1933
HALF-PORTION SCRIP ISSUE
In honor of the Bank Closing

MODERN RADIO

EDITED BY ROBERT S. KRUSE

CONTENTS

Now 15¢ Everywhere

All rates reduced to correspond

April Number 22 15 cents

NATIONAL

The *New* FB-7 H. F. RECEIVER

PRECISION S.W. RADIO Products

THE CIRCUIT

- 7 tubes; one 57, two 24's, two 58's, one 56 and one 59.
- Electron Coupled Oscillators.
- Separate Oscillator for CW beat frequency giving "semi-single signal" or "offset" tuning.
- High efficiency Litz wound IF Transformers.
- Class A Power Pentode Output.
- R-39 Coil Forms with grounded metal shield handles.
- Band Spread Coils available for 20, 40, 80, and 160 meter amateur bands, each covering 100 full dial divisions.
- Standard coils for continuous coverage from 20 MC to 1500 KC.
- No frequency drift.
- Double Shielding.
- May be used with either conventional antenna or "doublet" with transposed transmission-line lead-in.

THE CHASSIS

- Single Control Tuning. (No trimmers.)
- Full Vision Dial with SFL 270° condensers.
- Front-of-panel coil changing, without disturbing shielding.
- CW Beat Oscillator Switch on panel.
- Front of Panel Switch for "cutting" B voltages during transmission.
- Phone Jack, connecting ahead of final audio stage.
- Calibrated Volume Control located under tuning knob, for one hand operation.
- All fixed adjustments, such as I. F. peaking, accessible from top without removal of chassis from cabinet.

SINGLE SIGNAL OPERATION

- Both the circuit and the chassis layout have been designed for ready addition of mechanical filter (quartz crystal) when desired for full "single signal" operation.

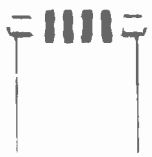
THE POWER SUPPLY

- May be operated from a filament transformer and B batteries; the new National 5887 low price Power Supply, or the standard National 5880 Power Supply (as used with the SW-3), R. C. A. Licensed.

NEW INTERMEDIATE-FREQUENCY TRANSFORMERS

Same as used in National "AGS" Communications Type Receiver and new National FB-7 Receiver. Litz wound, 500 kc. Equipped with trimmer adjustment for peaking, readily accessible from top of transformers, without removal of chassis from cabinet.

TYPE 100 R. F. CHOKE



Extremely low distributed capacity, four narrow sections universal wound, spaced on Isolantite form. Has stiff leads for mounting but fits in grid leak clips. 50 ohms DC res.; dist. cap. 1 mmf.; induct. 2½ mh.; rated at 125 M.

NEW FRONT-OF-PANEL COIL-FORM

As used in "AGS" and FB-7. With grounded and shielded cast-metal end handle. Form made of R-39 low loss coil form material, especially developed for National Company, and containing internally mounted adjustable padding-condenser. Coil shields are available for these forms and are designed for panel mounting, as in the FB-7.

NATIONAL ISOLANTITE SOCKET

Isolantite tube and coil sockets, glazed upper surface, give maximum efficiency in ultra-high frequency circuits, suitable for sub-panel or baseboard mounting, in standard 4, 5 and 6-prong types—now also available in 7-prong type.

NEW VERNIER INDEX DIAL TYPE B.

Equipped with well-known National B-Dial Velvet-Vernier drive with variable ratio, 6-1 to 20-1, and with vernier index reading to 1 10th division. Permits the accurate logging so necessary in short-wave work.

Send Coupon below for full information on the new

NATIONAL CO., INC.,
61 Sherman St., Malden, Mass.

Gentlemen: Please send me full particulars on the new National FB-7 Ham Band H. F. Receiver.

Name ...

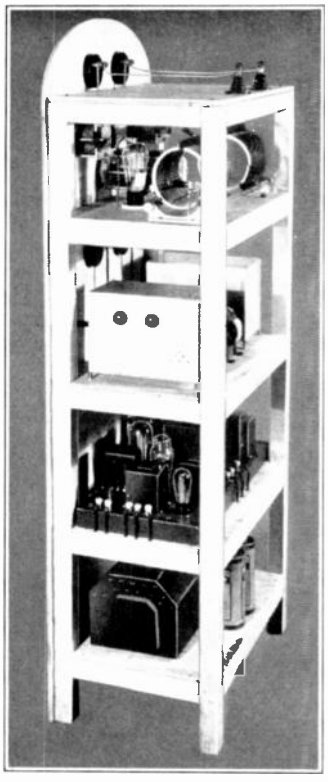
Address ...

M-4-33

The Toth Unit-type Transmitter—Part 2

A Voice and C.W. Transmitter Without Batteries

• • •



The machinery. The top deck carries the output stage, including the E. F. Johnson inductances, 865 tube, and the 3 tuning condensers for both tank circuit and antenna—everything above the milliammeters in the front view. These things never need attention and only the 865 is "plug-in."

The next lower deck carries the removable buffer (front) and oscillator units (rear) with filament transformers between them and resistors for bias and voltage-dividing below the deck. Note ventilation holes in side and top of shield.

The next deck below carries the modulating system or audio amplifier unit—also plug-in.

On the bottom deck are the microphone battery and the National Laboratory Power Supply—likewise readily removed.

In the first part of this article the peculiar advantages of the "Unit System" were explained—the possibility of testing everything separately on the bench, and of using the same basic structure for a 10, 20, 60 or 100-watt set, not to speak of being able to remove the audio system in a moment for public address work.

Most of the individual units were described in detail. Now go on.

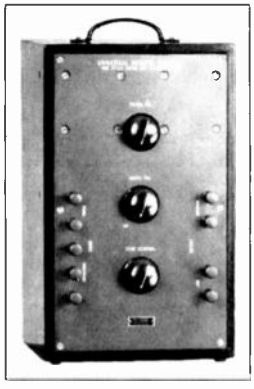
The Buffer Unit

Most of the remarks above apply to the buffer unit as well. This may be a good place to note that this compartment contains none of the grid chokes. The buffer grid choke is in the oscillator compartment, the output-stage r.f. choke is mounted under the top shelf. A little thought will show the reasonableness of these locations. The tapswitch in this stage is not essential unless various sorts of tubes are to be used in testing. For the 45 the "pickoff" should be practically at the plate end of the coil, for the 10 it may be 2 or 4 turns farther down. Another use for this switch is described later.

Control Switches

The switching of the audio system has been mentioned. This leaves only the transmitting tube filament circuits, the rectifier filament in the power supply unit, and the plate-supply itself. It will be seen that none of these appear on the transmitter panel. This is for the good reason that one needs them at the operating position—that is alongside the microphone and receiver. Since the National "Laboratory" Power Supply uses the 5Z3 tube no pre-heating is necessary and the unit may be turned on by one switch, just as in the case of the audio unit. The unit is accordingly plugged into a socket which is switch-controlled from the operating desk. Finally the transmitting filaments may be supplied from a second socket in parallel with the one last named. For a permanent installation these sockets may either be placed in a row near the transmitter (our pet arrangement) or else placed inside the transmitter frame. The first scheme makes the wiring less messy. For a temporary installation everything

may be plugged into a multiple plug supplied from the nearest socket—the total drain is within that permitted from a lamp-socket, although one had best look up the local city and insurance requirements in this regard—there being some very odd quirks in this matter. Turning on the whole transmitter at once may sound queer in view of the wandering temperatures that result from such a practice. If one is particular as to small frequency drifts the bulk of it may be stopped by leaving the 47 oscillator filament on *at all times*, using a separate filament transformer for this stage. Both the 47 tube and a filament transformer are cheap now. The shelf allows ample room for the extra transformer. Unless one goes to thermostatic temperature control ovens this is probably as far as it is worth while to carry elaboration.



The Universal remote control panel used as a pre-amplifier when working from a high-quality low-level microphone. It contains a 230 tube, the batteries to drive the same, a tone control and a volume control.

Microphones

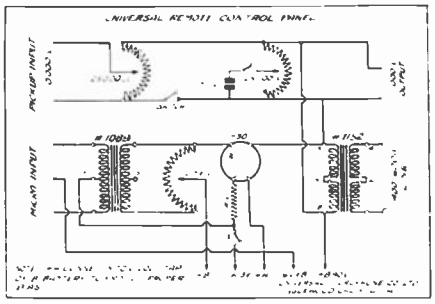
The audio system as it stands will modulate the set completely if the microphone is of the close-talking sort ordinarily used by amateurs. High-quality mikes produce a much lower output level and a pre-amplifier should be used with them. If battery operated and kept on the operating desk this stage will do much to minimize hum, even with a low-priced mike. Before deciding read the microphone paper elsewhere in this issue.

Note that the audio system has a gain control in the second audio grid—not the first. The reasons for this are a bit lengthy but rather definite. When a pre-amplifier is used this control may be set by trial and thereafter the one on the pre-amplifier used—but don't fall into the evil habit of constantly twisting this knob—learn to talk evenly, or else to move to and from the mike. The flicker-lamp on the desk helps in this matter.

The Transmitter Frame and Panel

Before going on to the adjustment and operation of the set a few words about the frame are not amiss.

It is entirely of wood for electrical reasons. The panel and shelves are of the type of 3-layer ply-board known as "panelboard" which is purchasable at



The circuit of the remote control panel contains some things not needed in the radiophone—but thoroughly worth while for those intending to use the same pre-amplifier for public address work. For purely amateur radiophone work omit the upper half of the circuit and feed from the "tube to line" transformer into the audio system described last month. Observe that this arrangement permits one to place the operating position in a remote location if desired. The pre-amplifier draws but little cfiurrent and dry-cells inside the case may be used.

lumber yards in 56″ lengths. The framing is made of material dressed 1½″ square, the 4 uprights being 48″ long. The top shelf is 21″ wide and 13½″ from front to back. The other 4 are cut to the same size, then laid together and notched out at one operation for the corner posts. The CLEAR space between the shelf supports is (from the top down) 8″, 11″, 10½″, and 10″, with 4″ under the lowest shelf. The panel is left of the full 56″ height, merely rounded at the top and cut out at the bottom.

WHOA!

OH PSHUX! JUST AS WE ARE ABOUT TO START IN ON THE CIRCUIT DETAILS AND ALL THE PLEASANT STUNTS THAT CAN BE DONE WITH THIS TRANSMITTER THE SPACE RUNS OUT. WE ARE "AGIN" THIS SCRIP BUSINESS. A REGULAR FULL-SIZED "MODERN RADIO" NEXT MONTH WILL LOOK GOOD TO US.

Methods of Single Signal Reception

*By Dana Bacon

"Modern Radio" is most pleased to present this clear discussion of the two most useful methods of "single signal" reception, both of which the author has engineered into the well-known AGS and FB-7 receivers of the National Company.

In particular we wish to emphasize that an unclear statement in the original FB-7 article (March "Modern Radio") was due solely to editorial mischance.

EDITOR.

An overly brief and, unfortunately, not altogether correct statement in the original article on the "FB-7" receiver (March Modern Radio) has caused much discussion of single signal reception, and the purpose of this paper is to clarify the principles and outline the characteristics of two systems. Incidentally, both systems are available in the "FB-7" receiver.

In spite of the many excellent articles published by James Lamb, there is still apparently some misunderstanding as to what the term "Single Signal" reception implies.

Going back to the simple oscillating detector, everyone is, of course, familiar with the beat note set up by a c.w. signal. When such a detector is tuned exactly to the signal, the frequency of the beat is zero. It necessarily follows, therefore, that in order to produce an

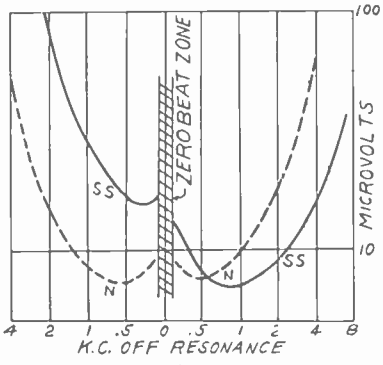


Fig. 1

audible tone, the detector must be detuned slightly to either a higher or a lower frequency from that of the signal.

* Engineering Department, National Company, Malden, Mass.

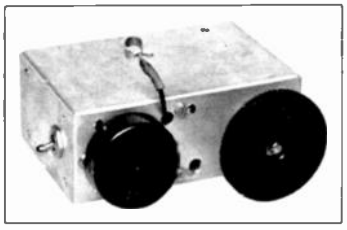


Fig. 2. A crystal filter. The switch at the left permits the use of a series or parallel connection as desired, or the crystal may be switched out, depending on the selectivity requirements. The crystal itself is in the round container, the I.F. peaking condenser is reached through the lower opening, and the phase-shifting condenser through the upper one. The milled knob acts upon the selectivity-control condenser.

For instance, in order to obtain a 1,000-cycle beat note, when receiving a 5,000 k.c. station, the receiver must be tuned either to 4,999 or 5,001 k.c. This detuning, being only .02% is negligible as far as reducing signal strength is concerned.

A short-wave superheterodyne, however, presents an entirely different picture. Receivers of this type ordinarily employ an intermediate frequency in the neighborhood of 500 k.c., and c.w. beat note is produced by beating the i.f. signal with a separate beat oscillator coupled to the second detector.

Let us assume that the beat oscillator is tuned exactly to the i.f.—the principles of producing a beat note will be exactly the same as in the case of the oscillating detector; that is, the i.f. amplifier must be detuned from the signal in order to set up an audible note. In the superheterodyne this is accomplished through the mechanism of the high-frequency signal oscillator and first detector, which is adjusted so that the i.f. signal impressed upon the second detector and beat oscillator is either 499 or 501 k.c.

The curve "N" in Fig. 1 shows this effect. The scale labelled, "K.C. OFF RESONANCE" refers to the *tuning of the beat oscillator*, while the microvolt scale is more or less arbitrary, being intended merely to show the rapidity with

which the signal is attenuated as it is detuned. The detuning for a 1,000-cycle beat being only .2%, is not serious, but does noticeably decrease signal strength. Obviously, then, it is desirable to tune the signal exactly, so that the maximum selectivity and amplification of the i.f. amplifier may be utilized. To do this and still obtain an audible beat note, it is only necessary to change the tuning of the separate beat oscillator to either 499 or 501 k.c. It makes little difference which frequency is chosen.

This scheme gives excellent results and is a definite approach to single signal performance. Referring to the "s.s." curve of Fig. 1, it will be seen that maximum sensitivity is realized when the receiver is tuned to give a beat note in the neighborhood of 1,000 cycles, and, furthermore, that this increased sensitivity represents an actual, useful, improvement in selectivity. The point to remember is that with the receiver adjusted to give this beat, the signal is quence maximum efficiency is obtained. It follows, that the single signal effect cannot be even remotely approached unless the selectivity of the intermediate frequency amplifier is of a sufficiently high order to markedly attenuate the signal when detuned 2,000 cycles, or that amount which would result in the audio image response of 1,000 cycles. The curves of Fig. 1 are those of the standard National FB-7.

The same general principles apply to full single signal reception in receivers employing a properly adjusted quartz crystal filter in the i.f. amplifier. The overall selectivity of the receiver will now be such that the acceptance characteristic is only a few cycles in width; usually less than 50. Actually, the signal must be tuned in exactly in order to be received at all, and this is just another way of saying that nothing reaches the second detector unless it is exactly equal to the crystal frequency.

The beat oscillator must be detuned as in the prevous case, in order to obtain any audible beat, but a most important point, which is not always realized, is that the pitch of the audio response will depend solely upon the detuning of the actually tuned in exactly and in consebeat oscillator; that is, with a 500 k.c. crystal and the beat oscillator tuned to 501 k.c., a sharp peak will exist at the difference (beat) frequency; viz. 1,000 cycles. The effect of such selectivity to the ear is similar to that of a very sharply peaked audio amplifier.

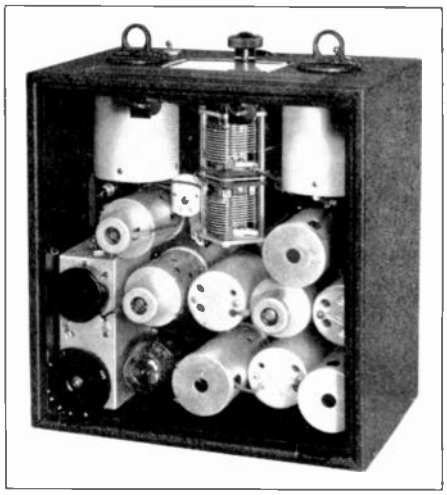


Fig. 3. An FBX receiver with crystal filter (lower left) replacing an ordinary i.f. transformer.

The photograph shows the "FBX" receiver, complete with a crystal filter, selectivity control, selector switch, etc. The crystal and all its associated equipment, including the input i.f. transformer, is mounted in the rectangular compartment at the right-hand side of the chassis. This unit is complete in itself, as shown in the photograph, Fig. 2. Only three leads are brought out, the grid lead to the first i.f. tube, and the primary leads of the i.f. transformer connecting to the first detector circuit. Built in this way, shielding of all circuits is complete.

Such a unit enables the FB-7, or any other short-wave superheterodyne of equal inherent stability, to be converted for full single signal reception with a minimum of trouble and expense. In such conversion there are, of course, several points to be considered, such as the stability of the high frequency and beat oscillators, the facility for changing the beat oscillator tuning, etc., all of which are essential when such extremely high selectivity is built into a receiver.

NOISES FROM RECTIFIERS

*By F. S. Dellenbaugh Jr.

From the good old days of the Raytheon Rectifier for B eliminators to modern power supplies with mercury vapor tubes of latest design, all users have been confronted wth problems of quieting ripple and other noises. The

Fig. 1. What may happen uader adverse conditions.

residual AC ripple can be handled by means of filter circuits and the ripple reduced to any degree desired by adding enough inductance and capacity assembled with even a small amount of intelligence. However, cases arise, particularly with bridge type rectifiers, when noise still persists. As the noise must be caused by 60 cycles both ripple and other parasitic noises have the same apparent pitch and are difficult to distinguish.

Fig. 1 is an oscillogram showing what may happen due to rectifier tube characteristics. This oscillogram shows the voltage across the load in the voltage doubling circuit of Fig. 2. The rectifiers were somewhat experimental, but in general were similar to '66 type. It will be noted in Fig. 1 that one-half wave comes through perfectly smoothly and is entirely normal. The other half-wave is full of steps. As far as external observations by means of meters or appearance of tubes was concerned the circuit was operating perfectly satisfactorily. When put on the oscillograph, however, these rather violent parasitic surges made their appearances. By changing constants in different parts of the circuit, the picture may be changed in appearance quite materially, but one tube always produced some form of oscillation. Obviously, a rectifier involving peculiarities of this sort is very likely to make trouble in smoothing the ripple. In fact, these sudden jumps in current may excite various parts of the circuit to produce damped oscillations, varying in frequency from a few kilocycles to radio frequency. While the oscillogram was taken on voltage doubling circuit with experimental tubes, very similar effects will occur in all types of rectifier circuits under some conditions, and have been observed occasionally with standard rectifier tubes. In one notable case parasitic surges became so violent that the insulation collapsed on the filament transformer.

The cause of these oscillations is probably due to the fact that the break down voltage of a mercury vapor tube is higher than the internal drop when current is flowing. As a result, immediately after the tube starts to conduct, the internal voltage drops almost instantaneously from starting to running value. This is equivalent to introducing a negative resistance in the circuit and whenever a negative resistance is present oscillations are always possible.

There are several possible methods of cure. In the first place an adequate first choke in the filter circuit, preceding the first condenser, is of great help. The

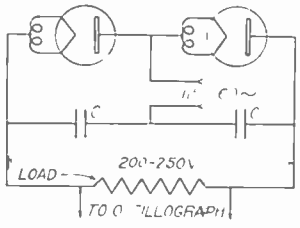


Fig. 2. The circuit used to produce the effects of Fig. 1.

size of this choke in Henries should at least be equal to the load resistance in ohms, divided by 1,000 and preferably twice this value. The first condenser must also be large enough so that the resonant frequency of first choke and condenser is well below 60 cycles. Under these conditions the starting voltage of the tube is provided by inductive voltage set up by the first choke, and the current is handed gently from one tube to the other, both tubes carrying current

(Continued on page 14)

* President and Chief Engineer, Delta Mfg. Co., 39 Osborne Street, Cambridge, Mass.

Western Electric General Purpose Triodes

TYPE	101D*	215A	244A	247A	262A	264A	272A
Base Pins	4	4	5	5	4	4	5
Cap.	—	—	—	—	Grid	—	—
Fil. V.	4.5	1.0	2	2	10	1.5	10
Fil. A.	1.0	0.25	1.6	1.6	.320	.300	.320
Bias	—18	—10	—10	—7	—7.5	—7	—21
Mu.	6	5.6	9.7	14.6	15	7	5.5
Plate Res.	5 600	15,000	10,000	16,000	18,000	12,000	7,000
Plate Volts	190	100	180	180	180	100	180
Plate Ma.	8	1.9	6	3.8	2.8	2.6	6
Capacities †	5-2-4	3-1-1.5	3-4-4	3-3-3	2-4-2	5-2-4	3-3-3

* 101F is a low-microphonic form of 101D.

† In whole numbers, for lack of space. The first figure is grid-plate capacity, the second is grid-plate and the third is plate-filament.

Western Electric Transmitters and Tubes
Released to Radiophone Amateurs

Western Electric tubes of both receiving and transmitting types have been released to radiophone amateurs through the Graybar Electric Co. and may be purchased through the nearest branch or by inquiring of Mr. A. J. Eaves, Research Products Sales Manager, Graybar Electric Co., Lexington Avenue at 43rd Street, New York City. The prices are the same as to broadcasting stations. Mr. Eaves writes "—in fact we have a release to sell anything to the amateur trade which is sold by Western Electric Company for broadcasting purposes, where the station is used for telephone purposes." This includes the 50 and 400-watt police-type transmitters. A 100-watt size is expected soon, and there are already 250, 500 and 1,000-watt sizes.

The triodes on the opposite page are priced (in the same order) at $7.75, (101F at $5.25), $3.50, $2.60, $2.60, $4.00, $2.50 and $4.25. The 101 types are stated to have lives of many thousands of hours. In addition the following other types should be noted.

AUDIO OUTPUT TUBES

252A, resembling RCA 250 but having 5-volt filament, price $10.25.

271A lies between RCA 210 and RCA 250 but has a 5-volt, 2-amp. heater-filament and a separate cathode, price $13.25.

275A, lies between RCA 45 and RCA 2A3, price $4.25. The filament runs at 5 volts, 1.2 amps., plate at 250 volts, 52 ma., mu 2.9, plate resistance 1,000 ohms.

RECTIFIERS

249A resembles the 66 but has a 7-amp. filament and will pass peaks of 1,100 ma. at a peak inverse voltage of 6,500. Price $10.00.

274A resembles the 80, max. r.m.s. input volts per plate 450 to 660 depending upon the filter type. Price $2.80.

280A resembles the 66 but has only a 3-amp. filament, hence peak plate current only 500 ma. peak inverse voltage 3,500. Price $6.25.

MISCELLANEOUS

205D—Spherical triode, mu. 7.3, fil. 1.6 amps. at 1.5 volts. Audio output 1,200 mw. at 370 volts. R.F. output 3 watts at 400 volts. $7.00

205E—Non-microphonic 205D. $8.00

212D—250-watt sending tube. Too well known to describe.

231D—Interchangeable with 99. $4.00

242A—Resembles RCA UV211 closely. $17.50

251A—Resembles RCA 865 "7½-watt" screen-grid tetrode but has 5-volt filament. $21.25

251B—Interchangeable with RCA 865. $21.25 (See 282A)

256A—"Trigger" triode containing argon gas. When plate voltage reaches about 30 times grid voltage, tube breaks down and conducts up to 75 ma. with drop of only 10 to 20 volts. 5-pin base, 2.3-volt, 1.7-amp. filament. $7.25

259A—High-quality screen-grid receiving tube. Resembles 224 but mu. 500, mutual 1,400, plate current 6 to 7.5 ma. at 180 volts plate, 75-90 screen. Plate resistance 300,000 to 400,000 ohms. Filament 2 volts 1.6 amp. $4.00

261A—Resembles RCA 861 but has 1.5-volt, 300-ma. fil. $2.50

276A—Resembles RCA 211 and W.E. 212A but has lower capacities and fil. takes but 3 amps. $17.50

277A—Big brother to 256A. $10.00

282A—THIS IS SOMETHING. Big brother to the RCA 865 and the W.E. 254A and 251B above. Hard glass construction permits operation at 1,000 volts with 30 to 50 watts output. $31.00

284A—Equivalent to RSA 845. For audio work, output 10 to 40 watts with 1 to 5% harmonics depending on load and applied voltages. $25.00

The Reversed Vacuum Tube

By Milton Rubin*

The triode, tetrode, pentode, et al—have been used as amplifiers for many years, according to the basic circuit in Fig. 1. By varying the voltage applied between the grid and filament the plate

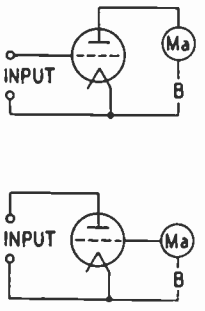


Fig. 1. Above, the usual amplifier circuit, with the input applied to a negatively biased grid, the plate being kept positive. Below, the reversed or de-amplifying vacuum tube with input applied to the plate and the grid kept positive. The plate MAY have a negative bias if desired.

current varies according to a definite curve. Nearly all circuits, amplifying, detecting, oscillating, etc., are based on this elementary effect.

The new circuit, which could well be called a de-amplifier, performs, as the title indicates, in exactly the reverse manner of the ordinary grid-tube circuit. In Fig. 2, the input voltage is applied between the *plate* and the filament; by varying this voltage, the *grid* current varies accordingly. In the usual vacuum tube circuit, since the grid is so much nearer the filament than the plate is, a small variation in the grid input voltage makes a large variation in the plate current. For the same reason, in the de-amplifying circuit, a large change in the plate input voltage produces a small variation in the grid current. Grid current is forced through the grid circuit by the grid battery; when the plate is made negative its field counteracts the positivity of the grid somewhat, and repels electrons that are flowing from the filament to the grid, in other words, reduces the grid current, the magnitude of the effect depends on the mu of the tube, the plate voltage, grid voltage, etc. Since the plate is so much farther from the filament than the grid is, the plate must be very negative to reduce appreciably the grid current. In fact, using a relatively low mu tube such as the 201A, with 6 volts on the filament, and 3 volts on the grid, the plate must be 135 volts negative to the filament, in order to prevent any current from flowing in the grid circuit.

Fig. 3 shows a graph made with a 201A as the de-amplifier. The grid battery consisted of two 1½ volt dry-cells, with the positive side connected to the grid and the negative side connected to the plus side of the filament through a milliammeter.

In using this reversed vacuum tube, there are, however, a number of annoying effects to be overcome.

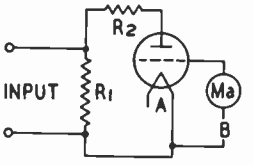


Fig. 2. A convenient practical form. R2 is a limiting resistor to prevent damage to the tube is a high voltage is applied to R1 in such a direction as to make the plate positive. R1 is the resistance across which the input is applied. Its use, as in ordinary vacuum-tube voltmeters prevents false readings from stray fields. (R1 may be 100,000 ohms and R2 10,000. Ed.)

First, touching the plate terminal with one's finger causes the meter needle to dip. Connecting it to the ground, or to one side of a battery or other body containing electric charges, causes the same effect. Now this is undesired, as, if the voltmeter is to have any use, the reading of the meter should vary *only* when the *potential difference* between the *plate and filament* is varied.

Second, when the two input leads, from plate and filament, are touched together, the reading of the meter varies.

Some more experimentation is undoubtedly necessary to perfect this instrument. Having neither the equip-

* 52 Westmore Road, Mattapan, Mass.

ment nor the time to investigate its possibilities further, I am hereby exposing all that I have done with it so far, for the edification and benefit of the fraternity.

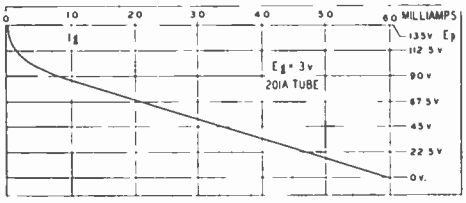


Fig. 3. Calibration of a 210A tube used as a de-amplifying voltmeter. Not all 201A tubes will give this exact curve. Read the grid current, find it on the upper scale, run down vertically to the curve and then to the right to find the voltage.

When used as a voltmeter, it will have to be calibrated.

It ought to work well on a.c. voltages. Positive high voltages will do no harm to the tube, because of the high resistance (R2) in series with it.

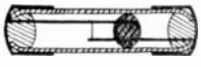
The multi-grid tubes are good for use in this circuit—each of the outer grids or plate, when used as the plate, can be used for a different voltage range.

High voltages can be measured, the only limit being the insulation of the tube, its (de-) amplification factor, and the grid current allowable.

The only current drawn is through the high resistance, R1,

MODERN RADIO
QUIZ-MATIC

As usual, one year's sub. or extension for the most to-the-point answer; six months to the next four—our judgment to be final. (Winners of a first or two seconds are ineligible until their time is up, but good answers meanwhile put their names in the KING ROW.)



Here's an easy one—without the kinks of last month's questions.

Part A—Why is a low-mu tube undesirable for Class B work?

Part B—(In case Part A was still too hard.) What is the device pictured here—and what do you suppose accounts for the unusual construction?

JANUARY WINNERS

First Prize: Richard How, Hollis, L. I., and Temple V. Ehmsen, Portland, Oregon. Second Prize: 000000000. Nobody else came within a row of apples trees of guessing either problem.

Short Circuits

"Modern Radio," having reduced its subscription rate from $2 per year to $1.50 per year hereby extends all existing subscriptions as follows:

Months paid for at old rate.	Months which will be sent.
3	4
4	5
5	6
6 and 7	8
8	11
9	12
10	13

Don't let the size of this "Scrip Issue" worry you—remember that "The situation is temporary."

P.S. Even as we write banks have started to re-open.

APRIL FOOLISHNESS

The Horrible portrait of Eddie Cantor on the Cunningham radiolog.

WTIC cooking lessons in which one does not use molasses but "molosses".

Speech by chief engineer of auto factory via radio to servicemen: "—study this car so that when they start piling up on the road—"

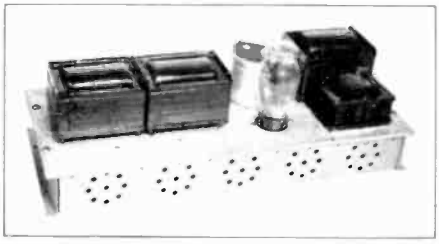
At W1CDW the transmitter uses a 210 push, 250 pull oscillator.

The boss of W1ANC sez that King Pradjadhipok (?) should never have gone back to Siam—lookat the fine white elephants we have for him right here—Radio City, frinstance.

A 7-prong tube may be connected about 1,080 ways, of which 3 are right.

(Continued from page 7)

during the transition period between half cycles. Another corrective feature is to introduce radio frequency chokes into the anode circuit of each tube used. As these chokes are to prevent parasitic frequencies, their size shoud be considerably larger than that corresponding to the radio frequency at which transmission is being carried out.



While it is not directly connected with the subject of this article we can't resist showing here this new Delta AD-61 compact power supply for small transmitters and for public address systems. Using an 83 tube it delivers 175 Ma. at 400 volts, with a ripple of less than 0.1%. The regulation is less than 18% from 10% load to full load. The filter consists of two 8 mfd. electrolytic sections, a 5-25 hy. first choke and an 8.5 hy. second choke. There is an in-built bleeder resistor. A separate transformer permits preheating of the rectifier. With the cast silicon-aluminum base and enclosure it weighs 21 pounds and costs $34.25 net about what the parts cost an amateur. With slight modifications it can use the 5Z3 rectifier instead of the 83. The device is due to Delta Manufacturing Co., 39 Osborne Street, Cambridge, Mass.

In a couple of nuts shells—the 77 tube is a better 36 and the 78 is a better 39.

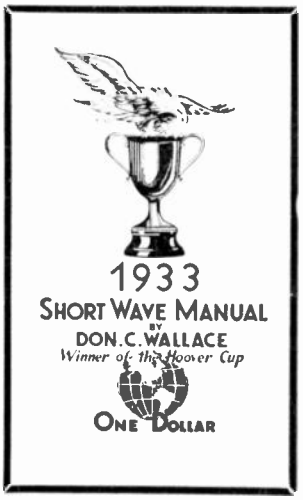
RADIO RESEARCH MOVES

Radio Research Co. has moved into its new building at 9th and Kearney Streets, N. E., Washington, D. C. The structure was designed specifically for radio work and includes a very extensive ground system with leads into each room. There are two built-in shielded rooms for test and measurement work. Ample space is available for towers to support antenna net works which will be erected in the near future.

A television record was made early in the year when the 1,000-watt Don Lee transmitter, W6XS, was "looked in on" at Houlton, Maine, by G. H. Hanson.

NEW UNIVERSAL PRODUCTS

Universal has just added blank and pre-grooved aluminum record-discs, in 4, 8, 10 and 12-inch sizes to its line. There is also a new line of volume controls and faders best described



The Last Word In Short Wave Books

▲▲▲ The 1933 SHORT WAVE MANUAL BY WALLACE

WINNER OF THE HOOVER CUP

A WELL-KNOWN radio manufacturer will market a kit of parts for the Wallace Short Wave Receiver. Anybody can build a Wallace receiver either from this kit of parts or by making all parts at home according to instructions contained in this Manual. Also shown is the new World Short Wave Log and Time Table, with Audibility and Probability Rating for stations. This Manual will solve many of your short wave problems. SEND YOUR ORDER NOW.

DEALERS and JOBBERS are invited to write for trade prices.

EVERY dyed-in-the-wool amateur and short wave enthusiast has heard of the achievements of Don C. Wallace. He seems to get stations right through the QRM and noise. He uses a receiver that is ultra-efficient. Its simplicity is what makes it so efficient. Wallace has made many improvements in his receiving and transmitting equipment. He tells about them in the 1933 Wallace Short Wave Manual . . . tells you how to build a duplicate of the inexpensive little two-tube receiver that outperforms anything yet tested at W6AM-W6ZZA. Anybody can build this receiver in an evening by following the instructions contained in the Wallace Manual. But that's not all. Wallace also tells how to make a simple '47 tube transmitter that is reaching out . . . how to make a simple 'phone transmitter, good for a couple of thousand miles . . . how to make the new cellulose-base short wave coils . . . how to design a short wave aerial that meets your exact requirements . . . how to pass the amateur examination . . . how to master the code . . . how to make ANY short wave receiver work better than it has ever worked before. Wallace speaks from FACT. His Manual will show many people the way to better short wave radio . . . the kind that enables you to "connect" when others fail. It will be out on March 20th. Pre-publication orders will be filled FIRST.

SEND YOUR ORDER NOW. ASSURE EARLY RECEIPT OF COPY . . . .

Pacific Radio Publishing Company (Established 1917)
422 Pacific Building, San Francisco, California.

Send me a copy of the 1933 Short Wave Manual by Wallace as soon as it is off the press. I enclose $1.00 in full payment. You are to send this Manual postpaid.

Name .....

Address .....

City and State .....