton, New York. The station very kindly gave me an extra four weeks' leave to add to my two weeks' vacation, so I am going to summer school, not exactly a vacation, but at least a change.

I'd better sign off now or you'll be hoping two years elapse before I write again. . . . P. S. We really will send some pictures soon, some that at least faintly resemble us.

New York Notes

By Dud Connolly and Pat Simpson

MOST of us have now returned from vacation and are back on the job. News, however, is meagre this issue but we believe that Boundbrook is on the right track; they have appointed an official reporter to represent them. How about other groups doing the same? RCA-Victor, Muzak, Lodi, etc. Let's hear from you. It doesn't have to be a literary masterpiece; just send facts to Dud Connolly or Pat Simpson c/o NBC or ABC, Room 558, 30 Rock Plaza, New York 20, N. Y. Don't forget photos that may be of general interest.

Merle Worster, W2HTW, has just purchased a new home—he says it isn't much of a house but oh boy, what a ham location!

Newcomers to ham ranks—Geo. Anderson, W1QBO, and Felix Ghirlando, W2VQY, both of field. Several of the gang going slightly (?) beserk building TV receivers—the idea is to make them work—so far, so good.

With the avalanche of disc jockeys in our field, it would be to our advantage for all of us to publicize the fact that on ABC and NBC (except Chicago) these jockeys are in reality chatterboxes, as NABET engineers do the record and ET spinning. We fought for this right; let's advertise it!

It is with great regret to announce the passing on Aug. 25th of Al Sinton, retired NBC Sound Effects technician. Al was one of the oldest sound men in the business and we are sure his many friends from coast to coast join us in expressing our sympathy.

John Gullens, Station Engineer recently returned from vacation, is a fisherman of no mean ability. The last one JG caught was this—well it was this long anyhow. Al Lindstrom is in Westport, Conn., for a few weeks vacation, while Stanley Crabtree is fishing out on Peconic Bay, L. I., N. Y.

We lost Eddie Morrell to TV, but gained in return McMillin from the RF Group and Mac has a fresh batch of stories. So in order to make the means serve the end or the end serve the means, which ever way you prefer, we gave Ed a dinner to send him off to TV and also heard some of Mac's stories. Guess the radiomans wife had the right dope after all.

Pirozek, Wagner, Stickles, Turner, Hickman, Stemple, Bolger, Bernie, and Danielsen, have taken vacations and reports coming back are from good to very good. J. Dunn is in Texas and will report on the current meat situation when he returns! Lester Whitehead went sailing out on the Lakes and reports the passenger list was as good as Pappy Moon reported in past years. Pappy and Art Holden are being advised to take snow shovels when they go on vacation. If it snows in Denver in July who are we to say it can't do the same in Jersey in October.

Cliff Kerstetter hopes to take a vacation from Radio soon—you guessed it . . . building a new receiver. . . .

The boys at Bound Brook wish to thank "Westy" for the dope that comes thru. It makes us feel that we are part of the NY Chapter. We are all interested in the proposed FCC licensing setup. . . .

Very little activity around the Engineers Lounge these days. . . . Markle just back from Vacation and Vose leaving soon. . . . All appreciated the quiet spell and are sending Gallant a Plaque for scheduling these vacations.

Sooner or later Studio Engineers will come in contact with the new speakers developed by Sound Effects. . . . High Fidelity seems to have crept in this department as the new speakers sound swell playing NBC Thesaurus transcriptions. . . . Well the American Legion has come and gone much to no ones sorrow. . . . Practically every piece of field equipment of both ABC and NBC was in use during the four day Jamboree. . . . It honestly looked like old times to see the Field division active. . . . Lets hope that both ABC and the New Program set-up at NBC will favor more Special events.

No important technical changes during the past month. "Cough Boxes" have been installed in 2-C and 5-A thus relieving the engineer of two of the 40 operations in 30 seconds. . . . A large curtain has been installed in 6D. Without the curtain the studio was much too live. The FM setup, formerly in studio 5A has been transferred to that room formerly known as 5C. . . . For a while it looked as if FM and AM would be fed together, but at last Mr. James Caesar Petrillo came through and FM remains in status quo. . . . A few of the talking programs such as Banghart, Lowell Thomas, Kaltenborn, and News of the World are fed to FM but all music is Verboten unless on records or transcriptions.

From NBC Sound division we learn that Johnny Powers (in an effort to improve his craft and eliminate as many recorded sounds as possible) is raising and training Crickets at his Pearl River Ranch. . . . Johnny has gathered together some 200 different species and is conducting experiments which should revolutionize out door scenes. . . . According to Johnny, the Giant Arizona Crooner offers the greatest possibilities as it will start and stop on cue and has three distinct voice changes. There is absolutely no foundation for the rumor that Donald Bain has preferred charges against Johnny.

Television & FM News . . .

* Warner Brothers Pictures and RCA-Victor have announced signing of a contract for a joint program of research on large-screen television.

* Elm City Broadcasting Corp., New Haven, Conn., has been granted a CP for a new commercial television station, Channel 6, 82 to 88 mc; 500 watts peak video.

* General Electric is building a 5 kw television transmitter for WOR-TV, which will operate on Channel 9, 186-192 mc. GE will also supply the plant and field television equipment.

* RCA has announced a 15 x 20 inch projection home television receiver, complete with standard broadcast band, FM, and shortwave radio; to retail at about $1200, including taxes, installation, and service policy.

* 20th Century-Fox and RCA-Victor have agreed to establish a joint television development center in New York for research in large screen television. This is similar to the RCA-V-Warner project on the West coast.

* Bamberger Broadcasting Service has purchased an RCA 5 kw television transmitter for WOIC, its Washington, D.C. television outlet. WOIC will operate on Channel 9, 186-192 mc.

The 1947 Winter IRE Meeting

Summaries of Technical Papers — Continued From Last 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.," although it is hoped that many of them will appear in the subsequent issues.

RECEIVER CIRCUITS

Chairman, E. L. CHAFFEE
(Harvard University, Cambridge, Massachusetts)

100. Synchronous Detectors.

J. G. Reid, Jr.
(National Bureau of Standards, Washington, D. C.)

Vacuum-tube voltage indicators synchronously gated by an alternating voltage from an external source are examined as a means of improving signal-to-noise ratio. The frequency selectivity, phase selectivity, and influence of gating wave form are considered. Applications, particularly to instrument amplifiers for measuring extremely small voltages, are discussed.

101. A Wide-Band 550-Megacycle Amplifier.

R. O. Petrich
(Airborne Instruments Laboratory, Inc., Mineola, New York; formerly, Radio Research Laboratory, Harvard University, Cambridge, Massachusetts)

A 2C43 triode is used at 550 megacycles in a grounded-grid amplifier circuit with an impedance-transforming bandpass filter in the output to give a gain of 10 decibels for a bandwidth of 20 megacycles. The equivalent circuit is analyzed to determine the conditions for maximum gain.

102. A Compact Electromechanical Filter for the 455-Kilocycle Intermediate-Frequency Channel.

R. Adler
(Zenith Radio Corporation, Chicago, Illinois)

A compact metallic ladder of mechanically resonant elements, linked by complaint members and coupled to electrical circuits by magnetostrictive terminations, transmits uniformly within a 4- to 14-kilocycle band with very rapid attenuation outside. Data for design and performance in a receiver are given. The filter is adapted to economical production.

103. Receiver Sensitivity at the Higher Frequencies.

J. M. Pettit
(Stanford University, California; formerly, Airborne Instruments Laboratory, Mineola, New York)

The standard definition and philosophy of receiver sensitivity in terms of receiver gain are reviewed. Limitations imposed by circuits and tube noise are pointed out. Two alternative methods of defining sensitivity are proposed in which account is taken of both gain and noise. Test methods and equipment are discussed.

VACUUM TUBES AND GAS RECTFIERS

Chairman, J. SLEPIAN
(Westinghouse Electric Corporation, East Pittsburgh, Pennsylvania)

104. Beam-Deflection Control for Amplifiers and Mixers.

Part I—High Transconductance Design Considerations—

G. R. Kilgore
(RCA Laboratories Division, Radio Corporation of America, Princeton, New Jersey)

The attainment of high transconductance and high ratios of transconductance to current and capacitance by means of deflection control is discussed. Limitations in design imposed by current density are considered, and expressions are derived for the maximum transconductance and transconductance-to-capacitance ratio attainable at high frequencies. A simple, effective gun system is described which combines focusing and deflection.

Part II—Mixer Tubes for Ultra-High Frequency—

E. W. Herold, C. W. Mueller, and H. A. Finke
(RCA Laboratories Division, Radio Corporation of America, Princeton, New Jersey)

Rectangular-cross-section beams of high current density and low current were used to build deflection mixers for 300 to 3,000 megacycles. Phase-reversal frequency conversion was used and, in some designs, secondary multiplication. Over-all receiver noise factors between 7 and 10 decibels were achieved below 1200 megacycles; the tubes had high gain, wide bandwidth, and freedom from local-oscillator radiation.

105. A New 100-Watt Triode for 1000 Megacycles.

W. P. Bennett, E. A. Eschbach, C. E. Haller, and W. R. Keye
(RCA Victor Division, Radio Corporation of America, Lancaster, Pennsylvania)

The design and development of a 100-watt grounded-grid triode for operation at full ratings to 1200 megacycles is described. Unusual mechanical design features have been co-ordinated with the electrical characteristics to achieve a tube capable of excellent performance at ultra-high frequencies which can be manufactured by production-line methods.

106. A Study of Microphonics in a Sub-miniature Triode.

V. W. Cohen and A. Bloom
(National Bureau of Standards, Washington, D. C.)

The simple theory of the triode has been applied to a calculation of the effect of motion of the tube elements on the plate current. The effect has been evaluated for a submarine filamentary triode and these values compared with experiment. Other causes of microphonic response are proposed and have been investigated in part. Experimental techniques are discussed for making repeated tests on individual tubes.

107. Design of Gas-Filled Cold-Cathode Tubes.

G. C. Rich
(Sylvania Electric Products, Inc., Flushing, New York)

Beginning with Townsend's equation representing conditions for breakdown in a cold-cathode, gas-filled diode, equations which may be used in the design of practical plane triodes are developed. This is accomplished by a rearrangement of Townsend's equation to give breakdown voltage in terms of cathode-surface sensitivity, gas pressure, and electrode spacing, assuming uniform field. The resulting equation is then applied to the grid-cathode region and the grid-anode region of a plane-electrode configuration.

108. Recent Advances in High-Voltage Rectifiers for Television Receivers.

G. Baker
(Chatham Electronics, Newark, New Jersey)

The special requirements of tubes for this service are reviewed and new designs to attain them are shown. Methods are described for removing from the metal electrodes and from the walls of the glass envelope small quantities of gas which were found to affect the rectifying characteristics and tube life. The operation of oxide-coated and of thoriated-tungsten emitters in strong electric fields is discussed.

(Continued next month)

Rocky Mountain News

By C. Eining

TOP news from the Rocky Mountain Chapter this month is the signing of the new contract with KFKA, Greeley, Colorado. Increases ranged from 20% to 23.7%. George Pogue, who took office as chairman last month gave up the major part of his vacation to contract talks with KFKA management. Al McClellan was elected Secretary-Treasurer.

Studio engineer Aubrey Blake was presented with a seven and a quarter pound boy by his wife Lucille on August 6. Mrs. Blake is a former Colorado University engineering student, which leads to speculation that the young Blake, Brenton Reid by name, may possibly follow in his father's footsteps.

Glen Glasscock, who warms the group 5 chair at the studio has undertaken a terrific administrative job with his acceptance of Brigade Command of the Denver organized Naval Reserve. Glen is a Reserve Commander, and saw considerable duty out Guam way during the late great hate.

The DX kids, Vern Andrews and Kenny Raymond, both of the studio gang are giving the boys on twenty fone a run for their money these days. In addition to their present rings, these exponents of the three-element beam are each grooming an ART-13. Also in the Auto-tune picture is Glen Glasscock.

When Garland Dutton of the transmitter gang worked the Phillipines with four watts input to his ten meter mobile rig, he set off a wave of building the carborn jobs. "Dutt" rebuilt for higher power, and Joe Turre immediately mounted one in his new cream colored Chev. Also building "flivver fones" are Harrison Goff and Ray Green of the transmitter staff. MCD's Stan Neil has been seen purchasing a dynamotor, and the writer's Ford has been resounding to the clang and clatter of wrench and hammer.

Hudson News

By Al King

EVERYONE at WOR sorry to hear about FE **Alfred Nilson's** accident. . . . Al was injured in an automobile accident in Texas while on vacation.

Sights you should see: SE **Johnny Garlinger** breaking in his new "traveling glass house" otherwise known as a Studebaker . . . and it's maroon, too! . . . **Don McLean** of WOR's traffic department (he's in charge of assigning the engineers) dashing for the 5:50 train out of New York every Friday afternoon. "Can't wait to get to the Jersey coast!" says Don.

Congratulations will be in order for SE **Gene Clark** whose wife is expecting. . . . MC **Jim O'Connor's** wife presented him with a baby girl a few weeks ago. P.S. Gene will get that long-promised ice cream soda soon.

Add new faces in WOR's Engineering Department: **Andy Cunningham, Derie Leighton,** and **Bob Norris.**

SE **Ed Boquist** enjoying his "job" doing the Kate Smith show from Lake Placid these days.

Vacation list: **Johnny Garlinger, Charlie Kibling, Ed Zajac,** and **Dick Quodomine.** Dick, by the way, will visit Grand Canyon and Yellowstone Park. To make sure about accomodations, he's bringing a tent along!

Ye Ed having trouble with the plumbing in his Valley Stream home. If he doesn't get a plumber soon, it will be disasterous.

Bright sayings by engineers: "You'll end up in jail—behind bars, too! . . . "Why don't you look me in the eye—what's the matter, am I bowlegged?" . . . "Is this elevator going crosstown?"

"Hax" Hadden (W2VFM) is now sporting a new "final" using a pair of V-70-D's. He acquired same from **Gene Clark** (W2HTA) who will soon be on with a pair of 813's. (Maybe now "Hax" will get into F-land now that the Boy Scout Jamboree is finished.)

MC **Jim O'Connor,** starting a radio course, trying to get call letters W2WOR. Activities have already started and SE **Jim Shannon** has offered his 500 watt rig as a starter, waiting to hear from the FCC about the license. Don't know when we'll find time to use it but we'll think of ways and means later.

SE **Jim Carter** is writing a book entitled "How High Is Up" or "Trials and Tribulations of a Beam-Happy Amateur."

And here's a little data on one of WOR's Studio Engineers and present Secretary-Treasurer of NABET, **Bob Albrecht.** Robert Harding (ahem!) Albrecht was born on September 22, 1922, in New York. Having a thirst for knowledge, Bob attended P.S. 19 and Evander Childs High School. After taking a course at RCA Institute, Bob worked at the Transmitter Equipment Manufacturing Company (TEMCO) and then for the Hammarlund Manufacturing Company, both in New York. He spent ten months in the Army Signal Corps and then, in December, 1943, came to WOR as a studio engineer. Bob prefers to do musical shows . . . says they're more relaxing than other types of radio broadcasts. Getting up in the world (he's only 6 foot, 7 inches tall!) and retiring when he's still young is Bob's main ambition. In his spare time Bob likes to play a little golf and bowl. Incidentally, "Ham Operator" Albrecht (W2MHP) won't refuse any extra tickets you may have for any Yankee ball game if you really coax him to accept them.

That's all . . . no scandal this month. Things are tough all over!!!

Chicago Chapter News

By Minor Wilson

FRED SHIDEL is spending his vacation on active duty as a full Colonel. The first three weeks will be in Washington in the office of the Chief Signal Officer and the last week in Fort Monmoth. While in Washington he expects to see quite a bit of **Sam Newman** with whom he has regular schedules by Amateur Radio.

For years **Joe Alusic** has been promising himself he will see the all-stars football game and this year he dashed down and purchased tickets. But on his way home he remembered that the game was to be played while he was on vacation and out of the city. He is as bad as **Washburn** in buying things he can't use.

Bill Beeson who is always building the latest gimmick, and the more complicated it is the better, is now in the midst of making his home made television receiver perk.

Ed Jacker is not only a fisherman but a stubborn man too; on his last fishing trip to Wisconsin they were not biting so he kept on traveling and fishing until he was on the Canadian border where he claims he did catch plenty of them.

Councilman **Nelson** of WROK is sporting a new Plymouth station wagon; he should tell **Art Hjorth** how he acquired it. ART has been trying to get a new car, any new car for so long he has about decided the news that Detroit is making new cars is just a rumor.

Ike Eichorst, Ed Holm, Bill Cole and **Fred Shidel** are our best DX hounds, they are spending their ham radio time hooking up overseas GI's with home via ham radio and telephone.

Wash Washburn has just returned from his 4th week vacation and when asked how he enjoyed it says, "I hit the jackpot"; seems he spent most of his week of rest playing the slot machines. Having tried to hit any number of jackpots myself, I can see why he is somewhat proud of his notable achievement. Wonder if he can do as well at the forthcoming NBC annual outing?

Ed Jacker just lost part of his WAIT antenna when a private plane struck it some 70' from the top. When ED got out to the wrecked plane he found one of the occupants dead and the other dying.

Positive Grid Oscillators

(Continued from Page Four)

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Tonks, L.—"Electronic Oscillations" *Phys. Rev.* 1927.

Equipment Announcements . . .

* Aeorvox announces increasing the working voltages available in its midget-can line to 500, 600, and 700 dc volts, in capacities of 8, 10, 12, and 16 mfd.

* The John Rider publishing organization has undertaken a "symbol standardization" survey, with the approval of the RMA and for their aid in standardization. . . . Rider also announces a new series of pocket-size technical radio texts to sell at 99c, to be known as "99ers." These texts will be reviewed here as they become available.

* GE has developed a new ignition, type GL-5630, for radio transmitter and power rectifier applications. The new tube rectifies and regulates current and provides a one-cycle circuit breaker action simultaneously. Output, up to 3000 kw of dc power; it has a peak voltage, forward or inverse, of 20,000 volts. Peak current is 200 amps and average current is 50 amperes. Further information available from the Tube Div., G-E Electronics Dept., Schnectady, N. Y.

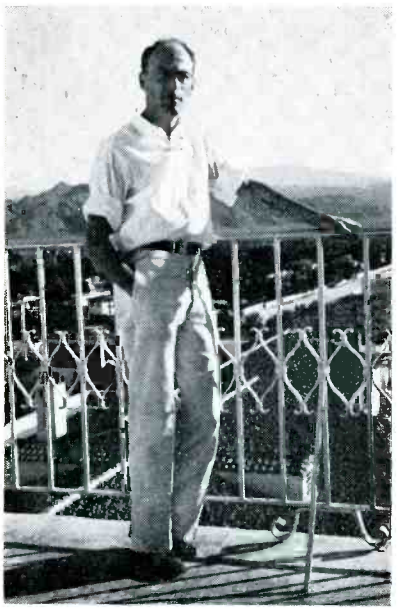
* RCA-Victor, Camden, announces a new manual available at $5.00, on the engineering and installation of sound

(Continued on Page Twenty)

Congratulations—

ED. PARKHURST!

BORN a Vermont Yankee, and reared in the vertical splendor of Colorado, Edgar L. "Parky" Parkhurst found the end of the rainbow



E. L. PARKHURST

with his college sweetheart and twin boys in California.

Parky graduated from the University of Colorado with a B.S. in E.E. in 1928, tucked Stella, whom he had married the year before, under his arm, closed her graduate books, and came to work for RCAC at Bolinas, California. Shortly thereafter he joined the old KGO Staff, then under General Electric, as a Studio-Field Engineer, and was finally absorbed into NBC in 1929 when KGO changed hands.

As a Studio-Field Engineer he has had a round of fun working in the Field, and incidentally, doing some very fine jobs on what are known as real "Turkeys" these days. Probably some of the boys will remember such pick-ups as the Cable Spinning Interview over the Golden Gate; (Parky remembers carrying the OP-3's out to the spinners in the center of the span —plenty of wind and water 400 some odd feet down) the Fleet Review in '37 with FDR aboard the Houston; the Red Net "City Voice" shots from historic spots of San Francisco. Parky's best junkets were probably the vhf broadcasts back in '35 from the Farallon Islands with Miv Adams—super-regen. receivers, arrays, and 1500 pounds of gear hauled up over the cliffs to the PU.

In 1939 he was transferred to studio maintenance, where he established a good reputation as a fast trouble-shooter and versatile "maintenance brain." He was promoted to a Group 4 MC Supervisor in 1945 and in August of this year was again promoted to Chief Engineer of the Dixon Overseas Broadcasting Plant at Dixon, California. This is a nice step up for Parky and a real responsibility, but one which he can handle nicely with his varied and long experience in radio. With Parky at Dixon, all the boys will be glad to make a tour, and especially, if we could see an arc-over on the 200 KW transmission line.

The Parkhurst hobbies have been Twins and Ham Radio with W6IY playing a losing game since Parky is now commuting between Dixon and Oakland on week-ends and, well-Stella, Terry and Jerry definitely have plans for Pop.

NABET loses an old and loyal member in this promotion since Parky's membership in the Union dates to the inception of ATE in 1934. He was a Studio-Field Councilman for an extended period and most recently acted as Associate Editor of this Journal for the San Francisco Group of NABET.

Good luck, "Parky", and may all your problems be "little ones."

San Francisco

(Continued from Page Twelve)

tanned skull and on a milk diet, the man says, "Boy if I could live like that for a year and survive, I wouldn't have to work for a living." mmm—(Naw I ain't interested). Puchy, the finger, Puccetti going around mumbling "Now how can I make that arm work"? Dunno whether he needs physical therapy or a new tone arm for his home lash-up. Jeepers there's a ready-mix concrete truck out in front, I didn't order anything like that, or did I?—See ya next month, Ed.—egs.

"Down, Fido . . . Down!"

Equipment

(Continued from Page Nineteen)

systems, said to be the most comprehensive volume of its kind ever published; titled, "Architects Manual of Engineered Sound Systems," contains 288 pages, 8½ x 11 inches. Write RCA Sound Products Section, Camden.

* RCA Tube Dep't has made available a 4-page folder titled "RCA Headliners for Hams" available from RCA tube distributors. Contains design data on 27 of the most popular ham tube types, and operating data on some of the types when used a frequency-doublers. Get your copy.

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DIMENSIONS: 9⅜" high x 6½" wide x 12⅞" long.

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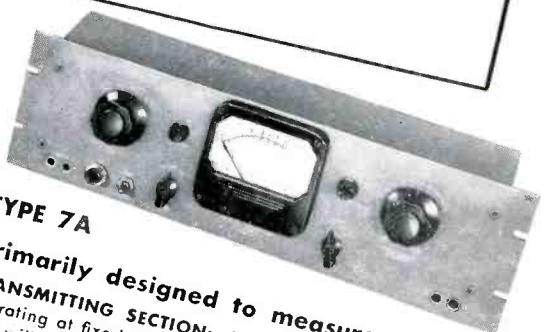
Input impedance is 600 ohms. Output impedance is 30, 50, 150, 200, 250, 500, and 600; 500 shunt and 600 shunt, either balanced or unbalanced to ground. Load impedance is 8, 15, 30, 50, 150, 200, 250, 500 and 600, either balanced or unbalanced to ground.



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