

THE BROADCAST ENGINEERS' JOURNAL
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The Broadcast Engineers' Journal

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The Broadcast Engineer



**OCT.
1944**

“This way for the Television
Auditions, please”

**VOL. 11
No. 10**

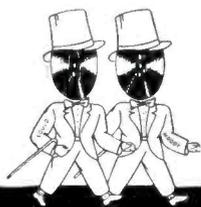
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Volume 11, No. 10



October, 1944

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THE BROADCAST ENGINEERS' JOURNAL

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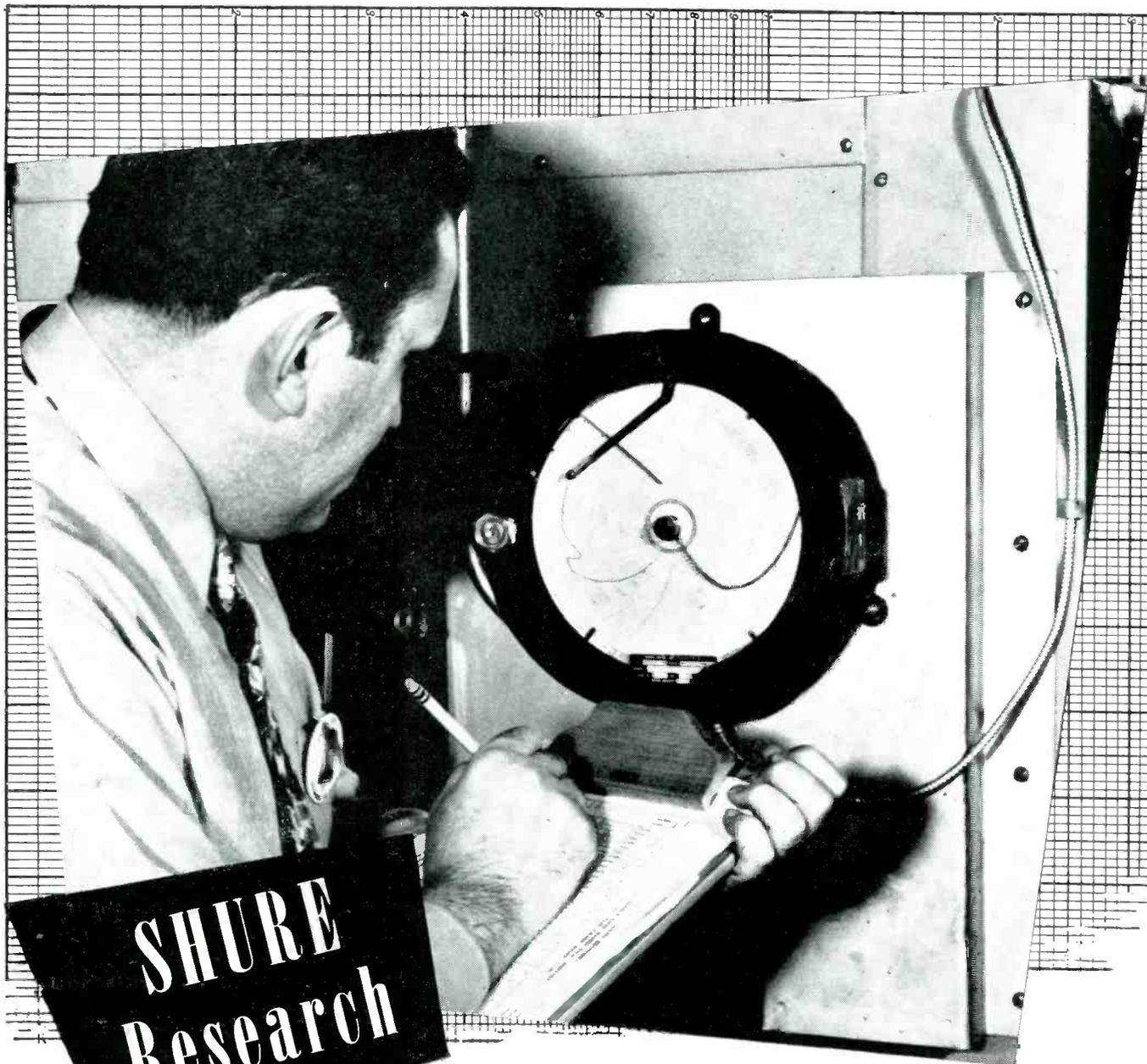
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WASHINGTON

By R. E. Shenton

A Resume of the Recent Activities of NABET President Al Powley

THIS month, the space usually devoted to gossip about happenings at NBC-Washington is turned over to a more serious, and, we feel, more interesting situation.

Having President Al Powley here in Washington as "one of the gang," we are perhaps inclined to overlook the splendid work that he continually performs for the benefit of NABET as a whole. With this in mind, there follows an attempt to disclose to all NABET members, as well as to other readers of the Broadcast Engineers' Journal, just how Mr. Powley spent his "vacation" this year.

Forsaking his golf clubs and swimming trunks, Al first boarded a train and journeyed to Albany, New York, where he met with representatives of WABY and WOKO, as well as WGY, Schenectady and WTRY, of Troy. Next, Al pushed on to the Big City itself, and saw, among others, the gang at the RCA Recording Division on 24th Street, after which he returned to Washington for a brief rest.

Embarking once more, Prexy Powley went all the way out to Michigan, Detroit, to be explicit, where he visited WWJ and WJR, meeting with the engineers of those stations. Returning east as far as Cleveland, Al commented that he was particularly pleased by the splendid hospitable hand which was so thoroughly extended to him. As Al put it, he "couldn't spend a dime". His hotel room, meals and all other expenses were provided by the gang there, adding no little to the enjoyment of the visit.

Following his stay in Cleveland, Al visited Schenectady, and then returned to Washington to add up the score. After the confusion of battle had cleared away, the results of the trip, together with some previous and subsequent negotiations, look something like this (and we definitely DO point with pride).

We now have the following new member stations in the ranks of NABET: WWJ, Detroit; WGY, Schenectady, which station, incidentally, was formerly a member of ATE when the organization of that outfit was on a company basis. WRGB, television outlet, and WGFM, frequency modulation outlet, both also in Schenectady were added as well. These three new member stations are doubly important as they introduce the name of General Electric potently into the ranks of NABET.

In Cleveland, WHK and WCLE have joined the organization, and down in North Carolina, we find WDNC in Durham and WSJS in Winston-Salem have also become affiliates.

To conclude the list, the engineers of the RCA Recording Division on 24th Street in New York City, although not affiliated with a broadcast station, of course, are bona fide members of NABET.

Mr. Thomas Dunn, attorney for NABET, accompanied Al Powley on a good majority of his travels, leaving at Cleveland to return to Washington.

Well, there are the facts; we feel that Mr. Powley is to



A. T. Powley, President NABET

be congratulated for his outstanding success in recruiting. Certainly little is left to be desired from the president of any organization who can turn in such a completely excellent record. I'm sure that we're echoing the opinions of all members when we say that it is a good job well done, and keep up the superb work.

Finally, a cordial welcome to all the new members of NABET—the welcome mat is always out to you both in person at NBC-Washington, and thru the written word of the Journal. Let us hear from you.

Next month, back to the usual sort of column, resplendent, we hope, with two months' worth of news instead of the usual one.

Report No. 97—(RULES AND REGULATIONS)

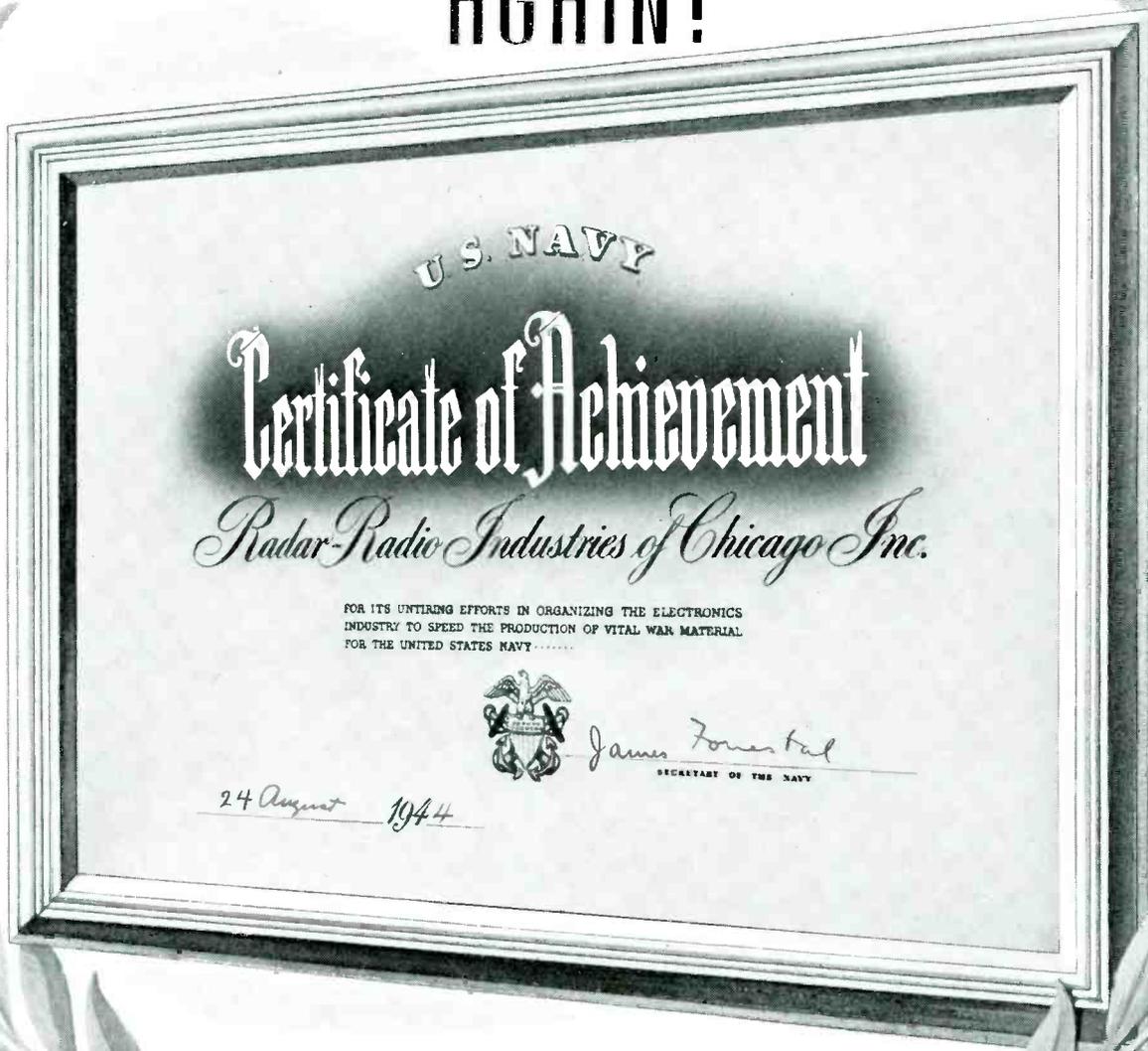
The Federal Communications Commission on August 15, upon consideration of Order No. 120 (Docket No. 6600) proposing to amend Section 3.407 of its Rules and Regulations governing the announcement of mechanical records, adopted a resolution rejecting the proposed amendment (Chairman Fly and Commissioner Jett dissenting).

At the same time, the Commission unanimously voted to clarify the existing section by adding a new sub-section (f) thereto as follows:

"Section 3.407(f): A licensee shall not attempt affirmatively to create the impression that any program being broadcast by mechanical reproduction consists of live talent."

The Commission declared this sub-section merely emphasizes a principle which has always been implicit in Section 3.407.

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Elemental Electronics Part IX

Clipping and Limiting Circuits : By Jordan McQuay

CLIPPING circuits are used widely in electronics for precision altering and reshaping of wave forms. Under this category are considered both clippers and limiters, since their relative technical operation and function are parallel and similar in principle.

A *clipping circuit* is used to remove one extremity or the other of any shape of input wave form. This attenuation or clipping effect is employed in the transformation of a sine wave to a square or rectangular wave, or in the elimination or narrowing of a peaked wave. A *limiter circuit* is used to maintain the voltage of any wave shape above or below a predetermined level. A limiter, therefore, is merely a type

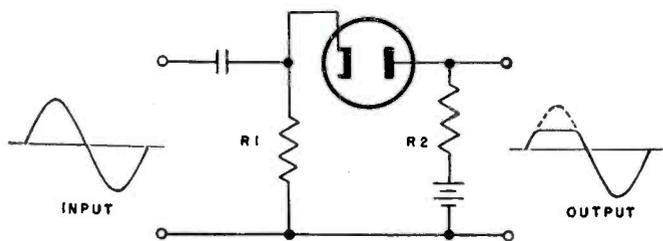


Figure 1—A single Diode Series Limiter (for removing positive peaks).

of clipping circuit. And the terms *limiting* and *clipping* should be considered synonymously.

Clipping, or limiting, is accomplished largely by ordinary vacuum tubes arranged in special electronic circuits. The most common of these circuits are: (1) the Diode Series Limiter, (2) the Diode Parallel Limiter, (3) the Double-Diode Series Limiter, (4) the Double-Diode Parallel Limiter, (5) Triode clippers, employing saturation and/or plate-current cut-off, and, lastly, (6) Triode Clippers, employing a grid-limiting resistor. Each of these six distinct types will now be considered in some detail.

It has already been shown in Part VI of this Series (*B. E. Journal*, June, 1944) that the diode vacuum possesses unilateral characteristics which make it very conveniently adaptable for electronic use. As previously stated, this unilateral action depends upon the fact that the diode conducts only when its plate is positive with respect to the cathode. This unilateral characteristic is employed in clipping or limiting circuits, by connecting the diode as shown in either figure 1 or figure 2.

A *Diode Series Limiter* is shown in figure 1, and illustrative wave shapes portray the action of such a device. The input voltage (in this case, a sine wave) is applied to the cathode through the condenser and resistor R_1 . A fixed voltage is applied to the plate of the diode, through the limit-

ing resistor R_2 . This voltage does not allow the diode to conduct until the voltage applied to the cathode is of a value more negative (or less positive) than that of the plate. For this reason, the diode does not conduct when applied input voltages (at the cathode) are more positive than the fixed battery voltage. If, for example, the battery in figure 1 is fixed at 10 volts, the positive maximum amplitude of the output would be 10 volts—regardless of the magnitude of the input wave form. Without the battery, the positive maximum of the output wave would be 0 volts. If the polarity of the 10 volt fixed battery is reversed, the positive maximum amplitude would be limited to *minus* 10 volts.

It should be noted that only the *positive* extremities of the input signal wave are limited or clipped, by the circuit shown in figure 1. Clipping of the *negative* peaks can be obtained by completely reversing the diode, i.e., interchanging the plate and cathode connections.

The resistance R_1 and the load resistance of the circuit (figure 1) are usually higher than the resistance of the series-connected diode tube.

If the diode tube is connected across the circuit, as shown in figure 2, the clipping circuit is known as a Diode Parallel Limiter. Positive peaks of any input signal wave form can be clipped by this circuit, the maximum amplitude of which can be established by varying the fixed battery voltage. This parallel-connected diode will not conduct until a certain positive voltage (with respect to the cathode) has been

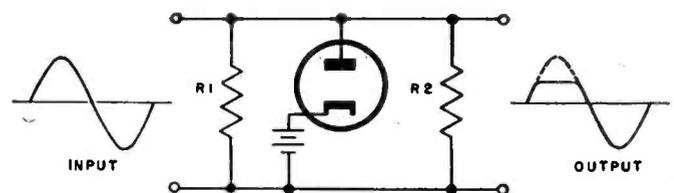


Figure 2—A single Diode Parallel Limiter (for removing positive peaks).

reached. Then, when the diodes conducts, it effectively *shorts out* any further increase in the output signal voltage.

If the tube of figure 2 is completely reversed, the limiter will function to attenuate or clip the *negative* peaks of the input signal wave form.

The Diode Parallel Limiter is not as satisfactory as the Diode Series Limiter, because as the diode conducts the IR drop of the tube and the fixed battery voltage are combined with the signal voltage, resulting in somewhat of a curved output wave form, instead of a sharply clipped output wave form obtained from the series-connected diode.

The similarity between the circuit shown in figure 2 and the circuit of a D.C. Restorer (Part VI, *B. E. Journal*, June 1944) will be immediately apparent. In fact, the basic schematic diagrams of the D.C. Restorer and the Diode Parallel Limiter are exactly the same. The difference, however, lies in the value of the time constant of the input circuit. This time constant is relatively short for a limiter circuit, while a long time constant is used for the D.C. Restorer.

For both series- and parallel-connected single-diode limiters it has been mentioned that the diodes could be connected in either of two ways: to limit either the positive or negative extremities of the input wave. Since one diode can be used to clip either the positive or negative, it is apparent that two diodes can be used to clip both positive and negative peaks in the one circuit. Such combination

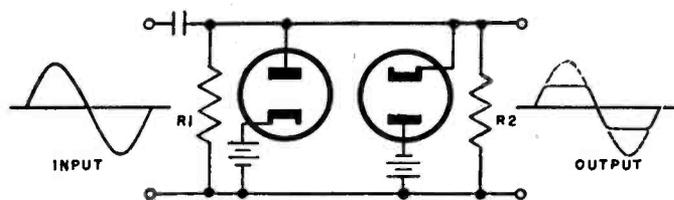


Figure 3—A Double-Diode Parallel Limiter (for removing both positive and negative peaks).

clipping arrangements are known as Double-Diode Limiters, and, as in the case of single tubes, there are two basic types or methods of connection: the Double-Diode Series Limiter, and the Double-Diode Parallel Limiter.

Figure 3 shows a typical Double-Diode Parallel Limiter, combining the functions of two separate diodes. The first tube attenuates or limits the positive extremities of the input wave, while the second diode clips the negative extremities. The result is that both the positive and negative peaks of the incoming wave are clipped or limited, the maximum amplitudes depending on the value of the fixed battery voltage for each tube in each case. Illustrative input and output waveforms (figure 3) show a typical operating condition of the Double-Diode Parallel Limiter.

The Double-Diode Series Limiter is extremely critical in adjustment and requires careful circuit balance. For this reason it is not as generally used in electronics work as the more common Double-Diode Parallel Limiter, explained above.

For any type of diode limiter the output signal will be a direct function of the input signal and, neglecting minor circuit losses, a unity transfer of energy may be expected.

Ordinary triodes and tetrodes can be operated under certain abnormal conditions which will result in a limiting or clipping action. This action is closely related to that of distortion, which is extremely desirable in electronics work. In fact, many wave-shaping circuits would not be possible in electronics if non-linear characteristics of certain components were not employed. Chief among the distortion-

producing media are ordinary vacuum tubes, particularly triodes and tetrodes.

Considering the I_p - E_g characteristic curve for any triode, it is known that a central portion of the curve is fairly linear. This portion of the curve can be used to obtain more-or-less distortion-free amplification, suitable for broadcasting and communication work. It is also known that if the tube is operated at or near either of the end (non-linear) portions of the curve, the resultant output wave will be distorted and often badly mutilated. In communications work these non-linear regions of the curve are avoided. But in electronics work, these parts of the characteristic curve are preferred, and tubes are operated in the region of plate-current cut-off and/or in the region of saturation.

In general, when the input signal strength and the grid bias are adjusted in such a way that the linear portion of the curve is departed from in only one direction, the amplifier is then referred to as a clipping amplifier, a triode (or tetrode) limiter, or a triode (or tetrode) clipper.

The operating point on the characteristic curve can be chosen at such a value that the negative portion of the input signal will carry the tube beyond cut-off. Under this circumstance, the negative half of the signal will suffer the removal of some part of the negative extremity (depending upon the value of grid bias) whereas the positive portion will be more-or-less perfectly amplified.

Or, the operating point can be chosen near the point of saturation on the characteristic curve. At such a value, almost all of the positive portion of the input wave will be distorted and attenuated, while the negative part of the input wave will be more-or-less perfectly amplified.

Thus by varying the amount of grid bias, in either instance of operation, varying amounts of either the positive or negative peaks may be removed. The action is similar to that of the single Diode Limiter, described previously.

Such uses of the distortion properties of vacuum-tube characteristic curves are common in electronics. While some amplification may or may not be present in such a limiter circuit, the tube is being used mainly as a rectifying device. Further, it can be seen that if the input signal voltage is of extremely high amplitude, there will be a limiting action at each non-linear end of the characteristic curve—very similar to the old familiar Class C operation of vacuum tube amplifiers used in radio. However, this double-limiting effect has no application to radio transmission. It is used to produce square waves, and will be considered in greater detail in Part X, next month.

Naturally, the somewhat unorthodox employment of non-linear portions of any characteristic curve is apt to result in some strange circuit actions and wave shapes.

When abrupt discontinuities in the I_p - E_g curve are required, it will frequently be found desirable to change the steady voltages applied to the tube by amounts greater than those used for linear operation. Thus no prediction can be

(Continued on Page Nine)



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made about the voltages which may be encountered in distortion amplifiers. For example, the maximum input signal wave may be four or five times the value of the plate voltage on the tube; sometimes the impressed voltages on the plate of a clipping amplifier may be only 10 or 20 volts; limiting amplifiers are occasionally designed in which the control grid is actually permitted to go positive, and the input signal to be clipped is then impressed on a second (or screen) grid.

The last method of clipping or limiting is by operating a normal triode (or tetrode) amplifier with a large resistance in the grid circuit. This type of limiter is known as a *Triode (or tetrode) Clipper*, with grid-limiting resistor, and the circuit is shown in figure 4. Placing the resistor R in series with the control grid of the tube causes the amplifier circuit to act as if it had a grid leak. When no grid current flows, there is no voltage drop across the grid resistor and the entire input signal voltage appears between the grid and cathode of the triode, or tetrode. When current flows, however, there is a voltage drop across the grid resistor, leaving only a small part of the positive input voltage to be applied

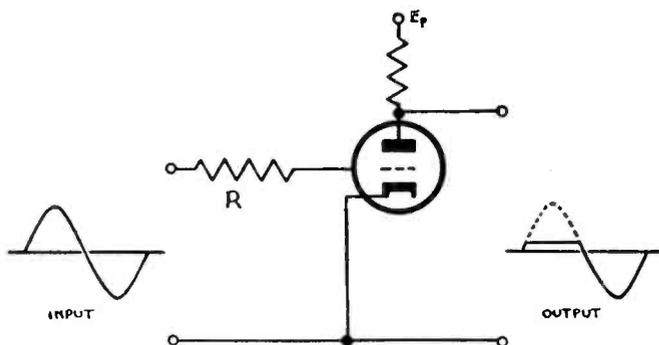


Figure 4—A Triode Clipper, using a grid-limiting resistor.

to the grid of the triode. Typical input and output wave forms, illustrating this grid-limiting action, are shown in figure 4.

We have thus discussed the six basic types of limiting and clipping circuits. There are, of course, numerous variations of these fundamental types.

As noted earlier, when diode tubes are used as clippers, the output signal will be a direct function of the signal input to the diode and, neglecting circuit losses, unity transfer of energy can be expected. However, when triodes, tetrodes or even pentodes are employed as limiters, some amplification will usually accompany the clipping function. Thus it becomes necessary to recognize the limitations which exist upon the amount of signal which may be taken from a clipper, or limiter, stage. Generally speaking, if the internal impedance of the clipper tube (with zero grid bias) is equal in magnitude to the value of the load resistance, one-half of the total plate voltage supply to the stage will be available for peak-to-peak voltage swings in the output signal wave which is produced.

KFI-KECA - LOS ANGELES NEWS

By E. F. Wilmshurst

IT IS still possible to head our column, The KFI KECA news. While KECA has been purchased by the Blue Network, it is being fed from our studios. Technical personnel remains on the Anthony payroll as does the announcing staff. There is an executive office at Sunset and Highland where John I. (Bud) Edwards, Clyde Scott and Amos (Pitch) Baron keep the crystal ball. One of the offices here on Vermont Street is given over to Bill Davidson of production and a programming staff. I understand that this will be the setup until such time as "technical facilities are more adequate".

We are hearing voices from high up on the peaks in the vicinity of Mount Wilson . . . they run about like this . . . " . . . Well . . . this morning . . . (pant) . . . we are transmitting from a new peak . . . (pant-pant) . . . it took me two hours to get this equipment up here . . . (pant-pant . . . pant-pant . . . "two pair of pants" . . .); . . . etc." Yes, it is the FM Brigade made up of Ray Moore, Chas. Young and Ted Darling. The boys have sounded a bit winded as they talk to us here at the studios . . . it's probably the 6500 foot elevation . . . it can't be cigarettes . . . (likewise I'm sure). The tests so far have been very satisfactory and at some later date we will report the results, maybe. The work up there must be very strenuous, I prefer to imagine, and the August heat is probably a bit trying. By wiping the sweat out of one's eyes one can get a view that is breathtaking, on a clear sky.

George O. Milne, Chief Engineer of the Blue, was reported seen in the company of R. G. Denechaud in the vicinity of the KECA transmitter . . . probably keeping an eye on their proppity . . .

L. F. Fritzinger of the Navy blew into town a while back enroute to the territory of Hawaii. Lt. Fritzinger looked lean and in good shape. A line comes from Lloyd Jones who is being shot with anti-everythings for an overseas assignment that makes us tingle . . . Terry and the Pirates better watch out . . .

Vacations have again been restricted due to shortage of gas. Most everyone is puttering around at home with everything from model trains to color movies. The muchly touted beaches from Malibu to Redondo are getting a bit on the crumby side for us family men . . . if it gets much higher in germ content we'll have to rename the ocean front from "Polio Palisades".

To you of the coast who don't read all the trade magazines, be it known that our old boss Don E. Gilman has deserted radio to take an executive v-p job with a Gas and Oil Association . . . well, I guess that's about the nearest thing to radio at that. "Don E" used to boss some of us lads back in the 1928-29 era in San Francisco. Radio seemed to have more meat and less bone in those days, albeit the present day Sinatra and Sonovox had its counterpart in Vallee and the Theremin . . . or vice versa.

Last minute reports indicate that Rex Bettis and Jonathan Smith will draw their future pay from the KECA "owned by the Blue Network" station. Rex gets a semi-brass job out of the shuffle but has no comment at this time . . . or to be truthful, he can't be reached. Jonathan will remain with the transmitter.

Hudson Chapter NABET News

By Richard H. Davis

WELL gang, your reporter is up in a nice vacation spot, 20 degrees cooler, and the only connection with the outside world is just a small radio. The fishing is not so good but there is plenty of evidence of same, and stories that begin, "it was just about the time we had started to pull up the anchor when suddenly——!" so leave us amble down to the postoffice and see what, if anything has arrived. Couple of local papers and a card from ye **Ed Stolze**, who says that copy must be in the 14th so the vacation is over, out come the notes, and here it is!

Lew Tower MC back from vacation as chipper as a sparrow—**GG Ruckstuhl** TE having gas buggy trouble; well chin up—there are hints that cars will be manufactured



—and I volunteered for a NEMO job!

soon—**Ryan** TE finding out how a gas lawn-mower works—**Sam Morse** SE still talking about getting into the marines?—**Jim Gavigan** TE vacating at his home town of Greenfield, Mass.

With autumn winds approaching, the **WBAM** boys are noting the wind velocity by the amount of swing of the lamps in the 43rd flood transmitter room; a swing of more than 3 feet is considered time to bail out!

While inspecting the roof and antennas, **Al Stanford** TE at **WBAM** reported the following: "two grasshoppers, surrounded by quantities of small ants were headed in the direction of the roof drain."

- Questions—1. How did the two grasshoppers get there?
2. How did the ants get there 600 feet up?
3. If they walked up, were these the ones

who started or are they the grandchildren?

Perhaps some of our entomologist members can enlighten us!

I note a flock of **WOR** programs are changing times October 1. It will be fun watching the late arrivals suddenly realize they go on the air in two minutes!

Romo, SE back to school, still retaining membership in

"**NABET**"; **Eric Herud**, who does the **FITZGERALDS** from their apartment, which is pretty nice for the "**FITZS**," wonders if it wouldn't be a good idea for an engineer to set up a studio and have the artists come there?

Jim Goode—sound effects—resting nicely in his backyard, suddenly roused from his day dreams by a sound—a European trainman's whistle!—**Jim** has been scouring New York for weeks trying to find one that sounded right. Investigation showed his small son had it, attached to a new sailor suit; when diplomacy failed, a small reimbursement (object ice cream) induced the would-be sailor to part with the whistle!

WBAM (FM) extends its schedule to 7 days a week instead of 6 from 5 to 11 P. M. on 10 KW.

WOR has established its own sick benefit plan separate from the co-workers association of **L. Bamberger & Co.**, which formerly owned **WOR**. This action had to be taken up with the National War Labor Board as it involved a change in compensation.

Note that **AT&T** is applying for a flock of frequencies way up in the thousands of megacycles. Instead of "line birdies" which we now get, the engineers in the future will be complaining about the flocks of geese flying across the channel.

New Television Stations

From FCC Report No. 1614:

Hearst Radio, Baltimore. Channels 17 and 18 (282 to 294 mc), and Channel 6.

From FCC Report No. 1616:

Consolidated Broadcasting, Los Angeles, Channel 7, 102 to 108 mc.

J. E. Redman, Fresno, Calif. Channel 2.

From FCC Report No. 1617:

E. Anthony & Sons, Providence, R. I. Channel 10, 186 to 192 mc.

From FCC Report No. 1619:

Seaboard Radio Broadcasting, Philadelphia. Channel 18, 288 to 294 mc.

From FCC Report No. 1624:

Philadelphia Inquirer, Philadelphia. Channel 6, 96 to 102 mc.

From FCC Report No. 1625:

WDAS Broadcasting, Inc., Philadelphia. Channel 9, 180 to 186 mc.

P. R. Mallory & Co., Indianapolis. Channel 2, 60 to 66 mc.

From FCC Report No. 1626:

Connecticut Television Co., Greenfield Hill, Conn. Channel 8, 162 to 168 mc.

From FCC Report No. 1627:

Columbia Broadcasting System, New York. (Experimental) 460 to 476 mc.



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1919 1944

25 YEARS OF PROGRESS
IN
RADIO AND ELECTRONICS

from
HOLLYWOOD



By

Norman Dewes

"Figures 1, 2, and 3"—Left to Right, Barbara Underwood, Norma Pollack, and Helen Evers.

SUN . . . parties . . . visits . . . changes . . . new faces . . . bowling . . . ashes . . . weather . . . GIRLS

PROCEEDING on the principal of First Things First . . . in war, in peace and in the hearts of engineers . . . we give you THREE of the reasons why the fellows are so frequently seen wandering up and down the halls with a GLAZED expression . . . or with eyes DOWNCAST and a HUNTING look on their faces . . . our lovely, glamorous, beautiful, gorgeous, enchantingly lovely PAGE GIRLS . . . in their new summer uniforms. (See Figures 1, 2 and 3, but please COME BACK!) **Barbera, Norma** and **Helen** are samples from the staff of some EIGHT such . . . groomed and GUARDED by **Miss Evelyn Hale** of Public Service, who obligingly describes the uniforms for us from a FEMININE viewpoint, WE not being able to tell crepe-de-sheen from silk jersey . . . except by the FEEL . . . they're of light weight light tan gabardine, with white blouses and shoes (**Barbera FORGOT** hers) and have NBC embroidered on the collars of the blouses . . . have another LOOK, fellows . . . how'd you like to plot THOSE curves . . . ANYWAY, beside permeating the place with puchritude, the dears are very HELPFUL around Radio City escorting guests, handling the studio audiences, delivering phone calls and messages . . . they call 'em Page Girls because when they come in the booth you LOSE TRACK

of things and forget what PAGE you're on . . . in the script. ALSO on the Guest Relations Staff are four Page Boys, who are OUTNUMBERED and have a h— of a time . . . there is a long WAITING list for those jobs, so don't apply . . .

VISITORS . . . to Hollywood this month included **George O. Milne**, Chief Engineer of the Blue and **Johnny Johnstone**, Blue Special Events Director . . . **Johnstone** out from NY to line up and launch Blue news coverage in Pacific Theatre and **George** out with wife on combination vacation and look-see trip. The **Milnes** were entertained by the **Denechauds**, with station wagon jaunts to local points of interest including prospective FM and Television sites. NABET gave 'em a VERY nice dinner and get-together at Brittinghams, arranged and conducted by **Thor La Croix**, Blue councilman and attended by some fifty prominent NBC and Blue engineers and their ladies including **D. A. DeWolf**, NBC Operations Supervisor and the **Missus**. Dignitaries were introduced by **Bob Jensen**, NABET Chairman, Hollywood Chapter, and **Mr. Milne** said a FEW words . . . food was good and an enjoyable time was had by ALL.

PARTIES . . . this month included Cocktails at the Knickerbocker for **Don Gilman**, recently resigned Blue West-

ern Division V. P. who has left after MANY years in Pacific Coast radio to become Executive Vice President of the California Gas and Oil Association . . . the event in the Lido Room was well attended by all Blue employees not on shows and the Hors d'oerves (YOU spell it, then . . .) and OTHER refreshments were WELL received . . . **Don Searle**, new Blue Western Division General Manager was introduced and the new KECA/Blue gang presented. HIGH SPOT of the evening were testimonial messages to **Don Gilman** from President Roosevelt, Eleanor and Winston Churchill, who were UN-ABLE to be present but whose transcribed remarks were VERY fun-yay. If you left SOBER, it was you're own d— fault . . . We didn't. A POKER PARTY in the Pine Room at the **La Croix** estate the other eve was enjoyed by **Craig Pickett** and **Steve Hobart** of Master Control, **Andy Anderson** of CBS, and your reporter . . . **Andy** had some interesting things to tell about the installation of the CBS Short Wave jobs at Delano, Calif., which he is supervising (no SECRETS, Mr. Bowman!) and we all reminisced over our chips and CUPS about the many funny things which have happened in radio . . . had a GOOD time . . . yes, **MRS. La Croix** was away . . . back East visiting folks . . . and you know us mice . . .

SQUEAK, SQUEAK!

ASHES . . . over Hollywood . . . correct spelling and not the title of a new show, but stuff which showered down from the forest fires, making it like snowing on Vine Street . . . with SMOKE hanging so heavy over the village that together with the ashes it all looked like the Last Days of Pompeii . . . or a De Mille background. From the roof of the building you could see a pall of smoke all around the horizon, with the tops of tall buildings sticking up through it and tongues of flame licking around the edges . . . the fires were pretty bad this year . . . in fact, just a little TOO bad for a lot of folks and a little TOO prevalent to be due to usual causes . . . WE think . . .

CHANGES . . . the Building has finally returned to normal pre-war conditions of visibility with the removal of dim-out paper and paint from glass-brick windows and doors in the corridors . . . we've been so used to going about like moles and miners that the unexpected DAYLIGHT is rather startling and many are wearing their sunglasses inside as well as out. New Fall shows are getting underway . . . with resulting SCUFFLES for studios . . . one big show will go off the air say at eight-thirty, with another ditto moving in and going on from the SAME stage at nine, just thirty very short minutes later . . . you can picture the MAD SCRAMBLE in between. The boys get together however, and endeavor to use as much and many of the same set-up and mikes as possible thus conserving time and effort, but mak-

ing so you can HARDLY tell one show from another . . . a situation which has its good AND bad features . . .

WEATHER . . . SUNNY . . . with temps approaching our GOLF score . . . it was around 104 degrees, C. of C. for a few days . . . the paper in the Valley ADMITTED that it was 108 in Burbank and 112 in Tarzana, which is just plain HOT in this part of the country . . . the fires in the mountains didn't HELP things any either . . . we seem to have 'em every year and together with the annual torrential rains and flooding rivers, snowfalls, heat-waves and fog, they make up the UN-USUAL weather so beloved to Californians . . . but who would want to live where they have the Cold Season, the Hot Season, the Wet and the Dry Season . . . at the same times each year . . . here we have 'em ALL . . . pleasantly mixed or sometimes all AT ONCE . . . so that you never know whether to start out in the morning in a topcoat or nothing at all . . . and are correct in EITHER. We see by the papers however where "Quake Rocks East—New York Area Shaken" . . . wonder if they can mean an EARTH-QUAKE . . . sure wouldn't want to live in a place like THAT.

PERSONNEL . . . Vic Livoti, SE leaves Engineering due to War Manpower ceilings and having been on a war replacement basis . . . has transferred to Sound Effects and is getting a big KICK out of making LOUD noises . . . Harry Bryant, one of our BEST men, resigning from NBC Studio to buy a partnership in Radio Recorders . . . Harry came to NBC from Mutual

about two years ago and has been doing some of our biggest shows including Jack Benny, Ginny Simms and Amos 'n Andy . . . his departure will be NOTICED. Jake O'Kelly now with NBC Studio Staff on trade deal with Bob McGaughey who goes over to the Blue . . . Jake was with NBC for some 16 years and was Senior Master Control Supervisor in New York for a long time, so he's really coming back home . . . left NBC Hlyd in 1942 to become a civilian engineer with the 4th Interceptor Command, returning to Hollywood and joining the Blue staff about a year later. We say WELCOME Jake and SO LONG Bob, Vic and Harry . . .

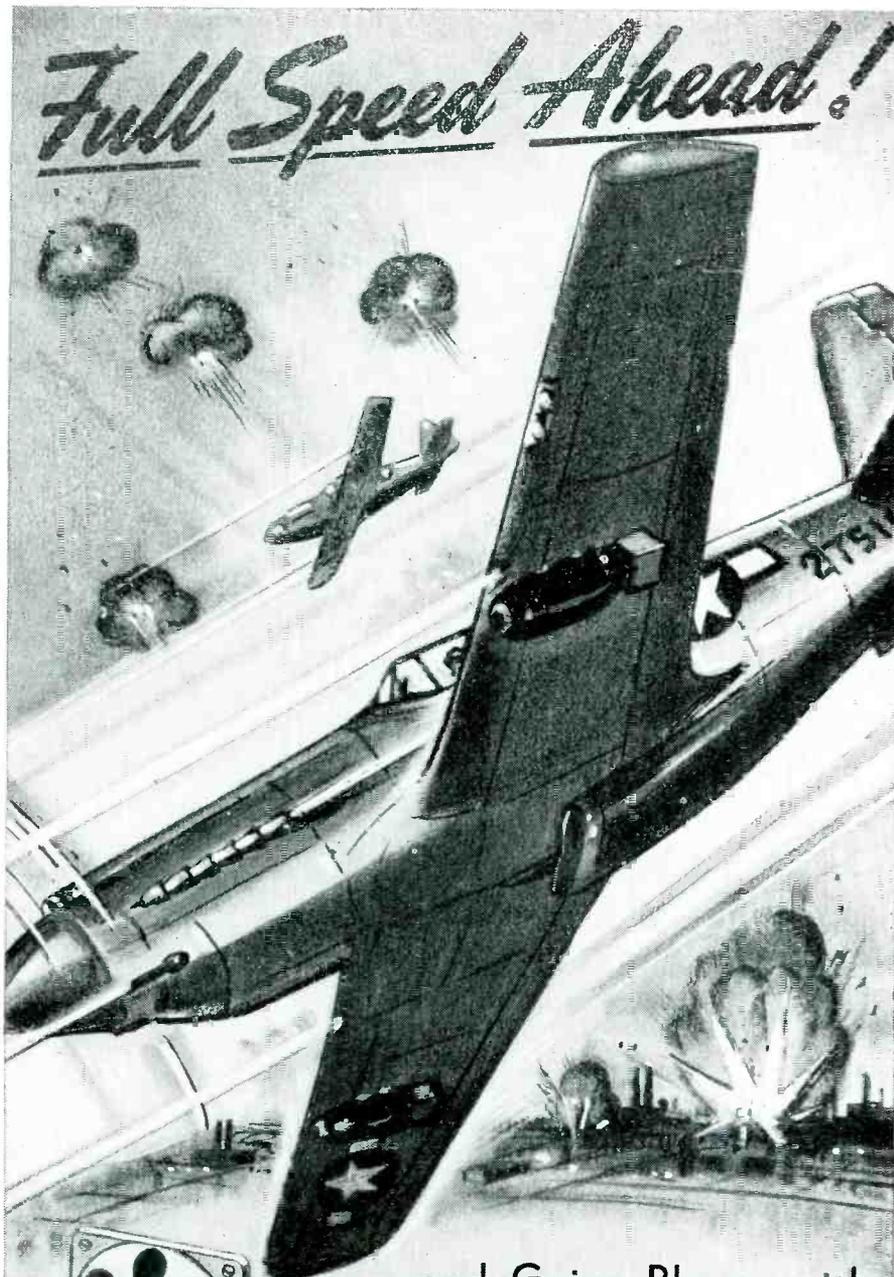
BLUE . . . topping Bluevents this month was the resignation of V. P. Don Gilman, who moves out of 302 into new fields . . . Don was head of NBC's Western Division for 14 years and was instrumental in the development of Hollywood's Radio City. When the NBC/Blue split became official in February, 1942 Mr. Gilman was appointed in charge of Pacific Coast activities and has been LARGELY responsible for placing the BLUE where it is today . . . Don's departure will be felt by many of us . . . no successor has been named as yet, and things are being run by a newly appointed General Manager for the Pacific Coast, Mr. Don Searle of San Francisco. Our new Don has been Gen. Mgr. of KGO and now adds general supervision of KECA and all Western network operations for the Blue. We WELCOME one Robert Palmer McGaughey to the

(Continued on Page Fourteen)

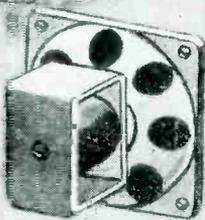
LEFT: Hollywood's Banquet to Blue Network Chief Engineer George Milne. Standing at speakers' table, left to right: Mrs. R. G. Denechaud; Mrs. G. O. Milne; G. O. Milne, Blue Chief Engineer; Ralph Denechaud, Hollywood Blue Engineering Manager; Mrs. D. A. DeWolf; "De" DeWolf, NBC-Hollywood Operations Supervisor. RIGHT: Left to Right: Mrs. R. G. Denechaud; Mrs. G. O. Milne; George Milne, Blue Chief Engineer; Ralph Denechaud, Hollywood Blue Engineering Manager.



Full Speed Ahead!

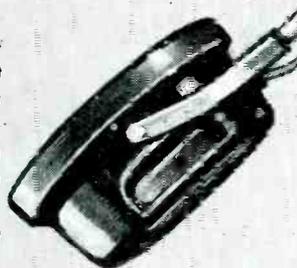


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PIONEER MANUFACTURERS OF PERMANENT MAGNET DYNAMIC TRANSFORMERS

Hollywood (Continued from Page Thirteen)

Blue engineers, an exchange with NBC for O'Kelly . . . Bob is called "RPM" because he gets AROUND so fast, having worked for KYCA, KPHO, KOY, KPRO, KFI, KFEL and NBC all in a space of some four years . . . was Chief at a couple of 'em, too . . . will PROBABLY be gifted with the Keys to the City, namely Studios "L" and "M," the Ambassador and the booth at Sardis. Carl Lorenz back from vac fishing trip with lots of NO FISH . . . didn't catch any LONG ones but came back with a TALL one . . . a wonderful tale and one of the best FISH stories we've heard for some time. Jimmy Banks excavated and evacuated . . . appendectomy at Hlyd Hosp successful and the boy is home again, with slight complications . . . tells many tales about NATURE and the bashful nurses . . . teehee. O'Kelly on vac at Laguna Beach and in swimming one day and here's a kid about nine or ten dog-paddling out beyond the breakers . . . suddenly ten-year old starts hollering and splashing around and then SINKS . . . Jake dives and grabs kid by the SHORTS and finds themselves on the BOTTOM, being churned about by the currents. They come up, to be pounded back down again by the breakers, but finally make the shore with Jake minus some SKIN off his tummy and OTHER places . . . the kid revives and departs and Jake is a HERO, but won't admit it . . .

CHIPS . . . Johnny Cravens, SE sporting a new cookie duster, started while on vac . . . makes him look like a CROSS between Ronald Colman and Errol Flynn . . . competition included SEASONED sifters of Eddie Miller, Johnny Morris and other raisers of lip muffs . . . Fergie becoming acclimated to booths again . . . we discover that HE plays chess too . . . another victim, but not for US . . . Hal Platt, Field back from fishing and pic-taking trip in High Sierras . . . made a 125 mile MULE hike among 10,000 foot high lakes up there, with ICE on 'em in the morning . . . in August. We always thought that you RODE the mules on a deal like that, but it seems that all they do is carry the frying pan while you trudge along BEHIND. CORRECTION on Sil Caranchini's new Recording Secretary in August issue . . . it seems that she belongs to Les Culley, Western Division Recording Super,

(Continued on Page Fifteen)

Broadcast Engineers' Journal-October, 1944 14

Who's Who in N.A.B.E.T.

Meet Robert R. Jensen, Chairman Hollywood Chapter, N.A.B.E.T.

LIKE father, like son," tells the story of Bob Jensen's early efforts and his subsequent career in radio . . . his father was a college professor of physics at Wesleyan University in Lincoln, Nebraska, at the time of Bob's arrival in 1912, and has been an ardent student and pioneer in the development of the new science of talking without wires since about 1904. In those earliest days, John C. Jensen taught physics and math at the Beaver City High School and spent his spare time tinkering with electrical gadgets, among them Marconi's coherer receiver and spark transmitter with which it was claimed messages could be sent thru the air without the use of wires.

Bob jest nacherly grew up to be a radio man under these influences . . . in fact, had his picture taken at the age of three wearing headphones and pounding brass. "Dad" Jensen was his constant guide, instructor, and companion thru the maze of the wonders of wireless, and together they built and operated many amateur transmitters and later, commercial ones. Bob was assistant op at 9YD in 1916, which was in operation for about a year when the advent of the first World War closed all amateur stations. Dr. Jensen became an instructor for a War Training Unit at the University and the rig in the Physics Lab was used for training purposes.

After the war, 9YD again took the air and progressed from spark to phone, with Bob assisting in the broadcasting of market reports, weather information, church services and music from a spring phonograph. Between schedules, they would talk to grandma and inform her of forthcoming visits of the family. Later, the government assigned the call letters WCAJ to the University station, and operation continued on 360 and 485 meters, with one of the first "remote" broadcasts being made in 1923, of a lecturer speaking over the telephone wires from Chicago. Meanwhile, son Robert had become a full-fledged operator and had secured his first ticket, a ham license in 1929 with the call 9DQM. A commercial license followed in 1930 and Bob became a combination

man at WCAJ, announcing and operating the station until his graduation from Wesleyan in 1933. A job at KFOR in Lincoln followed, where the pay was \$15 per week, plus two theater tickets! KFOR was later purchased by KFAB and KOIL in Lincoln and Bob became a studio control supervisor. A trip to Europe came along in 1935 with a fellow KFAB employee, and BBC's just completed Broadcasting House in London and Radio Paris were among the points of interest visited.

A job in the city of Denver at CBS station KLZ came up in 1936, and a year later an opportunity was secured thru KOA, the NBC station in Denver, to go to Chicago from which that early "network" broadcast had been made, as a studio man on the staff of NBC. However, it was pretty lonesome for the striving young radio man in the strange town, so Bob sent back to Denver for a young lady actress at KLZ, and they were married on a two-day leave from NBC.

While at NBC in Chicago, young Jensen became interested in photography, filming movies of surgery operations and production activities (radio) . . . and writing articles on picture taking for the **Journal**, while editing the Chicago column. Shortly after the arrival of their "first," Bob requested a transfer to the shores of sunny California, seeking a more suitable climate for his family.

Since coming to Hollywood, Bob has served as Hollywood Journal editor for a time and has been recently elected chairman of the Hollywood Chapter of NABET. The recent arrival of "Dad" Jensen's second grandchild brings us up to date, and Bob can be found these days either washing little prints in the kitchen sink or big ones in the laundry tub. At work, you'll usually locate him in the booth on the Westinghouse Program, Furlough Fun, Eddie Cantor's Show or whatever, surrounded by photographic gear with which he experiments during lulls in rehearsals.

After the end of World War Two, the first order of business for Robert will undoubtedly be getting W9DQM/6 back on the air and arranging a sked



Robert R. Jensen

with Nebraska Wesleyan University and Dr. Jensen, who still holds a First Class amateur ticket to operate W9ZHP . . . and is standing by.

HOLLYWOOD

(Continued from Page Fourteen)

who is **SORE** at us because now **SIL** wants one . . . we're **SORRY**, yuh, yuh, yuh . . . add chess players **Bert Korngold**, Rec. apprentice . . . **Alice Tyler**, former NBC Engineering Secretary who knew **ALL** the answers and could take you on a nemo and bring you back, with the proper gear and **EVERYTHING** is rumored to be new secretary to the **BIG BOSS**, Mr. Strotz . . . she'll make a **GOOD** one, we bet . . . our **TAG** yarn concerns one **Oscar Wick**, Maintenance . . . as we hear it, **Oscar** is just starting on his vac and along comes a guy who wants to sell him some fertilizer for his lawn . . . lawn looks pretty bad, so **Oscar** hurriedly invests in several sacks at some three or four slugs per sack, visualizing a nice green sward when he gets back. Returns to find **NO** improvement whatsoever and stuff just laying on top of the grass . . . on close inspection, grass vitamins seem to have a slightly **METALLIC** feel, so **Oscar** goes in and gets a **MAGNET** and sure enough it **ATTRACTS** the "fertilizer," which turns out to be nothing but a mess of steel chips and shavings. **Oscar** is wondering whether there were some **GOATS** concerned who ate too many **TIN CANS**, or just whataheck **GOES ON** . . . **JUST** learned that **NABET** annual convention **WILL** be held October 16th thru 20th in Cleveland . . . more dope next issue . . . **BCNU**.



Photo by Joe Conn

NEW YORK NEWS

By George F. Anderson, Jr.

WELL, after having had some four months of that California type weather, we are finally having some real Eastern Type days. (Rain twenty-four hours a day.)

This month sees under the heading of "New York News" another contributor, namely Gilbert McDonald, SE-BNCI. Gil has taken over the job of covering Blue Doings here in New York and is making this job very difficult. 'Twas hard enough to fill a page with the combined NBC and BNCI and now all that I can cover is NBC.

A little chiseling—Former SE BNCI's Bob Massell has been doing the interview spot on the Coca Cola Spotlight Band Program from London, and betting here in New York has it that Bob will stay on that side of the mike from now on.

August 22, 1944 is the day that SE Ray Glendon popped the question to Betty Wragge and received a "Yes". Ray is one of our younger studio engineers and Betty is one of radio's beautiful and smart actresses and is known to radio fans as Peggy in "Pepper Young's Family".

As of now we are informed that there has been no day set for the event, but you can be sure that when it occurs we will be on hand. Our best wishes. This month sees the RCA Victor 24th Street group of engineers entering into the New York Chapter of NABET. Welcome to NABET.

The engineers of WGY—Television and Broadcast Engineers have also joined Nabet and are forming their own Mohawk chapter. Howdy folks, welcome back.

We are informed that some time in the early part of this month SE Lionel Drayton became a papa. At the present time we do not have any particulars but in the next issue they will be there.

Our apologies to Max Jacobson, Field Supervisor, for the mistake in last month's column. Tony Hutson FE BNCI was listed as having been elected Field Councilman and

(Continued on Page Seventeen)

NEW YORK BLUE NOTES

By Gil McDonald

THIS is the first column devoted exclusively to news of the New York Blue Network engineering gang. If you have any news of interest please shoot it to me before the tenth of the month.

Ed. Watkins (SE) who hasn't been further south than 42nd Street since coming to the Blue from the deep South about a year ago, has left for a vacation in Florida, mainly to get his wife who has been recovering from an illness down there.

Deric Leighton (SE) has been having feedback troubles on a 3A show. It got so bad one day that the mikes started to whistle! The gals in the cast still think it was Deric doing the whistling and he's having an awful time trying to prove otherwise.

Al Bradley (SE) fresh out of WOV got an awful pain in the lower regions one night and was carted away to Polyclinic Hospital where the trouble was diagnosed as a gangrenous gall gladder. He says the past three weeks have passed awfully slowly but expects to be up and around soon. Bet he's raring to get going on that shift soon(?). By the way, Al is replaced on the midnight shift by another newcomer from WMCA and the OWI. His name is **Elliot Grey**.

Bert O'Leary is reported as doing very nice work with the CAP over in New Jersey. He pilots his own plane and does radio work for them.

John O'Neill (SE) is looking forward to "V" Day so he can once again flit around the clouds in his Piper Cub. The OM's chest is really puffed out these days. His three kids are all in the services and one of them is piloting a bomber over in the big show. John was radio Op on the USS Pennsylvania during the last war.

The original Ritz Brothers, **Gil McDonald** and **Pete Narkon**, was broken up when Pete got himself a day shift job.

The **Blue** has taken over the Vanderbilt Theatre and it will be in operation some time in October. This will take

(Continued on Page Seventeen)

New York News

(Continued from
Page Sixteen)

it should have been—Max Jacobson Re-elected. Sorry Jake, but if we don't get any news from your department we have to do something to fill this space up.

Adorning the bulletin board in the lounge is a picture taken at one of the local nemo pickup points—Piccadilly Circus Bar, it is possible to recognize the announcer—the “Three Suns Trio” but as to who the person behind the amplifier could be, it is impossible to say. However, we understand that Gil—“They can't do that to me”—Markle was recently assigned to do a nemo and as the only type of nemo that Gil is known to do now, is one with a free dinner and no equipment to carry, we suspect that the person in question in the photo is Gil.

Starting this week, September 11, the International Department is working studio 2C from early morn to early morn. Between Spanish, French, English, German, and a few others, there is a SE in 20 from 6:45 A. M. to 1:15 A. M. with few exceptions.

Fred Frutchey, Rec., who has been in England since sometime prior to the invasion, has now returned to New York. We would like to write about what he has seen and done abroad but as yet we have only seen him long enough to say “Hello”.

Ralph Reid SE, from Hollywood for a visit, and Ralph makes the boys here in New York look like fugitives from a sun lamp. If working in Hollywood makes one look as good as he does, how do you get transferred to Hollywood.

Coffee still being served in the lounge. Post card from Pvt. Jack Paine, AUS, former NBC SE, who is stationed at Camp Croft, South Carolina. Jack says that army life is like being at NBC, except that you work from awakening until you fall from exhaustion. And plenty of overtime, but no extra pay for it.

By the way, if anyone at Port Washington or Boundbrook reads this, and they have something that they would like to have in this column, send it over here by any means available. Your correspondent will be glad to buy you a beer at a local emporium if you can catch him when he has the necessary green stuff, that is, he will do the buying if you do writing. Coffee served.

Warrant Officer Herbert Florance, USNR, former NBC SE, dropped in for a quick “How Do” and showed that he now was Chief Warrant Officer. Herbie does quite a bit of traveling around this section of the country but every time he has an opportunity to do some real traveling, some personage with more brass than Herbie has, takes the trip. Coffee.

New York Blue Notes

(Continued from
Page Sixteen)

some of the pressure off the Ritz Theatre which now is turning out Blind Date, Jury Trials, Fred Waring, Philco, Basin Street and several sustainers. They are using two RCA 76B3's operated bottom to bottom but much of the original wiring has been changed and several new ideas are being tried out. One feature which looks very promising is this: The original mike keys are now used to set any predetermined group of mikes up into either of two master faders. There will be a program vernier to control the whole setup. This should be quite useful in some of these setups where you have three or four mikes open

on a band and you have to balance them against a vocalist. This feature will also prove that when God gave us two hands He didn't mean us to do the work required of six hands. Ben Adler and Bill Trevarthen have done most of the masterminding under the supervision of Chief Engineer George O. Milne.

Bill Simpson, after relieving Gil on RCA, Philco, and Basin Street for summer vacation, says, “Phew”.

Maurice Kamke (TE) writes that he is dickering for a place over on Packanack Lake, 15 miles from the WJZ transmitter. Maurice was formerly known as the Mayor of Rhubarb Patch when he lived up in Riverdale, N. J. Skup the bucket, Mece!

Pat Simpson (SE) working overtime these days trying to keep the studio gang happy. He's Blue Studio Councilman.

John Butler, a recent graduate from the apprentice group relieved Al Hayward on the Dunninger show for Al's vacation, and still is very much mystified by it all.

“Tony” Hutson (FE) is still trying to catch his breath after covering both the Democratic and Republican Conventions in Chicago. Tony and I have a sked on 40 meters the day after “V” Day.

Well, that's the end of the first one, gang, so 73 til next time.

COOTIES

Ex-inspectors (radio) of the San Francisco Signal Corps Inspection Zone who were assigned to the Los Angeles area after Pearl Harbor have formed a fun and frolic group similar to the “Cooties” and “40 and 8” of World War I veterans. It will be named the Trained Seals' Marching and Chowder Club, according to “The Inspector,” official journal of the inspection agency. Annual picnic will be in October at Griffith Park. Dr. Ralph L. Power, Los Angeles radio counsellor and former zone steatite engineering inspector, was elected permanent secretary-treasurer.

FCC — REALLOCATIONS

The Federal Communications Commission today announced that it will start holding public hearings on September 28 to obtain information and views which will assist it in planning its post-war frequency allocation policies. All interested persons both in industry and Government are invited to testify.

A complete review of present allocations of bands of frequencies is necessary as a result of the important advances in radio made during the war and the greatly increased demands for the use of radio, the orders for the hearing points out.

The information obtained at the hearings will be considered by the Commission in determining the frequency requirements of United States non-governmental radio services; in making recommendations to the State Department for international radio agreements, to the Interdepartmental Radio Advisory Committee concerning allocations to Government radio services and to Congress.

In the near future the Commission will issue a Public Notice outlining in detail the procedures which it will follow in conducting the hearings.

The Magnetron Generator for Ultra-High Frequencies

By Jordan McQuay

THE generation of ultra high frequency oscillations is an important and difficult problem in u-h-f technique, requiring the use of special types of vacuum tubes.

The conventional vacuum tubes used at lower radio frequencies cannot be used to generate frequencies above 300 megacycles (wave lengths below 1 meter) for a number of reasons.

Chief among these reasons is a consideration of the *transit time* of electrons within the oscillator tube. At most radio frequencies this time of travel from the cathode to the plate can be neglected. But when it is attempted to use ordinary vacuum tubes to generate u-h-f waves, the transit time increases the effective grid conductance of the tube—thereby increasing the load on the driving source—and will shift the phase of the plate current considerably with respect to the grid voltage. An obvious method of reducing this electron *transit time* for u-h-f operation is to reduce the spacing between the cathode and plate electrodes.

Another limiting factor in the use of ordinary vacuum tubes at such high frequencies is a consideration of the physical size of the electrodes and tube leads. As the frequency of operation is increased the physical dimensions of the ordinary tubes approach those of a tuned circuit, so that the highest frequency of operation as an oscillator is limited by the length of the tube leads to the elements. This limitation can be largely overcome by reducing the physical size of the vacuum tube, or by making the leads a part of the tuned circuit.

There is also considerable additional power loss (and therefore increased inefficiency) in a circuit using normal vacuum tubes, due to skin effect, lengths of terminal leads, the large current necessary for charging condensers, uncontrolled electromagnetic radiation from parts of the circuit, and various dielectric losses in the tube envelope and base.

The effort to develop satisfactory u-h-f oscillators—which either minimize or completely eliminate all of these undesirable effects, or, in some instances, turn them to an advantage—led to the discovery and perfection of several types of special u-h-f oscillator tubes, of which the magnetron is possibly the most important.

The magnetron is one of the most efficient and satis-

factory generators of ultra high frequency oscillations.* And the frequency range of the magnetron extends well into the *super high frequency* band (above 3000 megacycles), producing radio waves only a fraction of an inch in length.

This is made possible by the employment of a new and revolutionary process of oscillation, in which the transit time of electrons is not necessarily shorter than the oscillating cycle.

Basically speaking, the magnetron is essentially a *diode* with cylindrical electrodes placed in a uniform magnetic field, so that the lines of electromagnetic force are approximately parallel to the axes of a cathode and an anode.

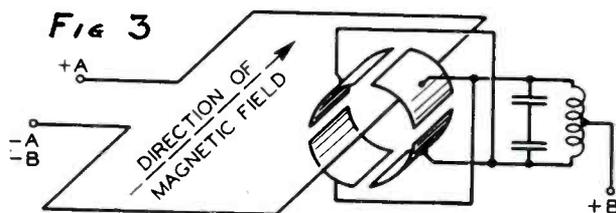
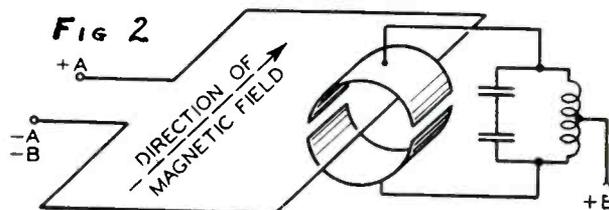
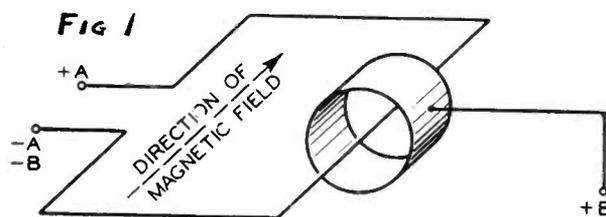


Figure 1 — Basic Magnetron, consisting of single anode and cathode.

Figure 2 — Split Anode Magnetron, consisting of two-segment anode and cathode.

Figure 3 — Slotted Anode Magnetron, consisting of four-segment anode and cathode.

* It is possible to operate a magnetron according to a negative-resistance method (sometimes referred to as the *dynatron method*), whereby oscillations of much lower frequencies are produced. Such oscillations (produced by the *dynatron method*) are not considered here. Further data on the *dynatron* properties of the magnetron will be found in the extensive bibliography at the end of this article.

The physical structure of the magnetron is simple. It consists merely of an anode cylinder and a concentric cathode, as shown in figure 1. There is no grid. A d-c potential is applied between the cylindrical anode and the cathode. The anode may be divided into two segments (figure 2), four segments (figure 3), or a larger number of segments—but the fundamental theory of operation remains much the same.

The complete theory of magnetron operation is elaborately mathematical, detailed, and highly complex—and will be simplified considerably for purposes of this discussion. The reader interested in further or more detailed study of the subject is referred to the bibliography on the magnetron appearing at the conclusion of this article.

Let us consider the simplest type of magnetron (figure 1) consisting of a single cylindrical anode and a cathode. An intense magnetic field can be applied to this device, so that the lines of electromagnetic force are parallel to the electrode axes and in the direction indicated. When electrons are emitted from the cathode of such a device they will be acted upon by two forces at right angles: the electrons will be drawn to the anode by the electric field, and the electrons will be deflected at right angles by the magnetic field. The path of the electrons, therefore, will be the vector sum of the electric and magnetic fields acting at right angles to one another. Since we are interested in the precise paths taken by these electrons, let's examine an open-end view of this simple magnetron as shown in figures 4a, 4b, 4c, and 4d.

First of all, consider the path of an electron when there is no magnetic field present in the vicinity of the electrodes. Under such a neutral condition an electron would travel from the cathode directly to the anode in a straight line (figure 4a).

But the introduction of a slight magnetic field—of small but stable value—will now cause a curvature in the electron path, similar to that of figure 4b. And the amount of curvature will depend directly upon the strength of the magnetic field applied to the magnetron. The stronger the magnetic field, the greater the curvature of the electron path—and the longer it takes for an electron to reach the anode. Thus the strength of the magnetic field is an important factor controlling the path of the electron. The strength of this electromagnetic field is measured in gauss.†

It is important to note that the greater the electron velocity (caused by increasing the anode voltage), the greater will be the effect of the magnetic field upon the electron.

Also, as an electron approaches the anode its velocity is increased, and the effect of the magnetic field is increased—thus causing the electron path to become more and more curved away from the cylindrical anode.

Since the cathode is slightly positive—due to loss of the

† The gauss is the C.G.S. electromagnetic unit of magnetic flux density; equal to one line (or maxwell) per sq. cm.

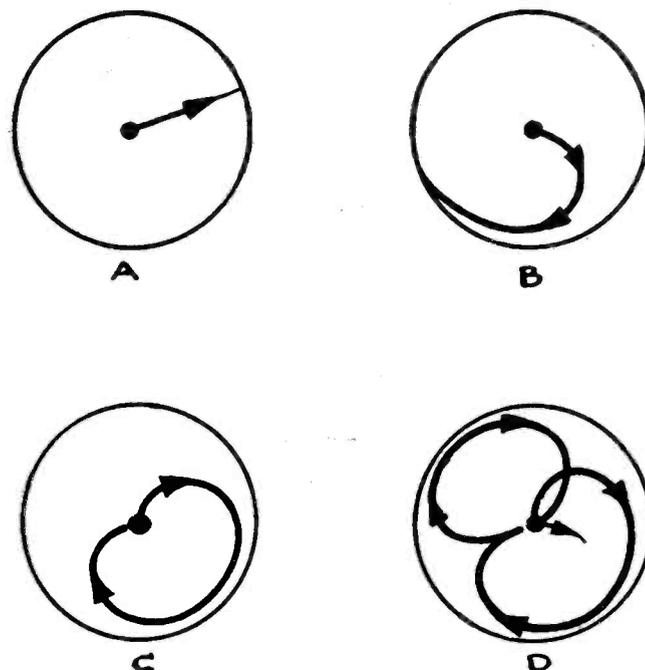


Figure 4—Electron Paths within a Magnetron (with Static Fields).

- a. Path of electron without an electromagnetic field.
- b. Path of electron with slight electromagnetic field.
- c. Path of electron with electromagnetic field at critical value.
- d. Path of electron with electromagnetic field beyond the critical value.

electron—it will attract electrons back to it. Thus, there will be three forces acting upon an electron after it has been emitted from the cathode and has almost reached the anode: the magnetic field deflection force, the electric field due to the anode supply voltage, and the electric field due to the cathode losing electrons.

Now, as the strength of the magnetic field is slowly increased the path of an electron becomes more and more curved, until at a critical value of magnetic field strength the electron just misses the anode cylinder and returns to the cathode after describing a heart-shaped circular path—as shown in figure 4c. Thus, if the magnetic field intensity is great enough the electron never reaches the anode, but describes an orbit and eventually reaches the cathode. The journey out and back to the cathode is equivalent to one cycle.

The value of magnetic field intensity which produces this electron effect is known as the critical field, the critical value, the cut-off value, or the cut-off characteristic.

After this critical value of magnetic intensity has been reached, the electron may be repelled by the cathode after completing its heart-shaped orbit. When this happens the electron may make several excursions between the cathode and plate—following orbits in the interelectrode space—

before finally coming to rest at the cathode. This is a normal phenomena, and is illustrated by figure 4d.

All types of magnetrons are generally operated at the cut-off or critical value of magnetic field intensity (measured in gauss). At this value the anode current drops to zero. The "sharpness" of the current cut-off value depends upon whether the anode is perfectly cylindrical, and upon whether the cathode is perfectly concentric within the anode.

The critical value of magnetic intensity may be calculated by the following formula:

$$H = \sqrt{11.3 \frac{Eb}{d^2}}$$

where H is the magnetic field intensity, measured in gauss.

E_b is the anode voltage on the magnetron, measured in volts.

d^2 is the distance between plate and cathode of the magnetron, measured in centimeters.

When the value of magnetic field intensity is less than the value H in the above formula, the electrons will strike the anode of the magnetron and be absorbed. When the value of magnetic field intensity is equal to, or greater than the value H in the above formula, the electrons will return to the cathode, and oscillations will be sustained within the magnetron.

The distance traveled by the electrons (in following their heart-shaped orbits) will determine the wave length of the generated oscillations. Increasing the anode voltage or the field intensity will cause an increase in the speed of the electrons, thereby increasing the frequency of the u-h-f waves. Conversely, decreasing the anode voltage or the magnetic field intensity will cause a decrease in the frequency of the u-h-f waves. By using high voltages on the anodes, very intense magnetic fields, and anodes of physically small size—certain types of magnetrons can generate undamped radio waves as short as two millimeters.

The wave length of u-h-f oscillations produced by a magnetron generator can be determined approximately by the following formula:

$$\lambda = \frac{15,160}{H} K$$

where λ is the wave length in centimeters.

H is the magnetic flux density, in gauss.

K is a figure of merit, representing the efficiency of the magnetron in an actual circuit. This factor will vary in value from 1.0 to 1.4.

It was stated previously that the electron journey out toward the anode and back to the cathode, at the critical field intensity, is equivalent to one cycle.

In order to cause these electron cycles to occur at specific times, the magnetron is operated in conjunction with a tuned circuit—usually situated in the anode or plate lead. The tuned circuit is shocked into oscillation directly by action of the magnetron. The "natural" frequency of the magnetron must be the same as the resonant frequency of the tank

circuit, however. What is then happening effectively is that an alternating voltage is being superimposed upon the B supply voltage to the anode. If electrons are emitted by the cathode as the anode voltage begins to go negative (following the movement of the negative half of the superimposed wave form), the electrons are retarded slightly; so that over this half cycle the magnetron gives up energy to the associated circuit. On the following half cycle, however, the anode goes positive and does not permit electrons to return to the cathode. In this manner, energy has been supplied to the tank circuit in half-cycle "bursts"—supplying the required energy for shock-exciting the tuned circuit into oscillation. On the other hand, all electrons leaving the cathode at the instant that the anode is going positive will be so speeded up that they will be attracted directly to the anode, thereby taking energy from the circuit—and constituting a dead loss. For this reason the efficiency of the single anode magnetron (figure 1) is relatively low, being of the order of only a few per cent.

Our discussion thus far while concerning all types of magnetrons in general principle has applied more directly to the single anode magnetron. While such a magnetron (figure 1) could theoretically be used to generate ultra high frequencies, such a simple device is seldom employed in commercial u-h-f circuits.

Most types of magnetrons have their anodes divided or split into a number of segments, the most common arrangements being 2, 3, 4, 8, 12, 16, or more segments.

Considering the simplest of these types first, refer to the split anode magnetron shown in figure 2. When the anode is divided in this manner, the induced alternating voltage will appear between the two segments. The magnetron is placed in oscillation in the same manner as a single anode magnetron: the intensity of the magnetic field is established at the critical or cut-off value. Then, with the two anode segments oscillating in opposite phase the associated tank circuit will receive twice the amount of energy from the electron stream within the magnetron. But the resonant frequency of the tank circuit must equal the electron transit time. This can be readily achieved, in most cases, by adjustment of the anode supply voltage and further readjustment of the magnetic field intensity. A two-segment magnetron has an operating efficiency of the order of 60 to 75 per cent, higher than any other type of single or split anode magnetron.

Radio waves of extremely short lengths—as low as 50 centimeters—can be produced with split anode (two segment) magnetrons by causing the electrons to oscillate at so-called "higher orders". When functioning in such a manner, the tuned oscillatory circuit interacts upon the electrons within the magnetron in such a way that the electrons are caused to move in a spiral trajectory, as shown in figure 5. It will be noted that the diameters of the loops which the electrons traverse are much smaller than in the normal method of magnetron oscillation. This results in

(Continued on Page Twenty-two)

TELEVISION *and* NBC

Of all the post-war developments promised by progress in the art and science of radio, TELEVISION presents the greatest challenge and the greatest opportunity.

It is a challenge which can be met only by the co-operation of Government, broadcasters, and the radio manufacturing industry.

War interrupted development of television as a commercial service. Of necessity, men and materials were diverted to the war effort and must continue to be so diverted until victory has been achieved.

Better Service to Public

The policy of the National Broadcasting Company always has been, and will continue to be, to foster and encourage any developments in the broadcasting field which promise *better service to the public*.

In respect to television, it is the policy of NBC to contribute to the utmost towards the *earliest possible development* of television as a national service and industry.

A deep and firm foundation for the ultimate television achievement already has been laid. For the past 15 years the National Broadcasting Company has actively pioneered in the development of television service.

Television Since 1931

NBC was granted the first commercial television license issued by the FCC, and began commercial operations on the day the license was granted, using the New York Empire State Building transmitter which NBC had been operating experimentally since 1931.

Currently we are maintaining a limited schedule of weekly television broadcasting, including films, outside pick-ups of sports events, and telecasts from our recently reconditioned live talent television studio in Radio City, New York. Our program schedule will be expanded as rapidly as war conditions permit.

NBC Sound Broadcasting to be Continued

Because of its extensive coverage and accepted type of highly developed program service there is no foreseeable period when sound broadcasting will become unnecessary. Therefore, NBC will continue to maintain its sound broadcasting services at the highest peak of technical entertainment and educational excellence.

Radio now is virtually an around-the-clock service. Even when television becomes universally available, there will be times when the radio audience will be predominantly *listeners* rather than viewers.

New Dimension for Radio

Television is the capstone of the radio structure. It adds a new dimension to radio. So you can logically expect NBC, as America's Number One Network, to bring you the finest television programs just as you look to NBC today for the finest in sound radio.

NBC is committed to a policy of close co-operation with the Government and other members of the industry in the efforts to secure the best practical standards of operation for a commercial television broadcasting system.

In developing a basis for an eventual television network, the National Broadcasting Company will co-operate in every way with the owners and operators of the stations affiliated with NBC.

NBC Prepares for Expansion

In preparation for the expected expansion of television services in the post-war period, NBC will continue to tap new sources of program material and talent, develop new program techniques, transmit outside pick-ups of sports and other spot news events, telecast more live talent programs and continue research and development in all phases of television.

When materials become available, NBC will construct a television station in Washington, D. C. To establish the anchor points of a television system, NBC has also filed application with the FCC for construction permits for television stations in Chicago, Cleveland and Los Angeles, where NBC already maintains a programming organization and studio facilities.

A nationwide network will not spring up overnight, but must proceed as an orderly, logical development. Such a development, as we see it, will develop first by the establishment of regional networks which will gradually stretch out over wider areas, and finally become linked together.

Moderate-priced Television Sets

Despite the problems and risks which confront the radio industry, NBC believes that television service should be brought *as soon as possible* into every home, and that this is and should remain the task of private enterprise.

While NBC is leading the way in development of network television, the radio manufacturing industry will be busy building the finest television broadcast equipment and television receivers at moderate prices.

Through this unity of effort, you can count on NBC to meet the challenge and the opportunity television presents.

National Broadcasting Company

America's No. 1 Network



A Service of Radio
Corporation of America

MAGNETRON

(Continued from
Page Twenty)

oscillations of higher frequency. In this so-called "higher order" mode of oscillation the frequency is not closely related to the characteristic frequency of the electron (as in the case of the single anode magnetron), nor is it determined solely by the external tank circuit. Since the electrons must follow circles of smaller diameter, the flux necessary for this method of operation must be greater than for the critical value of plate-current cut-off.

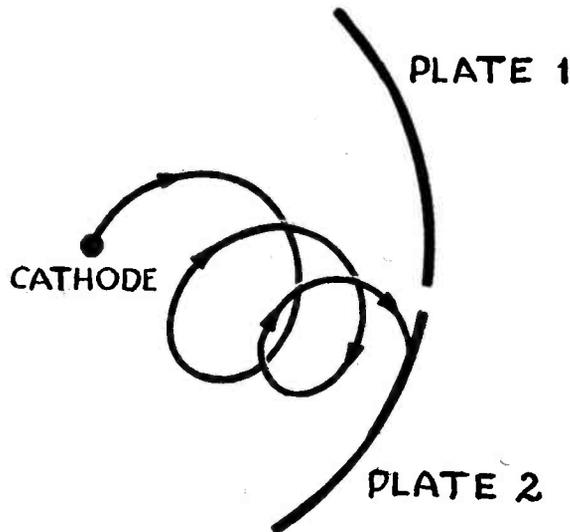


Figure 5—Spiral Trajectory Path of Electron within a Magnetron, illustrating the production of "high-order" oscillations.

The order of oscillation and the efficiency of the magnetron oscillator can *both* be increased by subdividing the anode into *more* than just two segments. Magnetrons having three segments exist; but such special-purpose tubes generate *three-phase* u-h-f currents, and are seldom used. Magnetron anodes are generally divided into even-numbered segments, and the segments are usually arranged in pairs.

A magnetron having four segments and a balanced oscillatory tank circuit is shown in figure 3. Such a device permits the generation of u-h-f waves as short as 5 centimeters, but the efficiency of such magnetrons is seldom greater than about 50 per cent.

Magnetrons having four or more anode segments are referred to as slotted anode magnetrons. As the number of anode segments is increased, both the operating wave length and the efficiency of the magnetron are lowered. Specially designed magnetrons of the slotted anode type, using "high order" oscillations and appropriate tuned circuits, are capable of generating radio waves as short as 1 or 2 millimeters.

Returning to the theory of electron flow in magnetron operation, let us consider a modification which can be made to all types of magnetrons when required. Electrons which *absorb* energy from the oscillatory tank circuit are quickly removed from the interelectrode space by striking either the

cathode or anode electrodes, while those electrons which *give up* energy to the tank circuit remain in the interelectrode space and continue oscillating. Since these latter electrons suffer a progressive phase shift, they may finally oscillate in such a phase as to *absorb* energy. To eliminate this disadvantage in many magnetrons and thus obtain a higher operating efficiency for the magnetron, some means may be provided for removing "spent" electrons from the interelectrode space. For this purpose positively charged "end plates" are employed on certain magnetrons to impart an *axial drift* to the electrons so as to remove them after most of their energy has been yielded to the oscillatory tank circuit. Such tubes are known as "end plate magnetrons".

We have thus concluded a general introduction to the theory of operation of the magnetron. For its exceptional capabilities in generating ultra high frequency oscillations, the magnetron—in its various forms and types—is destined to play an important part in the vast post-war development of microwaves. Increased use of the ultra high frequencies by military, naval, and air forces already has eliminated many of the earlier (pre-war) imperfections and limitations of the magnetron—such as extreme bulky weight, instability of operation, et al. Upon the cessation of hostilities and the consequent removal of secrecy restrictions on war-time u-h-f development, the magnetron will be found to lead all other types of microwave generators—as the most efficient and reliable means of obtaining ultra high frequency oscillations.

A Comprehensive Bibliography on the Magnetron

Compiled by: Jordan McQuay

A compendium of reference material is given below on the general theory, technique and operation of the Magnetron. This list provides the only authoritative sources for strictly technical information concerning this specialized subject, since few individual technical books or publications contain such a profundity of reference material on the Magnetron.

The references given are for articles published in the United States and Great Britain, giving the name of author, title of work, volume and issue number and date of each periodical.

A similar listing of technical articles published in languages other than English would occupy a space roughly *four times* as great as that of the references below. In this respect, Japan, Germany and Russia lead all other countries in the dissemination of technical information on the Magnetron. It is interesting to note that Japan, prior to 1941, published a phenomenal number of technical articles (many of which appeared in the English language) on experi-

(Continued on Page Twenty-four)

FLASH! Step right up, folks, and meet . . . MISS VIRGINIA TATUM . . . THE PRIDE OF 'PTF! She's the PROGRAM DIRECTOR, fellas—and a fine job she's doing, too. Born in the midst of text books and absent-minded professors at College Station, Texas, home of Texas A&M, "Gena" was beginning to enjoy the wide open spaces when she moved to Raleigh in 1928. Becoming citified was a hard task, but successfully accomplished after a degree from Women's College of the University of North Carolina. She has always been interested in dramatics and has



Miss Virginia Tatum

had much success in starring roles at WCUNC and the Raleigh Little Theater.

Miss Tatum joined the WPTF staff in June 1941 as the "Zesta Girl" on the pre-war "Strietmann Street-man" show. In August of the same year she became a continuity writer and was upped to head of the department the following January. Since then there's been no stopping her! When "Pappy" Poyner (Lt. Graham H. Poyner) entered the Navy in December, 1942, "Gena" succeeded him as Program Director for the duration. That she has filled the position capably and well is to her great credit.

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(Continued from Page Twenty-two)

mental work in the field of Magnetron research. More individual articles were published by Japan alone, than by all other foreign countries combined; and Japan published roughly *five times* as much technical data on this subject as did the United States—prior to December, 1941. This, of course, is no accurate barometer of research on the part of any country, since many technical discoveries in this field likely to be of importance to the national welfare of any country were not published by these countries (including the United States) during the years just preceding this war.

A study of the reference bibliography below yields a number of interesting points.

The earliest published information in the field of what is now known as Magnetron Oscillations was published by I. Langmuir in 1913. However, it was not until after the publication of the articles by A. W. Hull in 1921 that serious experimental attention was given the subject of the Magnetron.

For reasons of security, technical articles of importance on this broad subject have not been published since the outbreak of war. With the coming of peace and the lifting of this restriction, however, many new amazing and startling developments in the field of Magnetron research and development may be told to the general public.

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Book Review

Ultra-High-Frequency Radio Engineering by W. L. Emery MacMillan Co., 6" x 9", 295 pages, \$3.25.

An excellent text that had its root in the MIT Electronics Teachers' Conference in 1941, followed by a year and a half instruction by the author at Iowa State College in "Ultra-high-frequency Techniques. The text offers an introduction to microwaves, their properties and applications to communication. Chapters are devoted to Voltage-regulated Power Supplies, Electronic Switching and Synchronization, Cathode-ray Tubes and Sweep Circuits, Amplifiers, Square-wave Testing and Transient Response, Ultra-high-frequency Circuit Elements, Oscillators, Modulation and Detection, Radiation, and Wave Guides.

Recommended to those who didn't have the opportunity to attend the ESMWT U-H-F course, and also recommended as an excellent refresher for the many who took the course. Well illustrated and indexed.—Ed. S.

E. J. (Al) Eisenmenger has recently joined the Dancer-Fitzgerald-Sample agency, where he will handle the management and technical direction of their radio recording studio.

For the past 14½ years he was with National Broadcasting Company in Chicago as studio engineer. Starting with NBC in 1930, he is one of the two original NBC studio engineers and has been close to the development of radio and the growth of the network.

He will remain in Chicago with D-F-S in handling their radio recording studio work.

On September 1st a Western Electric publication well-known to the radio industry before the war as "Pick-Ups" once again made its bow under the new title, "The Western Electric Oscillator." Including a bright cover done in the war theme by artist Paul Rabut, the publication presents 36 pages of technical and allied information of interest to broadcasting and electronic people. The editor is Will Whitmore with Vance Hilliard, assistant.

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National Convention
October 23-27
Hollendon Hotel
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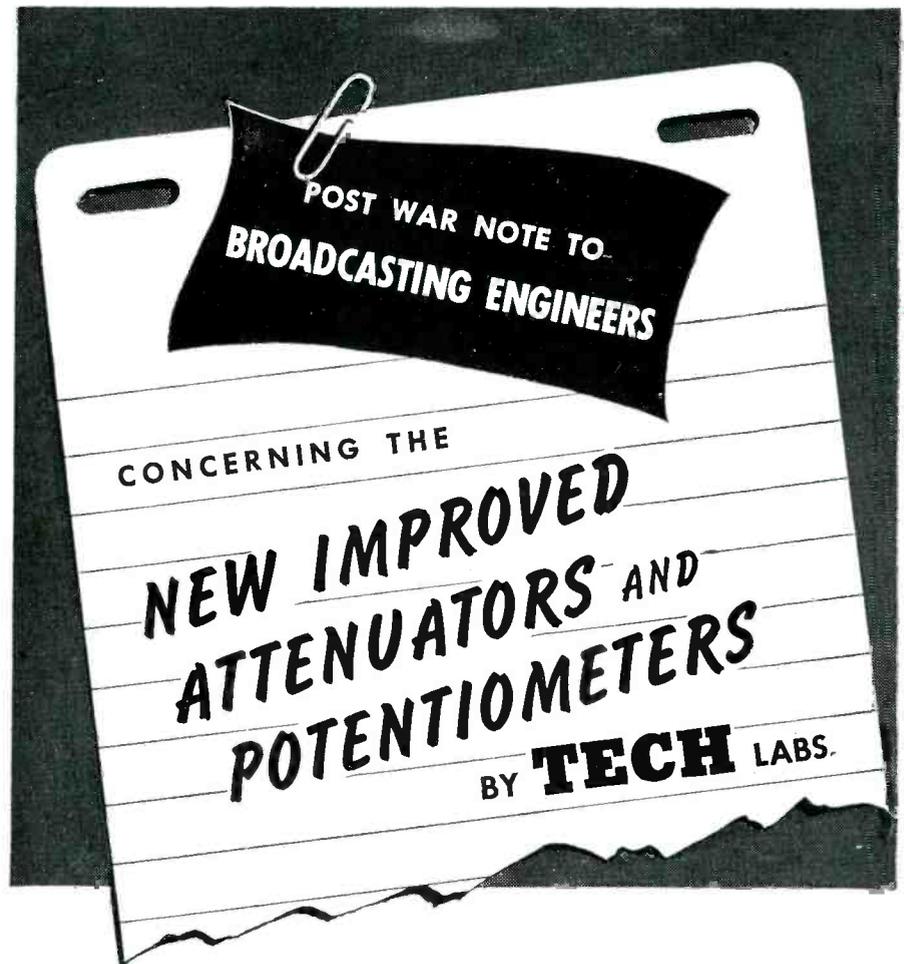
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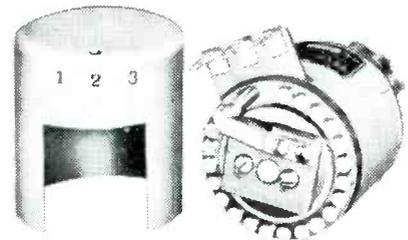
It has been our pleasure to "greet" and meet during the past month, W. E. Gilman, V.P. of Permoflux Corp.; Ray Bierman, Chief Engineer of Permoflux Corp.; Major Ed. Bernheim, Chicago NBC engineer-on-leave; Rex Coston, WPTF SE; Al Stuart, WRAL FE; Dick Poe, Carolina Power & Light; Lewis Parrish, Manager of Wynne Radio Co., Raleigh, just completed installation of WQLY, FM, for the Raleigh Police; former television technicians at WNBT, Stoddard Dentz and Dorman Albert (with charming wife in tow) now serving Uncle Sam; Al Isberg and R. Beardsley Graham, television engineers on leave; Jim Brown, USNR, former Nabet Prexy; Al Powley, Nabet Prez, virtually pushing Nabet ahead thru sheer expenditure of time and effort, in and out like a cyclone (see Washington Column, this issue); J. R. "Russ" DeBaun, Lt. USNR, now stationed at the Brooklyn Navy Yard and doing a swell job as usual; as we go to press, G. M. "Jerry" Sellar, world-traveler and former Nabet Prexy, just stepped off the plane from Istanbul, Turkey; and R. Beardsley Graham just stopped by to advise that he has left his position as Staff Member, MIT Radiation Lab to accept a position as Research Engineer with the Lewyt Corp., Brooklyn, where he will follow thru on the production of secret electronic equipment developed while at MIT; he is expected back in the television fold after the Victory. Last, but by no means least, Tom Gootee, veteran soldier of fortune, of Gran Chaco and Spanish Revolutions, British Flying Cross for his part in the early bombing of Bremen and Berlin, veteran of Dieppe, still able to smile!

Drop the Editor a line if you plan to visit the big city, we'd be glad to say "hello" and talk shop, women, the Journal, Nabet, etc.!

Broadcast Engineers' **27**
Journal-October, 1944



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Station WUHU Broadcasts from a Log Cabin

By Bert Pruitt

THE bigwigs at radio station WUHU decided to do something different. The idea was hatched in the fertile mind of Manager (Miss) E. T. Platter. After giving this idea considerable thought, she called an executive meeting in her office.

Millie McFader, Special Events, Announcer Sadies Condenserphone and Chief Engineer Josephine Ozite listened while WUHU's dynamic manager explained her idea of a special events program that would make WUHU's listeners sit up and take notice. Three heads nodded in perfect agreement with Manager Esther T. Platter. There would have been four heads nodding, instead of three, except for the fact that Miss Spark Gap, WUHU's Program Czar, was taking the afternoon off to get a permanent wave.

"You are a genius!" exclaimed Sadies Condenserphone.

"A stupendous idea!" agreed Millie McFader.

"Terrific!" said Josephine Ozite. "But where will we get the A.C. for the broadcast?"

While WUHU's potentates are solving the A.C. problem we shall attempt to pass along the information that manager E. T. Platter loves nothing better than to sandwich a paragraph or two, from a well written historical novel, between her daily conferences. This form of relaxation, she believes, gives one the steady nerves and confidence essential to the intelligent management of an up-and-coming radio station. One of the historic novels she read was a well written book that gave a detailed account of the daily trials and hardships encountered in the wilderness by our hardy pioneer ancestors. From that sentimental story came the idea that materialized into a most unusual broadcast.

"Why not," thinks she, "broadcast from a log cabin at midnight?" The more she thought of the idea the more enthused she became. And she knew of an ideal place to stage the broadcast. That old log cabin out there on the hill near their transmitter would be just the place! At this point manager Esther T. Platter called the executive meeting that was in session while we were writing the second paragraph of this story.

The A.C. problem proves to be simple enough. Lines would be strung from WUHU's transmitter to the log cabin. Program and cue circuits would follow the same route. The broadcast was scheduled for the 25th of April. Publicity was released to the newspapers and the news-starved radio editors made generous use of adjectives. Managers of the rival stations bit their fingernails when they saw the million-dollar WUHU write-ups. And they lost very little time making statements to the effect that there'd be some changes made in their publicity departments unless certain persons soon showed indications of getting the lead out of their pants.

Charley Ames read about the forthcoming broadcast. That gave him an idea. Why not have some fun for a change? "Yes," thinks he, "there's far too much seriousness in this troubled world today . . . why not put a little humor into it?"

Charley was as good as his word. He explained his idea to Jerry Jerome and Tony Anthony. I cannot hope to repeat the explanation word for word but here's the general idea. Why not give WUHU's female broadcasters a thrill they'd remember in the years to come when they'd be singing "Rock-a-Bye-Baby" to their gurgling grandchildren? It could be done, according to Charley, in the following manner: WUHU's Log Cabin broadcast was scheduled to take the air at midnight on the 25th of April. Charley says it gets dark at 6:52 P.M., in Cuyahoga County, on the 25th of April, so that would leave approximately five hours between the time when darkness fell and broadcast time . . . A lot of things can happen in five hours. One can install a PA system in the woods near a log cabin in less than five hours. Freddy Wilson promised Charley the use of his portable E.T. machine and Freddy has all kinds of sound effect records. Charley was especially interested in the one that reproduced the "Whoot" of an owl . . . and the one of the roaring lion offered excellent possibilities. That, explained in my own humble way, is the general idea of Charley's plan to put more humor into a sad and troubled world.

The days go by and we realize the sun is setting behind the rolling hills that lie due west of State Highway No. 21. An automobile, with three occupants, is parked near the apple orchard where Snow Road joins State Highway No. 21. A glance at our calendar shows us that is the 24th of April.

"Charley," says Jerry Jerome, "it will soon be dark!"

"And it's a perfect night!" Tony Anthony is talking.

"Yes," agrees Charley Ames, "and we'll give 'em a thrill they won't soon forget!"

Let's leave the three pranksters and find out what's taking place in the log cabin three hundred yards down Snow Road.

A peek through the cabin's window shows us that Manager E. T. Platter is spearing a hot dog with a birch limb. She places it over the glowing coals in the cabin's ancient fireplace and makes the statement that she's never been hungrier in her life. Chief Engineer Josephine Ozite is munching marshmallows as she gazes at her equipment. She's all set-up and ready to go. The girls at the transmitter have informed her that her quality is perfect. Millie McFader powders her nose with one hand and stabs a hot dog with a twig held in the other. Sadie Condenserphone hears the

eerie cry of a lonely lion and stays clear of the log cabin's only window. A fox barks in a nearby field and manager Platter wonders why she did not think of scheduling the broadcast for noon instead of midnight.

The hours go by and the countryside is blanketed in darkness. WUHU's broadcasters little suspect what is taking place out there in the darkness. What would they think if a little birdie should tell them that Charley and his pranksters have hooked their PA across WUHU's A.C. circuit?

The three men stand over the turntable they have placed on a beech stump in the clearing. They are approximately thirty yards due east of the log cabin. Charley turns his back to the cabin, pushes the button on his flashlight and looks at his watch. "Boys," he says, "it's 11:30 . . . play the record of the owl!"

Jerry slips the record on the turntable and turns the fader wide open . . . "WHOO! . . . WHOO! . . . WHOO!", bellows the loud speaker.

"What's that?" Manager Esther T. Platter turns as white as a sheet.

"Must be a . . ."

"WHOO! . . . WHOO! . . . WHOO!"

"It's a ghost!" moans Chief Ozite.

"WHOO!" bellows the loud speaker.

"That'll teach 'em not to scoop us again!" whispers Charley.

"Yeah!" agrees Tony and Jerry.

"And wait till they hear the lion roar!" Charley chuckles to himself when thinking of the excitement that it will bring.

Our conscience tells us that we would be guilty of withholding exciting news if we failed to let the BEJ reader listen in on the Brecksville party line at this time . . . news, that in all probability, will have a direct bearing on the outcome of this story. Mrs. June Patch Cord is calling her sister-in-law Trudie Baffle Board . . . listen!

"Hello!"

"Hello . . . hello . . . this you, Trudie?"

"Yes, June dear . . . what's wrong . . . you sound like . . ."

"I am . . . the lion's escaped from the Brecksville Zoo!"

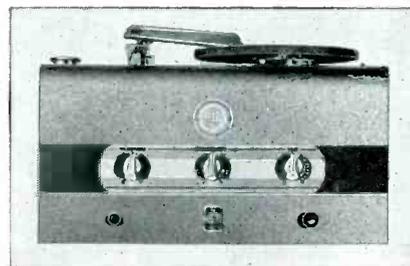
"WHAT?"

"Yes! . . . escaped . . . he's a man eater too . . . broke out of his cage less than an hour ago . . . Art Butler, Glenn Morr, George Molner, John Wilhelm, Bernie Edwards, John Hyatt, Barney Pruitt, Frank Whittam, Russ Russell, Eddie Leonard, Alvin McMahan, Cecil Bidlack, Tommy Cox and John Cheeks left here about ten minutes ago . . . they're armed with rifles, B&L and shotguns . . . they're out in the woods hunting the lion!"

"Why aren't John Disbrow and Jessie Francis out there too?"

(Continued on Page Thirty-one)

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CHICAGO CHAPTER CHATTER

By Arthur Hjorth

NBC BLUE Field Department very, very busy these days. Recent Golf Tournament at Tam O'Shanter with r.f. pickups and stuff had five wizards on the links including Chief Rife. Tickets for everything from free meals to soda pop furnished by George S. ("Sugar") May (see LIFE 9/11/44). A WAC with a JEEP furnished to haul the gang and their equipment around. Surplus war department equipment will include JEEPS, but sans WACs. Carl Cabasin, Alan Scarlett, Harry Maule and Louie Heiden.

The proverbial postman's holiday became a reality for "WOODY" Lahman with Saturday field assignments to Washington Park and Hawthorne.

Supervisor Vernon Mills' travel time



from the Merchandise Mart to the Panther Room of the Sherman is 6 min. and 14 sec. This includes deft (?) picking of the lock when one doesn't have a key.

Additional Councilmen elected were A. D. Aldred at the "Q" transmitter and George (two to one on F.R.D.) Maizer for the nite studio group. Close

aces in remaining groups require another run-off.

Secretary-Treasurer Frank Golder busy adjusting himself to ranch life on his country estate with wife Josephine and daughter Jo Anne with sons Frank and Robert Lee.

Supervisor Glenn Webster appointed by Chairman Bev Fredendall to represent NABET at recent national NAB War Executive convention held here.

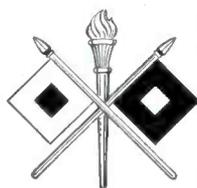
Frank Schnepfer is no longer a Commodore. The S. B. (Sail Boat) DINORO was battered by a recent storm when line parted. Insurance pay off resulted in net gain from four weeks' ownership. When asked if he would use a heavier line in mooring a future yacht Frank said, "No, just more insurance".

Early Bird Lee Tolleson plodding thru James Joyce's "Finnegan's Wake" at the rate of ten pages a week by use of the book by someone else interpreting the modern (?) thought-sounds. Woe the day this gibber is used in radio drahm-ma's.

Television instructor, Clarence Radius, now plans math course in addition to video classes now in session. Apt demonstration of two field cameras and associated equipment by Al Jackson of New York Development has given an added impulse to Chicago's enthusiasm for television.

Hunter Reynolds in the far northwest with the QUIZ KIDS at Portland and Seattle. Will Chicago Field cover the Victory parade in Berlin?

The "Positively One Nite Only" showing of THE GREEN HORNET on WMAQ will NEVER, NEVER be repeated. That's the way the twenty-three people involved feel about the whole thing.



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WUHU BROADCAST

(Continued from Page Twenty-nine)

"They're at the Zoo to close the cage door if the lion should decide to run back in!"

"Oh!"

"I'll scream if he looks in my window!"

"Me too! . . . well, I'll call if I hear anything more."

"Me too . . . g'bye."

"Now," says Charley Ames, gazing at the window in the log cabin, "let's play the record of the roaring lion!"

"OK, Chas," whisper Jerry and Tony.

A mighty roar shakes the countryside. The roar of the meat hungry lion is followed by a terrible gurgling sound.

"Jeepers!" says Charley, "I'm sure glad I know this sound is coming from a record . . . say . . . which one of you guys is tickling the back of my neck with a whisk broom?"

"Not me," answers Jerry.

"Me neither," says Tony.

"Bbbboys," stutters Charley, "dddoo you hhhhear some- one yyyawning hbbbehind me?"

Charley slowly turns and points his flashlight directly behind him and pushes the button. What he sees makes him gasp. He is looking straight into the horrible face of a huge lion! The lion's mouth is wide open and it looks like the Grand Canyon from where Charley is standing . . . Charley can see at least a yard down the man eater's throat and what teeth and eyes! The eyes seem to be on fire and those rows of teeth remind Charley of his grandmother's picket fence. The lion throws back his head and rocks the hillside with a blood-curdling roar!

Now let's see what is happening in the log cabin. One of WUHU's transmitter engineers has just given Chief Ozite the G.A. "Goodness," shudders WUHU's female transmitter engineer, "what a strange way to start a nemo . . . I had no idea our Chief could roar like a lion!"

"Lad . . . ladies and gentlemen," begins announcer Condenserphone, "ssss . . . st . . . strange things are hap-hap- happening out here in this log cab . . . cab . . . cab . . ."

Announcer Condenserphone gets no further. The cabin's barricaded door flies from its hinges and three men dive head first into the cabin. The fierce face of a lion fills the cabin's doorway. Terrifying screams make WUHU's transmitter groan.

"TIGERS!" screams announcer Condenserphone.

"WILDCATS!" contradicts manager Esther E. Platter.

"PANTHERS!" wails Chief Ozite.

"HELP!" pleads Millie McFader.

"LIONS!" moan three pranksters.

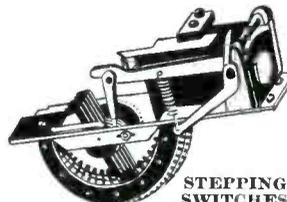
The man eater leaps! Who will he tear to shreds first? Alas! fifteen shots are fired simultaneously and the lion falls dead on the cabin floor.

"Boys," says Art Butler standing in the doorway with a smoking shotgun, "we were almost too late!"

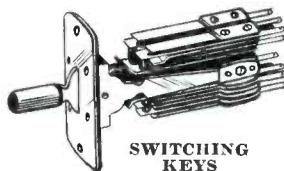
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OMAHA NEWS

By Roy Glanton

JOE HEROLD, Studio Supervisor, will spend the month of October in New York, attending the RCA Course on television. WOW is the first (and only) Omaha station to apply for a television license.

Roy Glanton, Transmitter Supervisor, presented John Gillin, Prexy of WOW Inc., with a basket of fresh vegetables from his victory garden. Along with it went a 42 pound Tom Watson watermelon. Nebraska isn't a very good state for growing watermelons and the size of this one isn't due to any special effort on Roy's part. It wasn't irrigated and had no fertilizer, must have been WOW's R. F.! Picture next time. Marguerite, Roy's better half has been busy canning the good things from the garden and the old larder is well stocked for the time, when the snow flies. Dillard, 13-year-old son, is secretary of a local 4-H Club and has won his share of honors with his secretary's book, winning first prize at a 6-county fair, out of 15 entries. And second prize at the State Fair, out of 75 entries.

Bob Rudd and Edine, celebrated their 13th anniversary September 26. Congratulations, and we hope you have many more.

Beuford Eaves, Chief at KODY, spent several days in Omaha, watching the wheels at WOW turn.

Bill Kotera, Chief at WOW, treated the fellows to a fine steak dinner at Marchio's September 12.

Fred Frye, vacation relief opr., underwent an emergency appendectomy and almost didn't make the grade. But we are happy to report that he has now fully recovered.

The U. P. Show has moved back to the Masonic Temple auditorium. It was abandoned during the summer because of not being air-conditioned.

Glenn Flynn is handling the field equipment for pick-up of Gov. Dewey's Campaign Activities, while on his sojourn in Nebraska. "G" starts his 10th year at WOW October 1.

The WOW Annual Picnic was held September 11, some 45 members attended. Games were played, a good meal was served and everyone had a good time. John Gillin did too, until—in a moment of strenuous effort trying to get under a volley ball, he stretched a muscle in his leg, which

resulted in a painful injury and at this writing, is laid up. Here's hoping for a speedy recovery, John.

Cy Hageman started his second year at WOW September 27.

NEW TUBES

RCA has recently made available to equipment manufacturers against WPB rated orders two new electron tubes as follows:

The 6AL5 is a miniature twin diode featuring high permeance. Because of this feature, the 6AL5 is particularly suitable for use as a detector in circuits utilizing wide-band amplifiers. In such circuits, the low internal resistance of the 6AL5 makes it possible to obtain increased signal voltage from a low-resistance diode load. Each diode unit has its own plate and cathode base-pin connections and can, therefore, be used independently of the other or combined in parallel or full-wave arrangement. The 6AL5 is an Army-Navy preferred type.

The 6F4 is an acorn triode of the heater type intended for use primarily as an oscillator at frequencies up to about 1200 megacycles. Operation of this ultra-high frequency is made possible by a close-spaced electrode structure and the use of a radial 7-pin base which provides two connections each for plate and grid. Because of the close spacing, the 6F4 has high permeance, and because of the double grid and plate leads, it has reduced lead inductance—features essential to high-frequency operation.

At moderate frequencies, a single 6F4 operated in class C oscillator service with 150 volts on plate is capable of giving a power output of approximately 1.8 watts. At 1200 megacycles, and with 100 volts on plate, approximately 45 milliwatts can be obtained.

The 1P29 is a gas phototube of particular interest for colorimetric applications because its spectral sensitivity characteristic approximates that of the eye. Its spectral response occurs over the spectral range from about 4000 to 8000 angstroms, with maximum sensitivity at approximately 4200 angstroms. Its sensitivity at maximum response is 0.10 microamperes per microwatt of radiant flux.

The 3B25 is a xenon-filled, half-wave rectifier tube employing a rugged construction which permits operation under conditions of severe vibration. Because of the xenon gas, the 3B25 can be operated under conditions where ambient temperatures in the order of -75° to $+90^{\circ}\text{C}$ are likely to be encountered. The 3B25 is capable of withstanding a peak inverse anode voltage of 4000 volts and of delivering an average anode current of 0.5 ampere.

The 1P28 is an ultraviolet-sensitive, high-vacuum, 9-stage multiplier phototube utilizing electrostatic focusing. It has the same size and general appearance as the type 931-A but is constructed with a special glass bulb which transmits radiant energy in the ultraviolet region down to

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about 2000 angstroms. Featuring small size, rugged construction, enormous sensitivity, freedom from distortion, low noise level, and extremely low dark current, the 1P28 is intended for scientific research and specialized applications where very low ultraviolet radiation levels are involved.

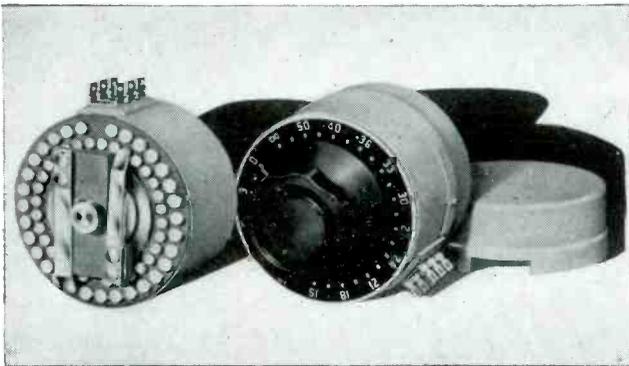
The 2D21 is a miniature, four-electrode thyratron of the heater-cathode type intended for use in relay and special applications. It features the same ratings as the bigger type 2050 and is capable of handling an average output current of 100 milliamperes in continuous operation. Its steep control characteristic is essentially independent of ambient temperature. The extremely small pre-conduction currents and the very low grid current permit the use of a high value of grid resistor to give high circuit sensitivity. Where compactness of equipment design is an essential requirement, the 2D21 offers special advantages.

The 6AQ6 is a miniature multi-unit tube containing two diodes and a high- μ triode in one envelope. Many of its electrical characteristics are the same as those of the metal type 6Q7, but the 6AQ6 requires only half the heater current and has appreciably lower grid-cathode and plate-cathode capacitances. The 6AQ6 is designed for use as a combined detector, amplifier, and automatic-volume-control tube. Its miniature size (without sacrifice in performance) facilitates the design of small compact receiver units.

An improved line of the Famous Attenuators, featuring a new detent gear, new materials and new type steel cover, has just been announced by The Daven Company, 191 Central Avenue, Newark 4, New Jersey.

The new Daven detent gear provides more positive action, greater degree of accuracy, more uniformity in operation, longer life and a stronger stop mechanism.

Contacts and switches of these attenuators are made of tarnish-proof silver alloy, giving uniform and definite elec-



trical contact. It should be of interest to note that the cleaning and lubricating of the contact points are now completely eliminated.

The new type steel cover provides improved magnetic shielding. The body of the cover forms an integral part of the attenuator assembly, protecting the resistors. A snap-on cap gives ready access to switch blades and contacts.

Preferred by leading laboratories and accepted by the United States Signal Corps, Navy and other governmental agencies, these Daven attenuators are noise-free in operation . . . supply positive values for each setting of the dial . . . and will meet the most rigid specifications for enduring dependability.

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Jap Rubber Seizure May Lead to Better Post-War Tire Fabric

B. F. Goodrich Installs RCA Electronic Units for Setting "Twist" in Rayon Cord

WHEN the Japanese seized the world's chief sources of rubber in the early days of the war, they unwittingly started a chain of developments which may mean better tire values for American motorists when the war is over.

The key to this paradox lies in the fact that it was the necessity for using synthetic rubber that led to the introduction of electronic power heating for processing the textile cord used in tire construction.

These facts are brought to light by the announcement by the Radio Corporation of America that RCA 15-kilowatt electronic power generators have been installed in the Industrial Rayon Corporation plant at Cleveland, Ohio; in the Martha Mills textile plant of the B. F. Goodrich Company, at Silvertown, Ga.; and in the Luzerne Throwing Company plant which is operated by Goodrich at Wilkes-Barre, Pa. The B. F. Goodrich plant is the largest cord tire mill in the United States.

The RCA units will each process several thousand pounds of rayon tire cord daily, doing thoroughly in a matter of minutes a job which took hours for less satisfactory results when former methods were used.

When natural rubber was available for tires, it was customary to use cotton cord in the manufacture of the reinforcing tire fabric. Early experience with synthetic rubber indicated the desirability of a substitution. After much painstaking study and experimentation, rubber company engineers found that rayon cord would generate less heat in the tire, and that it also offered greater strength per unit of weight, making for a lighter tire as well as a stronger one.

But another problem then was encountered. Cord used in tire fabric must first be treated to "set" or balance the "twist," to eliminate its tendency to curl and kink in the process of manufacture. However, no quick and economical method of twist-setting rayon cord was known.

The solution was found in electronic power heating, by means of which it is possible to raise the temperature uniformly and simultaneously in all parts of a non-metallic object or assembly. By placing large spools or cones of the cord in a high-frequency electrical field, it is possible to heat them evenly throughout in 10-minutes, compared with hours by other methods, and equipment and operating costs are substantially lower. Moisture content may be controlled by wrapping each cone in moisture-proof paper before processing. In effect, each spool is "steamed" within its individual paper wrapper, and the twist is set.

These installations are designed for continuous process

operation. The high-frequency power output leads of the generator are connected to copper electrode plates placed above and below a conveyor belt which is about 30 inches wide. A protective housing over the electrodes extends for about 8 feet along the belt. The wrapped spools of rayon cord, which are approximately 12 inches high, are placed two abreast on the belt, which carries them through the electrical field between the plates.

The electrode beneath the belt is a solid copper plate. The upper electrode, positioned just high enough to clear the tops of the moving spools as they pass through, is made of copper gauze to prevent condensation of any moisture which may escape from an improperly wrapped spool. The high frequency voltage between these plates, causes currents to flow in the cord, agitating its atoms and molecules and generating heat by means of molecular friction.

A significant aspect of this new application of electronics in industry, aside from the solution it provides for an urgent wartime problem, is the belief that it will help to produce a superior tire fabric for postwar tires when natural rubber is again available for civilian production.

The electronic power generators which have been installed at Cleveland, Silvertown and Wilkes-Barre are of the same type, RCA Model 15-B, with a capacity for delivering up to 15 kilowatts of power at frequencies ranging from 2 to 10 megacycles.

The unit is primarily designed for high-frequency dielectric heat-processing operations such as the drying and twist-setting of textile yarn and cord, bonding of glued wood assemblies and plywood, and preheating of plastics and compregwood to prepare them for molding.

Special features include a thorough system of protective devices to insure the safety of both operating and servicing personnel and the equipment itself. Carefully engineered design and incorporation of the latest electrical and mechanical developments make the 15-B easy to install and simple to operate.

FLASH!

Nabet President Al Powley reports the technical staffs of WHAM (NBC), WSAY (Mutual), and WHEC (Blue), all of Rochester, New York, have joined Nabet. Mr. Powley has filed for certification with the NLRB.

The NLRB decision in the pending Nabet-Petrillo dispute is expected October 16th—watch our next issue.

1934

1935

1936



1943

1944

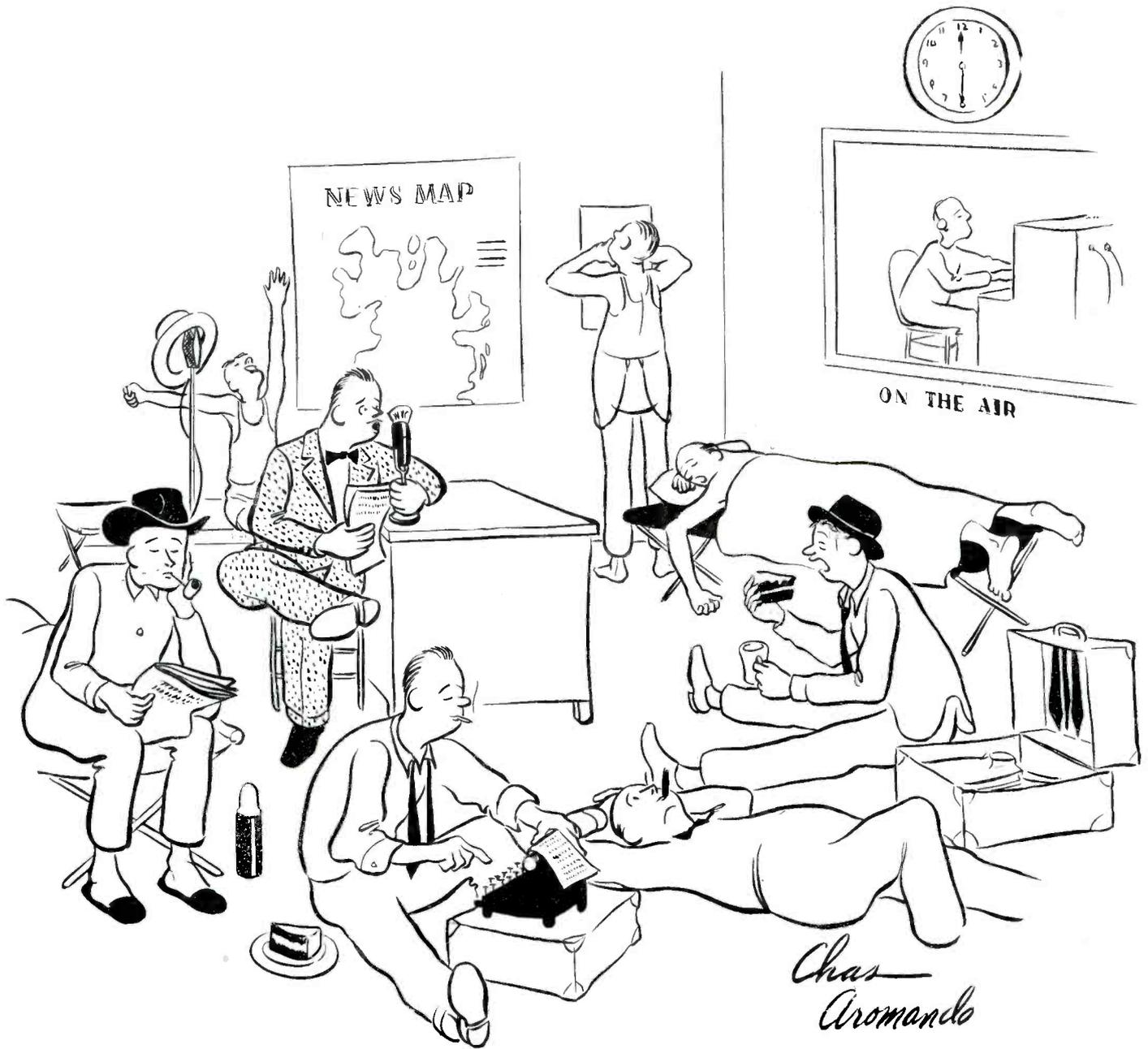
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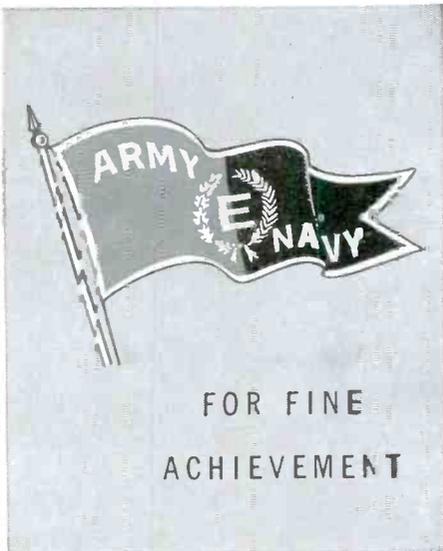


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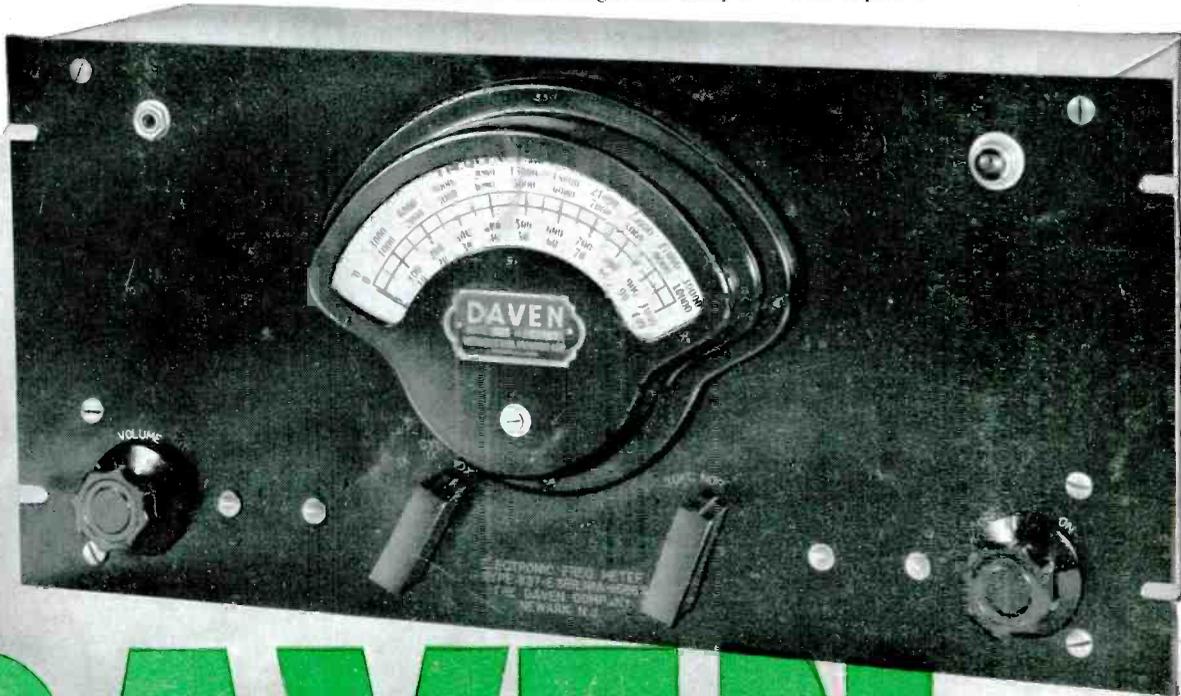
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