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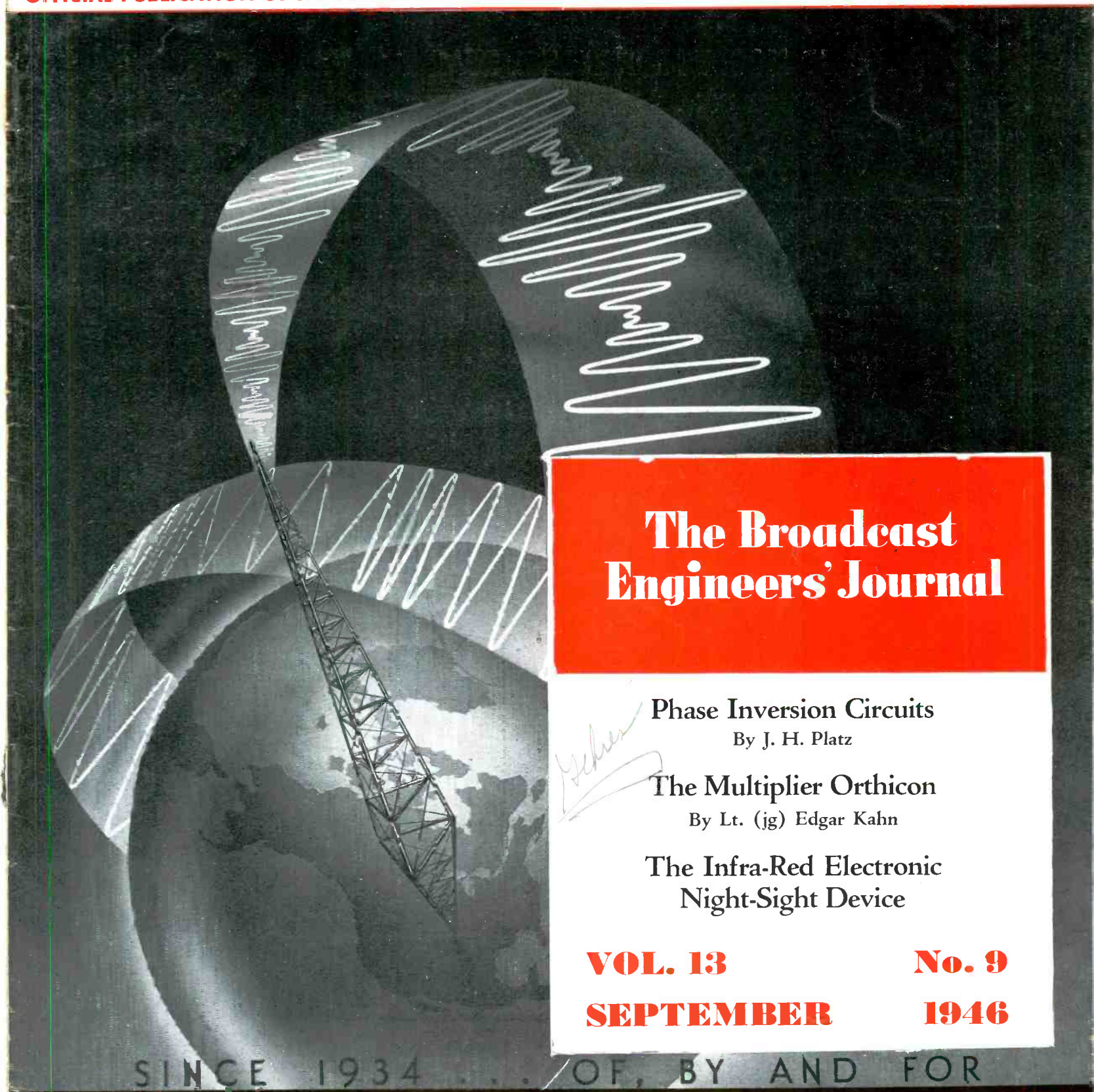

The Broadcast Engineers' Journal

Phase Inversion Circuits
By J. H. Platz

The Multiplier Orthicon
By Lt. (jg) Edgar Kahn

The Infra-Red Electronic Night-Sight Device

VOL. 13 No. 9
SEPTEMBER 1946

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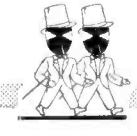

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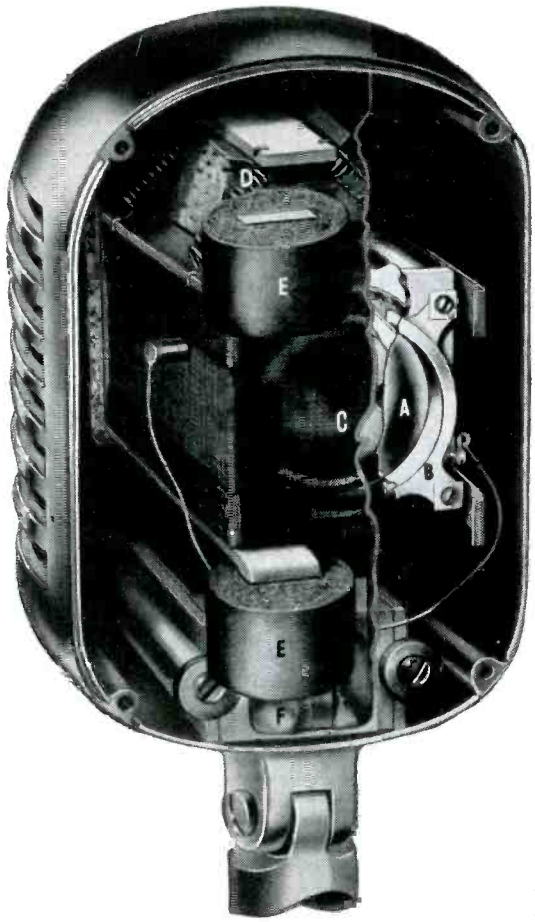

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THE BROADCAST ENGINEERS' JOURNAL

Ed. Stolzenberger — Editor

Volume 13, No. 9 409 September, 1946

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

NABET ACTIVITY

Victories—NABET won the election at Westinghouse KYW, Philadelphia. Contract signed for the NBC Model Shop Engineers. Contracts signed for the RCA-Victor Matrix Group and the NBC Matrix Group. Contract signed at WROK, Reckford, Ill. Renegotiations completed at WOLF, Syracuse, N. Y. Renegotiations completed at WSPR, Springfield. Contracts renegotiated at WMMN, Fairmont, W. Va., and Universal Recording Co., Chicago.

Welcome—The latest additions to NABET's ranks are the engineers at WWNY, Watertown, N. Y., and the engineers at WMSA, Masena, N. Y.—Welcome!

In the Mill—Contract renegotiations at WPTF, Raleigh.

NAB—The Employers' Union, at its recent Virginia Beach session, is alleged by the grapevine to have recommended that Broadcasters no longer attempt to fight the unions, but instead, to work vigorously to wear down the unions in spirit and also financially, by prolonging and delaying negotiations by every device—including sudden out-of-town trips by Management negotiators. If the report is correct, then mere membership in the NAB may be prima facie evidence of wilful non-operation in the Public Interest.

Note—We are trying to locate three small printing plates from our last Yearbook which may have been shipped in error to the wrong NABET Chapter. The missing plates are for Yale Radio (small cut, see p. 84 of Yearbook); Mirandy's Emporium (small cut, see p. 42 of Yearbook); Walter L. Schott Co. (small cut of staple machine, see p. 34 of Yearbook). If any relevant information, please advise Stolzenberger at once.

Trend—Printers Demand Pay Rise (from N. Y. Herald Tribune, 7/46:

"Chicago, July 23 (AP).—The American Federation of Labor International Typographical Union submitted new wage demands today on the union commercial printing houses of Chicago, asking that the present $1.65 hourly pay for day shift workers be increased to $3.02. Slightly higher pay was sought for night workers. Instead of the present arrangement providing overtime up to three hours at time-and-a-half, with double time thereafter, the union asked double time for the first three hours and triple time thereafter. The present contract, which has to run until Sept. 3, 1947, was reopened on the wage issue and negotiations were begun immediately."—We are getting underway right now for our upcoming Yearbook, and an earlier start is planned along with an earlier closing date.

Employment Service—Members seeking employment should immediately contact the NABET National Office.

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

★ SUPPORT NABET 100% OF, BY, AND FOR THE BROADCAST ENGINEER ★

NABET 13th Annual National Council Meeting will be held as provided by the NABET Constitution during the month of October. The meeting will convene Monday, 9:30 a.m., October 14th, through Friday, October 18th, 1946, at the Brown Palace Hotel, Denver, Colorado.

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Phase Inversion Circuits

By J. H. Platz*

IN THE operation of "push-pull" amplifiers it is standard practice to supply the two amplifier grids with approximately identical signal voltages that are presumed to be 180 degrees out of phase. Originally this was done by means of special audio transformers which were generally designed to work out of a single tube plate circuit into the two grids. In this arrangement a centertap is necessary on the secondary winding in order to feed bias voltage to the grids. The use of such transformers for present day needs meets with a number of difficulties. First, a GOOD audio transformer is a large, heavy and expensive affair at best and the difficulties in design of an accurately center-tapped secondary are great. Second, at best it is limited to the "high fidelity" audio range and thus its usefulness is limited. Third, it is often the source of hum pickup. In the course of time a number of vacuum tube phase inversion (or "paraphase")

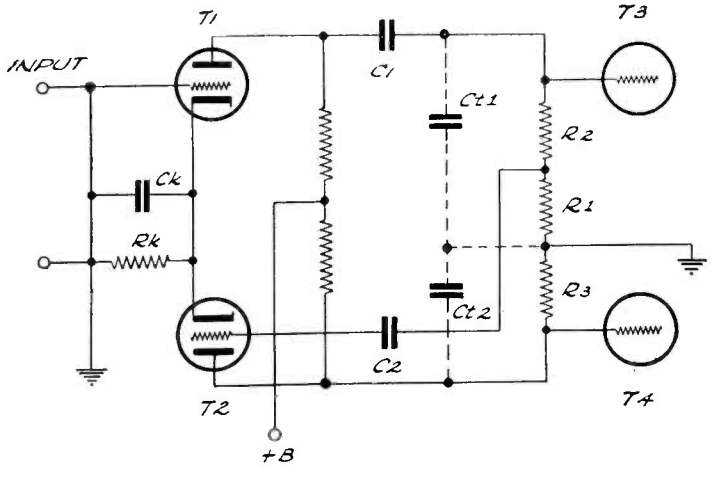

Fig. 1. Basic phase inversion circuit, where R1 plus R2 equals R3, and (R1+R2)/R1=Gain of T2. Ct1 and Ct2 are stray Capacities to ground.

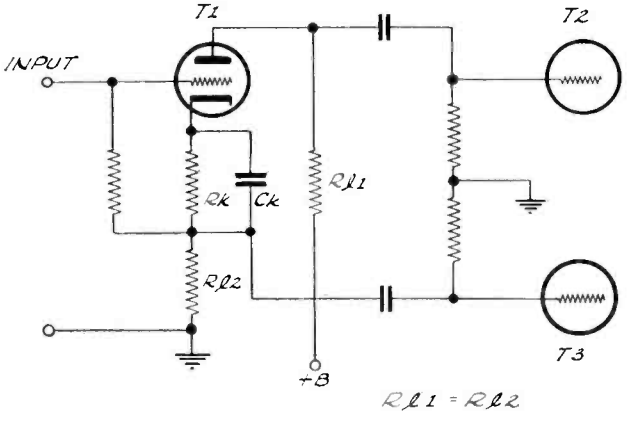

Fig. 2. Single-tube cathode-coupled phase inversion circuit.

circuits have been developed which provide grid driving voltage for push-pull stages without the use of transformers and their attendant limitations. Five such circuits will be considered.

What is probably the original vacuum tube paraphase circuit is shown in Fig. 1. It will be seen that in this circuit the output of T1 appears across the series combination of R1 and R2 and also that R1 and R2 in series serve as grid resistor for T3. Ignoring for the moment the effects of coupling and stray capacities, the voltage across R1-R2 is 180 degrees out of phase with the input to T1. A portion of the output of T1 is fed to the input of T2, the amplitude of this input being determined by the input to T1 and by the ratio R1/(R1+R2). If this ratio is made exactly equal to the reciprocal of the gain of T2, the signal voltage applied to the grid of T2 will be equal to—and 180 degrees out of phase with—the signal applied to the input terminals. The result will be perfectly balanced signal voltages at the grids of T3 and T4. The combination of T1 and T2 provide an overall voltage gain equal to twice the voltage gain of T1 alone. This circuit has given quite reasonable satisfaction and is still quite popular.

There are a number of disadvantages which the circuit of Fig. 1 shares to a greater or less extent with other phase inversion circuits. Appreciable unbalance will result if the gain in either T1 or T2 changes for any reason. This could be caused by a change in characteristics of either T1 or T2, by a change in the load resistor of either tube, by a change in the value of either R1 or R2 and also, to a lesser extent, by a change in R3.

The circuit of Fig. 1 is also subject to considerable phase distortion. A signal applied to the grid of T1 is subject to a normal amount of phase distortion at high and low frequencies before it reaches the grid of T3. However a portion of the signal voltage applied to T3 is fed through T2 to the grid of T4 and in this process the equivalent of an extra stage of phase distortion is introduced. Thus at both ends of the useful frequency range the signal voltages applied to T3 and T4 are not exactly 180 degrees out of phase. A direct result of this additional phase distortion is some additional attenuation at the high and low frequency ends of the range.

In like manner the signal voltage arriving at T4 will have been subjected to two stages of frequency distortion at the high and low frequencies. The net result is a rather complex combination of phase and frequency distortion. As an example, consider the condition when the gain reduction in either T1 or T2 at some extreme frequency is 3DB with the accompanying additional phase shift of 45 degrees each in T1 and T2. The grid to grid voltage across T3-T4 will have shifted approximately 65 degrees with respect to mid-frequency operation while the total amplitude reduction will be about 5DB. The net effect of this distortion can be lessened by designing the circuits of T1 and T2 for operation

* Control Supervisor, NBC Chicago. See "Audio Amplifiers" by Platz, August, 1945, BEJ; "Video Amplifiers" by Platz, October, 1945, BEJ. and "Degenerative Feedback Amplifiers" by Platz, August, 1946, BEJ.

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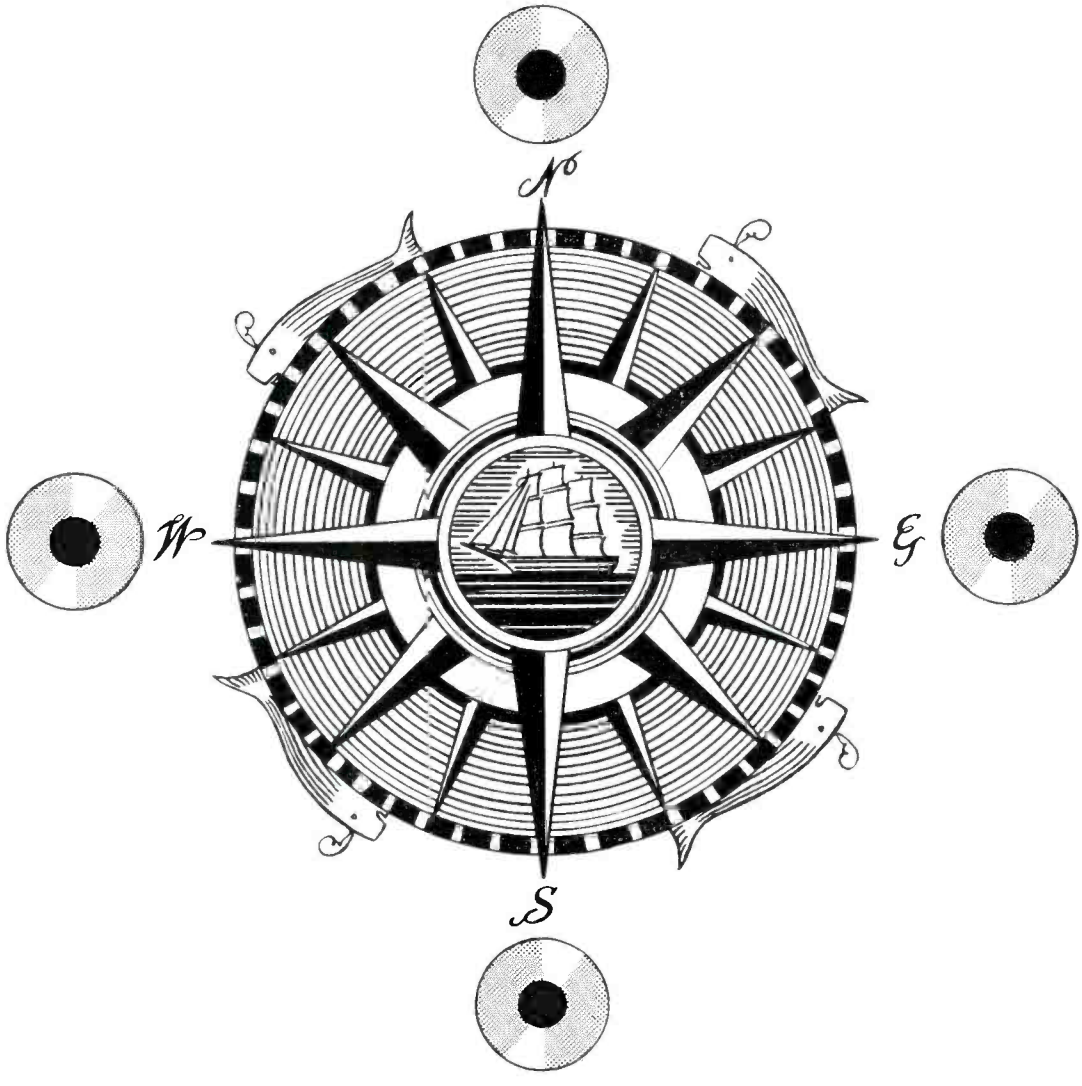

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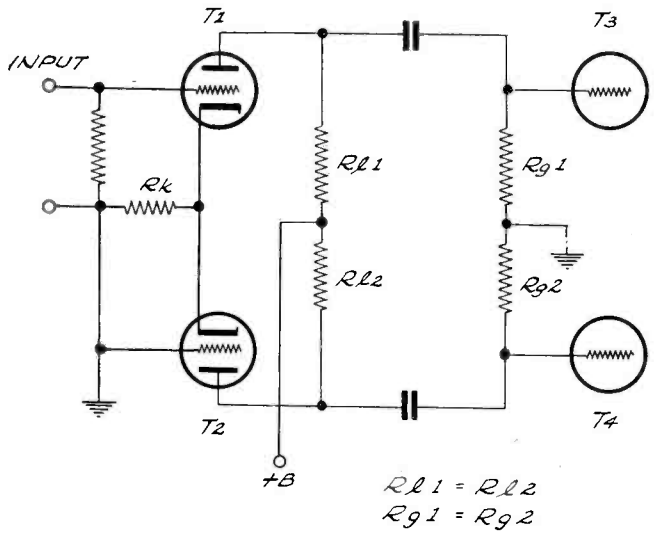


Fig. 3. Two-tube cathode-coupled phase inverter.

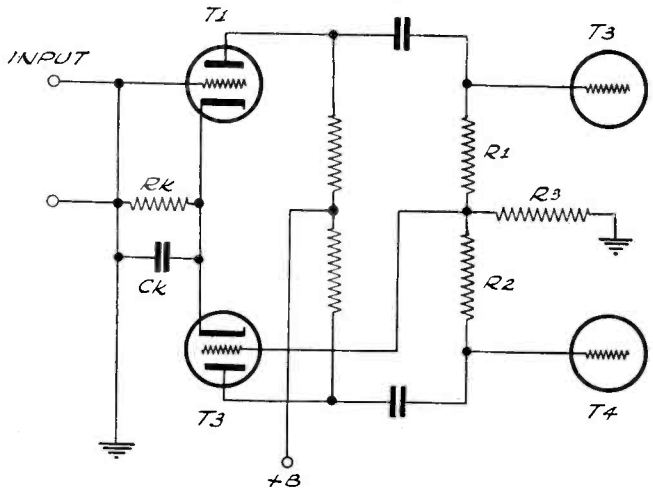


Fig. 4. Floating paraphase. R1 = R2. R3 is smaller than R1.

over a frequency range extending well beyond the range which will actually be used.

In most cases phase distortion is more troublesome than moderate unbalance. Generally the actual amplitude of plate-to-plate output voltage from a push-pull amplifier is more important than whether or not one tube is supplying perhaps 10% or even 20% more than the other tube. Push-pull audio output transformers take output from both tubes and deliver it to a single load. Push-pull deflection amplifiers used in oscillographs merely provide a voltage difference between opposite plates of a pair. In both cases as long as unbalance is not too severe it is the magnitude of voltage difference rather than the matter of exact balance that determines the output. On the other hand push-pull amplifiers in oscillograph use are subject to severe limitations in phase shift since improper phase shift will modify wave forms under observation and defeat the original purpose of the instrument. About the only objection to a moderate amount of unbalance in the output of two tubes in push-pull operation is the fact that such operation does not make maximum use of the output capabilities of the two tubes involved.

Certain phase inversion circuits have been designed with the purpose of holding down phase shift by one means or another. Figure 2 is an example. It will be seen that phase inversion is accomplished by dividing the load resistor into two equal resistors, Rl1 in the plate circuit and Rl2 in the cathode circuit. Signal voltage at the plate of T1 will be 180 degrees out of phase with the input signal while (remembering the cathode follower) voltage at the upper end of Rl2 will be in phase with the input signal. If Rl1 and Rl2 are equal the voltages across them will be equal since the same current flows through both of them. Phase shift to the grids of T2 and T3 will be about the same as for a single-stage amplifier.

In the circuit of Fig. 2, T1 has 50% inverse feedback which results in low gain through the tube. The signal voltage applied to each push-pull grid is slightly less than the signal applied to the grid of T1. With the high percentage of feedback, distortion in T1 is negligible. Since phase inversion is accomplished in the one tube, a change in tube characteristics will not unbalance the output but of course, a change in value of Rl1 or Rl2 will directly affect balance.

The principal difficulty with this arrangement is a difference in incidental capacities which exist across the two load resistors. Since the load resistances are generally quite high, 50,000 ohms or more, appreciable capacity across them will result in phase and frequency distortion at high frequencies and to make matters worse, this distortion will not be identical in the two outputs because of the above-mentioned difference in capacities involved. A decrease in the value of Rl1 and Rl2 will increase the practical upper frequency limit just as was the case in video amplifiers and the gain is already so low that the slight resultant reduction would not be noticeable. All in all, the circuit of Fig. 2 is an improvement over that of Fig. 1, combining good balance with reduced phase distortion.

Another variety of cathode coupled paraphase circuit is shown in Fig. 3. In this case a minimum of phase distortion is accomplished but at some sacrifice of balance. Phase inversion is accomplished in T1 and T2 in conjunction with Rk, the unbypassed cathode resistor. Signal input is applied to the grid of T1 and the grid of T2 is grounded. Here again a variety of cathode loading is used. When a signal is applied to T1 the cathode potential of T1 rises and falls in phase with the input signal and a portion of the input signal appears across Rk. However, since Rk is connected between grid and cathode of T2, the signal voltage existing across Rk becomes the grid input to T2. Furthermore the cathode end of Rk being in phase with the signal voltage applied to T1, the opposite or grounded end of Rk is out of phase with the input voltage and thus drives the grid of T2 180 degrees out of phase with the grid of T1. However the action is not quite so simple as it first seems. If T1 and T2 are truly push-pull with grid inputs of exactly equal amplitude there will be equal and opposite changes of current in Rk, resulting in a constant current in—and constant voltage across—the cathode resistor Rk. A constant voltage across Rk means no signal input to T2. Obviously the final result is that plate current changes in T2 are always less than the corresponding changes in T1 and there will be a certain definite amount of unbalance in the output of the two tubes. However since Rk is always quite low—in the neighborhood of a few hundred ohms—the effect of parallel capacities will be quite negligible. Probably the best testimonial for the circuit of Fig. 3 is its use by Du Mont in

horizontal and vertical deflection amplifiers which are designed to handle input signals having component frequencies up to one megacycle.

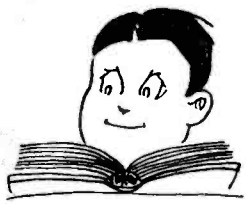
A fourth form of phase inverter, known as the "Floating Paraphase" is shown in Fig. 4. This arrangement employs the differential between the outputs of two tubes as the input to the phase inverter section. T1 is an amplifier to increase the amplitude of the applied signal. The output of T1 appears across the series combination of R1 and R3. For this discussion R1, R2 and R3 will be considered as equals although in actual practice R3 is sometimes as low as 20% of R1. In any event however, R1 and R2 must be equal to each other.

In operation a portion of the output of T1 appears across R3 and is applied to the grid of T2. The output of T2 is applied across the series combination of R2 and R3. Thus a part of the outputs of both T1 and T2 appears across R3. However the outputs of T1 and T2 are out of phase so that the net voltage appearing at point "x" will be the difference between the two individual output voltages which are developed across R3. If these two output voltages are exactly equal there will be no voltage at "x" and no voltage to be applied to the grid of T2. Therefore in operation the output voltage from T2 approaches but never quite equals the output voltage from T1. The unbalance is so small that it can be disregarded in ordinary practice and the inputs to T3 and T4 are considered to be equal and 180 degrees out of phase. This circuit is widely used because of its self balancing properties. Since the voltage at point "x" required to drive T2 will decrease as the gain of T2 is increased, normal practice is to use pentodes at T1 and T2 instead of the triodes shown in the figure.

It might be well to examine the operation of the circuit of Fig. 4 from a somewhat different attack. Assume that a steady sine wave is being applied to the grid of T1. Imagine action in the circuit to be stopped at the instant when the grid of T1 reaches its greatest positive swing. We shall look at the instantaneous voltages existing elsewhere in the circuit at the same moment. Since the grid of T1 is being driven positive, the plate voltage will be driven in a negative direction and point "x" will be negative with respect to ground. This negative voltage will be applied to the grid of T2 and the plate of T2 will go positive. Since a portion of the output of T2 appears at point "x," the tendency will be for it to be driven positive by T2. But at the same instant it is being driven negative by the output of T1. If the outputs of T1 and T2 are exactly equal, the net result at point "x" will be zero and there will be zero grid driving voltage for T2. Therefore point "x" must never be zero (except at the instant of zero input to the grid of T1) and for this to be true it is necessary for the output of T2 to always be slightly less than the output of T1.

The circuit of Figure 4 will show a relatively small but nevertheless definite amount of phase distortion. For audio purposes it is quite satisfactory but it can not be used in high frequency pedestal or sawtooth applications. Its operation can be materially improved by removing the bypass condenser Ck. This change will cause Rk to develop some phase inversion voltage just as does Rk of Fig. 3. As in the circuit to Fig. 3 the voltage across Rk (of Fig. 4) will be insufficient for perfect balance of output but on the other hand there will be essentially no undesirable phase distortion in the voltage developed across Rk because Rk will be only a few hundred ohms. However the voltage developed across Rk is augmented by the unbalance voltage developed at point "x." The improvement obtained by removing Ck comes from the fact that most of the grid input to T2 is developed across Rk and only a relatively small voltage need be developed across R3. Since any voltage appearing across R3 is the result of unbalance in the output of T1 and T2 it follows that a very small unbalance will result in adequate voltage across R3 which is added to the voltage across Rk. Since the major portion of the grid drive for T2 comes from Rk, phase distortion will be considerably less than with Ck in the circuit and this arrangement has been found useful in certain wartime indicating devices.

The phase inverters discussed herein are examples of types of circuits and numerous modifications are possible. For example, the circuits of both amplifier and phase inverter tubes may be modified to include compensation for wide band operation. Again, while the phase inversion circuits as described are of too high output impedance to drive a Class B amplifier, the push-pull tubes might be operated as cathode followers and successfully used to drive a Class B stage.



Now It Can Be Told

By Jordan McQuay

New G. E. Electronics Plant

A university of industry will begin to rise shortly on 155 acres of ground near Syracuse, New York, as the General Electric Company begins construction of its new 10 million dollar electronics plant.

Landscaped like a college campus, the new plant will be known officially as G. E.'s "Electronics Park." From here will flow to the United States and the world a myriad of products which will help bring about that new world of tomorrow — television transmitters and receivers, radar for safety at sea and in the air; f-m radio and wire recording for entertainment; two-way mobile a-m u-h-f radio communications; to mention a few of the many new applications of electronics science — turning a wealth of war-won knowledge into practical peace-time products.

* * *

Shortly before D-Day last year, a swing version of an old French folk tune, "Sur le Pont d'Avignon" was written in England. The new title was, "On the Bridge at Avignon." Hot dance bands blared forth its brisk rhythms in dance halls and over the BBC radio stations, and the song became quickly popular.

Then, almost as suddenly, word came from the underground Maquis in subjugated France to "stop that song." And on the very brink of Invasion Day the song was banned from the air waves without explanation. The original French version of the song continued to be heard occasionally over BBC, however. And the mystery deepened, only to be lost amid the vastly more important news of the invasion.

But recently the ban was lifted. And now — with the BBC air lanes again filled with the swing version of the song — the full story can be told.

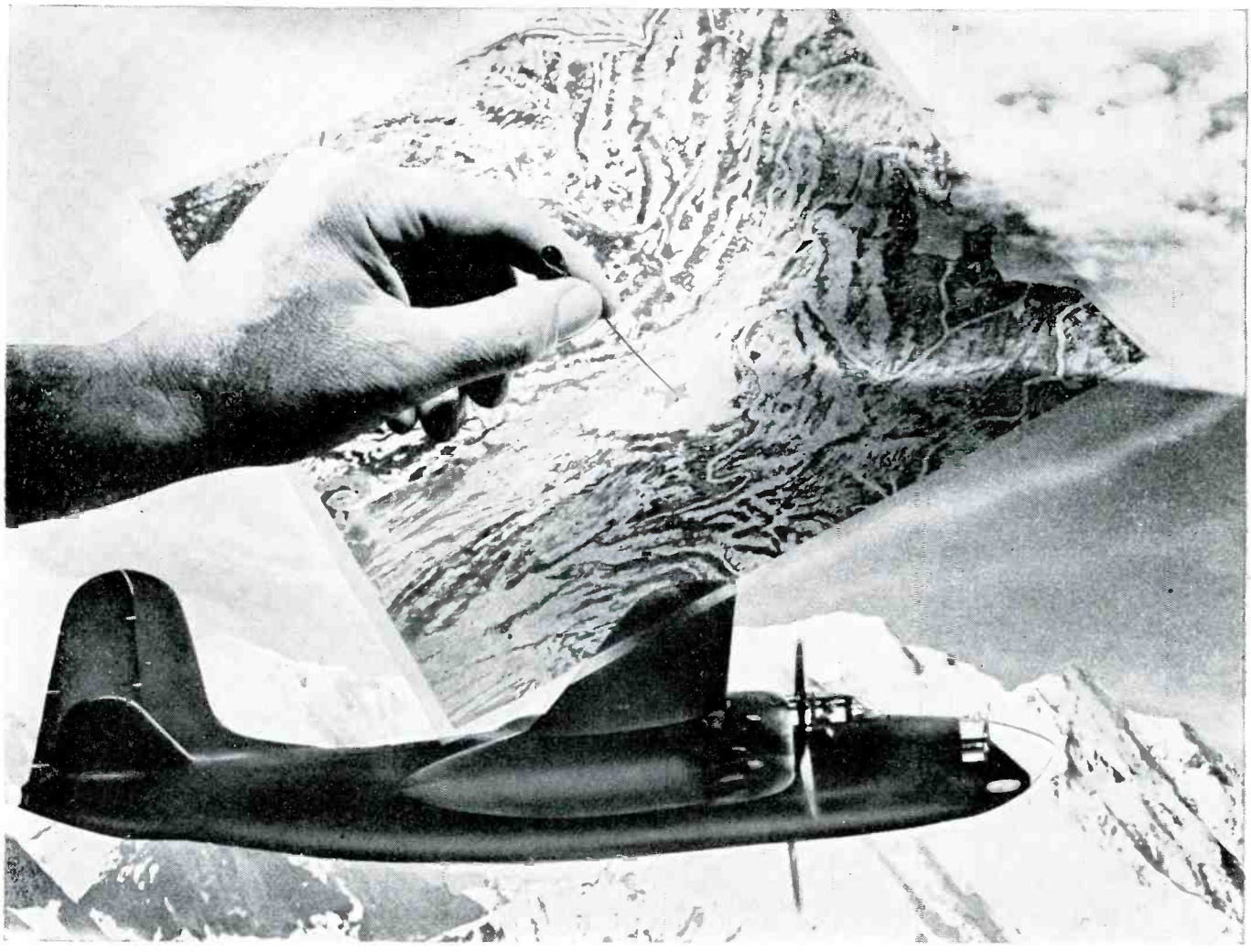
Special recordings of "Sur le Pont d'Avignon" in regular tempo served as a secret signal for all Maquis in France to listen attentively to the BBC. The song was followed by a secret, coded message.

The jive version of the song, it seems, confused the valiant Frenchmen.

* * *

A Southern textile mill, hard-pressed by war orders and short of help, borrowed an Army "inspirational" film to spur its few workers to greater production. The motion picture depicted the

(Continued on Page Ten)



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Until recently a closely guarded military secret, Shoran was developed at RCA Laboratories—a world center of radio and electronic research. Here, in this vast community of scientists, the same imagination and skills that developed Shoran keep RCA and RCA Victor the outstanding names in radio, television and recorded entertainment.

RCA **RADIO CORPORATION of AMERICA**

Army Removes "Night Sight" Devices from Secret List - - - *By Ed Stolzenberger*

ONE of the war's most carefully guarded secrets, a device which made it possible for U. S. infantrymen and marines to find and kill the enemy in total darkness by means of infra-red radiation, was released from the Army's secret list today after British authorities informed London newsmen that the Germans had utilized "night sight" equipment during the war.

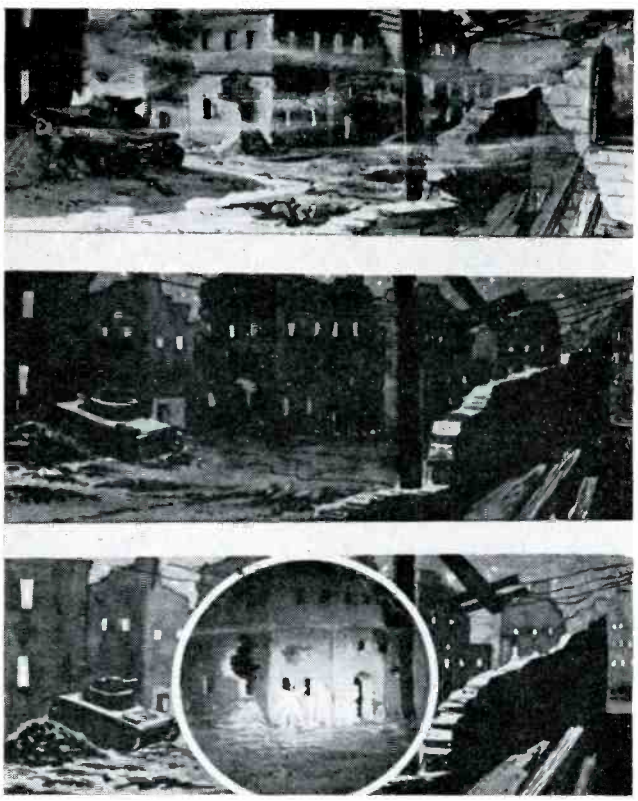
With the secret given away by the British, Army authorities decided to tell the story of vastly superior, lighter, more effective U. S. equipment, produced in quantities unmatched by the Germans. In the hands of U. S. fighters, the night sight instruments were responsible for 30 percent of the Jap casualties in the first seven days of the Okinawa campaign.

The devices came in two models, a sniperscope and a snooperscope, and enabled U. S. fighters to shoot an invisible beam of light into the night, by which means they were able to stop enemy night infiltration. The sniperscope was mounted on a .30 caliber carbine, while the latter, a hand model, was used for observation and signalling.

To the carefully selected enlisted men and officers chosen to use the first batch of equipment in the summer of 1944, they were known by code names, "Milly and Molly." A certain records clerk at Ft. Belvoir, Va., where the equipment was developed, may now understand the impertinence of the officer who wired the head of his section, "Slept with Molly all night."

SNIPERSCOPE IN SEARCHING POSITION

An American soldier presses the handgrip to turn on light of one of U. S. Army's most carefully guarded war secrets. Device permits soldier to see at night by means of invisible light which casts beam but cannot be seen by enemy.



USED IN STREET FIGHTING

Top: Street scene in town in daytime. Center: Same scene at night with unaided eye. Bottom: As seen through the sniperscope. Note how the figures stand out.

In December, 1943, when work was begun on the project, a small handful of officials also literally slept with the equipment as they raced against time to develop a weapon which the Army today considers as important as the proximity fuse.

The sniperscope has what appears to be a fog light, its glass face painted black, mounted under a carbine. A telescope is mounted above the rear sight, and the entire unit is connected, by means of a cable conductor, to a small power supply carried on the back in a canvas case.

The snooperscope consists of the telescopic device mounted on a hand grip, and under it the same black-faced fog light. This, too, is connected to a similar power supply by a like cable.

A soldier with a sniperscope was more effective in stopping infiltration than 12 men with regular weapons; here is how the infra-red carbine operates:

A fighter armed with a sniperscope hears a sound. He points his weapon into the darkness, peers into the telescope, and turns on the power supply. He moves the weapon back and forth, like an invisible searchlight, his eye pressed to the telescope, until he sights the enemy, slowly crawling forward.

The enemy soldier is unaware that he is impaled by a beam of invisible light of a greenish hue. (In the telescope all objects appear as various shades of green regardless of their color in daylight.) The U. S. soldier focuses his telescope quickly, lines up a bead on the enemy with the telescope sight, and, with a press of the trigger, there is one less infiltrating enemy.

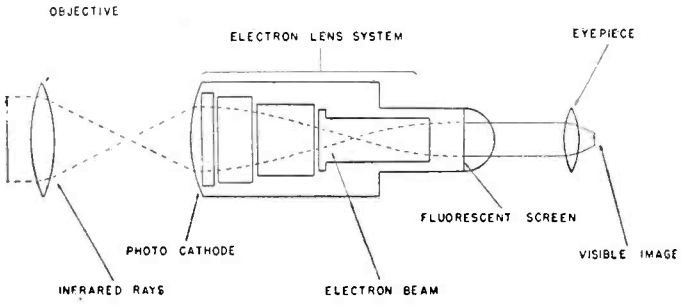


Diagram of image tube showing how objects, illuminated by infra-red light, are made visible to observer.

The snooperscope, operating the same way, enabled a platoon leader to signal in total darkness or direct concentrated fire by locating the enemy.

The telescope receives reflected invisible infra-red images at one end and produces visible images at the other. The reflected infra-red is picked up by the objective lens of the telescope and focused on the image tube. When the rays of infra-red light strike this tube, electrons are released in direct proportion to the intensity of the light rays. As all electrons possess a negative charge, the released electrons are attracted by the positive plates. These electrons are accelerated as they pass through the tube to a fluorescent screen. They bombard the screen and produce a visible image corresponding to the infra-red image on the front screen.

When the infra-red equipment is available for civilian purposes, it will have many uses, particularly in crime detection and riverboat traffic.

Other interestings facts about "Milly and Molly":

1. Infra-red radiation rendered camouflage almost ineffective. In the lens, the Japanese uniform appeared to be almost white. A lighted cigarette appeared in the lens as a large globule of light, about the size of a half-dollar. Most unfortunate was the Jap who took time out to prepare a little tea on the ordinarily invisible flame of an alcohol stove.

2. The Army experimented and found the equipment highly efficient for running locomotives and other vehicles in pitch blackness.

The miniature image tube is distantly related to television's image orthicon tube. In its final standardized form, the tube is less than two inches in diameter, and four and one-half inches long. Compressed in that space are a glass surface chemically treated to make it sensitive to infra-red rays, an electron optical system which forcuses the rays, and a fluorescent screen on which the image appears for observation through a telescope ocular, or eyepiece.

Although the light-sensitive surface and the fluorescent screen are similar in many respects to corresponding units in the Image Orthicon camera tube, which was widely used in airborne television equipment, extensive research was necessary to meet the rigid requirements of the military devices in which the tube was used.

One of the first experimental applications of the infra-red image tube was in night driving of vehicles. Tests showed that the tube made it possible for the driver to follow the road while driving at normal speed in absolute visual darkness. An improved model in the form of binoculars, incorporating a more sensitive tube and a more powerful source of infra-red, permitted the driver of a scout car to speed at a rate of 40 to 50 miles an hour over good roads in complete safety. As the size of the tube was decreased and the sensitivity increased, it was tested successfully in many special applications including the detection of infra-red marker lights and buoys in amphibious operations, and as an identification device for planes, and other forms of land and water vehicles. Early models had a range of 300 to 400 yards, but as development continued, the range increased until it was possible to see a shore line and buildings along a coast a mile away, and to detect, but not identify, trucks, tanks, and other large vehicles at 700 yards.

The sniperscope consists of a 30 watt infra-red lamp slung beneath the standard Army carbine with the image tube telescope on top of the barrel. To observe a scene, the operator of a sniperscope aims his rifle in the normal manner and presses a button which feeds electrical energy from the back-pack to lamp and image tube. The infra-red radiations striking objects in the scene, are reflected back to the sensitive image tube in sufficient strength to create a picture of the area on the tube screen. Total weight of equipment including battery and generator in the knapsack was 18 pounds.

Using a sniperscope-equipped carbine, a soldier could detect objects at a range of 150 to 200 feet in complete darkness while remaining completely invisible to the enemy. By aligning telescope and rifle, the sniperscope served as an accurate gunsight, making it possible to hit a target the size of a man at a distance of 75 yards, and at even greater distances against certain types of background.

NOW IT CAN BE TOLD

(Continued from Page Seven)

life and times of the nation's fighting forces, but it had a negative effect. Immediately after the showing, 32 men enlisted in the Army and 10 women joined the WAC.

* * *

Not one, but four different kinds of fire bombs were dropped on the Japs by our Superforts. The largest, the M-76 or Goop bomb weighed 500 pounds and scattered flaming synthetic lava over an area of hundreds of square yards. A smaller edition of the Goop but almost as formidable, was the 100-pound M-47. The smallest lava bomb, the M-74, weighed only 10 pounds and had a spring mechanism for scattering flames 25 yards in all directions.

The synthetic lava substance consisted of jellied gasoline, liquid asphalt, magnesium, black powder, and a thickening ingredient.

But the most vicious and destructive of all fire bombs was the six-pound M-69 — housed in a metal chamber, hexagonal in shape and about 19 inches long. These bombs were released in 100- or 500-pound "clusters." Such a "cluster" dropped as one bomb until reaching a predetermined altitude, when it was broken open by a time fuse. The M-69 bombs were well scattered, each trailing a 40-inch tail. On impact with the earth, each bomb was ignited by a magnesium-powder charge. Flaming jellied oil was expelled from the tail of the bomb, splattering in all directions and clinging to every surface it struck. The chemical burned for about ten minutes at a temperature of over 3000 degrees Fahrenheit, and covered such a wide area it was almost impossible to extinguish.

* * *

Radio-correspondents returning from Greece report that fighting in Athens during the rebellion was grim — but neighborly. Throughout hostilities, British Tommies passed through ELAS lines to draw daily rations. And the Athens pumping station, controlled by ELAS troops, kept water running to British headquarters in the city. No fighting was ever permitted in or near the Cosmopolite Hotel, where Americans were quartered. And ELAS and British troops often played football or soccer when fighting wasn't in progress — which was most of the time.

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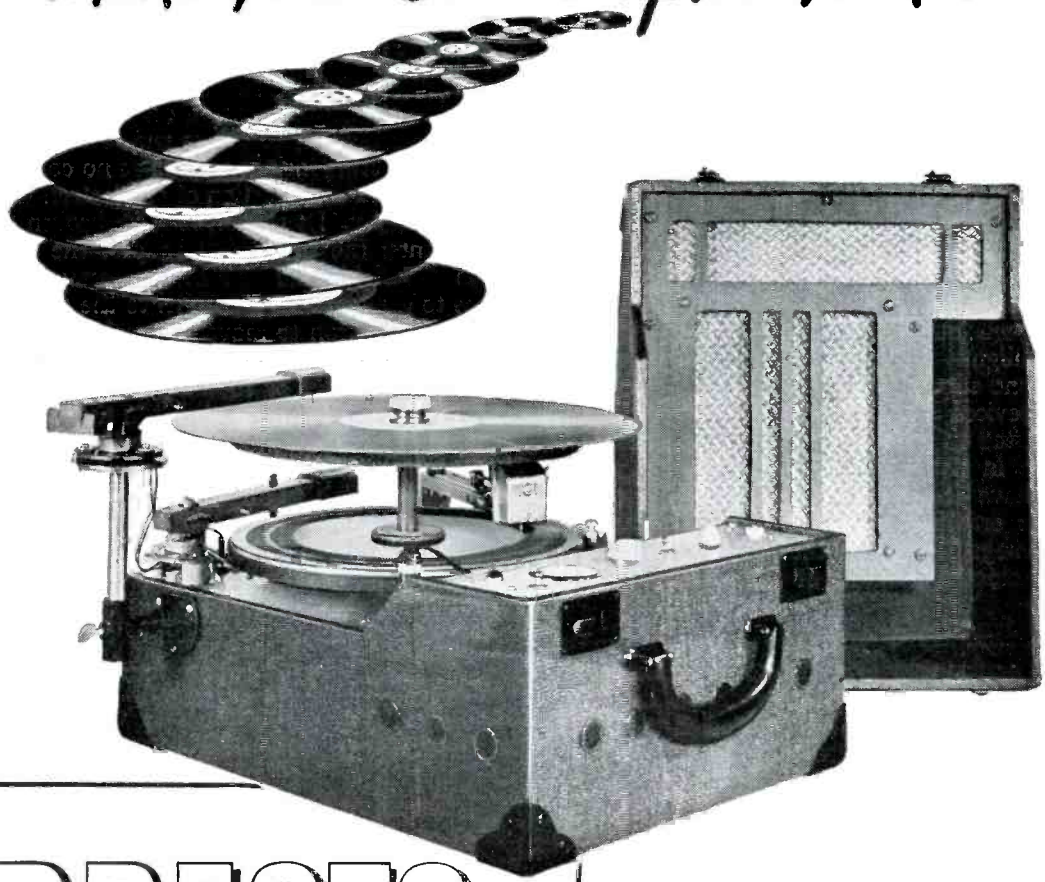

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300-A
RE-RECORDER

Illustration shows the PRESTO 300-A Re-Recorder on the popular PRESTO Model K Recorder. It can also be used on the PRESTO Model Y Recorder and can be adapted for use on both PRESTO 6-N and 8-N Recording Turntables.

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THE MULTIPLIER ORTHICON

By Lt. (jg) Edgar Kahn, USNR*

THE choice of a pickup tube for use in television broadcasting is one which is necessarily limited by many factors. The standard iconoscope provides a picture which is ordinarily quite satisfactory for live talent or film studio programs produced under controlled lighting conditions. However, with the growing importance of "on the spot" news and sporting programs there has long been a great need for the development of a pickup tube whose performance will not be too severely limited by the vagaries of sunlight. Experimentation toward this end has centered around efforts to improve the performance of existing pickup devices. For example, the iconoscope has an efficiency limited to about ten percent and much work has been done in an effort to increase its output. These experiments have led to the development of the image-iconoscope, the orthicon and, more recently, a tube which combines the image principle of the image-iconoscope with the low beam potential scanning of the orthicon, the multiplier orthicon.

Fundamental Operation

In operation, an optical image of the scene to be reproduced is projected on the photocathode of the multiplier orthicon. The electron image thus formed is caused to travel toward the target and, striking the target, to produce a charge image. This secondary image is then scanned by the electron beam in the orthicon section of the tube and produces a modulation of the beam which is amplified in the multiplier and appears as the video signal.

A simplified cross section of the 2P21 is shown in the accompanying diagram. Fundamentally, it consists of two sections: the image section, which is housed in the larger diameter section of the tube, and the orthicon section in the long narrow portion of the envelope. The image section contains a semi-transparent photocathode, an accelerator, and a thin glass disc target with a fine mesh screen mounted in front of it. The orthicon section is composed of an electron gun (heater, cathode, No. 1 grid and No. 2 grid), a set of beam control electrodes (No. 3 grid, No. 4 grid and No. 5 grid), the glass target, and an electron multiplier consisting of five dynodes and a signal plate.

Electromagnetic Focussing

Just as in the 1840 orthicon, focussing is accomplished magnetically and an understanding of magnetic focussing is essential to any consideration of the multiplier orthicon. Let us consider the effect of an unchanging magnetic field upon an electron in motion. If an electron enters such a field in a direction parallel to the field, it continues straight through the field without its course being affected. If, however, it enters the field at right angles, it moves in a direction in accordance with the right hand rule for current. Since it remains in the field, its motion will be continually affected, and it will describe a circular path as it passes through the magnetic field. The diameter of this circle varies directly with the speed of the electron, electron mass being constant, and several electrons starting from the same point (but with different velocities and directions) will therefore complete their particular circles at the same time. This action continues, with the electrons beginning a new set of circles and returning to the starting point at the same instant as long as no collisions occur.

Now consider the action of an electron which enters the field diagonally. Its motion may be broken down into two components: the first tends to pull the electron directly across the field, and the second component is at right angles to the first and is parallel to the magnetic field. This causes the electron to move in a helical path (instead of a circle) and it continues to describe a series of helices while under the influence of the magnetic field.

In the 2P21 multiplier orthicon the electrons are at the same time accelerated axially by an electrostatic field parallel to the magnetic field. The electron velocity thus attained is sufficiently high to nullify the effects of the small initial velocity components of the individual electrons.

In this manner, a group of electrons entering an unchanging magnetic field maintains its entity and is just as compact at the end of each loop as when it enters the field. In the case of the image section of the multiplier orthicon, we can therefore transfer the existing charge deficiencies from the photocathode to the target electrode while, at the same time, focus is controlled by varying the potential of the photocathode with reference to the target.

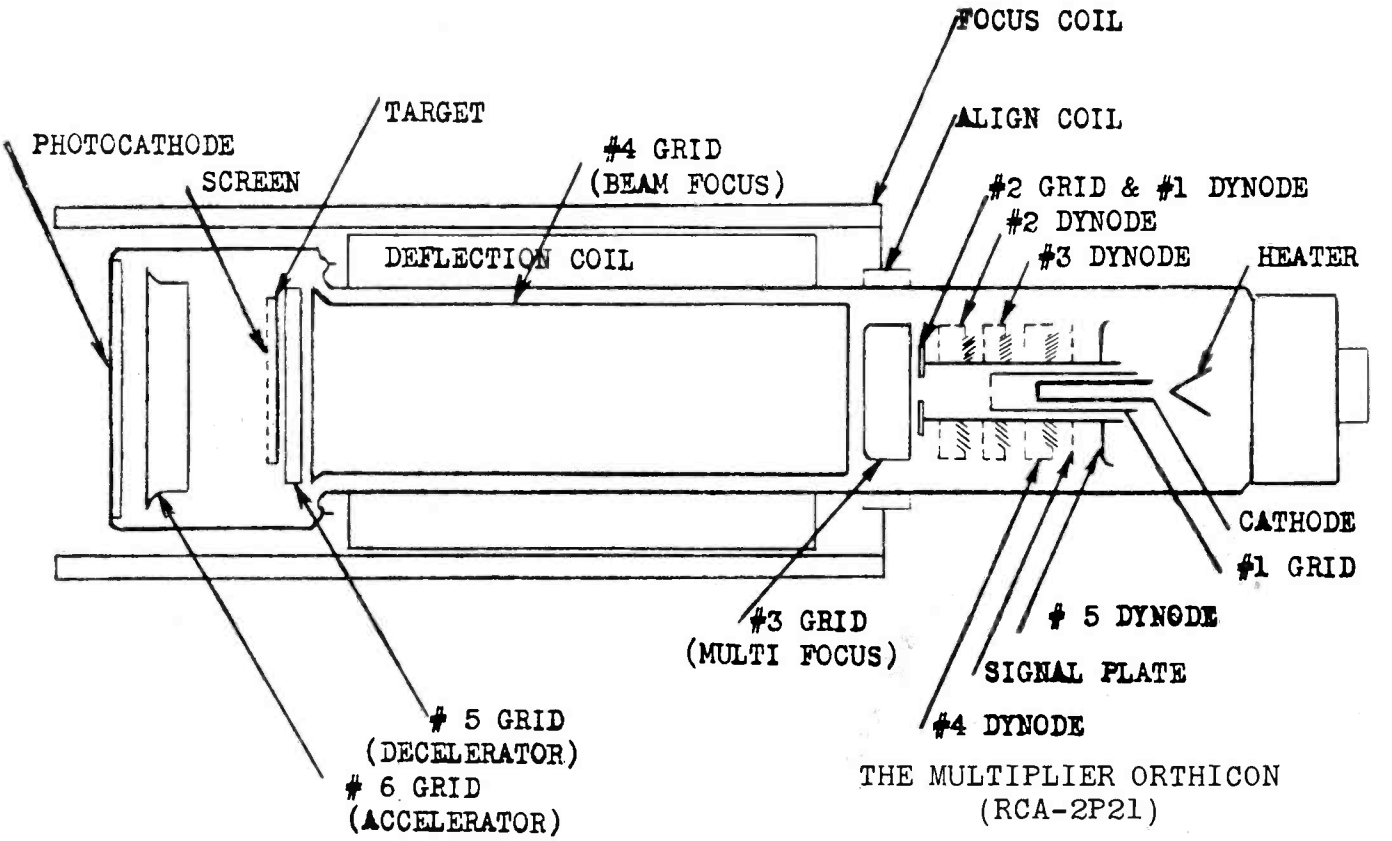
Image Section

When an image is focussed on the photocathode, electrons are emitted from its opposite side at a rate per unit area proportional to the light distribution of the source. Since the photocathode potential is 300 volts below that of the target, the electrons emitted are accelerated toward the latter. Those electrons emitted vertically from the photocathode are drawn directly to the target. However, many electrons are emitted at an angle, and, as noted above, must travel in spirals; these are then brought to focus on the target by adjustment of the photocathode potential. The electrons thus drawn to the target strike it at a rather high velocity and cause the emission of secondary electrons which are collected by the fine mesh screen and serve no further useful purpose.

Orthicon Section

The scanning beam in the multiplier orthicon is produced in the usual manner. Its intensity is determined by the potential of the No. 1 (control) grid and it is brought into focus magnetically by proper adjustment of the No. 4 grid. The action of the fields provided by the Nos. 3, 4, and 5 grids, and the target electrode is in direct opposition to the accelerating field and causes a considerable reduction in the velocity of the beam as it approaches the target. If there is no charge deficiency existing on the target (corresponding to a black portion of the scene), this reduction in speed is sufficient to prevent the beam from striking the target and to cause it to retrace its path in the tube. When a charge deficiency (due to scene illumination) does exist on the target, the beam deposits sufficient electrons on its rear surface to nullify the charge on the front surface. After sufficient electrons have accumulated, the beam once again fails to reach the target and returns to the rear of the tube. If the temperature of the target is sufficiently high, its transverse resistance is low enough to permit the charge produced on the target by the photocathode to be

*The author has since returned to civilian life as Television Engineer with NBC.



THE MULTIPLIER ORTHICON
(RCA-2P21)

neutralized by the beam before the beam again returns to that point on the target. Concurrently with this action, a new positive charge proportional to the brightness of the scene at that point is accumulated on the front of the target. In this manner, the beam may be considered to be amplitude modulated by the charge deficiencies existing on the target, since it returns to the rear of the tube at maximum strength when approaching a black portion of the target, and is proportionally reduced in strength in accordance with the scene illumination of a lighted portion.

In order to make use of this modulation component in the beam, the returning electrons are brought to focus on the No. 1 dynode. The high secondary emission ratio of this electrode causes multiplication of the signal and, by means of the No. 3 grid and the multiplier focus electrode, it is brought to focus on the No. 2 dynode. This action is a continuing one thru the entire electron multiplier until the electrons strike the No. 5 dynode. The output of this dynode is collected by the signal plate and it is this current, still preserving the original beam modulation, which is fed to the first load resistor and constitutes the video signal.

While it cannot be considered as a sinecure for all of the deficiencies existing in the iconoscope, the multiplier orthicon offers the following distinct advantages:

a) The need for keystoning is obviated by placement of the electron gun on a line with the target.

b) The multiplier orthicon exhibits no observable black spot (or shading) signal since its output is dependant upon beam modulation rather than secondary emission.

c) Use of short focal length lenses is practical in the 2P21 due to its physical construction with the photocathode adjacent to one end.

d) It is a gamma unity device since the light output vs. current curve is a linear one. Orthicon blanking thereby provides a useful reference level.

e) The multiplier orthicon can be operated under conditions of extremely low scene illumination as it is approximately 100 times as sensitive as the iconoscope.

Since the proving of any electronic device can come only under field conditions, it is probably too early to estimate the effects of the multiplier orthicon on television broadcasting practice. Due to the characteristics previously outlined, however, it bids fair to eliminate many of the hazards usually associated with outdoor nemos, and to mark a definite step forward in the development of the television art.

hallicrafters establishes national network of strategically located SERVICE CENTERS

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

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NEWS OF BALTIMORE

By Alex Beauchamp

OH, WHERE, oh, where, is my report from WCBM. It is now past the dead-line, and not a word from Larry Taylor. Surely, there's things happening over there, and I would like to say something about them in this column, but, what can you do, when our WCBM reporter, seems to be hibernating. Let's get on the job, boys!

May I put my two cents worth in this column, in answering Mr. Richard T. Parks' letter to the editor of the journal. It is, without a doubt, the biggest slap any one has ever received in the journalistic field, living in a democracy. The innocent gossip I've read in the personal chit-chat columns, might not be sensational, or breath-taking, neither is it educational. It does swell the ego of those mentioned, and increases morale. Perhaps, Mr. Parks, and the members of other chapters do not read other columns, and are not interested in the doings of the many new chapters of NABET, since they are growing up and becoming of age. Maybe, they do not know the true valuation of new friendship, or how these personal chit-chats are helping to bring about better relations between our organization and the management of various broadcast companies. Mr. Parks states in his letter: Such prattle is nonsense and childish, and should be discontinued at once! I would like to inform him, that such gossip has built many large news publications, press wire services and radio broadcasting companies. Mr. Parks may have the same feeling as most of the Te's, who have to sit and listen to one soap opera after another, day in and day out, yet, the radio polls give them the highest rating of any day-time program. If the chief editor informs me to change the format of this column, I will be happy to do so. But until then, I am continuing on the basis of building better relations between NABET and management.

Checking my personal notes, I find items of interest to the Baltimore Chapter.

The wedding of Mr. James F. Crist and Miss Louise Foster was held at the home of the bride, 6 East Burke Ave., in Towson, on June 28, 1946.

Howard O'Day, Te, just completed a vacation in Iowa, and at this writing, Bill Kelly and Mr. Wm. Q. Ranft are on their's. John Lappe is now back and taking it easy at the xmitter. John completed a fish pond in his back yard while on vacation. Martha Ross Temple, director of women's program, is flying to California on her vacation. She will visit several cities in the southern part of the State.

Harry Boone has been transferred back into field work. He and Steward Kennard, director of special events are having quite a time eating crabs on the eastern shore of Maryland, while on (fishing fair and boat race) remotes.

On July fourth, Bill Kelly had a watermellon party out at his new home in Catonsville, Balto. County. The engineering staff was well represented and a swell time was had by all.

Bill Dothard, salesman, and Bertram Hanauer, program director, were in the later's office the other day discussing sunburn. Bill said his mid-section was more sunburned than Bert's. A by-stander then remarked, "why not 'Matchabelli.' "

The WMAL, ABC Washington flag, sent over by The Evening Star, to be used on the Admiral Richard E. Byrd trophy race, was last seen by the engineer, being used as a mainsail on one of the Hampton sloops with material to spare. The WFBR flag was used by one of the girls for a complete bathing ensemble, with nearly enough material for another.

Miss Mae Hughes, Secretary to Mr. Tinsley, was rushed to St. Joseph's hospital on July 18, for an emergency appendectomy. The operation was successful and the patient is well on the road to recovery.

The management of WITH held its annual picnic at Bay Side Manor near the mouth of the Magothy River. the summer home of Mr. and Mrs. Ralph Powers. There was plenty of bathing, boating and water polo. I was one of the participants of the game. The game was played with such fervor, that the ball was punctured, and if you did not catch it or pick it up as soon as it hit the water, the ball would immediately sink to the bottom. Then there was a mad scramble of diving, to find the ball—which reminded me of coin divers of the South Seas.

On Monday, July 22, lightning hit one of the WFBR's towers. The damage was negligible. However, it took several hours for the smoke to clear. By that time, Bill Doster, not a ham, was a well smoked technician.

Speaking of hams, we have two in the Baltimore Chapter that are now active. W3DKE, operated by Sam Houston, on 10 meters, and W3FDJ, operated by Bill Hoos, on all bands. And I do mean all bands. For Bill has just become a father of a baby girl. This is Bill's thrid visit from said stork, one boy and two girls. Nice family, Bill.

Birthday greetings go to Leslie Ann Duff, daughter of James S. Duff, one year old on July 23, 1946.

Ernie Simon, major domo of Wake Up Baltimore (and he does) became a father for the first time on July 22, 1946. The blessed event happened at the Sinai hospital, and it was a little girl. Ellen, the mother, wanted to name their daughter Ginger Ray, but Ernie insisted it should be Fisterace. To satisfy both mother and father, the little girl will have to go through life with a name like this: Ginger Ray (Fisterace) Simon. I understand that mother and daughter are doing fine, but Ernie looks like he's beyond recovery.

The Young Father

Tramping up and down the corridor
Till my feet were sore and numb.
I was aware of naught around me,
For once in my life, I was dumb.

Then, like a crashing thunderbolt
The news was herald aloud.
I felt as light as a feather,
As it swept away the cloud.

Yes, sir, I'm the proudest of them all,
And you bet your life I'm glad!
But, who's the guy that wouldn't be—
On the day he becomes a Dad!

By Alex Beauchamp

Out of the Boston Beanpot

By Jim Hughes

HEREWITH, the Boston Chapter of NABET makes its modest bow to the readers of the Journal. This first appearance will be bried and, in form, a self-introduction.

The newly-formed Boston Chapter includes thirty-one members, all employed by Westinghouse Radio Stations, Inc., at WBZ Boston, and WBZA Springfield. Of the thirty-one members, fourteen are main studio engineers, ten operate the WBZ transmitter, and the remaining seven expend their solicitude and talents at WBZA.

WBZ and WBZA operate synchronously (we hope) on 1030 kc/s; the WBZ transmitter being located in the seacoast town of Hull, and WBZA in Springfield, about a hundred miles inland. The Main studios, common to both RF outlets, are in the Hotel Bradford, Boston.

We held our first formal meeting May 13, 1946, with Mr. Powley present. On that occasion were elected Chapter Chairman Bill Flanders; Secretary-Treasurer Bill Bazzy; and the following councilmen: Truman Craine, Studio; John Elmore, Hull, and Earl Woods for Springfield.

Upon that occasion also yours truly was named journalist, it being rumored about that he owns a pen. Unfortunately for the literary standards of the Journal, the pen has been used heretofore solely for the purpose of signing checks or I O U's.

We have hopes of producing pix of our governing body for some future issue; however, a few of the boys are waiting for the statute of limitations to remove their likenesses from post-

office walls around and about, and the others must be just plain bashful.

Here is a list of the Boston Chapter members, along with such ham calls as are available to me at the present moment. To those whose calls I have missed or messed, apologies; all will be atoned for in the next issue, by which time I hope to have my spy system organized and functioning.

Main Studio

Bill Bazzy
Dick Bower
Wally Brown
True Craine, W1IHF
Art Curran
Bill Flanders, W1ARY
Bob Henderson
Sid Jarman
Bob Kingman, W1BGH
Elmer Lantz, W1GBY
Fred Moriarty
John Moses, W1BZ
Doug Standbridge, W1KSY
Tom Sullivan

Hull Xmtr

Jim Eastman, W1JTZ
John Elmore, W1VM
Buz Gahm, W1DIU
Irv Grant, W1CED
Jim Hughes, W1KXV
Jack Humason, ex-W8
Eddie Parsons, W1FCZ
Rod Perry, on air soon.
Sid Stadig, W1IVI
Don Wise, W1ERH

Springfield

Norm Bacon, W1NZK
B. A. Budz
Arthur Davis
Phil Gilchrest
John Gunther
Harold Moffett
Earl Woods

And we're all very pleased to make your acquaintance. 73, J. W. H.

THE CHICAGO STORY

By D. R. Fitch

THIS with frail hand I catch the flaming fagot tossed me by the now ex-slob sister, K. A. Slobb, former Chicago editor, who by the way has been doing a swell job and my only hope is to approximate his accomplishments . . . so removing the little black book from its cache . . . black books are a prerequisite in this reporting business . . . and thumbing past the Bell telephone entries we see first that the stork took advantage of the removal of OPA ceilings and presented the Harry Johnsons with twin boys. Also, Emerson Squires of WMAQ transmitter reports the arrival of John Vernon Squires, July 2 . . . Donna Leslie Pierce arrived in Chicago this month, causing hurried application for specialized laundry service for her by Curt Pierce NBCFE . . . and new in the ranks of NABET are Gordon Cozier, formerly of CBS; also Paul H. Prokes of WGN-WHFC-WIND . . . understand Bev. Fredendahl was in town for the Mackinack boat race, this is one Bev makes regardless, I don't know at present writing if it was win, place, or show this year . . . other visitors from the East were Paul Gallant, NBC operational super., and Charles Phelan, NBC New York maintenance . . . C. A. Allen, national NABET drummer, was also in town this month for a confab with Frank Schnepper, local chairman, regarding WROK, Rockford, Ill. I understand there is a fine picture of Allen and Schnepper floating around . . . Will try to get a copy for you Ed. . . .

Local Council met at Ye Old Corner House this month and a very fine meeting it was too, waxed hot and heavy over present revisions of by-laws, etc. . . . all present had the pleasure of meeting Mr. Reed of WROK, Mr. Elliot of Universal Recording and Mr. Bayne of RCA Recording, all new Councilmen . . . NABET is expanding . . .

NBC held annual shindig this month at Madina Country Club where much golfing, swimming, dancing, and fine food were enjoyed by all . . . Ralph Davis, NBC Recording super., tells me he drove eleven hundred miles just to attend . . . seems Ralph was in Boston enjoying baskets full of fish which he caught. I wonder if he used that new float on the market that lights up when the fish bite . . . must send out an AC ripple . . . when he remembered the outing . . . it takes a good show for that kind of draw . . . confidential reports are though that said outing was much tamer this year than in previous years . . . most of engineering had to work and there are shortages yet.

Ham news . . . Bill Cole W9BU just erected 20 meter three element and reports very FB with a Jap and Aussi first morning . . . big subject of conversation around the lounge though is the BC-348—seems that about 15 of them have appeared on the scene and there is much talk as to who got the best one who did the lease to do the best job of conversion, etc. . . . seem to be a very fine job though. Marvin Eichorst W9RUK still doing a fine job for the boys overseas . . . Jim Platz W9GY tells me he felt much like a knight of old charging up the streets of Elmhurst on his bicycle with a set of dural lances for his beam . . . That about winds it up for this month. How about that NABET net? ?

CLEVELAND NEWS

By Earl Holl

IT SEEMS like old times out at WTAM transmitter. Most of the old timers that were in the service are now back at their old stand at the O.P. desk. Capt. John Cheecks is the latest to come back. John spent the most of his time in the Pacific. [We might add John has a very nice collection of sourvenirs.]

We gave W-0-G C D in Omaha, Neb., a call on the ten meter band. It was a surprise to find out he was a fellow member of NABET. The other evening we had a nice round table (all members of NABET) W-8-L E X, W-8-FP, W-8-BUM, W-8 W X U, W-8-W B N, and W-8 J V N. These fellows all work for WTAM. Al Stewart W-8-D H F will soon be heard on the ten meter band. Al has been inactive in ham radio for some time, but the bug bit him again.

Art Butler is on his vacation; he is doing some real fishing according to the dope sheet. We asked Art to bring us a nice fish back, one about 2 foot long. Art said, "They have to throw back the little ones up there." So we are expecting something about four foot long!

Frank Whittam, S.E., is becoming the official beam tuner around these parts. Frank has tuned up a number of beams and they are doing a nice job. Maybe we can get Frank to write up an article on how he does it. What say, Frank?

Herewith a few notes on WHK engineering personnel doings, not previously reported.

A son was born to Mr. and Mrs. P. C. Tuttle on February 17, 1946; his name Paul A. Tuttle.

David E. Irwin (Lt. Cmd'r.) recently returned from a long tour of duty with the fleet in the Pacific, vacationed for a week over Decoration Day fishing in the AuSable River, Michigan lower peninsula. Dave reports that fishing was satisfactory, bringing back several fine walleyes as proof. He also did some super relaxing including sleeping late mornings, then warming up the cottage with a roaring fire prepared the night before and fused (no doubt navy style) so he could light it from bed and wait for comfort of a warm roon before rolling out. Dave's brother Bill joined him for the last few days at camp, adding a little competition to the fishing and much to the enjoyment of a well rounded out vacation for Dave, who is now back at work on night Master Control at WHK.

Hugh Okeson and wife Mildred vacationed the month of March in Florida, including a week with Hugh's sister in Miami, a week with friends near Orlando and some very fine fishing at Everglades City, where they stayed at the Rod and Gun Club, 100 pounds of fish were expressed home for freezing, all caught by the Okesons (both are fishermen). The catch included redfish, snook, mangrove snapper and speckled trout, and fish are regularly on the menu for some time to come at the Okeson home. Hugh is back at the WHK transmitter, taking time out occasionally to dream of still another vacation next year.

Foolishness

A drunk leaning against a light pole with both hands and moving around it hollering, "Let Me Out of Here."

1st Drunk—Did you ever meet me before?

2nd Drunk—No.

1st Drunk—Well, then how do you know it's me?

HOLLYWOOD

By Norman Dewes

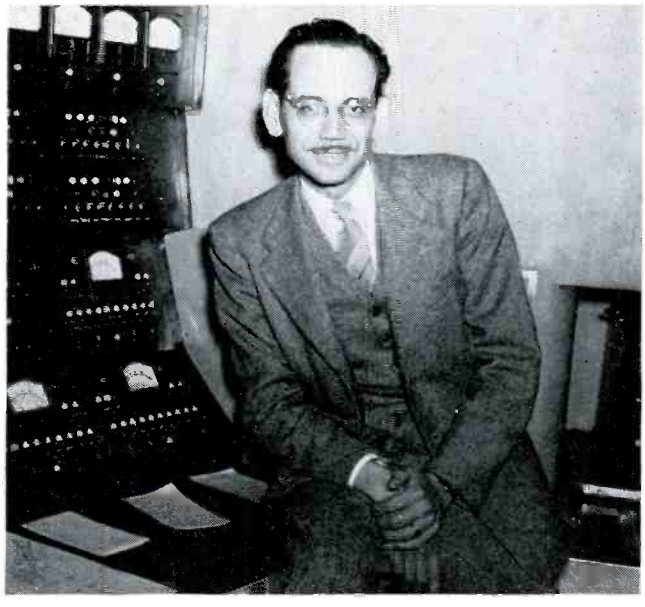


Photo by Ralph Denechaud

JAMES H. BROWN

Hollywood NBC Master Control Supervisor, and former NABET National President, was recently elected Chairman, Hollywood Chapter NABET.

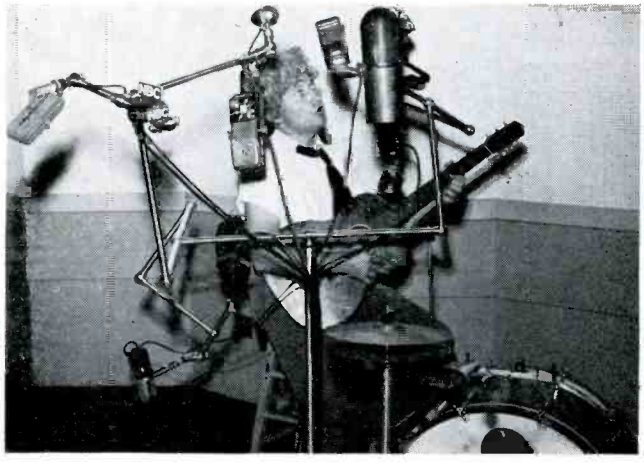


Photo by Bob Jensen

"CONSEQUENCES"

Still Life—posed by Johnny "Harpo" Pawlek, Hollywood NBC Studio Engineer on the "Truth or Consequences" Program.

Hudson Eddy Currents

By Pat Miller

JIMMY GOODE (Sound) thinks he's keeping it a secret, but we all know about that third Goode. Name is Thomas Quilligan Goode. Bon Voyage on the road of life.—T. Q. D.

Ronny "Bunny" Harper works fast. His wife is expecting already.

Bachelor Dreisbach SE is a speedboat enthusiast, being the proud owner of a class "F" hydroplane that does everything but fly. He brags about its sixty knot potential and is going to prove it at the Redbank Regatta if he can get that vital propeller. (The underwater kind, we mean.)

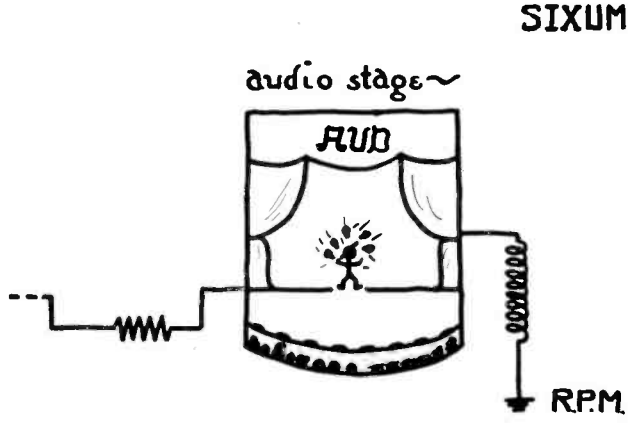
Bert Harkins management is a horticulturist. He grows bushes for people to beat around.

Johnny Cook SE is off for a rest at Beach Haven Terrace, one of Jersey's salt water spas. He's taking the family this time.

Bill "Dammitall" Boher, Master Control, caught 82 fish on his vacation up Chatham, Mass., way. Some of his catch shone at night and started to flash "WCC WCC ans 36".

Next month's profiles. Ralph Schlegel of recording for the Union and Charlie Singer for Management.

Sixth in a Series of Humor-Sketches from the NBC-NY Radio Recording Group



Now, for contributions courtesy of:—
We have finished our technical misuse
Someone's got to be blamed for the above
As this marks our last—final issue.

Jewels of Etymology.....Poetic License Bureau (East Side Branch)
Research......"Haywire Heaven" Division
Humane Element.....Associated Scully Dusters
Misc. Pearls.....Red Tape, Inc.

73. —RPM

ABOUT ROCHESTER

By Don Anderson and George Wilson

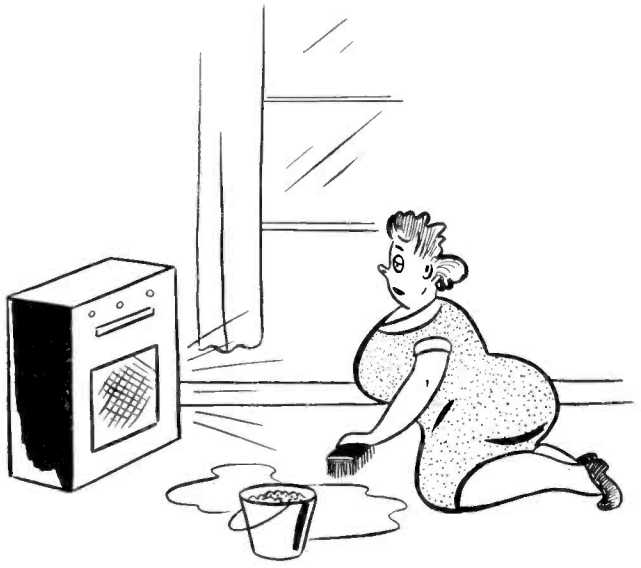
(Continued from Last Issue)

AND WHAM——

The boys at the xmitter in Victor are literally stewing in and about all that heat taken from the tubes and delivered to the building and operators in large quantities, to the great enervation of the latter, since it only adds to that supplied free gratis by Ma Nature. Alex Gresens started out to paint the outside of his new house the other day, the one that he can't occupy as yet because of an uncooperative tenant and the OPA. Beginning in the shade, he was hot enough, but when the sun moved around to his side . . . ! He melted into a mass of sweat and disgust, and quit. Yep, we know the sun doesn't move and we do, but he got hot just the same. Alex, working on the outside, matches up with Al Balling, Xmitter Supervisor, who is in sight of the end of the lovely little chore of painting the inside of his be-it-ever-so. His work was complicated more than slightly by the decided allergy of his helpmate to the smell of paint. He had to be choosy about painting with the windows open or when she wasn't home or else!

Incidentally, the above-mentioned Mr. B. has stated most emphatically (and is agreed with by Ken Gardner, Chief Engineer) that he will refuse to go on the air with a ham rig if he has to trade his lovely W8ALY call for a stinker W2 under the new assignments. They're only kidding, of course . . . we hope. Ray

Lucia, CR Super., W8BEN, has his new call: believe it or not, it's . . . W2BEN! He's not on the air as yet but Charlie Snyder, ex-W8ATH, is using his new call W2PWY on the 80-m. band with one of those war surplus transmitters souped up to eight watts. Some difference from the pre-war kilowatt job, but he hopes to have that fired up before August. Didja notice that he could pronounce his call "W too pewey"? Art Kelly is on with 25 watts of CW and his old call, W8LTJ; his new moniker hasn't



"Well, good afternoon, soap lovers!"

been issued as yet. Walt Malone, W8GZX, and Hank Boyce, W8RVS, have also been burning the ether while hunting for friends. Hank, between his picher-taking, working at WHAM, the Sheriff's Office (no, not that; he puts in the new tubes at the County xmitters), and fishing, swears that he doesn't even have time for wimmen! Ah me! How the mighty have fallen! He used to be our favorite wolf and all us married guys learned about the new twists in feminine wile from him. Now it looks like we gotta go out and find out for ourselves. Well, that might not be so bad, at . . . ! No, dear! No! No! Don't throw that vase! Use the piggy bank so I can get some good out of it. Sure I'm kidding! Certainly I'll stay home Yes, dear. Yes . . . Yes . . . Phew! That was narrow!

This guy, Elmer Grabb, must have the law hot on his tail: he's moved again! That makes three times in the last year or so. 'Sa good thing he has the journal sent to the station or the addressograph would run a temperature. The pity of it all is that he owns a house and can't get into it yet. A common complaint, I guess. Now I'm glad I was forced to buy the one I was renting. Speaking of major lacks, several of the rich guys at this ether-burner are waiting, along with a coupla other people in these Yewnited States (thanks, Al Capp) for new cars. Curly Green probably needs one the worst of all—he has none now but does have about twenty-five miles of commuting (dignified word for thumbing rides) per day to look forward to. It seems he ordered the car last November and the salesman said . . . but you know the rest.

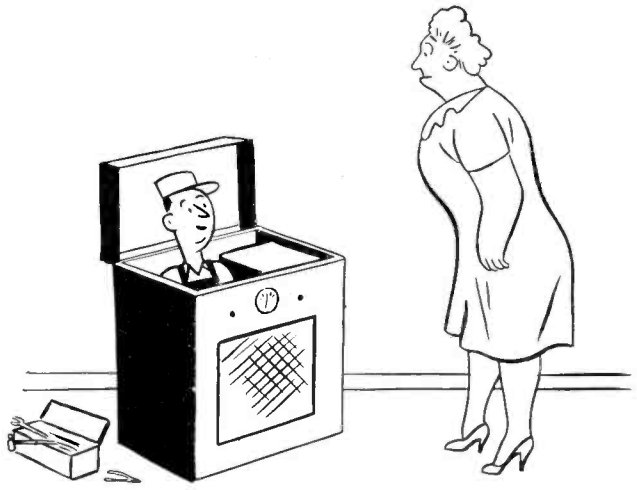
Suggested song for the Hollywood gang: "Hahcum You Dewes Us Like You Dewes, Dewes, Dewes?"———(thud)———Well, somebody had to say it. . . . I think. Hey, Norm, who springs for those pix that so beautifully light-and-shadow the virginal purity of these-here pages? We have the subject matter here in Rochester; now, about money? and persuading the lovelies? and the price of entertainment? Must be something to that West Coast area at that, though: Walt Harrison took his vacation there also, following in the feetsteps of Ray Gondek, who is also single and who must have returned with lush and lurid tales of the wonders to be found walking the streets of Hollywood.

Remember us talking about the heat here? Al Berrens picks that kind of weather to insulate his attic! He reports that wearing only shorts is too hot and confining, so he quit wearing those, too. Well! My Sainted Aunt, Al! . . . Wonder what it feels like (itch, itch) when he's putting that stuff up overhead and the little fibers (itch) drift down, and down, and he can't let go of it . . . (scratch, scratch, scratch, scra-a-a-atch!) Gosh, now I'm itchy! Al came into radio from a glass decorating business. That's the kind of thing that gives a man pause: howinell can a person in his right mind jump from glass-cutting to dial twisting? No logic at all, at all.

'Way down in the middle here, where maybe it won't be seen, we confess to jumping the gun ju-u-st a little in giving you the results of the local election. It looked a sure thing for Gresens to be re-elected Councilman from the transmitter, the vote wasn't fully in, the deadline approached rapidly, and we went out on the limb by saying that he is in again. The boys then proceeded to have a political upset, sawed the limb off, and elected Scoop O'Brien, thereby reddening the editorial puss. Sorry, fellers.

AND WHFM——

Tony DeLucia is now invading the model airplane field with a seven-foot wingspread job, radio controlled if everything works right. Another drone plane for an atomic cloud? Anybody wanta swap notes on such models? That dummy, Bob Brethen——oops, excuse me!——that dummy of Bob's is still amusing the populace here, there, and yonder. We toldja last month, you uninitiates, that he's a ventriloquist: very little competition for Bergen yet, but doing OK. Also magic tricks done, reasonable rates. The FM station, by the way, is called Platter Manor around here because of its programming. Mr. Petrillo says . . . so, Tony and Bob make



"Don't get excited, lady, this ain't television!"

'em go 'round and 'round for eight hours a day plus. Do you know how many xcriptions can be played in eight or nine hours? Especially those minute-and-a-half shorties? Pardon me while I shudder.

Guess that's the works from Rochester, the Flower City, for the nonce. (Who's calling names? Take that back you———!) Betcha we can and will find some more of this sort of thing for next issue. CUL.

EMPLOYMENT

NABET Members seeking employment will be listed in this box. For listing here, advise the National office immediately.

Profiles . . .

By Pat Miller

YE ED. intends to present two profiles each month. One to describe the history of one of the men active in the Union's ranks and the other to tell how a former Union member and now a member of management got to his lofty estate. Let's know how you like the idea. To start off, I have chosen Al King as the representative for the gang and Barney Boyle as the guy on management's side.

Al King is a natural for a starter as he is a screwball deluxe who still manages to turn out a whacking good job of gain riding. All

AL KING — WOR

of us take great delight in listening to his salty jargon which is a queer combination of New England twang and Local 802. One gets a new insight into electronic problems when they hear Al describe his problems in making his home brew ham rig tick. Grid exitation, plate mils and resonance take on a new subtle meaning due to his unique ability of including as an adjective the verb that appears in the well known remark "Snafu". Parasitics take on a roseate hue when Al says, "The XXXX parasites are driving me out of my XXXXX mind. Every time I plug in the XXX crystal the XXX buffer ad naseum". Well he's good for a laugh on any given occasion.

This "character" as he would refer to himself was born in 1910. Swampscott, Mass., was the victim but fortunately he was an only child. He earned his first honest dollar at the age of thirteen driving a horse and wagon for a grocery store. Ham radio hit him between the eyes one year later when a school chum made him a convert through the antics of a rotary spark gap. The virus spread rapidly and one year later he had a ham ticket and W1JM for a call. Now he spreads an ill controlled aura of qrm out Long Island way. The racket maker is an 812H with 170 watts input with two badly abused 616's doing the modulating.

Strangely enough his interest in radio from a technical angle remained in the amateur stage for 19 years, when quite by accident he decided to make it his living. Another fair maid lured him in his early days and won over radio. This maid was that shiny golden instrument known as a horn in 802 circles and a trumpet to us folks. The same year he got his ham ticket he pulled down a five dollar note for playing the horn at a county fair. From the county fair he graduated to Jimmy Cashmen's band up Boston way. From there on "Lips" King had a meteoric career. He played with Leo Reisman, Jacque Renard, Artie Shaw, and Vaughn Monroe. Finally he fell for the lure of organizing his own band. This financial fiasco took place in 1941 and wobbled uncertainly through 1943. However as he says, "it was good for a lot of laughs." One of the "laughs" occurred when he fired his drummer for being too chummy with Demon Rum. After paying off the guy and giving him his fare home he went up to bed in the local hotel. About two a.m. that morning his roommate and tenor sax man shook him awake and said, "Hey Al, did you leave the water running?" "I don't think so, mumbled Al sleepily but hearing the same sound he got up to investigate. In Al's inimitable way he described his investigation. "I got outta bed and cripes I was in water up to my XXXXX knees. I turn on the light, my suitcase and shoes were floating around the XXXX room and I finds that that jerk drummer as a goodbye gift has stuck the firehose through the transom and turned the damn thing on. I'm excited so without thinkin' I open the door and the water goes tearin' down the XXXXX hall. I had to pay the hotel $500 damages." Hardly a dull life but episodes like this one slowly wore him down and when he bumped into some WOR boys at a "remote" he fell for the lure of engineering. 1944 in June was his baptism of fire and he made the grade where many other "war time" engineers failed. He clicked almost instantly. His intimate knowledge of music along with his radio "know how" shot him into key radio shows in a jiffy. The "Kreml" show with Phil Brito was his first bigtime commercial assignment. Right at the moment he is doing a bang-up job on one of Mutual's better musicals "Endorsed by Dorsey". He even has his hand in on the murder mysteries doing the "Falcon" for Gem Blades every Tuesday.

Leo Reisman is still trying to tempt him back to his horn and at a good wage too but Al says "I'm through with that XXXX racket." "I've got a wife and a kid and I want to stay put."

Top Drawer Profile

BARNEY BOYLE was born in the year 1900 with a blacksnake whip in his mouth. He first saw the light of day on a farm near the village of Calringford in County Louth, Ireland. At the age of fourteen he left Christian Brothers School to enter the business world as an assistant to a merchant of agricultural supplies. At the same time he joined the Irish volunteers, Ireland's first IRA. He participated in both the 1916 and 1919 rebellions against the British crown. Twenty-six notches decorate his gun. He feels, so he says, that that evens the score for two cousins lost in battles. Barney was not the only fighter in the family. Tom Boyle, one of his brothers, lost his life fighting for the United States in the first world war.

Barney first was introduced to radio in 1919 when he was taught Morse code by flashlight. He used this to signal his compatriots at night when they set ambushes for the Black and Tans as the British were called. After the peace treaty was signed in 1921 he became an adjutant to the Irish Free State General Staff. He held this post until 1923 and during this period took his license exam which allowed him to ship out as a "sparks". 1924 found him working for the Indian Marine service both ship and shore to and from Bombay. This lasted until

BARNEY BOYLE — WOR

1927 when he came to the States to have some shrapnel from the Irish wars removed from his insides. In 1928 he made a second and permanent visit taking a job with Tropical Radio, holding this until 1936 when he decided to beach himself permanently by coming to work with WOR.

His advancement with WOR tho slow at first, became rapid as his abilities became recognized. 1938 found him in Master Control and 1941 found him on top of the heap as Chief Supervisor.

Barney really missed his calling though. He should have been the Chairman of a draft board but he did get the next best thing. After two years as Chief he was offered a job as Chief of a newly formed traffic department. Now he makes out the schedules not only for us chickens but that group of prima donnas known as the announcing staff. Poor guy he has to have his evening's two fingers at the end of the day to keep him from yapping at his better half. He has his bad points too. He has the delightful habit when both your hands are full of handing you a broom. But like all good Irishmen he passes the dirty work down to a bewildered callow Scotch youth named McLean. Mac is more easily browbeaten so the gang pile into him when they have a gripe.

I was particularly interested to know why Barney decided to leave the staff and take on this tough job and to quote him, he said, "I firmly believe that the members of the technical staff are the men who made radio

OMAHA NEWS

By Cy Hagrman

LOOK again and see if something new hasn't been added. In case you haven't noticed, the Omaha News is now in charge of Cy Hagrman, transmitter engineer. Cy was appointed by the new chairman, Mark L. McGowan, at a recent chapter meeting.

As I leave the column, I feel it is in good hands. I have observed Cy over a long period of time and feel he is well qualified to represent the Omaha Chapter as its editor. Cy is a talented cartoonist and can dash off poetry at a moment's notice. He has an excellent command of the English language and I am sure his material and style will be enjoyed by all.

I wish to thank you one and all for the fine cooperation you have given me the last two years and hope you will all give your support to CY as you did to me. Best of luck Cy and 73.—Bob Rudd.

* * *

After reading the above paragraph, I am convinced that Bob Rudd, the retiring editor of BEJ for the Omaha sector, is possessed of an imagination that is exceeded only by his ability to exaggerate the true facts. I am hoping that through some miracle I can do half as good a job as Bob has done during the past two years.

Vacations are the order of the day at the time of this writing here at WOW, Bob Rudd spent two weeks in northern Minnesota and reports the fishing excellent and that the lakes in that part of the country make beautiful scenery. Mark McGowan has also been vacationing but details have not been learned at this writing as to where he went and what he did. G. Flynn is spending his vacation around home and seeing the sights of Omaha. Roy Glanton, Transmitter Super, has had the old bus revitalized and is seen frequently these days wandering around the Trans. grounds with a far away look and one hand clutching a map of western United States. He plans to include Boulder Dam and Grand Canyon with numerous side trips in his itinerary.

Al Maller, the confirmed bachelor of the Omaha Chapter and who is also a confirmed control engineer, worked several shifts at the WOW transmitter during the vacations of Mark McGowan and Roy Glanton.

Lawrence Sibelia, new addition to the WOW engineering staff, began working a regular shift in the control room on July 1st of this year. Larry is a native of Omaha and attended Tech High where he first became interested in radio. He attended an electronic school in Omaha and served three years in the Navy and was discharged with an ETM rating. He obtained his radiotelephone first license in June of 1942. We are sure that Larry will prove to be a valuable addition to the WOW Engineering Dept.

Dick Peck, studio engr., has moved into his new house which he recently purchased. Dick says he has had enough of two by four apartments and that he can now really begin to live.

Paul McDonald, well known Omaha electronic engineer, has begun employment at KOAD, FM station in Omaha. All of his friends at WOW wish him every success in his new position.

Bill Dunbar has been promoted from control engineer to Assistant Chief Control Engr. Bill has a lot of Navy radio in his background and has a lot of ability. Good luck, Bill, from all members of the Omaha Chapter.

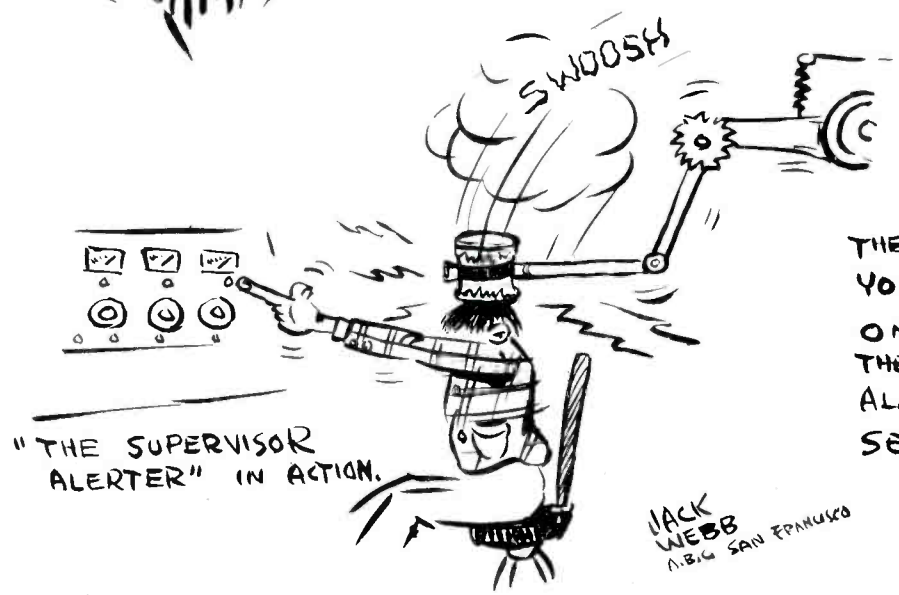
No news from KODY this month, so don't know what the boys out there are doing. The one bit of Vital Static that we have to offer this month is the news of the birthday on August 10 of Louis Deboer. According to the record, which I inherited from Bob Rudd, Louie has reached the ripe old age of 25 years. Congrats, me boy, and may you live to be a hundred.—Hope to see you all next month—Cy.

SAN FRANCISCO SENDS ITS TIDINGS IN THE FORM OF A CARTOON — SEE OPPOSITE PAGE!

HELPFUL HINTS TO THOSE WHO ~~MAKE THEIR LIVING~~ WORK IN RADIO. NO. 1

MEET **PROF. UGO NEMO,** A.B.C., N.B.C., C.B.S., A.W.O.L., L.S.(M.F.T., P.E.E.. WHO OFFERS THIS GREAT, NEW INOVATION WHICH ALL MASTER-CONTROL SUPERVISORS WILL WANT TO SEND FOR! (PATENT PENDING)

DO YOU HAVE TROUBLE REMEMBERING THOSE STATION-BREAKS? THOSE NECESSARY SWITCHES AND PRE-SETS?



"THE SUPERVISOR ALERTER" IN ACTION.

JACK WEBB A.B.C. SAN FRANCISCO

WELL ▭▭ THIS HANDY GADGET GOES OFF, AUTOMATICALLY AT 14:30, 29:30, OR 59:30!

THE PROFESSOR GUARANTEES THAT YOU'LL NEVER MISS ANYTHING ONCE YOU'VE TRIED ONE OF THESE. COMES IN A HANDY KIT, ALL READY TO ASSEMBLE. SEND FOR YOURS NOW!!

The 1946 Winter I. R. E. Meeting

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

By Ed Stolzenberger

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

44. Model Aircraft-Antenna Measurements.

George Sinclair, E. W. Vaughan, and Edward C. Jordan

(Ohio State University Foundation, Columbus, Ohio)

Although antenna models have been used for many years in studying antenna patterns, the measurements were severely limited as to frequency and type of antenna. It is shown how the techniques may be extended to cover a very-wide-frequency range and a wide variety of antennas. Particular application to the study of aircraft antenna patterns are cited. The utility of models in studying special properties of antennas, such as polarization errors of direction finders, propeller-modulation effects, ellipticity of polarization, etc., are discussed.

68. One-Millionth-of-a-Second Radiography.

C. M. Slack and D. C. Dickson

(Westinghouse Electric Corporation, Bloomfield, N. J.)

The making of ultra-speed radiographs, using exposure times of the order of one millionth of a second, requires the passage of electron currents of 1,000-2,000 amperes. Such currents can be supplied by an electron source utilizing field emission from a cold cathode electrode which degenerates into a metallic arc in a high vacuum. The recording of such high-speed transients will be briefly discussed. The development of this equipment has been greatly accelerated because of the war. Slides showing its applications to various radiographic problems requiring short exposure times which have just been released by the War Department will be shown; among these are radiographs taken at Frankford Arsenal and Aberdeen Proving Grounds of exploding shells and bombs, and at Princeton University, showing the wounding mechanism of high-velocity fragments. Future applications will also be discussed.

80. Theory of Impulse Noise in Ideal Frequency-Modulation Receivers.

David B. Smith and W. E. Bradley

(Philco Corporation, Philadelphia, Pa.)

An analytical treatment of noise in frequency-modulation receivers is given for the case when a mixture of noise and useful signals is applied to the receiver input. Methods of measuring the performance of receivers with respect to frequency-modulation noise are discussed.

23. Ground-Controlled Approach.

Ernest Storrs, W. Devitt, and Ben Green

(Watson Laboratories, Red Bank, N. J.)

Out of the development race for military supremacy in World War II has come one of the most outstanding navigational aids yet known. It is known as ground-controlled approach or, more popularly termed, GCA. Our military designation has been the nomenclature AN/MPN-1. Its purpose is to talk the pilot down the glide path under conditions approaching zero visibility to a safe landing by means of the normal communications equipment already installed in the aircraft.

19. A Kinescope for Home Projection-Type Television Receivers.

L. E. Swedlund

(RCA Victor Division, Harrison, N. J.)

The development of a small high-voltage cathode-ray tube for home projection-type television receivers, soon to be available commercially, is described. Several new insulation and fluorescent screen problems had to be solved because of the need for operating at relatively high voltage. An outstanding gain in light output and performance was attained by applying an electron-transparent, light-reflecting aluminum film to the back of the fluorescent screen.

88. High-Frequency Plated Quartz-Crystal Units for Control of Communications Equipment.

R. A. Sykes

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

A description is given of the general problems relating to the development of high-frequency plated-crystal units, the methods employed for supporting the crystal blank, adjustment to final frequency by means of vaporized or evaporated films, and the various problems associated with the aging of such units are described. The general problems of devising simplified procedures for the large-scale manufacture of such crystal units are also described.

61. Crystal Rectifiers in Superheterodyne Receivers.

H. C. Torrey

(Radiation Laboratories, Massachusetts Institute of Technology, Cambridge, Mass.)

Crystal rectifiers as frequency converters are superior to other detectors of microwave signals as measured by the noise figure—a quantity dependent on conversion loss and noise temperature of the mixer. Linear network theory can be applied to microwave converters, a mixer being represented as a three terminal pair device with terminals at signal, image sideband and i.f. Such a representation is helpful in estimating the effect on conversion loss of image sideband termination and of parasitic impedances. Other factors of importance are resistance to burn out and stability. Representative microwave mixers designed by Radiation Laboratory are described.

48. Radar Aspects of Naval Fire Control.

Captain Dundas P. Tucker

(U. S. Navy, Bureau of Ordnance, Navy Department, Washington, D. C.)

Application of radar to fire control required the development of many new designs and techniques for the purpose of providing high precision in measuring target position and high resolution against multiple targets and interfering objects. A special circuit for measuring time intervals to 0.05 microsecond, and angles to 0.05 degree were developed. American possession of radar-controlled gunfire was a decisive factor in many naval engagements with Japanese ships and aircraft.

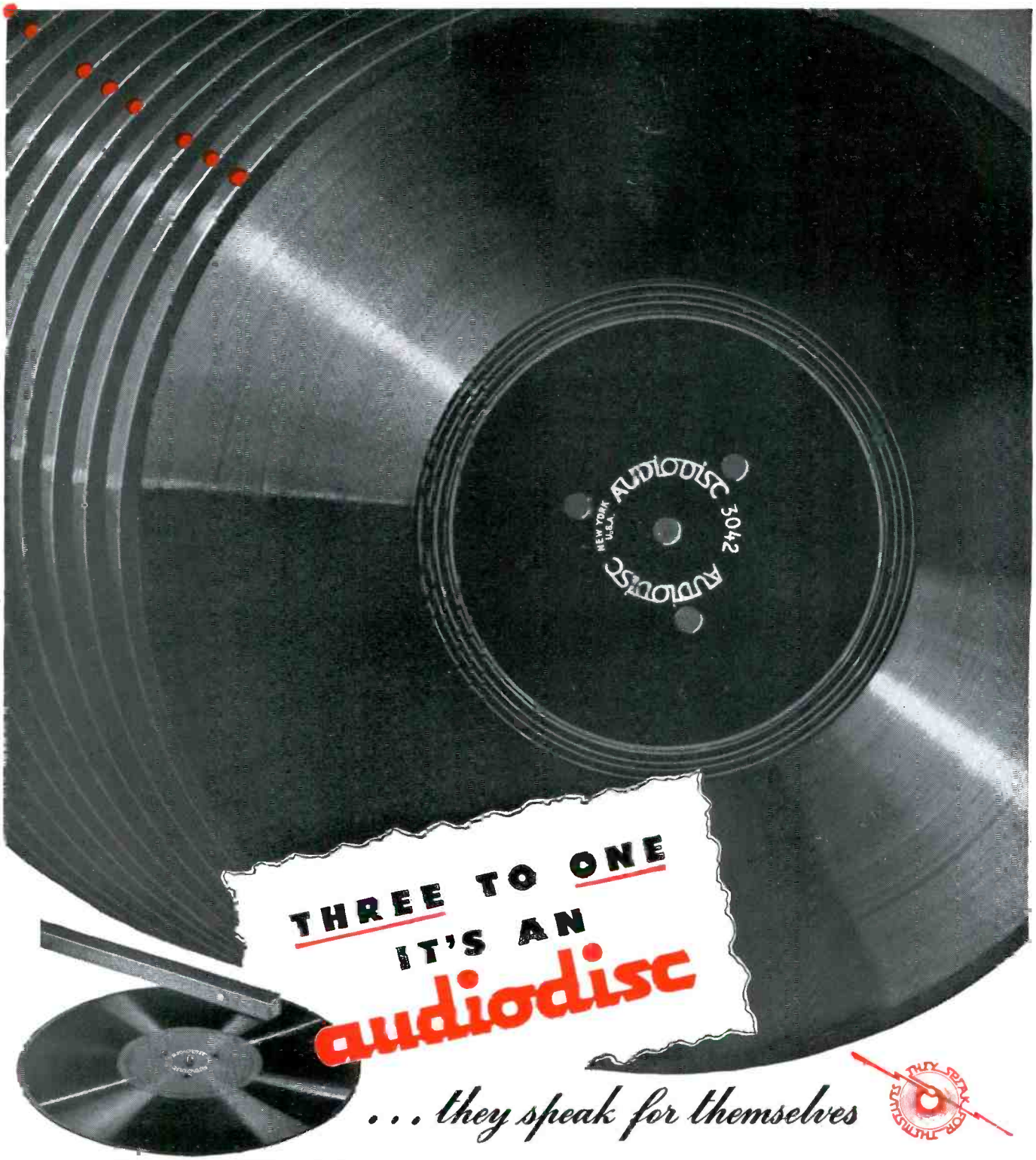
42. Beam-Shaping Methods in Antenna Design.

L. C. Van Atta

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

The angular width of an optical searchlight beam is determined by the extended light source placed at the focal point of the paraboloid reflector and by inaccuracies in the reflector shape. The beam width of a microwave paraboloid antenna, however, is due to diffraction of the radiation at the aperture. For sharp beams, it is desirable, frequently, to distribute the radiation in some manner other than that determined by diffraction. The focusing property of the antenna system can be modified either by providing an extended antenna feed or distorting the paraboloid shape. Straightforward experimental and theoretical approaches are available to the antenna designer in achieving a wide variety of beam shapes for special application.

(To Be Concluded Next Month)



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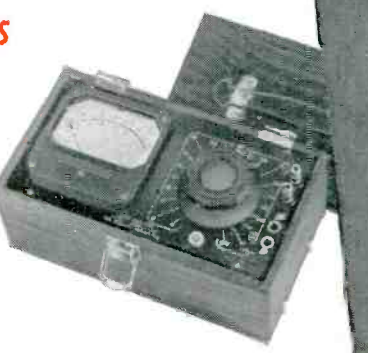

Daven volume level indicators are designed to indicate audio levels in broadcasting, sound recording and allied fields. They are sturdily constructed and correctly damped for precise monitoring. Specialized experience, for almost a quarter century, in the design and development of test equipment has established Daven-Engineered products as "preferred" by leaders in the industry.

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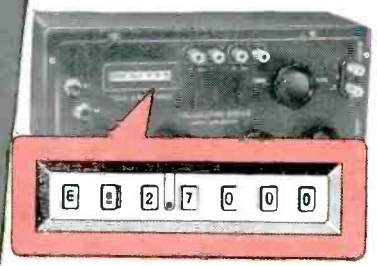

Automatically totalize various dial settings at one point on the face of the unit, where the total can be seen quickly and easily. On units where the decimal point is not fixed, the calculating indicator sets the decimal point in the correct place. Eliminates the possibility of error in calculations. . . . Saves time and effort. Available on bridges, resistance decades, voltage dividers, attenuation networks, etc.

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