

MODERNIZING EXISTING ANALYZERS

AUG. 26

1933

15c

RADIO

REG. U.S. PAT. OFF.

WORLD

The First and Only National Radio Weekly

Twelfth Year

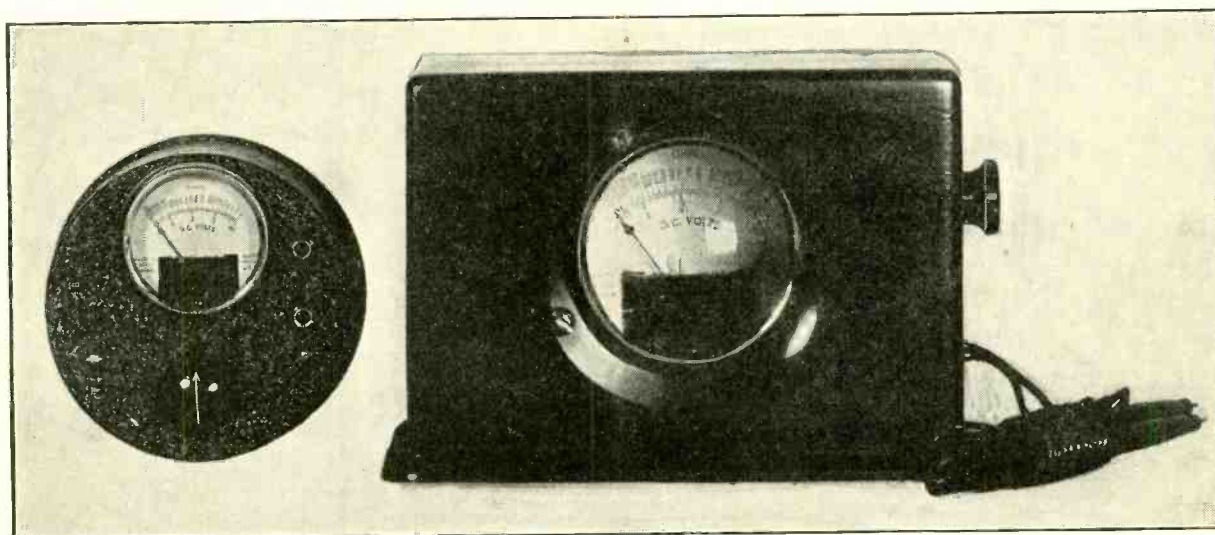
596th Consecutive Issue

All-Range

Capacity Meter

Bandspread Problems

MAGNIFIER TYPE OHMMETER



To improve the legibility of an ohmmeter, a magnifying glass is used in the instrument at right. The same type meter, without such glass, is illustrated at left.

**Marconi's
Ultra Waves
Pierce Hills
in 170-Mile Test**

**Employes
Walk Out at
Atwater Kent
and Philco Plants**

**Business Bureau
Gets
After
"Gyp" Ads**

North American Radio Conference Fails

SPECIAL SMALL POWER TRANSFORMER

Filament-plate transformer, for oscillators, 1 or 2-tube sets, etc.
 Primary, 110 volts a-c.
 Secondary A, 2.5 volts, center-tapped; stands up to 3 amperes.
 Secondary B, 110 volts, not center-tapped.
 Excellent for test oscillators with a-c in plate.

Price, \$1.10

RADIO WORLD

145 West 45th Street New York, N. Y.

PRICES GO UP SEPT. 15 TROUBLE SHOOTER'S MANUAL, Nos. I, II and III

Having assembled 2,000 diagrams of commercial receivers, power amplifiers, converters, etc., in 1,200 pages of Volume No. 1 of his Perpetual Trouble Shooter's Manual, John F. Rider, noted radio engineer, has prepared Volume No. 2 on an even more detailed scale, covering all the latest receivers. Volume No. 2 does not duplicate diagrams in Volume No. 1, but contains only new, additional diagrams, and a new all-inclusive information on the circuits covered.
 Volume No. 3 (Recently issued). Order Cat. RM \$7.50
 Volume No. 2—Perpetual Trouble Shooter's Manual, by John F. Rider, Shipping weight 6 lbs. Order Cat. RM-VT @ \$5.00
 Volume No. 1 (8 lbs.). Order Cat. RM-VO @ \$5.00
 We pay postage in United States on receipt of purchase price with order. Canadian, Mexican and other foreign remittances must be in funds payable in New York.

RADIO WORLD

145 West 45th Street New York City

115 DIAGRAMS FREE

115 Circuit Diagrams of Commercial Receivers and Power Supplies supplementing the diagrams in John F. Rider's "Trouble Shooter's Manual." These schematic diagrams of factory-made receivers, giving the manufacturer's name and model number on each diagram, include the MOST IMPORTANT SCREEN GRID BEHAVIORS.

The 115 diagrams, each in black and white, on sheets 8 1/2 x 11 inches, punched with three standard holes for loose-leaf binding, constitute a supplement that must be obtained by all possessors of "Trouble Shooter's Manual," to make the manual complete.

Circuits include Bosch 54 D. C. screen grid; Balkite Model F. Crosley 20, 21, 22 screen grid; Eveready series 56 screen grid; Eria 324 A.C. screen grid; Peerless Electrostatic series; Philco 76 screen grid.

Subscribe for Radio World for 8 months at the regular subscription rate of \$1.50, and have these diagrams delivered to you FREE!

Present subscribers may take advantage of this offer. Please put a cross here to expedite extending your expiration date.

Radio World, 145 West 45th St., New York, N. Y.

LOOK AT YOUR WRAPPER

You will see by the date thereon when your subscription for Radio World expires. If the subscription is about to run out, please send us renewal so that you will not miss any copies. Subscription Department, RADIO WORLD, 145 West 45th St., N. Y. City.

Vol. III of RIDER'S MANUAL (A New Book)

Just out, John F. Rider's Vol. III Manual weighs nearly 11 lbs. and has 1,100 pages, all diagrams of commercial receivers, etc. (no text). Sets announced up to May 1st, 1933, are included—and complete information on every one, including resistance values. The volume is original and necessary and does not repeat data that are in Vols. I and II.

A Chronological Catalog and Index of all nationally-advertised radio receivers manufactured and sold in the United States between January, 1921 and January, 1933 are contained in Volume III. This list will be of tremendous aid in the identification of receivers for which the model number is not known.

Complete data include schematic wiring diagrams; chassis wiring diagrams; parts layouts; photographic views of chassis; socket layouts; voltage data; resistor values; condenser values; location of alignment and trimmer condensers; alignment and trimmer adjustment frequencies; intermediate-frequency amplifier peaks; alignment and intermediate-frequency adjustment instructions; color coding; transformer connections; point-to-point data; continuity test data; parts list with prices; special notes.

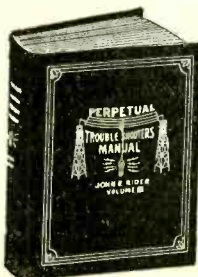
Complete tabulation of tube data showing electrical characteristics and constants for all of the tubes employed in radio receivers and amplifiers since 1921. Also a table of interchangeable types.

A complete table of I-F. peak frequencies as used in radio receivers. This list augments the information of this type shown upon the diagram pages. Intermediate-frequency amplifier peak information is very important because quite a few of the manufacturers employ more than one figure in their Year's production. A wrong guess on your part means trouble.

Order Cat. RM-3 @ \$7.50. Remit with order and we pay postage. Order C.O.D. and you pay postage.

Volume I—Order Cat. RM-1 @ \$5.00

Volume II—Order Cat. RM-2 @ \$5.00



Volume III of Rider's Manual has a page sequence in accordance with Vols. I and II, and is not cumulative, or repetitive of the earlier volumes. However, it contains an index for all three volumes.

HENNESSY RADIO PUBLICATIONS CORP.

145 WEST 45th STREET, NEW YORK CITY

NO MORE CALCULATING OF INDUCTANCE!

Get your answers accurately from curves in the only book of its kind in the world, "The Inductance Authority," by Edward M. Shipe, B.S., M.E.E. Two charts, one in the book, the other (16x20 inches) as a supplement, relate inductance, capacity and frequency, the large one from ultra to audio frequencies. Thirty-five charts, with 13 curves on each, cover the numbers of turns and inductive results for solenoids, for 35 wire sizes and insulation types. Wire sizes are Nos. 14, 16, 18, 20, 22, 24, 26, 28, 30, 31 and 32. Insulations: single silk, double silk—single cotton, double cotton and enamel. Form diameters: 3/4, 7/8, 1, 1 1/8, 1 1/2, 1 3/4, 2, 2 1/4, 2 1/2, 2 3/4 and 3 inches. Pages 9x12, printed on one side only. Price, \$2.00 postpaid, including supplement.

RADIO WORLD

145 WEST 45TH ST., NEW YORK CITY

RADIO WORLD and "RADIO NEWS"

BOTH FOR ONE YEAR

\$7.00

Canadian and Foreign \$1.50 extra

You can obtain the two leading radio technical magazines that cater to experimenters, service men and students, the first and only national radio weekly and the leading monthly for one year each, at a saving of \$1.50. The regular mail subscription rate for Radio World for one year, a new and fascinating copy each week for 52 weeks, is \$6.00. Send in \$1.00 extra, get "Radio News" also for a year—a new issue each month for twelve months. Total 64 issues for \$7.00.

RADIO WORLD, 145 West 45th Street, New York, N. Y.

COMPLETE YOUR SUMMER FILE OF RADIO WORLD

If you are short of any summer issues of Radio World, send us 15c for each copy or any 8 for \$1.00. Or start your subscription with any date you wish. Radio World, 145 W. 45th St., N. Y. C.

"SOUND PICTURES," by Cameron & Rider. Over 1,100 pages, 500 illustrations. The whole question of Sound Motion Pictures treated from a new angle. A Complete Guide for Trouble Shooting. Explains in detail the construction, operation and care of sound recording and reproducing equipment. Price \$7.50. Radio World, 145 W. 45th St., New York City.

BLUEPRINT NO. 627—Five-tube tuned radio frequency, A-C operated; covers 200 to 550 meters (broadcast band), with optional additional coverage from 80 to 204 meters, for police calls, television, airplane, amateurs, etc. Variable mu and pentode tubes. Order BP-627 @ 25c. Radio World, 145 West 45th Street, New York City.

NEW SERVICE EQUIPMENT



Cat. 907 WLC De Luxe Analyzer Plug, with 5-ft. 8-lead cable attached. Price \$3.25

De Luxe Analyzer Plug, with new seven-pin base, with 5-ft. cable (not shown), two alternate grid connector caps and stud socket at bottom that connects to both grid caps. Eight-wire cable assures adaptability to future tube designs, including tubes with 7-pin bases and grid cap soon to be released to the public (2A7, 6B7, 2B7 and 6A7).

The eighth lead connects to the two grid caps and stud socket which is a latch lock. Standard adapters for the De Luxe Analyzer Plug are 7 top to 6 bottom, 7 top to 5 bottom and 7 top to 4 bottom, thus reducing to required number of pins and enabling testing of circuits using all popular tubes. Special adapters, as for UX-199, UV-199, etc., obtainable.

Latch in Analyzer Plug base grips adapter studs so adapter is always pulled out with Analyzer Plug (adapter can't stick in set socket). Pressing latch lever at bottom of Analyzer plug releases adapter. Analyzer Plug is of smaller diameter than smallest tube and thus fits into tightest places. Made by Alden.

Analyzer Plug, 7 pin, with 8-lead 5-foot cable attached. (adapters extra). Cat. 907-WLC @ \$3.25



Cat. 976-DS New plug-in adapter, 7-hole top, 6-pin base, with locking stud that fits into 907-WLC latch. Price75

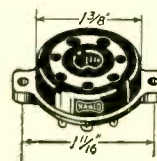


Cat. 975-DS New plug-in adapter, 7-hole top, 5-pin base, with locking stud that fits into 907-WLC latch. Price75



Cat. 974-DS New plug-in adapter, 7-hole top, 5-pin base, with locking stud that fits into 907-WLC latch. Price75

Above three adapters essential for 907-WLC to test UX, UY and 6-pin tubes, including such tubes with grid caps.



CAT. 456-E In the Analyzer end, use a 9-hole universal socket, that automatically takes UX, UY and six-pin tubes, with errorless connections. Price35



CAT. 437 E To accommodate 7-pin tubes, which will not fit into Cat. 456-E universal socket, use Cat. 437 E, a seven-pin companion socket, same size. Price .24

If instead of using two sockets, the universal Cat. 456-E and the Cat. 437, the universal alone may be used, with an adapter that has six-pin bottom and 7-hole top to enable putting 7-pin tubes into the universal socket. A 6-inch lead with phone tip is eye-letted to the side. A pin jack you put on Analyzer, connected to seventh lead of 907-WLC cable, picks up control grid of 7-pin tube through the eye-letted lead. Cat. 976-SL \$.75

MULTIPLE SWITCH

For switching to nine different positions, enabling current, voltage and other readings. Any one position opens a circuit and closes another. Thus the operator, by interruption, gives access to plate, cathode, etc. leads, for current readings, while the closer puts the current meter in the otherwise open circuit. Opener is disregarded for positions used for voltage measurements. Switch has detent for "snappy" action. Cat. 2NS9-KP-9-B9 \$ 2.85
 Double pole, nine throw switch. Cat. 2NS9-KP-9 @ \$2.18

Hennessy Radio Pubs. Corp.

143 West 45th St., New York City

SOLDERING IRON FREE!

Works on 110-120 volts AC or DC, power, 50 watts. A serviceable iron, with copper tip, 5 ft. cable and male plug. Send \$1.50 for 13 weeks' subscription for Radio World and get these free! Please state if you are renewing existing subscription.

RADIO WORLD

145 West 45th St. N. Y. City

THE FORD MODEL—"A" Car and Model "AA" Truck—Construction, Operation and Repair—Revised New Edition. Ford Car authority. Victor W. Page. 708 pages, 318 illustrations. Price \$2.50. Radio World, 145 W. 45th St., New York.

ROLAND BURKE HENNESSY
Editor

HERMAN BERNARD
Managing Editor

RADIO WORLD

J. MURRAY BARRON
Advertising Manager

The First and Only National Radio Weekly
TWELFTH YEAR

Vol. XXIII

AUGUST 26th, 1933

No. 24. Whole No. 596

Published Weekly by Hennessy Radio Publications Corporation, 145 West 45th Street, New York, N. Y.

Editorial and Executive Offices: 145 West 45th Street, New York

Telephone: BR-yant 9-0558

OFFICERS: Roland Burke Hennessy, President and Treasurer; M. B. Hennessy, Vice-President; Herman Bernard, Secretary.

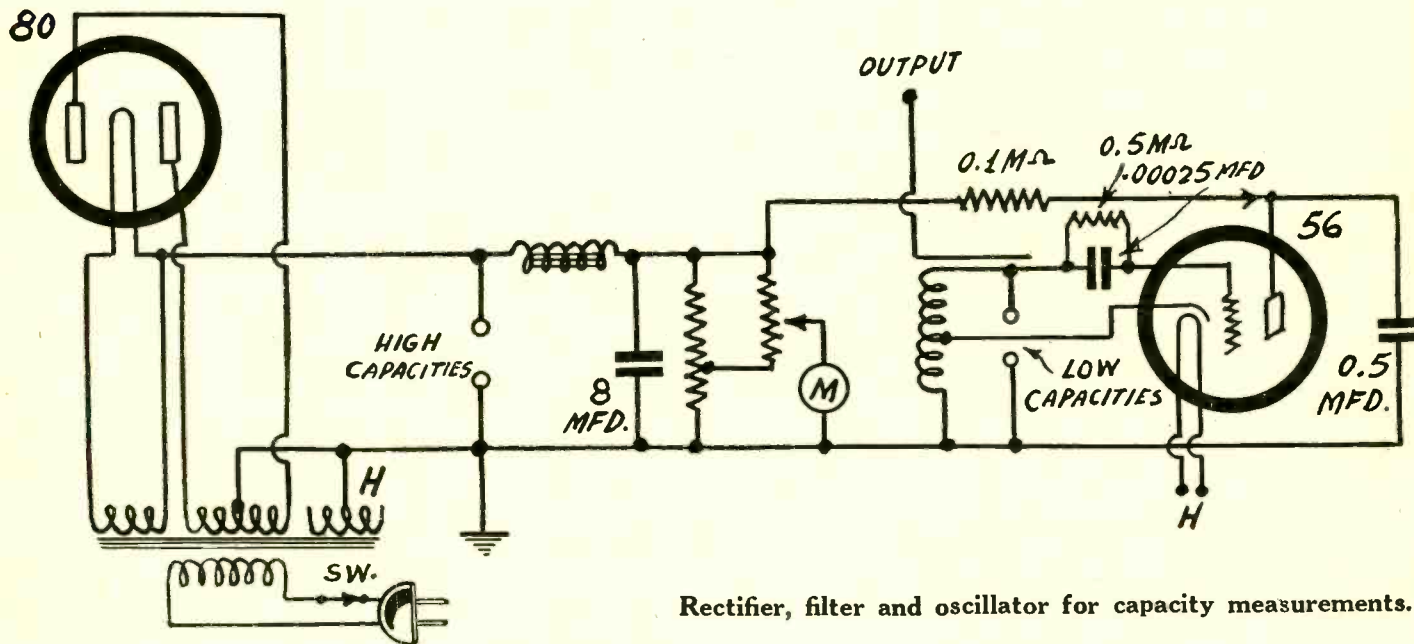
Entered as second-class matter March, 1922, at the Post Office at New York, N. Y., under Act of March 3, 1879. Title registered in U. S. Patent Office. Printed in the United States of America. We do not assume any responsibility for unsolicited manuscripts, photographs, drawings, etc., although we are careful with them.

Price, 15c per Copy; \$6.00 per Year by mail. \$1.00 extra per year in Foreign countries. Subscribers' change of address becomes effective two weeks after receipt of notice.

CAPACITY MEASURED

From 20 Mmfd. to 20 Mfd. with Home Equipment

By Reginald W. Wallace



Rectifier, filter and oscillator for capacity measurements.

THE measurement of capacities from about 20 mmfd. to 20 or more mfd. may be accomplished with the circuit shown. This consists of an a-c supply, rectifier, filter and oscillator.

The rectifier has no condenser from filament to β minus, as the object is to determine the capacities of unknown large condensers by putting them between the two posts. The filtration is not very good, but this is intentional, as the result is a sufficient modulation of the oscillator by the hum frequency.

Unknown small capacities are determined by using the posts across the grid winding of the oscillator coil, which has an inductance of 25 millihenries. This is a honeycomb type of coil, about 1.25-inch outside diameter, and has a tap on it, so that the plate current is fed from cathode through part of the winding for

oscillation purposes. The coil is commercially obtainable for less than 50 cents.

Considering now the small capacities, these may be determined from comparison with a broadcast receiver, by ascertaining the frequency generated, on the basis of the known values of capacities to attain these frequencies.

Frequency and Capacity

The following table serves the purpose:

kc.	mfd.	kc.	mfd.	kc.	mfd.
10	0.01	35	0.0008	80	0.00016
12	0.007	40	0.00061	100	0.0001
14	0.005	45	0.0005	120	0.00007
17	0.0035	50	0.0004	140	0.00006
20	0.0025	60	0.00028	150	0.000046
25	0.0016	65	0.00025	160	0.00004
30	0.0011	70	0.00021		

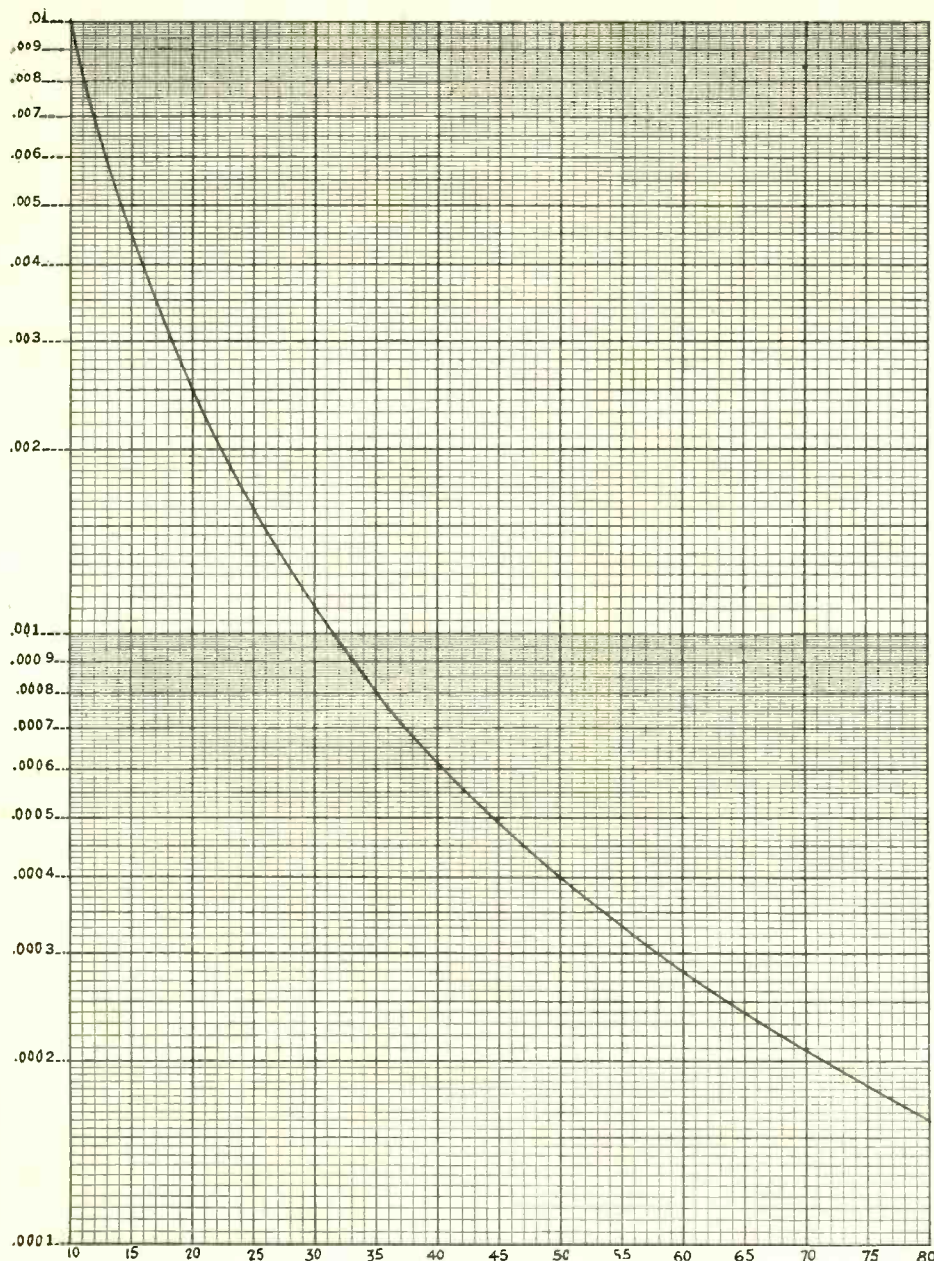
The object is to enable the construction of a capacity meter, using parts you prob-

ably now have, although there will be a little more than the usual amount of experimental work involved.

The first task is to build up sufficient capacity, by the oscillator test method, to enable the high capacity section of the meter to be calibrated. The capacity next to the rectifier, which is omitted purposely, will increase the voltage, read at the output with the voltmeter, so that if known capacities are inserted the capacity relationship between voltage and meter readings can be calibrated.

Use with a Broadcast Set

Since we have a means of determining low capacities, let us determine the highest one in the low region. This would be 0.01 mfd., and when put next to the rectifier would show a small change in voltage, (Continued on next page)



With a 25-millihenry coil the capacity (perpendicular axis at left) is related to the frequency (horizontal) as shown by the curve.

(Continued from preceding page)

enough to be noted, although we shall assume that the high capacity range will be from 1.0 mfd. up.

We have around the shop or home some 0.01 mfd. condensers, at least they are so marked or coded, but commercial tolerance is 10 per cent., which is not close enough. So we put the unknown, as we shall call it, across the oscillator coil, where the posts are, and couple the output of the oscillator to a broadcast receiver on the dial of which we can locate two stations a known number of kilocycles apart.

Suppose the stations are 50 kc apart, a common separation for locals. Then a 10 kc oscillator that generates harmonics freely, as this one does, should give us six response points as we turn the set dial between the two stations. The first will be the response at one station position, and the last will be the response at the other station position. The number of responses is the frequency difference divided by the oscillator frequency, but we add one response because we are utilizing also the response at the first setting equivalent to no change introduced between an oscillator harmonic and the station.

If the stations are 100 kc apart the number of response points would be 10

plus 1, or 11. Thus we can measure the frequency accurately. If there are more than the number of desired responses within the prescribed frequency span, the capacity is higher than estimated, and if there are fewer responses the capacity is less than expected.

Right Capacity Built Up

Since it is easier to add capacity, by paralleling one condenser with another, if we can not locate a condenser that falls on the dot we select one that gives us fewer than the desired number of responses, that is, capacity is too small, and we put small fixed capacities across it until we build up the capacity to just the right amount.

Now we can select from an assortment of condensers of certain ratings above 0.01 mfd. and put these condensers in the oscillator circuit, one at a time, in series with the known 0.01, and ascertain the frequency by the method already outlined, to check up the capacity. The object is to fill the gap between 0.01 mfd. and 1.0 mfd.

Capacity Formula

Another 0.01 mfd., in series, would give effectively 0.005 mfd., accounted for in the table, while another 0.005 fixed added to

the series chain would yield 0.0025 mfd.

The unknown series capacity may be obtained when the known series capacity and the net effective capacity are known, from the formula

$$\frac{C1 \times C2}{C1 - C2}$$

where C1 is the effective capacity of the series and C2 is the known (smaller) series capacity, the other or larger series capacity being the unknown.

The capacities as listed in the table are close and are used as reference points in the curve, so that for untabulated values the curve may be used.

The oscillator circuit has distributed capacity totalling 20 mmfd, assuming normal type of short-lead wiring, so that for small values of capacity 20 mmfd. should be subtracted from the measured value, which includes that minimum. For any capacity lower than 0.0016 mfd. the minimum surely may be neglected, as the difference is less than 2 per cent.

The series method is used to attain capacities smaller than 0.01 or larger than 0.01 as for instance 0.05 mfd. By close work 0.1 may be established that way, and ten such condensers put in parallel to constitute 1.0 mfd.

Bleeder Resistor

It is not imperative to start the high capacity method at any particular value, as it will depend somewhat on the voltage and the regulation. The system works better when the regulation is poor, and it will be rather poor if the bleeder resistor is not made too large, considering the meter current. If one has a voltmeter of a resistance of 1,000 ohms per volt, the bleeder resistor may be around 30,000 ohms, and the bleeder current will be 10 ma if the voltage is 300 volts. For less sensitive instruments (though they read the same voltage), the bleeder current should be larger. A good rule is to have the bleeder at least ten times as great as the full-scale-deflection current of the meter.

As the line voltage will not always be the same, a potentiometer is put across part of the bleeder resistor to enable taking off lower than maximum voltage, and the adjustment can be made to the selected value each time a test is to be run, if that is necessary. Moreover, when the voltage at the maximum capacity to be read is ascertained, the potentiometer arm may be moved to take off about 85 per cent. of this voltage, to allow for line fluctuations, and then the calibration of the meter made in respect to capacities.

Since the setting for 1.0 mfd. has been ascertained, assorted 1.0 mfd. condensers may be tested until one or more are found that register just 1 mfd., whereupon two in parallel would give the reading for 2.0 mfd. Then 2 mfd. is duplicated by selection from commercial condensers, and 3 and 4 mfd. readings taken. When 4 mfd. is duplicated, 5, 6, 7 and 8 mfd. readings are recorded, and so on.

This testing system applies to electrolytic condensers as well as to paper and mica dielectric condensers, and moreover it tests the large capacities at or near the voltage at which they are to be worked. The voltage of the B supply will be higher than if the power transformer were used in a receiver, assuming some capacity of 1.0 mfd. or greater next to the rectifier in testing, because there is hardly any load.

If desired a variable condenser of around 0.00035 mfd. may be put across the oscillator, even if externally, and the oscillator used for general testing and lining up. The frequency range would be from about 50 kc to about 150 kc, and the tenth harmonics would serve for the broadcast band.

SPANNING PROBLEM

As Affecting Short-Wave Receivers

By William H. Eastlake

THE diverse spans of frequencies in short-wave tuning have been given considerable attention by amateurs, who build or buy band-spreading sets, so that the particular bands they are interested in may be tuned in more conveniently, because being spread over a large part of the dial.

In short-wave sets generally, where four coils are used for each circuit, and the condenser is around 0.00014 mfd., the frequency ratio is the same for all bands, usually about 2.2. Thus the frequency span for the lowest-frequency spectrum is 1,500 to 3,300 kc, a difference of 1,800 kc, whereas in the highest-frequency band, same ratio of frequency, the absolute extremes are 15,972 and 35,138 kc, a difference of 19,166 kc, or the frequencies covered are nearly 10.7 times as great as in the first instance.

As the handiest aid to helping to atone for this a dial of large reduction ratio may be used, say, 30-to-1, instead of the usual 5-to-1. Parallel condensers may be inserted, usually the adjustable type, to reduce the capacity ratio, hence frequency ratio, but if calibration is of any importance this method is not so good, because you can't have a satisfactory calibration of an unknown, can you?

Padding on Two Bands

If the setting of any band-spreading-effect capacity is determined by a scale position, then it would be necessary, for exactitude, to have a built-in single frequency separate oscillator, so that any variation from the scale point may be compensated by trimmer setting.

The local oscillator of a short-wave superheterodyne would have to be padded for the first or lowest-frequency band, perhaps also for the next, but not for the succeeding ones, if popular intermediate frequencies lower than the lowest broadcast frequency are to be used.

The situation with the four-coil system may be visualized from the following table for the fixed ratio of frequency, normally 2.2:

Extreme Signal Frequencies	Frequency Difference
1,500 to 3,300 kc	1,800 kc
3,300 to 7,260 kc	3,960 kc
7,260 to 15,972 kc	8,712 kc
15,972 to 35,138 kc	19,166 kc

The frequency span is equal to the low-frequency setting multiplied by the frequency ratio, and as the low-frequency

padding throughout, and the use of the physically small tuning condensers now so popular for short waves.

Use of 10 Coils per Circuit

Certainly it would be advisable to have a better spread than that denoted by the tabulation, which is close to what exists in actual practice.

One limitation is the number of coils, whether plug-in coils or switching is used.

Instead of having a fixed frequency ratio, the difference between maximum and minimum frequencies may be fixed. This is equivalent to bandspread on all bands. A computed instance indicates that ten coils would be needed for each circuit, and, of course, at such a handicap the circuits would be limited to two.

Since the frequency span is fixed, say, at 3,000 kc, the ratios will have to differ. Let us see from a table what the change would be:

Extreme Signal Frequencies	Ratio
1,500 to 4,500 kc	3.
4,500 to 7,500 kc	1.67
7,500 to 10,500 kc	1.43
10,500 to 13,500 kc	1.29
13,500 to 16,500 kc	1.222
16,500 to 19,500 kc	1.18
19,500 to 22,500 kc	1.154
22,500 to 25,500 kc	1.133
25,500 to 28,500 kc	1.118
28,500 to 31,500 kc	1.1

Series and Parallel Capacities

The ratio, as between the first and second examples of the variable-ratio table, is practically halved, but thereafter the ratio reduction is gradual. The situation suggests that a regular broadcast capacity 0.00035 mfd. or so, be used for the lowest-frequency band, reduced by series capacity for the next step, to reduce the ratio, and thereafter that the ratio reduction be attained by a parallel capacity, be manually-operated, and to make a frequency-calibrated dial effective, the built-in extra oscillator would be virtually imperative, to check up each time on the correct extra parallel capacity.

Instead of the awkward capacity jump from the first to the second bands, the even distribution of spans by 3,000 kc could be disregarded in the one instance, and the low-frequency band split into two bands, which is entirely contrary to the principle of equal frequency difference, and gives most spreadout where least is needed, but does permit parallel capacity

Single Calibration of Dial

If frequency calibration is to be adhered to, naturally the problem becomes a little more difficult, but a built-in oscillator would facilitate this. It would oscillate at one frequency and be used on its fundamental and harmonics for setting the parallel or spanning condenser to the accurate position, which would be somewhere close to a marker position. Even the markers could be worked out to a fair degree of accuracy, without the extra oscillator.

If the even-frequency-span method is adhered to, the signal frequency and oscillator frequency dials may be calibrated with a single scale, say, the lowest frequency, with a reference table giving the multiplication factor. This would be true even in the case of ganging. Thus for the 1,500 to 4,500 kc band the factor would be 1, for the 4,500 to 7,500 kc band it would be 3, for the 7,500 to 10,500 kc band it would be 5, for the 10,500 to 13,500 kc band it would be 7, etc., and for the last or highest frequency band it would be 19. Any splitting up of the low-frequency band as compared to the table would upset this handy calibration for two bands.

Low Fixed Ratios

Another way out would be to use a fixed ratio of frequency, but have it a low ratio, so as to effectuate a compromise. Thus, the numerical average of the ratios of the preceding table of frequencies (the sum of the ratios divided by the number of bands) is very nearly 1.3. This would dispense with the complication of series or parallel padding, but would not be a band-spread approximation. Also, there would have to be a separate calibration for each coil, as the difference in frequency will increase as the frequencies of the bands increase.

The frequency ratio of 1.3 would require a capacity ratio the square thereof, or 1.69, or, assuming a minimum capacity of 30 mmfd., the maximum would have to be 0.000507 mfd., or approximately 50 mmfd. Thus, the tabulation would show that the lowest band would be 1,500 to 2,900 kc, the next 2,900 to 4,860, etc., with increasing frequency difference between extremes as the frequency of the bands increases.

Amateurs Among Scouts Are to Be Organized

Hartford, Conn.

Organization of a national network of radio amateurs who are also members of the Boy Scouts of America is projected by H. W. Yahnel, scoutmaster of a Helmetta, New Jersey, troop and owner or amateur station W2SN. Cooperation of the national scout headquarters, as well as the headquarters of the American Radio Relay League, the national amateur organization, has been assured. Several hundreds of active boy scouts

are known to have amateur transmitting stations in operation at the present time, and the success of a nation-wide net seems assured. Already more than fifty stations have been lined up, and interested scouts in every section of the country are being urged to join Yahnel in the movement.

No special requirements in the way of operating ability or technical equipment are being put on the volunteers, according to F. E. Handy, communications manager of the American Radio Relay League. Boy scouts interested in radio, but not possessing federal licenses, are expected to leap at this excellent opportunity to enter the field.

Price Rise Prediction

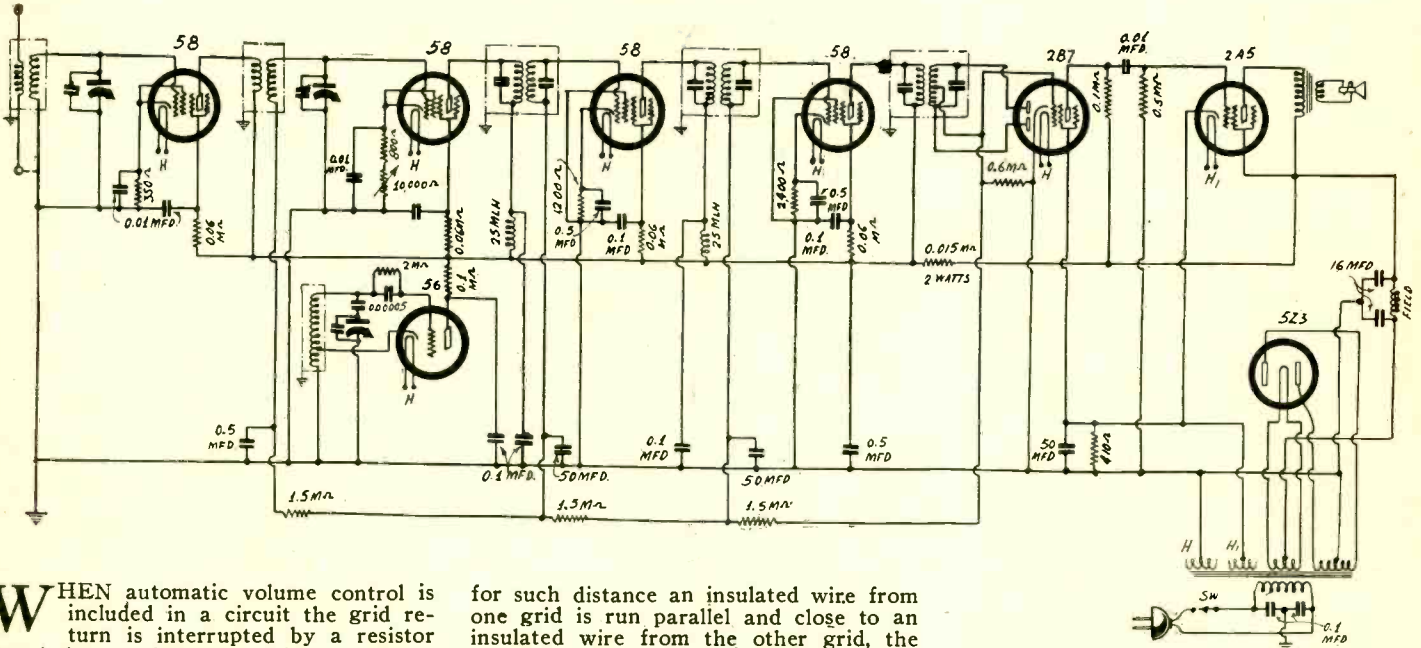
Already price increases are a fact in the radio industry. Radio receivers and likewise tubes are already advanced in many instances. There are cases where advance notice has been given and those co-operating with the NRA in shorter hours and additional employees will naturally have radio materials and parts, in fact practically everything, raised in price, so we must all look for a general uptrend in radio merchandise prices. For those who plan to buy in the very near future, to do so now might mean a saving of from 10 to 25 per cent.

—J. Murray Barron.

HIGHER CAPACITIES

In A. V. C. Bypassing Boost Volume

By Benson Fellows



WHEN automatic volume control is included in a circuit the grid return is interrupted by a resistor that is bypassed to ground by a condenser, while the resistor makes conductive connection to a rectifier, usually the second detector. It is advisable to have the resistors large, as they are substantially in parallel with the diode load as audio-frequency effectives, so the condenser should be large.

It has been the experience of many that sensitivity drops considerably when automatic volume control is used, compared to no such control, and of course some drop is to be expected, if the control is effective. But the large and almost ruinous drop of which some complain is not at all necessary, and it can be avoided by use of a large bypass capacity. While 0.5 mfd. is sufficient where shown, the capacity may be 1.0 mfd. or more in the i-f level, and if one has some of those small 30 or 50 mfd. electrolytics these will be found most useful at the intermediate level, with negative to chassis (ground).

Some Surprised

The extreme point on the detector load resistor from which the control voltage is taken off is negative as to ground as an audio signal. But there is no direct current flowing, hence no rectification, until and unless the anode is at r-f positive in respect to cathode and so the electrolytics, being effective only on d.c., are connected with their anodes to the positive d-c side of the circuit.

Quite a surprise was given to some radio experimenters when an output meter showed a very marked rise in voltage with the high capacities used at the intermediate level.

"Well," said one, "this seems to get rid of the principal reason why a.v.c has been ducked in short-wave sets at least."

The diagram herewith may be used for broadcast waves or for short waves or for a combination. The second tube from upper left is the modulator, and below it is the oscillator, but no coupling between them is shown, as a small capacity between the two grids will suffice. The set may be so wired that these two sockets are only a couple of inches apart, and

for such distance an insulated wire from one grid is run parallel and close to an insulated wire from the other grid, the extremes of each wire being open as only the condenser effect is desired.

Doublet May Be Used

The receiver, even on short waves, can attain exceptional sensitivity, so that no long aerial would be needed. The circuit follows standard practice, with precautions taken against tunable hum and other such troubles, and also with primary of the antenna coil terminating in two free posts, to enable use of doublet antenna.

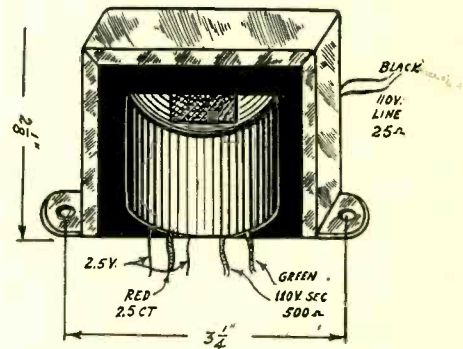
For the standard Marconi antenna the low-potential side of the primary should be connected to the ground circuit, but for the doublet antenna, one end of one of the insulated aerial wires goes to one post and the adjacent end of the other insulated wire to the other post. A doublet antenna in general may be regarded as one horizontal stretch of wire, cut in the center, and the insulator separating the cut parts, and the downleads coming from these insulator or separate-stretch terminals. The lead-in should be transposed, either by using blocs for the purpose, or simply by using twisted pair lampcord.

Coil Information

The antenna coil and the interstage coil are the same, except for any difference in the size of primaries, which may be larger for the interstage purpose. The oscillator tap is not imperative. A separate winding, more usually supplied commercially, may be used from cathode to ground to the same effect.

The secondaries for broadcast purposes would consist of 230 microhenries for the signal level and 126 microhenries for the oscillator. Due to a 2 per cent inductance drop caused by shielding the coils, the windings are equal to 235 and 130 microhenries unshielded, i.e., 120 turns of No. 32 enamel wire for one level, 77 turns for the higher level, diameter 1 inch. The broadcast padding capacity is 400 mmfd., but an adjustable condenser is commonly used, set once and left thus.

Power Transformer for Test Oscillators



In the construction of an a-c-operated modulated test oscillator, the cost is reduced and the building simplified if no rectifier is used, but a.c. is put on the plate. Therefore a small power transformer may be used. Also it is practical to use a regular filament transformer, with no secondary winding, but this is dangerous, as it renders a line short quite likely.

The simple solution is the use of a small power transformer that has, besides primary and the filament secondary, only a 1-to-1 ratio secondary, so that the a-c line voltage is obtained from that secondary, but without conductive coupling to the line. Only inductive coupling is used.

The primary will have a low resistance, say, 25 ohms, the filament secondary will have even a lower resistance, and although the primary-to-high-voltage-secondary ratio is 1-to-1, that secondary will have a much higher resistance than the primary, say, 500 ohms.

FORUM Grid Leak Values for Pentagrid Battery Tube

Stenode and Sidebands

Editor Radio World:

I WAS VERY MUCH INTERESTED in your news of the proof of the reality of sidebands. Now that it has been proven, I wonder what happens to them in the Stenode type receiver? The Stenode, you know, proves that sidebands do not exist. What are we to believe? We would all like to know what the Stenode promoters have to say to this.

I am of the opinion that the Stenode's audio amplifiers produce an artificial result and that the fidelity is imagined rather than real.

A d B D C

Suppose we have three frequencies, A, B and C, separated by 5,000 cycles. Then A and C are 10,000 cycles apart, while B is the middle or carrier frequency. Frequencies A and C are radio frequencies, the same as B, but while they are thus also carrier frequencies in themselves, being unmodulated, they are distinguished from the middle frequency by being called side frequencies.

Now there is one thing that is absolutely certain, insofar as it is given to anyone to be certain, and that is that if these frequencies are generated simultaneously they will heterodyne into a single frequency modulated into amplitude, and what is just as certain is that despite this heterodyning, the side frequencies do not disappear but can be tuned in separately. Further, with the same certainty, if a very selective receiver is tuned to B, A and C will be received feebly and to just that extent the 5,000 cycle heterodyne note will be feeble also. The Stenode has an audio amplifier that compensates the effects of super-selectivity and restores the intensity of the 5,000-cycle note in the proportion that it was reduced in the radio frequency amplifier.

Now suppose we have another set of frequencies, d, B', D, 4,000 cycles apart, with B' the same frequency as before and in synchronism with the former B carrier. D and d are 8,000 cycles apart. The Stenode then receives two modulated carriers, one of 5,000 cycles and one of 4,000 cycles, and these two tones must appear in the audio amplifier.

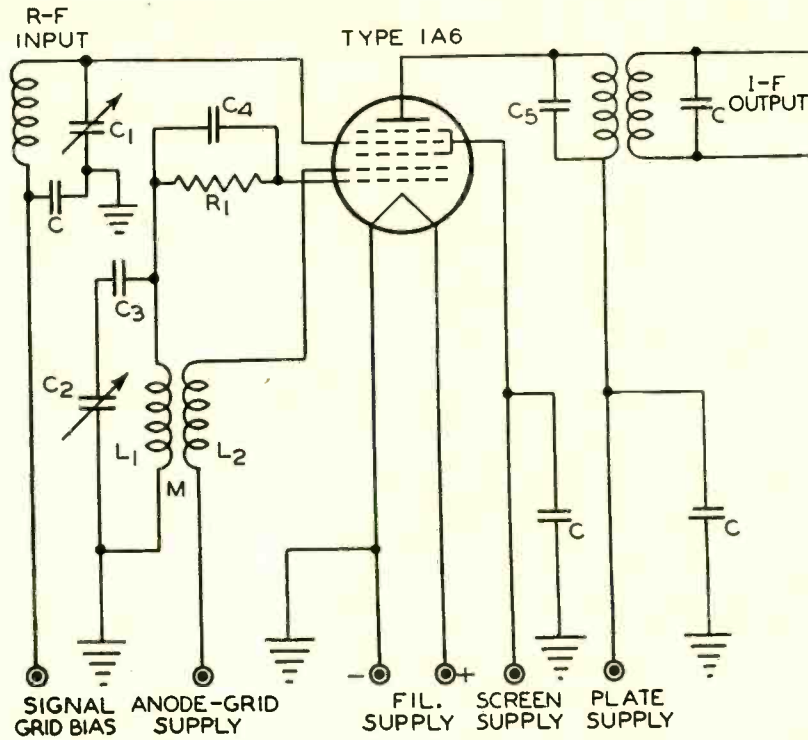
With the two modulated carriers received simultaneously suppose we suppressed d & B', leaving only D to heterodyne A at 9,000 cycles, B at 4,000 cycles and C at 1,000 cycles. Give this matter a little thought and see what it leads us to. Here we have the condition of test made by Dr. Robinson of the Stenode, in which he locates a carrier wave inside the sideband region of another modulated carrier just as the frequency D is located within the sideband region BC and yet according to his contentions he receives C, B and A and rejects D.

The question arising is: How is it possible to compensate C and not compensate the 4,000 cycles note due to D at the same time? Many authorities have tried to attribute this phenomenon to detector peculiarities but have failed to date to account for that property of a detector or to actually show that such is the case.

Suppose we suppress first d and then B'. At what point of the process of going to single sideband transmission, which this is, will the single sideband D disappear also?

You have heard demonstrations of the Stenode and should be able to judge whether the tone of the Stenode is entirely natural.

VERNE V. GUNSOLLEY.
Minneapolis, Minn.



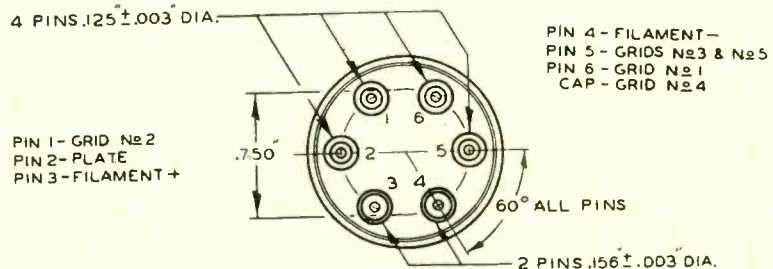
- C = 0.1 μ f.
- C1 = } GANGED VARIABLE CONDENSERS
- C2 = }
- C3 = PADDING CONDENSER
- C4 = GRID CONDENSER OF 200 μ μ f.
- L1 = OSCILLATOR GRID INDUCTANCE
- L2 = OSCILLATOR PLATE INDUCTANCE
- M = MUTUAL INDUCTANCE OF L1 AND L2
- R1 = OSCILLATOR GRID LEAK

NOTE-1

ANODE-GRID SUPPLY MAY BE OBTAINED FROM PLATE SUPPLY TAP THROUGH VOLTAGE-DROPPING RESISTOR OF 20000 OHMS SHUNTED BY BY-PASS CONDENSER OF 0.1 μ f.

NOTE-2

VOLTAGE APPLIED TO ANODE-GRID (GRID No 2) SHOULD BE HIGHER THAN THAT ON SCREEN (GRID No 3 & No 5).



The grid leak R1 is usually recommended at 0.05 meg. for standard plate and screen voltages, with any pentagrid tube. The circuit illustrated, and the socket diagram, refer to the new battery-type pentagrid tube, the 1A6.

The function of the grid leak here is to supply a bias to the tube that changes with grid current. The higher the grid current the higher the negative bias. This is because the drop in the resistor constitutes a bias proportionate to the current, yet it does not explain why the bias should be negative. One might expect it to be positive.

The static condition is that of zero bias, because the grid is returned to negative

filament, here grounded. But when the oscillator section of the tube is functioning grid current starts to flow. The action in the leak-condenser circuit is such that the electrons, accumulating at the grid, become excessive, and can be discharged fast enough only through the leak. Since electrons are negative particles of electricity the resultant bias is negative. And measurement of the plate current action proves that the effect is that of negative bias. However, the modulator part of the tube, having a separate bias, usually negative, is independent of the oscillator bias through the leak. If there is trouble with blocking, therefore, reduce the value of the grid leak.

REBUILDING AN EXISTING NON-OBSOLETE ANALYZER

By William

ON account of the large number of types of tubes now being manufactured and particularly the arrangement of the elements inside the tubes it becomes more difficult to design or rebuild an existing analyzer to accommodate all the tubes.

Most of the new analyzers described use the universal meter, but many servicemen do not have this meter but have a set analyzer using two or three meters and they would prefer to use these meters in rebuilding their analyzer to handle the new tubes.

Simple changes in the old analyzer will not do any more. Most of them were cut over for the screen-grid tube, then again for the pentode, then for the six-pin tubes, and so on.

The problem now requires a circuit that will handle all the existing receiving tubes and with a few simple changes will handle the new ones which may be announced in the future, including the eight pin tube.

RMA Code Used

In designing a set analyzer about the only thing which is standard for the various tubes is the code for the base pins adopted by Radio Manufacturing Association, Inc.

These socket pins and the leads from the set to the analyzer can be designated by the numbers from one to eight. The first seven are on the base and No. 8 is the overhead grid.

In the old days there were only two leads which were used as the control grid lead. One was connected to the base and the other was the overhead grid. Now there are at least four leads which at various times become the control grid lead, depending on which tube is in the socket. The same is true of the cathodes in the different tubes as well as some of the other elements.

In order to have a mutual conductance test in a set analyzer it is necessary to have the grid button in the grid lead. In this method no matter which lead is the grid lead the grid button can be inserted in that lead and all other leads are continuous for their purpose. This is accomplished by using the multiple rotary switch.

Shorting Stunts

The same kind of switch is used to insert the current meter in the lead in which it is desired to read the current.

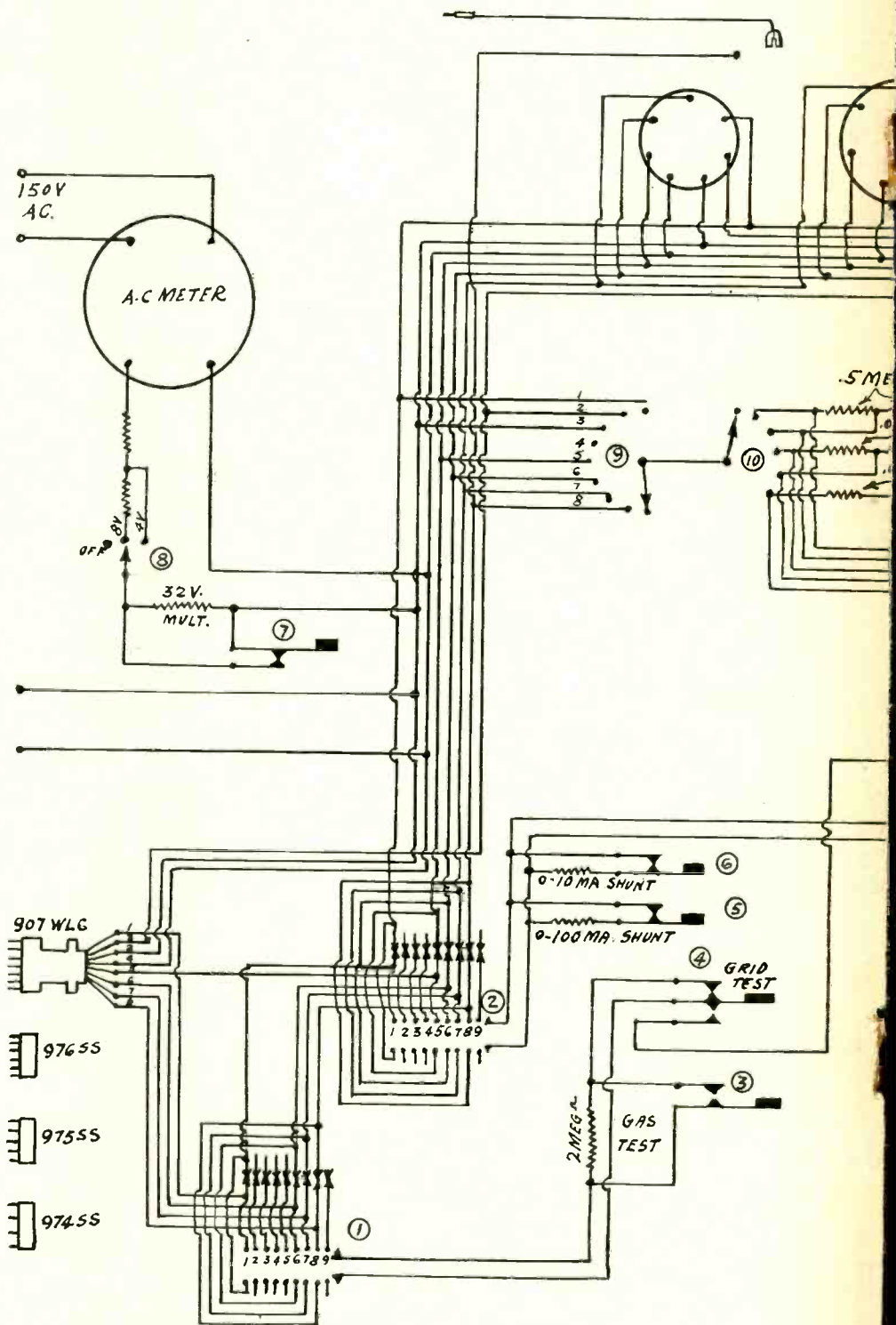
Base pin No. 2 is usually the plate. This lead does not go through the switch. No. 2 has a separate meter inserted for reading plate current.

This meter and the 0-1 milliammeter are protected by a shorting shunt and it is necessary to open the shunt by depressing a button to get a reading.

Where there are so many controls it is necessary to give the meters all the protection possible.

All voltages and all the necessary currents can be read. It is not necessary for the serviceman to read filament current, so no provision is made to read it.

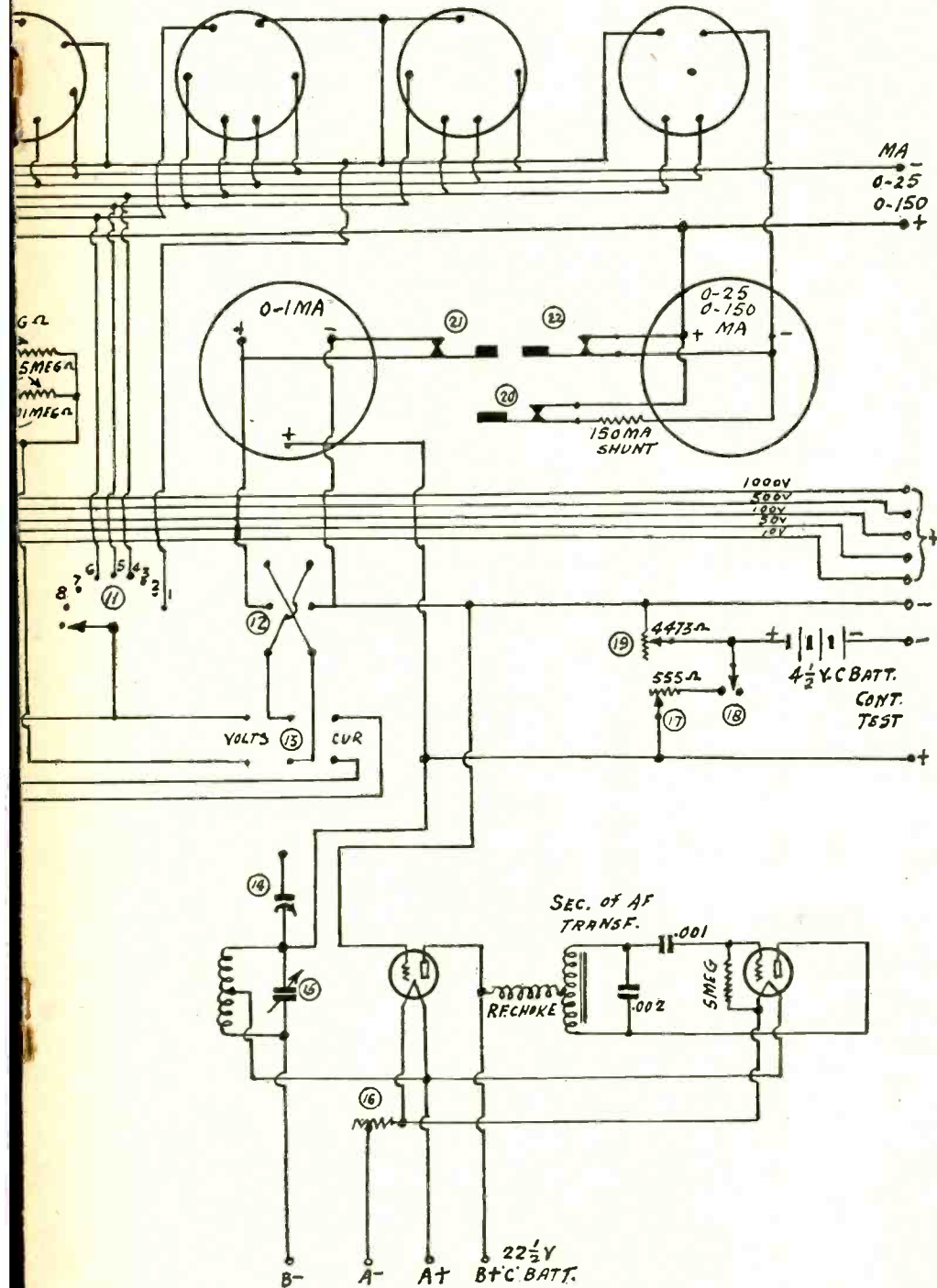
The meters can be utilized for outside readings, a.c. at the left and d.c. at the



The Diagram Shows the Method of Revamping an Old Analyzer to Accommodate a Change for an 8-Pin Tube

ANALYZER TO MAKE IT OBSOLETE

by S. Buckley



right. The various leads are brought out to pin jacks and two leads with test prongs are used.

Five sockets are used to take the various tubes. Four medium sockets, 7, 6, 5 and 4 hole, and a small 7-hole for the 2A7, 2B7, etc.

When the eight-pin tube comes out it will be necessary to have an eight-hole socket and if this tube also has an overhead grid it will be necessary to have a nine-lead cord, but only minor changes will be necessary in the analyzer itself because there are already nine positions on the switches.

The Method

The plate meter is always in the No. 2 lead, which is usually the plate lead. It is a 0-25 milliammeter, but is shunted so as to read 0-150 ma, unless the button is depressed. It is also protected by a shorting shunt. The controls Nos. 4, 20 and 22 should be arranged on the panel so that they can be operated by three fingers of one hand to be convenient.

Leads from this meter are brought out to be used with test prongs so the meter is available for outside readings.

The 0-1 meter is the Weston Model 301 and is used for a variety of purposes. There is a switch, No. 13, to change it from voltage to current. Five voltage scales are provided. These leads are also brought out for outside readings. Three ranges of current can be read. When both shunts are in the circuit the meter reads 0-100 ma. When the 100 ma. shunt button is depressed only the 10 ma. shunt remains in the circuit and the meter reads 0-10 ma. When both buttons are depressed at the same time the meter reads 0-1 ma.

Includes Reversing Switch

This meter has a reversing switch, No. 12, which can be used whenever necessary.

The continuity test uses this meter and is also an ohmmeter with two ranges for determining resistance values.

Filament voltages of d.c. tubes are read on this meter and, of course, with a.c. tubes the voltage is read on the a.c. meter.

An oscillator is also used in conjunction with this meter for lining condensers by the grid dip method.

The leads in the cord are numbered from one to eight inclusive and correspond to the socket terminals. This numerical order is also carried out in regard to the controls on the analyzer as far as possible.

Thus in the first switch position, No. 1 puts the grid test in the grid lead for the particular tube you are testing. It is merely necessary to know the number of that lead and put the dial on that number.

Switch No. 9 is to be used when taking a voltage reading of any lead.

Switch No. 11 connects the meter to the lead which happens to be the cathode or negative filament. Both of these switches are wired according to the numerical order of the pins on the sockets to avoid confusion.

Analyzer to Test Latest Circuits and Prevent Obsolescence.
Tube Is Easily Made Later.

Radio University

A QUESTION and Answer Department. Only questions from Radio University members are answered. Such membership is obtained by sending subscription order direct to RADIO WORLD for one year (52 issues) at \$6, without any other premium.

RADIO WORLD, 145 WEST 45th STREET, NEW YORK, N. Y.

Biasing Power Stage

IN THE CONSTRUCTION of an output (power) stage, using push-pull or otherwise, which is better, self-bias, or bleeder-bias? I see self-bias used a great deal, but bleeder-bias gets all the praise. Also, need a condenser be used across the self-bias resistor in push-pull?—J. T. C.

In the construction of the output stage for a receiver the difference is not enough to be noteworthy. There are conflicting considerations. The self-bias method does not require any by pass condenser, for if the stage is truly symmetrical there will be no signal current through this resistor, the phases being 180 degrees apart at any instant. The power output for the B voltage available is less by the self-bias method, or lower B voltage may be used for the same power output if the bleeder-bias method is used. However, the bleeder-bias method always requires a bypass condenser, and to be effective at the low frequencies it should be very large, high in the microfarads. If cost is a factor, since a specially-well-filtered circuit is needed, the bleeder-bias has that much against it. The difference is not great enough to make an audible impression on persons for whom such output stages are built.

Fading Explained

WHY DO SOME stations in the broadcast band fade so badly, others not at all? Some semi-distant stations fade, always the same ones, while other stations, far more distant, never fade? Why are some areas poor for receiving certain short-wave frequencies of certain stations, and yet even the same short-wave frequencies

of other stations come in well. Has this anything to do with sun spots? What are sun spots and what are their effect?—J. D. W.

The fading on the broadcast band is probably due to the same conditions that cause fading on the short-wave bands. It is believed that the transmission from the station travels on an enduring sky wave in a more or less steady angle, a sort of inverted conical representation from the transmission point, and strikes the layers of conducting media in the upper atmosphere, to be reflected back to earth. The other wave, or ground wave, is not enduring, but within short distances of the station both might be received. The reflection back to earth from the ionized strata is uneven, as there are at least four strata, and the wave may even be delayed there awhile. Hence the return to earth may result in a phase displacement that also varies. When the phases on return are 180 degrees apart the reception stops. When it is less than 180 degrees apart it is diminished. When there is no phase difference the signal is full strength. This waxing and waning is fading. The reflection back to earth depends on the distance of the layers from the earth and on the frequency of the transmission (wavelength), so some stations even in the broadcast band have assignments that result in large fading areas, often semi-distant from the transmitter, whereas at greater distances the transmitter lays down its signal much more steadily. The same condition in short-wave reception is called skip-distance, as it is more pronounced, and there are areas where the sky wave does not come down, represent-

ed as the base of the isocetes triangle. Sun spots have about the same general effect on radio, in that radio reception is best when the sun-spot activity is least. We are now in a period of low-activity and it will get still lower, so that reception now is good and will be even better within the next two years. This is one reason why short waves are holding such exceptional interest right now. The sun spots are not well understood, although their manifestations and effects are, so the situation is comparable to that of electricity itself. One may say that strong electron activity has a bearing on sun-spot activity. Sun-spots lower the effective height of the ionized layers, and thus reduce distant reception, as the angle of reflection is about the same, but the distance between the points of departure and return is less.

Man-Made Static

WHAT IS the transposed lead-in, what is its effect, how can one be put up? Will it cut out man-made static? Is there anything else you can suggest to do this?—P. L.

The transposed lead-in is the connection from the horizontal or flat portion of the antenna system, brought down in such a manner as not to pick up anything. This manner is the transposition of the leads, either by using twisted pair, or by using insulation blocks, to criss-cross the two wires brought down. There must be two for transposition. One is connected to the aerial itself, and the other, which is grounded at the set end, may be open at the other end, but if long, has to be grounded at several points, including the far end, for effectiveness. The system works in the manner you suggest, to eliminate man-made static, because such interference is usually close to the earth, and if all pickup is confined to a well-elevated aerial, the other and undesirable energy not being picked up, the trouble disappears. Besides the interference coming over the air there may be some getting in through the a-c lines and this may be reduced or eliminated by winding two coils on two forms about 2 inches in diameter, 100 turns of No. 18 insulated (bell) wire, putting the two coils in inductive relationship, running one a-c lead through one, the other a-c lead through the other, free ends of the coils to the a-c cable to set, and condensers of 1.0 mfd. or greater capacity from the two extremes of each coil to ground (total four condensers). If there is less interference when the ground wire is off the set, but greater hum when such omission is made, reversing the connections to one of the filter coils just described may correct that condition.

Tuning Meter "Backwards"

IN A SET that I built I have put a tuning meter but it reads the wrong way. There is a direction printed on the meter scale saying "Tune for maximum deflection" and the arrow points one way, but I have the meter in the plate circuit of a 55, and the meter should be tuned for minimum deflection. I can not reverse the meter, as it would not read (goes from 0 to less than 0). What shall I do?—F. D.

You may remove the rim of the meter and slide the "works" out of the case, get some Chinese white and effectively hide the head and tail of the arrow, and with a sharp pencil draw in a head where the tail was and a tail where the head was. Then the arrow will indicate correctly the direction of needle movement for greatest volume, and the word "maximum" may be read in that light without slight tax on the imagination.

Grid Current

WHEN GRID current is flowing is there secondary emission in a tube from its plate circuit, or is the grid supplied di-

Two for the price of One

Get, EXTRA, one-year subscription for any One of these magazines:

- POPULAR SCIENCE MONTHLY.
- RADIO-CRAFT (monthly, 12 issues).
- RADIO INDEX (monthly, 12 issues), stations, programs, etc.
- RADIO (monthly, 12 issues; exclusively trade magazine).
- EVERYDAY SCIENCE AND MECHANICS (monthly).
- RADIO LOG AND LORE. Bi-monthly; 5 issues. Full station lists, cross indexed, etc.
- AMERICAN BOY—YOUTH'S COMPANION (monthly, 12 issues; popular magazine).
- BOYS' LIFE (monthly, 12 issues; popular magazine).
- OPEN ROAD FOR BOYS (monthly, 12 issues).

Select any one of these magazines and get it free for an entire year by sending in a year's subscription for RADIO WORLD at the regular price, \$6.00. Cash in now on this opportunity to get RADIO WORLD WEEKLY, 52 weeks at the standard price for such subscription, plus a full year's subscription for any ONE of the other enumerated magazines FREE. Put a cross in the square next to the magazine of your choice, in the above list, fill out the coupon below, and mail \$6 check, money order or stamps to RADIO WORLD, 145 West 45th Street, New York, N. Y. (Add \$1.50, making \$7.50 in all, for extra foreign or Canadian postage for both publications.)

Your Name.....
Your Street Address.....
City..... State.....

DOUBLE VALUE!

- If renewing an existing or expiring subscription for RADIO WORLD, please put a cross in square at beginning of this sentence.
- If renewing an existing or expiring subscription for other magazines, please put a cross in square at the beginning of this sentence.

RADIO WORLD, 145 West 45th Street, New York. (Just East of Broadway)

rectly from cathode and acting as anode of a rectifier?—K. H. C.

There may be some of both actions, but the usual condition meant is that the grid becomes like the anode in a rectifier, the positively-charged element during the rectification cycle. When that grid is negative and the cathode positive no current flows and no rectification takes place.

55 as V.T.V.M.

IS IT POSSIBLE to use a 55 in connection with a vacuum tube voltmeter, so that I can use the device for a-c measurements, and if so should the triode unit be used or not?—K. H. X. O.

It is quite practical to use the 55, as the diode units provide linear rectification. This takes place not in the entire region but over a good part of it, say, from 5 to 20 volts, which would be sufficient for calibration for a-c within those ranges. For the higher voltage parts of this scale the load resistor current alone may be read, and the calibration run that way, whereas for lower voltages the triode may be cut in, due to its amplification, and a plate circuit meter used. It does not make much difference whether the diode is used alone or in connection with the triode, so long as the coupling is direct (non-reactive). The triode is not linear, of course, but even that is not so important, because the calibration would take into account the non-linearity, or, to put it differently, the average voltages read would be calibrated in terms of r-m-s input values, and these would be the values even though the curve when plotted will not be a straight line.

Neon Pilot Lamp

IN A RECEIVER I am asked to build there is scant current to spare, as it is battery-operated, and so I would have to dispense with a pilot lamp, unless one could be obtained that drew only a small amount of current, around 1 milliamperes or so.—U. D.

You could use a small neon lamp, which would draw even less current than what you state, and could have it operated from the B batteries. There are some such lamps that light on 85 volts, so 90 volts would be perfectly safe.

Lazy Man's Oscillator

WOULD IT BE POSSIBLE to construct a local oscillator that would function over one frequency band, and then use its harmonics for the higher frequencies to be covered? This struck me as feasible in a wide-frequency-range receiver, because the frequency ratio of the oscillator could be held the same (as it would be) and the frequency ratios of the r-f end lined up with that, instead of the more usual method of padding the oscillator.—J. M. B.

Yes, this method works, but it is not very good. The fact that harmonics are used results in multiple harmonics yielding response as the frequencies become quite high. When this condition is combined with insufficient selectivity at the r-f level, two stations are heard at the same time. One set actually was produced commercially that did include such a method.

When to Listen for S. W.

IS THERE any particular time for listening to short waves?—D. C.

Yes. The most important consideration is to try to tune in a station when it is on the air, not when it is off the air. This requires, first, that due consideration be given to the time difference, and, second, that a close check be made on the frequencies and hour. As short-wave stations are nearly all experimental, they change their transmission hours frequently, and even their frequencies occasionally, especially as some transmitters have several frequencies they can use. Besides,

the general rule of the shorter the waves the earlier in the day you should listen (computed from daybreak), and the longer the wave the later the day or night, is worth remembering. In particular, from daybreak to 4 p. m. or so, try 13 to 20 meters; from 10 a. m. to 10 p. m. try 20 to 35 meters; at night try 35 to 80 meters. The higher wavelengths are for night transmission, too. Whether you are east or west of the transmitter has some effect, too.

Frequency-Holding Super

WHAT PRECAUTIONS should be taken to hold the frequencies in a superheterodyne?—H. W. C.

The oscillator should be stabilized, the padding of the oscillator should be done with an air-dielectric condenser, or accurate fixed condenser of mica-dielectric, which has been vacuum-impregnated with wax; the intermediate coils should be on moisture-proof forms (non-hygroscopic), the coils at the intermediate level should be wax-impregnated, and the condensers tuning them should be air-dielectric or accurate fixed condensers as above described. The stabilization of the oscillator is of the utmost importance for such a precision objective as you outline. The trimming condensers on the r-f and oscillator tuning capacities should be air-dielectric, not postage-stamp type, and should have stiff spring tension. A precision dial should be used, so that dial shift or misreading will not be thought to constitute frequency shift. The traveling light type of dial should not be used, because of the inductive and capacity effects of the moving leads at the higher frequencies even in the broadcast band.

Grid Dip Meter

YOU HAVE NOT DESCRIBED a grid dip meter, although this type of instrument is widely used.—T. D. S.

The grid dip meter draws too much power from the measured circuit, which it therefore detunes somewhat. While that type of meter is in general satisfactory, it can not be said to come near to the highest requirements.

No Chance

I HAVE A variometer-tuned set, three separate dials used, worked from a storage battery and a 135-volt, 30 ma B eliminator. Please let me know how to use them in building a most up-to-date set.—W. S. A.

Those parts and appurtenances can not be used to build anything but an antiquated set.

IS THE RELATIONSHIP between the maximum and minimum capacities of a condenser strictly in accord with the frequencies? What is the rule about the change in inductance in respect to frequency, also change in number of turns? Has resistance an effect on r-f resonance? R. C.

The maximum capacity divided by the minimum capacity gives the condenser's capacity ratio. The frequency ratio is the square root of that. The frequency changes approximately as the inductance. The frequency changes directly as the number of turns for small changes in turns, but for large changes (sufficient seriously to affect the shape factor) the frequency changes as the square of the number of turns. Resistance affects frequency to a greater extent than most persons believe.

Amateurs on the Ultras

ARE THE ultra frequencies now used by the amateurs, and are they getting good results? What is the reason for permitting amateurs to use these frequencies?—K. E. C.

Yes, the amateurs are using them to advantage. The object, if we sense your question correctly, is to enable them to have a short-distance spectrum relatively free from any interference. If you mean what right they have to be using such frequencies, we can say they have a better right than any one else on earth. They are the ones who showed the way to the use of all short waves, after these frequencies were given to them on the secret assumption their use was negligible or worthless.

Join Radio World's

UNIVERSITY CLUB

And Get Free Question and Answer Service for the Coming 52 Weeks.

THIS SERVICE FOR UNIVERSITY SUBSCRIBERS ONLY

Subscribe for RADIO WORLD for one year (52 numbers). Use the coupon below or write on a separate sheet of paper, if preferred. Your name will be entered on our subscription and University Club lists by special number and you will be apprised of the number. When sending questions, put this number on the outside of the forwarding envelope (not the enclosed return envelope) and also put it at the head of your query. If already a subscriber, send \$6 for renewal from close of present subscription and your name will be entered in Radio University.

NO OTHER PREMIUM GIVEN WITH THIS OFFER

[In sending in your queries to the University Department, please paragraph and number them. Write on one side of sheet only. Always give your University Club Number.]

RADIO WORLD, 145 West 45th Street, New York City.

Enclosed find \$6.00 for Radio World for one year (52 nos.) and also enter my name on the list of members of RADIO WORLD'S UNIVERSITY CLUB, which gives me free answers to radio queries for 52 ensuing weeks, and send me my number indicating membership.

Name

Street

City and State.....

ULTRA WAVES PIERCE HILLS, SAYS MARCONI

Rome.

Guglielmo Marconi has reported to the Royal Academy regarding his most recent experiments with ultra frequencies. He used a wave of 45 centimeters, he said, and found that it was possible to carry on two-way communication, by code and 'phone, despite intervening promontories, including hills.

More than a year ago Marconi announced that he found ultra frequencies did not suffer much from the impedimentary effects of tall buildings, boulders and the like, as light waves do, but penetrated them. This was contrary to the general idea of the behavior of such waves, as they were even called quasi-optical on the assumption that they behaved much like light waves. Their frequencies, of course, are enormously lower than those of the waves of light.

Transmitted from Yacht

Marconi has been doing much of his experimenting from his yacht Elettra. He recently established successful communication with inland points at distances varying from 96 to 170 miles. In last year's work he had achieved distances around 170 miles, then considered extensive, as it had been thought, consistent with the quasi-optical theory, that the range was limited to the horizon distance.

Marconi's previous reports have not been altogether complete, as nothing was said about the elevation of the transmitting aerial, which would affect the horizon distance. However, the activities from the yacht preclude the possibility of any high antenna, and make the case different from that of the National Broadcasting Company's experiments from the Empire State Building, in New York, where 135 miles were covered by readable signals.

Used Combination Set

Marconi for his most recent work built a combination receiver and transmitter of the type popular with amateurs in the United States, and while he used around 30 watts output, he believes that this may be increased to advantage, and also that more sensitive equipment ought to be used. He said he is engaged in preparing such equipment and hopes to render a further report before the end of the coming winter.

Despite Marconi's experiments and reports, it is generally agreed that the behavior of the ultra waves are somewhat in line with that of light waves, as to several limitations. However, radio physicists are watching the results of Marconi's work, which is directed toward the possibility of rendering such waves widely useful commercially.

The First Instance

Ultra waves were first used in the Hawaiian Islands, where the local static and other objections made wire telephony difficult and expensive, also none too reliable. An ultra wave system was developed there by RCA and was found to be virtually free of static, though the waves would not travel far. Distance was not necessary for the purpose.

H. C. RICE APPOINTED

The Buffalo Broadcasting Corporation announced the appointment of Herbert C. Rice as production director for its two stations, WGR and WKBW. Mr. Rice is from the dramatic field, having written and produced the H-Bar-O Rangers for the Columbia Network last season.

Walkout Follows Code Notice at Plant of Atwater Kent

Philadelphia.

The radio labor troubles in this area, which began at the Philco plant, have been extended to the Atwater Kent plant, where some employees walked out. Officials of Atwater Kent denied there was a strike but admitted the walkout of about 100 and that its cause was due to dissatisfaction with labor conditions.

The trouble followed the posting of a notice on the bulletin board of the plant, stating that the company would operate under the labor provisions of the Radio Code. This puts the maximum working hours at 36 per week for factory help and 40 per week for others, with \$15 minimum weekly wage.

The labor provisions of the Radio Code were the only ones that had been given even tentative approval by the Recovery administration at Washington, therefore the notice meant that the company was signing the President's blanket code, with the special notation attached to the standard certificate of compliance which made the Radio Code's labor provisions applicable.

The American Federation of Radio Workers is organizing the action of the employees about wages, hours and working conditions, and is responsible for the walkout at Philco's, which is said to have concerned 4,000 employees, as well as the more recent one.

CAPITAL BAR TO TELEVISION

San Francisco.

Broadcasting of television will require a large outlay of capital, and for that reason alone has not been attempted, said John B. McCargar, president of Television Laboratories, Ltd., who had just returned from the Philco plant in Philadelphia.

Technical development has reached a point exceeding that at which sound broadcasting started, he said, adding that the cathode ray tube would be used and the transmissions made on ultra frequencies, where sight and sound could be sent on the same wave, due to the width of the transmission band.

Local service will be the opener, he said, because of the limitation of the radiation of ultra frequencies, but he believed that ultimately there would be tie-ups, so that a program originating at one point could be relayed across the continent. He figured on a 25-mile limit for the local service.

Philo T. Farnsworth, who at 22 developed an electrical scanning system for transmission and reception using the cathode tube, and who has been working for Philco on television, is associated with Television Laboratories, Ltd.

PARLEY IS OVER WITHOUT PACT FOR CONTINENT

Washington.

The North American Radio Conference adopted several recommendations. It failed to settle the puzzling question of how nations on the continent should divide up the available frequencies.

In announcing results of the conference, the Department of State explained, that other nations are to adopt our system of frequency separation. Stations will have a 10-kilocycle separation and 50-cycle tolerance, as now practiced in this country, with an improvement in general reception predicted.

Favors Directional Aerials

This will reduce interference now caused by powerful Mexican stations which are assigned mid-channel frequencies. Such assignments interfere with stations adjoining either side of such frequencies. From now on, only one station in this country will meet interference from a station in Mexico.

The Conference favored use of directional antennas and synchronization where possible to reduce the number of broadcasting channels used.

"Friendly" Adjournment

Under the Madrid treaty, which controls international radio operations, each continent can adopt its own frequency allocations.

The Mexico City conference recommended that allocation and regulations covering use of non-broadcasting frequencies be based on the United States proposals, which assign frequencies to services such as mobile, radiobeacon, airplane, amateur and similar groups.

Adjournment was on a friendly basis, the Department of State announced, with an expression of hope that co-operation would be continued to solve remaining problems.

Dall Heads Board of Wynn's Chain

Curtis B. Dall, son-in-law of President Roosevelt, was confirmed as chairman of the board of directors of the Amalgamated Broadcasting System. This is the outfit of which Ed Wynn, comedian, is the president and featured personality. The other officers are Ota Gygi, formerly a theatrical professional, vice-president; Henry Goldman, general manager; Graham Adams, secretary; N. B. Grove, treasurer.

The personnel of other departments was announced. It includes Frank Orth, chief engineer, and the following announcers: Dwight Weist, Raymond Saunders, Mark Cassidy, Morton Allen, John Henderson, Carl Rukoff and Crawford Wright.

Transcriptions Sent by Air Express

With the growing popularity of Electrical transcriptions among radio program sponsors, the problem of recording the programs and distributing the records to stations leasing the broadcasts with a minimum loss of time has been solved through the use of air express, reports United Air Lines, which is affiliated with the Air Express division of the Railway Express Agency.

Master records of programs transcribed in the Chicago studios of the National

Broadcasting Company are rushed via passenger-cargo plane regularly to New York, where copies are made and dispatched to the various stations throughout the country.

Special trunks are used to ship the records, and the shipments vary in weight from 70 to 110 pounds. Records of programs transcribed in Chicago in the morning reach New York City the same day as the plane time between the two cities is only 4¾ hours.

Station Sparks

By Alice Remsen

THE POET PRINCE ARRIVES

There is a new sensation down the radio rialto; he is a tenor, his name is Anthony Frome, and he is known to the air audience as The Poet Prince. You might know that he is worthwhile, for Eddie Wolfe is handling him, and Eddie never bothers with mediocre artists. Vaudeville offers have been received from all circuits and picture houses, but Eddie has turned down every offer and I think he is wise in doing that, until The Poet Prince is more firmly established in the hearts and minds of the radio public. . . . Do you remember the sweet orchestra which accompanied Bing Crosby on his Cremona broadcasts over WABC some time ago? Carl Fenton was the leader. Several folk have asked where he could be found. My special ferreter has discovered that Carl and his boys are up at Bear Mountain Inn for the summer. . . . Tess Gardella, Aunt Jemima to you, is over in dear old London playing the variety houses. . . . Joe Penner will be the comedian for the new Fleischmann Sunday night programs; a half-hour show on WJZ, commencing October 8th, 7:00 p.m. EDST. . . . Jacques Renard is back on the air again via WABC, after an absence of a year. . . .

"I WANT MY MONEY!"

Jim Doane, Morton Downey's manager, is suing Fred Waring for commission on the Old Gold account. . . . Roger Wolfe Kahn will have a radio commercial upon his return from his European honeymoon trip; his new bride, Dorothy Nelson, is all of a dither over it. . . . L. B. Wilson, owner of Station WCKY, Covington, Kentucky, says that business has picked up to such an extent that he is having his studios, office quarters and engineering laboratories enlarged, and is also adding to his office staff and artists bureau. . . . Dr. A. Winfield Hoeny, noted dramatic reader, has joined the staff of the Nation's Station, WLW, Cincinnati, and will be heard from that point in a series of interpretative presentations selected from the great literary classics. . . . Hal Neiman has gone to Cuba for a trip; he is M-C'ing the entertainment on the S. S. Mauretania. . . . By the way; that romantic Poet Prince continuity is written by the young daughter of an old friend of mine, Doris Wolfe Gilbert—and she is none other than the daughter of Wolfie Gilbert, the noted song writer. . . .

WHEN AND WHERE

William Scotti, whose music is heard over NBC networks from the roof of the Hotel Montclair in New York, was born in Venice, Italy, December 1st, 1893; studied in Italy and then learned the clarinet, saxophone and piano in America; went to school in Brooklyn; got his first radio audition in 1924 with Station WEAJ when it was at 195 Broadway; was house conductor for NBC for a long time, then a saxophone soloist; has three children, Louis, 17; Tina, 15; Alfred, 9; remembered chiefly for his long association with the Venetian Gondoliers. . . . Agnes Moorehead, dramatic actress in many radio productions, is a minister's daughter. . . . Edna Fischer, pretty little NBC pianist, has written a book explaining her system of piano-playing; it is to be published soon. . . . Frances Langford, NBC singer, has left New York for Chicago, where she will play a four-week return engagement at the Chez Paree in the

Exposition City; the petite songstress will broadcast for NBC from the Chicago studios. . . . Roy Hallee, second tenor of the Rondoliers Quartet, will be more careful about his breakfast menu in the future; one morning recently he ordered lobster and then took a swim afterwards; result, as you might imagine: Roy collapsed at the microphone while singing over an NBC network; the other three boys had a wonderful time doubling up over the air, while Roy doubled up with indigestion. . . . The Landt Trio and White are back in New York once more after a long commercial contract which kept them in Cleveland at WTAM; they will take a rest before returning to the air from NBC, their first vacation in five years. . . .

FOR A COLUMBIA NETWORK

A new series of one-hour programs will be heard over a nation-wide Columbia network every Sunday, beginning October 1st. The broadcasts will be sponsored by the Corn Products Refining Company in the interests of Linit; program not yet decided upon. . . . Vera Van, the CBS contralto, had her fox terrier shipped from California last week. . . . Little Jack Little is thinking of becoming a golf professional. . . . Freddie Rich is in Italy. . . . Each Thursday at 10:00 p.m., NBC will broadcast a program to our Canadian cousins over WJZ, and Canada will reciprocate every Saturday, at 8:30 p.m. EDST; over WEAJ. . . . The new Nestle radio series starts August 25th, with Walter O'Keefe and Ethel Shutta as a team; Don Bestor's Orchestra will supply the music; every Friday, at 8:00 p.m. EDST, over WJZ and network. . . . The Richfield Country Club has returned to the NBC network; Grantland Rice, Mary McCoy, Betty Barthell, Leith Stevens and a double male quartet, with Jack Golden's Orchestra, will furnish the entertainment; every Monday, at 7:30 p.m. EDST; WJZ and network. . . . The Pickens Sisters, those sweet singing girls from Georgia, are on their way to the Coast to make a picture for Paramount; they will be featured, and the two Jacks, Oakie and Haley, will be co-starred; tentative title for picture, "We're Sitting Pretty," Charles Rogers will direct. . . . The other afternoon Jane Pickens told me a little story which tickled me; when Lily Pons sang from 711 Fifth Avenue, the Pickens Girls were rehearsing in the next studio; Miss Pons came in and was introduced to them; she asked to hear a number, so what do you think the girls sang, bless them? Dave Ringle's "Blue Eyes," for which I wrote a lyric; and Pons liked it so well that she, herself will sing it; that's what I call a break! . . .

BUSY PETER DIXON

Peter Dixon is so busy writing radio scripts that he has no time for anything else; he has just been retained by the Hecker Mills people as script writer and director of their new H-Bar-O Ranger program, with a fifty-two week contract, five programs a week; that's some assignment; besides that, Peter is writing for several well-known air-comedians, and has other things under way. . . . Frank Hazard, the tenor singer, is making a hit these days over Station KYW, the Chicago Herald and Examiner station, through an NBC wire from New York; Frank is heard five times weekly. . . . Phil Kalar's Melody Men, who were an

TRADIOGRAMS

By J. Murray Barron

In a great many lines one finds numerous agents or direct representatives who have built up a steady following in their community, which often is only a small town or possibly a number of small towns. These representatives have the confidence of the people and over the years sell considerable merchandise. While some servicemen and others interested in radio do considerable selling, in the most cases they are not organized as well as the average direct salesman or representative. Just why this should be is not so easily explained, unless perhaps in the first case the direct salesman has made selling his forte and knows how to pick his merchandise, whereas on the other hand the fellow selling radio direct just sells a few numbers that perhaps a few want, and has not given selling really serious thought. There is for either the direct salesman or the serviceman or anyone else interested in selling radio direct a wonderful opportunity to build up a big following with quality radio merchandise, not as a temporary thing but has a steady, regular business. It is not only the actual sales one makes, but the sales that will follow through the good-will naturally resulting from satisfied customers. If one would not be blinded by the so-called immediate profit and instead would build on the proper foundation success will ensue. Service and quality need never fear cheap competition, whereas every one can not do business by the gyp method. How many would want to stoop so low? Some day unfair methods in radio will be stopped by law. Even the misleading window signs then could not be displayed and only the real radio merchants would survive.

* * *

After September 1st, the Shure Brothers Company, manufacturers of microphones and related equipment, will occupy larger quarters at 215 West Huron St., Chicago, according to a statement by S. N. Shure, president of the company. Increased demand for microphone equipment necessitated the expansion.

* * *

A popular item of interest to servicemen, especially those having contact with users of automobile radio receivers, is the Fansteel Balkite Automotive Battery Charger. It is the new home garage model and is designed especially for the car owner who might want to charge his own battery due to the drain on the battery from extra lights, heaters, auto radio, etc. Mail order distribution is handled by Postal Radio Corp., 135 Liberty Street, N. Y. City.

outstanding feature on the Prairie Farmer Station, WLS, Chicago, for a long time, have returned from a protracted tour and have resumed their broadcasts from WLS. . . . The Friendly Philosopher, Homer Griffith, brings his program of reflections to WJJD, Chicago, each Monday, Wednesday and Friday at 5:30 p.m. CDST, replacing Nick Nichol's Cartoon Class formerly heard at that hour. The latter is now heard in the morning at 10:15. . . .

DON HALL TRIO A BET

The Don Hall Trio are still waking up the customers of WJZ every morning except Sunday, at 7:30; here is a combination that should be a great commercial bet; why doesn't some sponsor wake up and realize it? . . . Merle Johnston is doing some good work over WOR these days with his great saxophone combine. . . . So is Jack Arthur; Jack sounds better each time I hear him; don't know what he's doing to his vocal chords, but that boy is climbing higher and higher; a great picture possibility. . . . Well, I think it's about time to call it a day and hie me across the bridge into the Isle of Manhattan, if this column is to see the light of day.

RCA MONOGRAM STILL USED BY 'GYPS' AS BAIT

Although previous bulletins have been issued urging advertisers to describe accurately and clearly radio products made under RCA patents, a recent survey shows considerable misleading advertising still prevalent, says National Better Business Bureau, Inc. It adds:

"Radio dealers and mail order firms employ the term 'RCA Licensed' in advertising radio sets and tubes of various makes. Some advertisers have shown the word 'RCA' in large type and the word 'licensed' in small type in a manner tending to mislead the public into believing that the product advertised is made by the Radio Corporation of America. In many cases neither the brand of the set or tube, nor the name of the manufacturer is mentioned, and this situation has given rise to confusion on the part of the public.

"The description 'RCA Licensed' as applied to radio products means simply that the article so advertised has been made under RCA patents by a manufacturer who has obtained a license from the Radio Corporation of America. It does not mean that the product or the manufacturer is affiliated with RCA or that the product is approved or endorsed by RCA.

"In some instances advertisements of such products have used without authority the trademark monogram of the Radio Corporation of America. Such use of the RCA trademark is misleading to the public as this trademark can rightfully be applied only to products actually made by the Radio Corporation of America and its subsidiaries.

"In order to protect the public and to promote fair competition, the National Better Business Bureau again recommends that:

"Radio sets, tubes, and other equipment made under Radio Corporation of America patents or license agreements should be designated in advertising by the actual trade name or brand name of the merchandise. If advertisers of such products desire to use, in addition, the expressions 'Licensed by RCA' or 'RCA Licensed,' all the words in these terms should be given equal prominence. Under no circumstances should the RCA trademark monogram be used in advertising by a licensee or a dealer handling licensed products. This trademark may be applied only to products manufactured by the Radio Corporation of America and its subsidiaries."

CORPORATE ACTIVITIES

The National Union Radio Corporation has notified The New York Curb Exchange that its certificate of incorporation has been amended so as to authorize 10,000 shares of new no par preferred stock. New permanent common stock certificates, which bear on the reverse side a statement of the designation and preferences of the preferred and common shares, are being issued by the company. Deliveries against transactions in the common stock may be in either old or new permanent certificates until and including August 24th, 1933.

United States Radio and Television Corporation, common stock, no par, has been removed from unlisted trading by the New York Curb Exchange.

CORPORATION REPORT

Orpheum Circuit, Inc. (Controlled by Keith-Albee-Orpheum Corporation, in turn controlled by Radio-Keith-Orpheum Corporation) and subsidiaries, report a net loss for 1932, after amortization, depreciation, interest, provision for loss on advertisements, and other deductions, of \$2,723,943. For 1932 the net loss was \$798,621.

Prices Go Up Along Line; Consumer Crux of Recovery

Higher prices are now in effect in the radio industry as the frank result of the activities of the National Recovery Administration. Minimum wages and maximum hours having been fixed, more money had to be spent on payroll. There was no Federal appropriation for this, of course. The manufacturers were losing money as it was, so couldn't pay more for less. So the extra cost is passed on to the purchaser, and one purchaser after another passes it on until it reaches the consumer. The NRA advises that people spend more money. The advice is good, but unnecessary. They have to spend more money because things cost more.

The depression itself was unsound economically. A proposed solution, if unsound economically, but less so than the evil it seeks to cure, can do much good. Everyone wishes well and must act courageously in regard to the recovery program. The psychological reaction of rebirth of confidence is all-important.

The best job is being done by the Recovery Administration at Washington, aided by its local committees. Their work is to see that proper codes are enacted and fulfilled. So far industry itself has not done its utmost by any means. Most of the proposed codes were faulty and fortunately the faults were rejected by the NRA. These codes were drawn up by the leading association of the industry, and such associations are dominated by the industry leaders. Sufficient selfish provisions were included to make one blink. This includes the radio code, which has been tentatively approved by NRA only as to its labor clauses. In fact, the general rule has been that only so far as the codes coincide with the President's Re-employment Agreement (blanket code) have they met with much success. But the consumer will do much better as a 100 per cent. co-operator, it is quite certain, and since the real burden falls on him, how he reacts to and is affected by the recovery efforts is the more important factor.

BUSINESS ANGLE

Edward M. Shiepe, B.S., M.E.E., designer and builder of custom-made oscillators, and also the author of a new book, "The Inductance Authority," announces his removal to a more central location at 135 Liberty Street, New York City. Radio engineers, the trade and others who have need for his services will find this new address very convenient, as it is just around the corner from New York's radio centre.

* * *

The Madison Square Radio Show to be held September 20th to 30th is progressing in excellent style. Under the personal direction of Joseph Bernhart, aided by the New York Electrical League, New York, it is expected to be one of the best shows in years.

* * *

An interesting announcement comes from Universal Microphone Co., Inglewood, Cal., regarding its Model HAI Hearing Aid Device to the effect that ten headsets may now be used with a two-stage amplifier, using the 230 tube.

* * *

Boston announces a Radio Trade Show to be held September 6th and 7th at Hotel Statler.

Literature Wanted

Readers desiring radio literature from manufacturers and jobbers should send a request for publication of their name and address. Address Literature Editor, RADIO WORLD, 145 West 45th Street, New York, N. Y.

Robert Rockwell, 5 N. Marfindale Ave., Ventnor City, N. J.

Fred W. Rose, 475 East 124th St., Cleveland, Ohio.

Francis Mittner, 37 Nebraska St., Painesville, Ohio.

H. A. Pond, General Delivery, Wichita, Kans.

C. Rostron, 2588 42nd St., Long Island City, N. Y.

M. J. McNicholas, 3753 63rd St., Woodside, L. I., N. Y.

Sidney A. Warner, The Warner Department Store, Mount Vernon, Wash.

H. Robert Heinrich, 108 Fairbanks St., N.W., Grand Rapids, Mich.

A. E. Philbrick, Roxbury, Conn.

G. E. Pilgrim, Spindale, N. C.

James F. Golden, 4018 Wilsby Ave., Baltimore, Md.

F. B. Greeley, Box 1558, Tulsa, Okla.

A. H. Crippen, 307 Stanton Ave., Ames, Iowa.

W. D. Bridge, Jr., 15 Deering Ave., Portland, Me.

Walter O. Benson, 20 Woodbridge Ave., Chatham, N. Y.

Willard C. White, R. F. D. No. 1, Box 59, Curtice, Ohio.

Mantel Type Set, 15 to 2,400 Meters



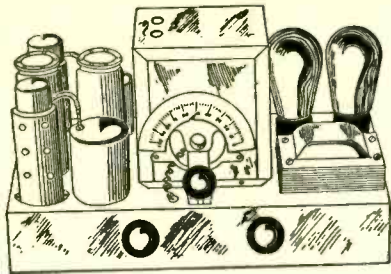
For the first time radio fans and experimenters are now able to get a radio set that covers all waves, ranging from 15 to 2,400 meters, in an export model heretofore available only for the export trade. It is a five-tube set using one 2A5, one 57, two 58's and one 80. It comes in a-c and a-c-d-c types. It is equipped with automatic volume control, illuminated vernier dial, kilocycle calibration, the wave bands on dial in different colors, has dynamic speaker, and is sensitive. This and the four-tube a-c come in t-r-f and superheterodyne models. There are also separate broadcast, short-wave and ultra-long-wave models and also a four-tube a-c-d-c midget. An illustrated booklet will be sent free by addressing Fanning Radio Labs., 377 Eighty-seventh Street, Brooklyn, N. Y.

BOOK SET EXHIBITED

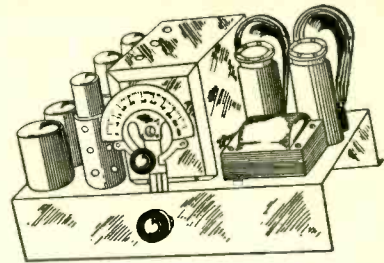
A display is being held at the Du Pont Exhibit on the Boardwalk at Atlantic City of the novelty book radio sets made by Stewart-Warner Corporation of Chicago. When closed, these resemble a set of two or three books, according to the size of the cabinet desired. The sets are six tube in size. In order to heighten the illusion of books, they are bound in Fabrikoid.

A THOUGHT FOR THE WEEK

RADIO sets on sale in chain grocery stores? It doesn't sound reasonable—and yet a certain manufacturer is said to be conferring with an official of a big grocery chain with a view to placing a small set on sale in several hundred stores throughout the country.



BLUEPRINTS, COILS and CHASSIS FOR THE TUNED R-F DIAMOND OF THE AIR



FOUR-TUBE DIAMOND

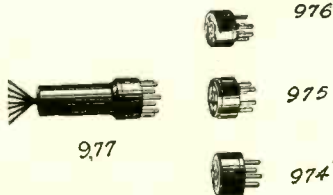
Extremely fine performance, including fetching tone quality, marks the Four-Tube A-C 1933 Diamond of the Air, blueprint of which is now available (half-scale). Many have been surprised that so much can be accomplished on a t-r-f set that costs so little to build. The circuit uses a two-gang 0.00035 mfd. condenser. Special coils are required. The chassis is metal, 13.75 x 6.75 x 2.5 inches.

Send \$3.00 for six months subscription (26 issues) and get the blueprint, two official shielded coils and the drilled metal chassis free. Order PRE-D-4-COMB.

FIVE-TUBE DIAMOND

The Five-Tube A-C 1933 Diamond of the Air provides greater sensitivity than the four-tube model, also somewhat more selectivity, as a three-gang condenser is used. An infallible method of permanently suppressing oscillation is introduced, so that besides having a sensitive and selective set one will have a stable receiver. The tone is most excellent. Send \$4.00 for 34 weeks subscription (34 issues) and get the blueprint, three shielded coils and drilled metal chassis free. Chassis is 13.75 x 9 x 3 inches. Order Cat. PRE-D-5-COMB.

Analyzer Plug and Adapters



For constructing a set analyzer, an analyzer plug, to go into a receiver socket, is necessary. We offer the exclusive seven-pin analyzer plug, plain long handle as illustrated, and three adapters that enable putting the plug

connections into UX, UY and six-pin receiver sockets. The plug has 5-foot 7-lead cable. All four parts sent free on receipt of \$6.00 for one-year's subscription (52 issues). Order Cat. PRE-ANPLAD.

0-10,000-Ohm Resistance Meter

A 0-10,000-ohm ohmmeter and continuity tester. A rheostat is built in for correct zero resistance adjustment. The unit contains a three-cell flashlight battery. Supplied with two 5-foot-long wire leads with tip plugs. Case is 4-inch diameter baked enamel. Sent you for an order for one year's subscription for RADIO WORLD (52 weeks) at the regular rate of \$6. Order Cat. PRE-500.

We do not pay postage on resistance meter. Average postage 17c.

RADIO WORLD and } \$7.00 RADIO NEWS

Get both of these magazines for one year for \$7.00, although the regular subscription price of RADIO WORLD alone is \$6.00 a year and that of "Radio News" alone is \$2.50 a year. Instead of paying \$8.50 you pay \$7 and you get 52 issues of RADIO WORLD (one a week) and 12 issues of "Radio News" (one a month). "Radio News" recently bought "Citizens Radio Call Book," and "Technical Review" and consolidated them with "Radio News." This offer at this combination price applies only to United States and possessions. Send \$7.00 and order Cat. PRE-RWRN. To Canadian and other Foreign subscribers the combination price offer is at \$8.50 for these two magazines. Order Cat. PRE-FOR-RWRN.

RIDER'S MANUAL

The standby of the service man is John F. Rider's "Perpetual Trouble Shooter's Manual," of which Vols. 1 and 2 have been published. Vol. 1 consists of 2,000 diagrams of commercial receivers, power amplifiers, converters, etc. Total pages, 1200. Vol. 2 contains additional diagrams on the same basis as above, but in Vol. 2 there is no duplication of any of the diagrams printed in Vol. 1. To get Vol. 1 free, send \$9.00 for 1½-year subscription (78 weeks) and order Cat. PRE-RM-1. To get Vol. 2 free, send \$9.00 for 1½-year subscription (78 weeks) and order Cat. PRE-RM-2.

PHONOGRAPH MOTOR

Allen-Hough synchronous phonograph motor, 78 revolutions per minute; takes up to 12-inch records. Works from a-c line, 50-60 cycles, 105-120 volts. Equipped with felt-covered turntable. To start the motor give it a slight impetus. Fits into 3-inch depth, hence handy for compact installations. Given free with 34-weeks subscription at \$4.00. Order Cat. PRE-PHOMO.

A-C, D-C SOLDERING IRON



A serviceable iron that works on a-c (any frequency) and d-c, 105-120 volts. Sent free on receipt of \$1.50 for three-months subscription (13 issues). Order Cat. PRE-SOLIN.

R-F CHOKE COILS

These coils have 50, 100, 200, 400 and 800 turns, diameter 1 inch, and are suitable for detector plate filtering, screen filtering, grid and plate loads, etc. The 50 is for short waves, 100 for television band, 200 for broadcast band, 400 for high intermediate frequencies (450 to 300) and 800 for lower intermediate frequencies. Any four, or four of a kind, or combinations not exceeding total of four, sent free on receipt of \$1.00 for 8 weeks trial subscription. Order Cat. PRE-4-CH and state chokes desired, by quantity and number of turns.

TWO BOOKS BY ANDERSON AND BERNARD

"The Superheterodyne," by J. E. Anderson and Herman Bernard. A treatise on the theory and practice of the outstanding circuit of the day. Special problems of superheterodynes treated authoritatively. "Foothold on Radio." A simple and elementary exposition of how broadcasting is conducted, with some receiver circuits and an explanation of their functioning. Both books sent free on receipt of \$1.00 for 8 weeks trial subscription. Order Cats. PRE-SH-FH.

CHOICE OF PANEL TYPE METERS

One meter sent free with each \$1.00 trial subscription (8 weeks). Order Cat. PRE-MTR and add the number of the meter to the catalogue number. Any number of meters may be ordered on the equivalent extended subscription basis.

0-6 Voltmeter D.C.....	No. 326
0-50 Voltmeter D.C.....	No. 337
6-Volt Charge Tester D.C.....	No. 23
0-10 Amperes D.C.....	No. 338
0-25 Milliamperes D.C.....	No. 325
0-50 Milliamperes D.C.....	No. 350
0-100 Milliamperes D.C.....	No. 390
0-300 Milliamperes D.C.....	No. 399
0-400 Milliamperes D.C.....	No. 394

HANDY PACKAGE OF PARTS

One grid condenser of 0.00025 mfd., with clips; one 5-to-7 meg. fixed grid leak; one knob with ¼-inch shaft; one a-c cable and plug. All sent on receipt of \$1.00 for 8-weeks trial subscription. Order Cat. PRE-HANPKG.

SHIELDS FOR 57, 58 TUBES

Aluminium shields of the type specified by the tube manufacturers for sensitive circuits, so that the shield top fits snugly about the tube dome, are obtainable, six free on receipt of \$1.00 for 8 weeks trial subscription. Order Cat. PRE-TUBSH.

RADIO WORLD, 145 West 45th Street, New York, N. Y.
(WE PAY POSTAGE ON ALL PRODUCTS LISTED ON THIS PAGE, EXCEPT OHMMETER).

NEW SHIELDED TEST OSCILLATOR!

Either 50-150 kc Fundamental Model, a-c or battery; or 500 to 1,500 kc Fundamental Model, (broadcast band) a-c or battery, available.

Either model FREE with two-year subscription for Radio World (104 issues) \$12.00

An improved modulated test oscillator, fundamental frequencies, 50 to 150 kc, enabling lining up of intermediate frequency amplifiers, t-r-f and oscillator circuits, is now ready. It is shielded in a metal box 9 1/2" wide x 6 1/2" deep x 4 1/2" high, with beautiful Japanese finish. The test oscillator is obtainable in two models, one for a-c operation, the other for battery operation. The same cabinet is used for both.

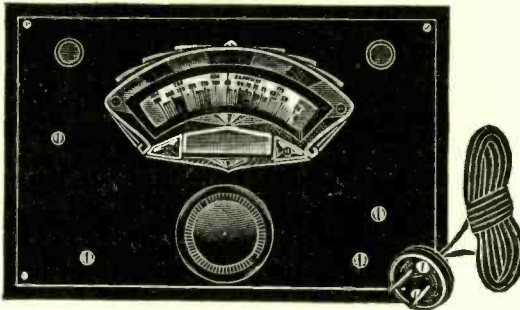
The a-c model not only is shielded but has the line blocked, that is, radio frequencies generated by the oscillator cannot be communicated to the tested set by way of the a-c line. This is a necessary counterpart to shielding, and a special circuit had to be devised to solve the problem.

The modulation in the a-c model is the a-c line frequency, 60 cycles, effected by using the line voltage on the plate of the tube. In the cabinet there is a very high resistance between the shield cabinet end and the a-c, a double preventive of line-shorting and application of a-c line voltage to the user.

The oscillator is equipped with an output post. No ground connection need be used, as the circuit is sufficiently grounded through the power transformer capacity to prevent body capacity effects in tuning.

The frequencies are more accurately read than normal use requires, being never more than 2% off, and usually not more than 1% off, many readings being right on the dot (no discernible difference). The frequency stability is of a high order from 100 to 50 kc, and somewhat less from 100 to 150 kc. Zero beats are guaranteed at all frequencies.

The oscillator was designed by Herman Bernard and is manufactured under the supervision of graduates of the Massachusetts Institute of Technology.



The test oscillator has a frequency-calibrated dial, 150 to 50 kc, with 1 kc separation between 50 and 80 kc and 2 kc separation between 80 and 150 kc. Intermediate frequencies are imprinted on the upper tier. Broadcast frequencies are obtainable on tenth harmonics (500 to 1,500 kc).

THE a-c model is completely self-operated and requires a 56 tube. The battery model requires external 22.5-volt small B battery and 1.5-volt dry cell, besides a 250 tube. The use of 1.5 volts instead of 2 volts on the filament increases the plate impedance and the operating stability. The battery model is modulated by a high-pitched note. Zero beats are not obtainable with the battery model.

Directions for Use

Remove the four screws and the slip cover, insert the 56 tube in its socket, restore the cover and screws, connect the a-c attachment plug to the wall socket, and the a-c test oscillator is ready for service.

For testing some particular set, follow the directions given by the designer or manufacturer. In the absence of such directions, use the following method.

Mentally affix a cipher to the registered frequencies on the lower tier (so 50 is read as 500, and 150 as 1,500), and set the dial for any desired broadcast frequency. Connect a wire from output post of test oscillator to antenna post of set. Leave aerial on for zero beats, off otherwise. At resonance the hum will be heard. Of resonance it will not be heard. For testing intermediate frequencies, connect the wire to plate of the first detector socket. The first detector tube may be left in place and bared wire pushed into the plate spring. The intermediates then are tuned for strongest hum response. If an output meter is used, tune for greatest needle deflection.

The battery model is connected to voltage sources as marked on oscillator outleads and is used the same way.

RADIO WORLD

145 West 45th St., New York, N. Y.

BOOKS AT A PRICE

"The Superheterodyne," by J. E. Anderson and Herman Bernard. A treatise on the theory and practice of the outstanding circuit of the day. Special problems of superheterodynes treated authoritatively. Per copy. (Cat. AB-8E), postpaid, \$5.00

"Foothold on Radio," by Anderson and Bernard. A simple and elementary exposition of how broadcasting is conducted, with some receiver circuits and an explanation of their functioning. (Cat. AB-FH) postpaid, \$2.50

HENNESSY RADIO PUBLS. CORP.
143 West 45th St. New York City

"HANDBOOK OF REFRIGERATING ENGINEERING," by Woolrich—Of great use to everybody dealing in refrigerators. \$4. Book Dept., Radio World, 145 W. 45th St., N. Y. City

RADIO WORLD AND RADIO NEWS. Both for one year, \$7.00. Foreign, \$8.50. Radio World, 145 W. 45th St., N. Y. City.

PADDING CONDENSERS



Either capacity, 50c

A HIGH-CLASS padding condenser is required for a superheterodyne's oscillator, one that will hold its capacity setting and will not introduce losses in the circuit, for losses create frequency instability. The Hammarlund padding condensers are of single-condenser construction on Isolantite base, with set-screw easily accessible, and non-stripping thread. For 175 kc. intermediate frequency use the 850-1350 mmfd. model. For i.-f. from 460 to 365 kc., use the 350-450 mmfd.

0.0005 HAMMARLUND S. F. L. at 98c.

A sturdy, precision straight frequency line condenser, no end stops. The removable shaft protrudes front and rear and permits ganging with coupling device, also use of clockwise or anti-clockwise dials, or two either side of drum dial. Front panel and chassis-top mounting facilities. True straight line. This rugged condenser has Hammarlund's high quality workmanship and is suitable for precision work. It is a most excellent condenser for calibrated radio frequency test oscillators, any frequency region, 100 to 60,000 kc., short-wave converters and adapters and TRF or Superheterodyne broadcast receivers. Lowest loss construction, rigidity; Hammarlund's perfection throughout.

Order Cat. HO's @

Guaranty Radio Goods Co., 143 West 45th Street, New York, N. Y.

Quick-Action Classified Advertisements

7c a Word—\$1.00 Minimum
Cash With Order

TELEVISION 16-INCH ALUMINUM SCANNING DISC. State the type and size of shaft and number of holes. \$2.00, cash with order. L. Jones, 168-22nd Ave., Melrose Park, Ill.

STAMPS—100 different, 10c; 1,000 mixed, 35c; 1,000 hinges, 15c; Album (2,000 spaces), 25c. H. Seligman, 371 Elwood Avenue, Oakland, Calif.

"THE CHEVROLET SIX CAR AND TRUCK" (Construction—Operation—Repair) by Victor W. Page, author of "Modern Gasoline Automobile," "Ford Model A Car and AA Truck," etc., etc. 450 pages, price \$2.00. Radio World, 145 W. 45th St., N. Y. City.

"THE FORD V-EIGHT—'B'-FOUR—'BB'-TRUCK," by C. B. Manly. A New and Practical Book for Everyone Interested in the Construction, Adjustment, Upkeep and Repair of the New Fords. Over 250 pages, 125 illustrations. Complete cross index. Pocket size, flexible leatherette cover. Price \$2.00. Radio World, 145 W. 45th St., New York, N. Y.

HENLEY'S "TWENTIETH CENTURY BOOK OF RECIPES, FORMULAS & PROCESSES." New 1933 Edition. Ten thousand processes, recipes, trade secrets and money-making formulas. For the laboratory, workshop, factory and home. Some subjects fully covered: Dyes, Inks, Waterproofing, Perfumes, Cement, Plating, Glass, Dentifrices, Varnishes, Soaps, Glues, Paints, Adhesives, Enamelling, Hairdressings, Cosmetics, Oils. Price, \$4.00. Book Dept., Radio World, 145 W. 45th St., New York City.

NEW RADIO AMATEUR'S HANDBOOK, 180,000 words, 207 illustrations, 218 pages (10th edition, issued 1933). Issued by the American Radio Relay League. Price, \$1.00 per copy. Radio World, 145 West 45th Street, New York, N. Y.

"A B C OF TELEVISION" by Yates—A comprehensive book on the subject that is attracting attention of radioists and scientists all over the world. \$3.00, postpaid. Radio World, 145 West 45th St., N. Y. City.

BLUEPRINTS OF STAR CIRCUITS

8-TUBE AUTO SET

Sensitivity of 10 microvolts per meter characterizes the 8-tube auto receiver designed by J. E. Anderson, technical editor of Radio World, and therefore stations come in with only six feet of wire for aerial, and without ground. Most cars will afford greater aerial pickup, and besides the car chassis will be used as ground, so with this receiver you will get results. The blueprint for construction of this set covers all details, including directions for cars with negative A or positive A grounded. The circuit features are: (1) high sensitivity; (2), tunes through powerful locals and gets DX stations, 10 kc either side; (3), latest tubes, two 239 pentode r-f, two 236 screen grid, two 237 and two 238; push-pull pentodes, all of 6-volt automotive series; (4), remote tuning and volume control on steering post, plus automatic volume control due to low screen voltage on first detector; (5), running board aerial. The best car set we've published. This circuit was selected as the most highly prized after tests made on several and is an outstanding design by a recognized authority. Send for Blueprint 631, @

5-TUBE AC, T-R-F

Five-tube a-c receivers, using variable mu r-f, power detector, pentode output and 280 rectifier, are not all alike by any means. Forty circuits were carefully tested and one selected as far superior to the others. This prized circuit was the 627, and if you built it, you will always be glad you followed our authentic Blueprint, No. 627. This is the best 5-tube a-c t-r-f broadcast circuit we have ever published. Price

SHORT-WAVE CONVERTER

If you want to build a short-wave converter that costs only a very few dollars, yet gives good results, furnishing all its own power from 110 volts a-c, and uses no plug-in coils, you can do so from Blueprint 630. Price

RADIO WORLD, 145 West 45th Street, New York, N. Y.

SEPT. 2

1933

15c

RADIO

REG. U.S. PAT. OFF.

WORLD

The First and Only National Radio Weekly

Twelfth Year

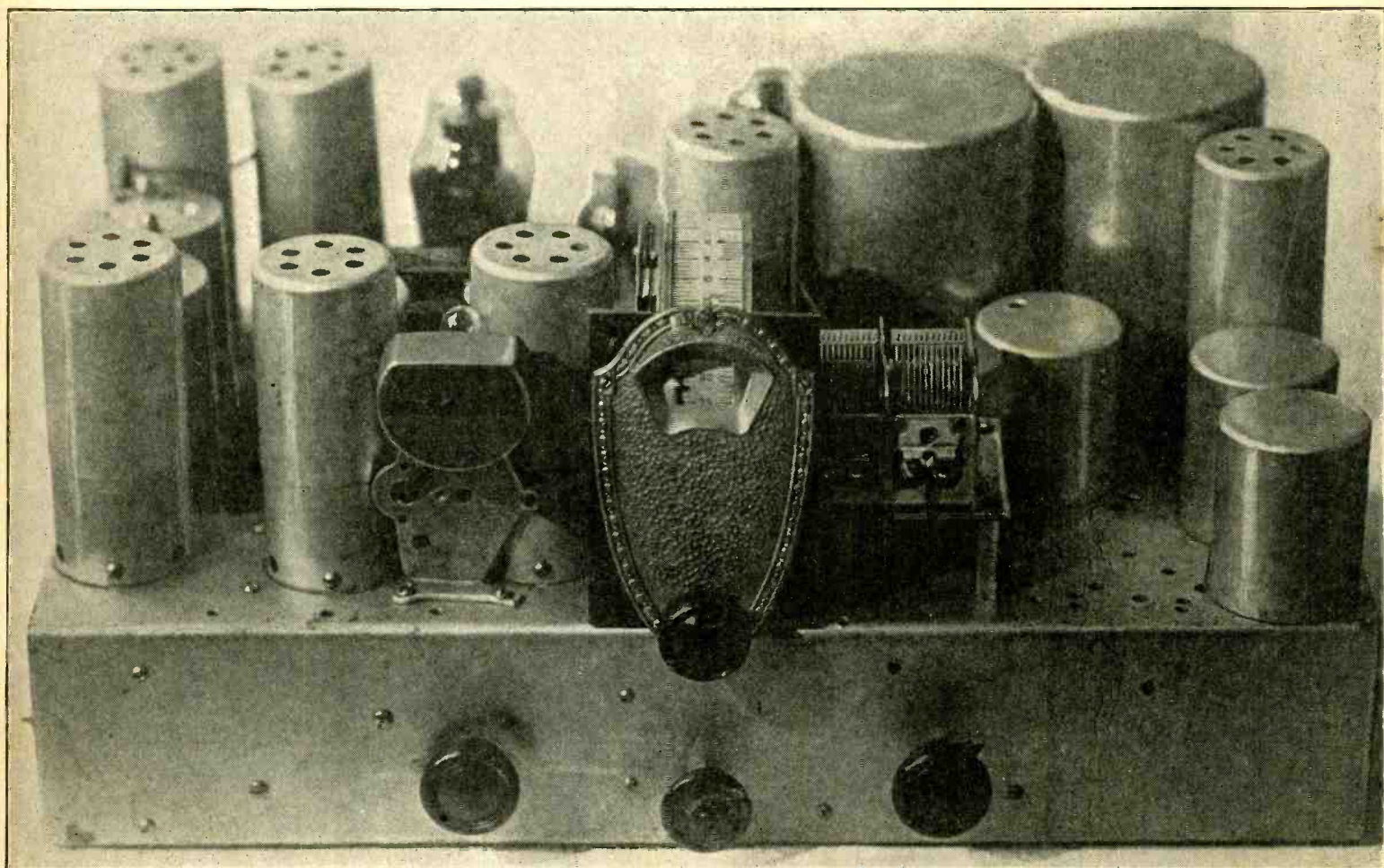
597th Consecutive Issue

**FINAL NRA CODE
IN FULL**

**2-to-1 Frequency Ratio
for Short Waves**

Universal Set Hints

ALL-WAVE D-C SET



A 10-tube superheterodyne, 540 kc to 30 mc, using a switch, and operating from the 110-volt d-c line. See page 8.

Received VK3ME Melbourne, AUSTRALIA

**on the POWERTONE
UNIVERSAL AC-DC
Short Wave Receiver**

*As Described in this Issue of
RADIO WORLD by Herman Cosman*

Melbourne, Australia, over 11,000 miles, was received on the Powertone Universal just on the outskirts of New York City. This is authentic proof of its receptive qualities. The Powertone Universal was first introduced in the May 13th issue of Radio World, but since has been improved upon for even greater clarity and ease in DX reception. Operates on either AC or DC electric current, without any batteries. Uses 1-43, 1-78 and the new 1-2525 tube. Hammarlund parts add to its fine performance.



- Complete kit of parts with cabinet, blueprint, and four plug-in coils (15-200 meters)..... **\$7.95**
 Wired, with coils.....\$2.00 extra Broadcast coil.....85c
 Portable AC-DC Short Wave Kit.....\$8.95
 "Regent" Four Kit.....7.95
 "Beginner's" Twin Kit.....7.95
 "Rocket" Two Kit.....4.50
 Powertone Wallace Kit.....14.70

HANDY SERVICEMEN'S MANUAL A priceless guide for Servicemen and Experimenters. Reserve your copy NOW. QUANTITY LIMITED!...25c

SEND FOR OUR LATEST CATALOG

TRY-MO RADIO COMPANY, Inc., Dept. RW
 85 Cortlandt St., N. Y. 178 Greenwich St., N. Y. 179 Greenwich St., N. Y.

**PRICES GO UP SEPT. 15
TROUBLE SHOOTER'S
MANUAL, Nos. I, II and III**

Having assembled 2,000 diagrams of commercial receivers, power amplifiers, converters, etc., in 1,200 pages of Volume No. 1 of his Perpetual Trouble Shooter's Manual, John F. Rider, noted radio engineer, has prepared Volume No. 2 on an even more detailed scale, covering all the latest receivers. Volume No. 2 does not duplicate diagrams in Volume No. 1, but contains only new, additional diagrams, and a new all-inclusive information on the circuits covered.

- Volume No. 3 (Recently issued). Order Cat. RM.....\$7.50
 Volume No. 2—Perpetual Trouble Shooter's Manual, by John F. Rider, Shipping weight 6 lbs. Order Cat. RM-VT @.....\$5.00
 Volume No. 1 (8 lbs.). Order Cat. RM-VO @.....\$5.00
 We pay postage in United States on receipt of purchase price with order. Canadian, Mexican and other foreign remittances must be in funds payable in New York.

RADIO WORLD
 145 West 45th Street New York City

**SPECIAL
SMALL POWER
TRANSFORMER**

Filament-plate transformer, for oscillators, 1 or 2-tube sets, etc.
 Primary, 110 volts a-c.
 Secondary A, 2.5 volts, center-tapped; stands up to 3 amperes.
 Secondary B, 110 volts, not center-tapped.
 Excellent for test oscillators with a-c in plate.

Price, \$1.10

RADIO WORLD

145 West 45th Street New York, N. Y.

BLUEPRINT NO. 627—Five-tube tuned radio frequency, A-C operated; covers 200 to 550 meters (broadcast band), with optional additional coverage from 80 to 204 meters, for police calls, television, airplane, amateurs, etc. Variable mu and pentode tubes. Order BP-627 @ 25c. Radio World, 145 West 45th Street, New York City.



FOR YOUR NEW ANALYZER

Get This Latest Professional Plug
 Used on the newest Weston-Jewell, Supreme, Hickok, etc., testers. For the man who wants the very best obtainable. Has the famous Na-Aid Latch-Lock with thumb release for locking Associate Adapters to this basic plug.

Two new styles of lower priced but thoroughly practical analyzer plugs are now available.
 977P KIT of 7-prong plug and associate adapters. List price, \$2.60. Write for descriptive literature. Analyzer rewiring instructions and diagrams included.

- New Composite Sockets
- New Short-Wave Coils
- New Testing Adapters
- New Adapter Parts Kit

907WLA



Now is the time to resurrect your dead equipment. Write today for Complete Catalog Sheets and other data, including information on using the new tubes in old sets. Mention Dept. W-2.

ALDEN PROD'TS CO., 715 Center St., Brockton, Mass.

**NO MORE
CALCULATING
OF INDUCTANCE!**

Get your answers accurately from curves in the only book of its kind in the world, "The Inductance Authority," by Edward M. Shiepe, B.S., M.E.E. Two charts, one in the book, the other (18x20 inches) as a supplement, relate inductance, capacity and frequency, the large one from ultra to audio frequencies. Thirty-five charts, with 13 curves on each, cover the

numbers of turns and inductive results for solenoids, for 35 wire sizes and insulation types. Wire sizes are Nos. 14, 16, 18, 20, 22, 24, 26, 28, 30, 31 and 32. Insulations: single silk, double silk—single cotton, double cotton and enamel. Form diameters: 3/4, 7/8, 1, 1 1/8, 1 1/2, 1 3/4, 2, 2 1/4, 2 1/2, 2 3/4 and 3 inches. Pages 9x12, printed on one side only. Price, \$2.00 postpaid, including supplement.

RADIO WORLD

145 WEST 45TH ST., NEW YORK CITY

CHARACTERISTICS CHART

All the receiver tubes, and some others, under the following groups: Detectors and Amplifiers, Power Amplifiers, Rectifiers, Phototubes, Regulators. Two full pages, also page of descriptive text. In Radio World of April 1, 1933. 15c a copy, or send \$1.00 for trial subscription of 8 weeks, including April 1. Radio World, 145 W. 45th St., New York City.

The FAMOUS PILOT SUPER

7 Tube A.C. or 7 Tube D.C. SUPERHETERODYNE Receiver completely wired, fully equipped with tubes and Dynamic Speaker, and housed in beautiful two-tone cabinet **\$17.50**

A LIMITED NUMBER of the PILOT MODEL "K136" SHORT and LONG WAVE Receiver Kits, complete with cabinet, 14 to 600 Meters, less tubes and speaker **\$29.50**

SETS NOW ON DEMONSTRATION

THORS BARGAIN BASEMENT

167 GREENWICH STREET (between Cortlandt and Liberty Streets) NEW YORK CITY
 MAIL ORDERS FILLED

ROLAND BURKE HENNESSY
Editor

HERMAN BERNARD
Managing Editor

RADIO WORLD

The First and Only National Radio Weekly
TWELFTH YEAR

J. MURRAY BARRON
Advertising Manager

Vol. XXIII

SEPTEMBER 2d, 1933

No. 25. Whole No. 597

Published Weekly by Hennessy Radio Publications Corporation, 145 West 45th Street, New York, N. Y.

Editorial and Executive Offices: 145 West 45th Street, New York

Telephone: BR-yant 9-0558

OFFICERS: Roland Burke
Hennessy, President and
Treasurer; M. B. Hennessy,
Vice-President; Herman
Bernard, Secretary.

Entered as second-class matter March, 1922, at the Post Office at New York, N. Y., under Act of March 3, 1879. Title registered in U. S. Patent Office. Printed in the United States of America. We do not assume any responsibility for unsolicited manuscripts, photographs, drawings, etc., although we are careful with them.

Price, 15c per Copy; \$6.00
per Year by mail. \$1.00 extra
per year in Foreign countries.
Subscribers' change of ad-
dress becomes effective two
weeks after receipt of notice.

FREQUENCY RATIO OF 2 in a Short-Wave Switch-Type Set

By Herman Bernard

IN short-wave reception there is more and more crowding as the frequencies become higher, and this is almost inevitable, since to make the spread in frequencies the same throughout the bands would require many coils and also a discouraging profusion of padding.

The worst case of crowding results when a receiver is of the so-called all-wave type, using the same condenser, as the broadcast band is included and has to be taken care of without any switching when covering it, due to popular requirement.

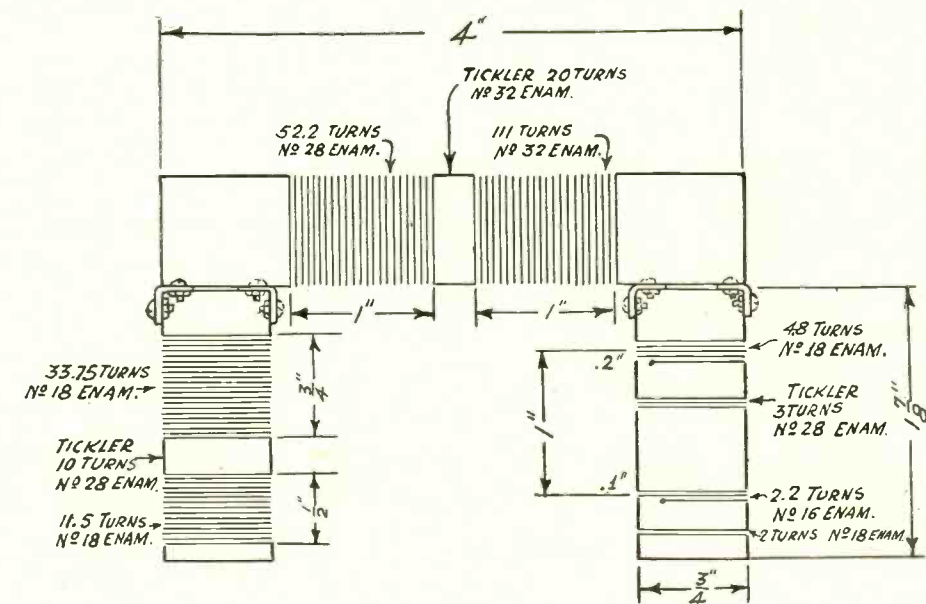
The next step is the short-wave receiver that has the usual condensers of around 0.00014 mfd., with no provision for reducing the maximum tuning capacity. This is about in the same class as the all-wave receiver.

To help atone for such conditions band-spreading is used, with parallel manual condensers cut in, so that the frequencies are lowered, but can not be raised, in respect to the starting point. This has advantages, although the ratio of inductance to capacity becomes rather low, whereas it should be as high as possible.

2-to-1 Frequency Ratio

Most sets use plug-in coils, four for each tuned stage, to cover from about 1,500 to 30,000 kc. and the condensers are 0.00014 mfd. to keep down the number of coils.

If switching is used, then an increase in the number of coils is not material. There need be only enough switch points to cover the coil requirements. The tuning capacity may be nearly half of the normal. Thus the frequency ratio is reduced. It may well be selected at 2-to-1, and then it is easy to calibrate the dial for one range and have that calibration hold with applied multiples, to the other ranges. If the dial is frequency-calibrated, the bars need be only extended, and the multiple frequencies written in. Thus, with a 2-to-1 ratio the extreme frequencies would be: 1,500 and 3,000; 3,000 and 6,000; 6,000 and 12,000; 12,000 and 24,000; 24,000 and 48,000 kc. The low-frequency calibration would be multiplied by 2, 4, 8, 16



Coil assembly and turns data for a switch type short-wave set, using one tuned circuit and regeneration. In two instances one tickler is made to serve two coils, but the polarities of the secondaries would have to be reversed because of the phase shift due to the equivalent difference in the tickler location respecting the two coils concerned. Otherwise one secondary served by one tickler should be wound reverse to the other secondary served by the same tickler.

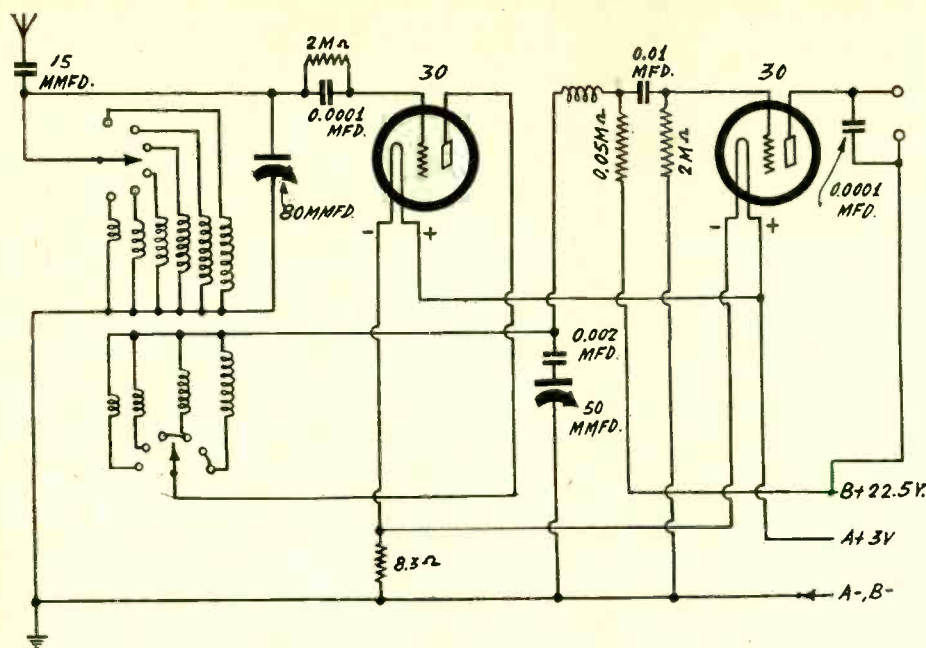
and 32. That is what is meant by the multiples. One scale would suffice, and one could refer to a chart to obtain integral multiples. Or the scale could be extended radially, as suggested, and the frequencies imprinted on six tiers, using a wide scale, of course, and then the dial would be direct-reading in an instantaneous sense for all bands.

Inductance Values

Note, also, that by the system suggested there is an approach to band-spreading

throughout, but not quite successful, because at the higher frequencies there would be crowding. Yet if more coils are not objectionable the frequency ratio could be reduced to 1.5, requiring nine coils, and of course a switch to match. But the present intention is to develop the idea along the lines of a frequency ratio of 2.

We need know the inductance for only one range and then can compute it very simply for the other ranges, since the
(Continued on next page)



A two-tube short-wave earphone set, using the coil system previously illustrated, and discussed in detail in the text. There are six tuned windings, called secondaries for convenience, and three ticklers, as the two smallest coils have a tickler apiece, and two ticklers serve the four other tuned coils.

(Continued from preceding page)
inductance ratio is the reciprocal of the capacity ratio. To get a frequency ratio of 2 the capacity ratio (maximum to minimum of the tuning condenser) must be the square of 2, or 4, so if we know the inductance for the lowest frequency band we know the other inductance values, as they are the reciprocal of 4, or one-fourth.

Winding Data

We have to select some capacity values so let us assume a minimum of 20 mmfd., made possible if the series antenna condenser (the effect of which is to shunt the tuning condenser) is less than 20 mmfd. The maximum capacity would have to be 80 mmfd. To reach 1,500 kc with 80 mmfd. requires an inductance of 140.8 microhenries, and so the other inductance values would be 35.2, 8.8, etc., microhenries, dividing the previous inductance value by 4 each time.

The number of turns of different wire

sizes and insulation types for such wires, for any diameters, may be obtained from Edward M. Shiepe's book, "The Inductance Authority," which reduces all this information to curves, so that no computation is required. Thus the coil system may be worked out for different values of condenser and, if desired, for additional frequency ranges.

The winding data for the coils, 80 mmfd. maximum capacity for tuning, form diameter 0.75 inch, are as follow:

Coil No.	Frequency Range	Mgc.	Inductance	No. Turns	Winding Space
1	1.5 to 3		140.8	111; 32 en.	1"
2	3 to 6		35.2	58.2; 28 en.	1"
3	6 to 12		8.8	33.75; 18 en.	3/4"
4	12 to 24		2.2	11.5; 18 en.	3/4"
5	24 to 48		0.56	4.8; 18 en.	3/4"
6	48 to 96		0.14	2.2; 18 en.	3/4"

The coils are numbered in the ascending order of frequency. The frequency range is in megacycles and should be multiplied by 1,000 to attain kilocycle

values. The inductance is the accurate value, no shielding assumed, and is not merely the "current sheet inductance." The number of turns refers to close winding. The winding space is the amount of axial length taken up by the winding.

Ticklers

The inductance values refer to the tuned coil. There is no primary, as aerial is connected to the grid through the small series condenser. The ticklers in general have about one-quarter the number of turns on the secondaries, except for the highest frequencies, when the tickler may have as many turns as the secondary. Also, it is practical to use one tickler for two bands. This is illustrated in two instances of the coil assembly that leaves room for most switch types now on the market, as 2.25 inches will clear most of them as to width.

Naturally, where switching is used, the fewer the tuned circuits the greater the simplicity. Therefore a circuit is shown for battery use, earphone reception, with the coil system as explained.

As has been stated, the frequency ratio does not change, and all true band-spread depends on such ratio change. However, it is unhandy to have bandspread not related to calibration, and the same general condition obtains, that the spread is not so good for the highest frequencies.

The frequency ratio of 1.5 would require a capacity ratio of 2.25, so if the minimum were 20 the maximum should be 45 mmfd. If the commercial type 50 mmfd. condenser is used, the ratio would prevail if the minimum capacity were raised a bit to 22.2 mmfd. (very nearly), and the low-frequency inductance required would be 220 microhenries. Since the ratio is 1.5 the inductance for each succeeding stage is two-thirds.

Short-Wave Sets, Metal Tubes, at London Fair

London

Low-powered short-wave transmitters and receivers were featured at the radio exhibition. There were nearly ten miles of booth frontage. Dynamic speakers, Class B amplifiers and unbreakable tubes were exhibited.

The new tubes, made by Osram G. E. C. Lamp Company, are all-metal and called Catkins.

Handy Manual Gives Money-Making Aids

"Handy Servicemen's Manual" is the title of a 25c book published by Try-Mo Radio Corporation, 85 Cortlandt Street, New York City. The book information is intended to aid servicemen and others to make money. Besides the suggestions for modes of attack, it also contains information of general practical use, including hookups, for ohmmeters, condenser meters, transmitters, sound appliances, etc. The volume appears in its so-called 1934 edition.

FEEDBACK IN NOVEL WAY

In battery-operated one-tube test oscillators, sometimes the desired coil is not at hand, for instance tickler may be lacking. However, suppose the coil has a tap. A simple solution to provide oscillation is to ground the coil tap (equivalent to A minus usually, though sometimes A plus), and then connect the terminal of the small winding to B minus. In other words, B minus does not connect directly to the A battery but indirectly, through the feedback section of the winding.

Literature Wanted

Readers desiring radio literature from manufacturers and jobbers should send a request for publication of their name and address. Address Literature Editor, RADIO WORLD, 145 West 45th Street, New York, N. Y.

- E. F. Julian, 3004 Emmaus Ave., Zion, Ill.
- J. Newt. Eager, Pioneer Radio Laboratories, 308 North Street, Middletown, N. Y.
- Carl E. Skedeger (Service Shop), 54 George V Str., Dorval, P. Q., Can.
- Lee W. White (Service Man), 8 Willow Rd., Evansville, Ind.
- Alvin Siegler, 73 Ellwood Street, New York City.
- Carl W. Becker, 3869 Park Ave., St. Louis, Mo.
- Melvin E. Davis, Florence, Texas.
- Bob Lively, Canton, Texas.
- W. E. Port, North Girard, Penna.
- A. E. Philbrick, Roxbury, Conn.
- John Popp, 2904 East 115th St., Cleveland, Ohio.
- David Stewart, Cold Spring Harbor, L. I., N. Y.
- Albert H. La Fleur, 24 Rathburn St., Chicopee Falls, Mass.
- W. A. Utzinger, 127 W. Hudson Ave., Dayton, Ohio.
- Archir M. La Due, care Lloyd La Due, 661 Gerth Ave., West Salem, Ore.
- W. F. Stine, P.O. Drawer 835, Beaumont, Texas.
- Jim Richesin, Box 724, Lefoss, Texas.
- R. Findrich, 5026 N. Keeler, Chicago, Ill.
- James F. Golden, 4018 Wilsby Ave., Baltimore, Md.
- W. D. Bridge, Jr., 15 Deering Ave., Portland, Me.
- Jack Jepeway, 358 N. Hamlin Ave., Chicago, Ill.

- Dallas F. Chappell, 420 N. Trade St., Sears Roebuck & Co., Winston Salem, N. C.
- E. J. Koester, P.O. Box 1879, Milwaukee, Wisc.
- Paul Wubben, R. 1, Box 64, Forreton, Ill.
- Seth H. Lewis, Radio Service & Parts, 421 Washington St., Geneva, N. Y.
- Walter Jaeger, 261 E. 188th St., Bronx, N. Y.
- H. A. Lott, General Post Box 374, Staten Island, N. Y.
- M. T. Stephenson, Route 3, Box 585, Sacramento, Calif.
- Hammond Matthews, W9JRM, Silverton, Colo.

CONDENSER "MIKE" POWER SUPPLY

The Shure Model 41A power supply, manufactured by the Shure Brothers Company, 215 West Huron St., Chicago, is now available for condenser microphones. A special rectifier circuit converts a.c. from commercial circuits into filtered d.c. for both filament and plate circuits of the head amplifier. The equipment weighs 12 pounds.

STABILITY AND HARMONICS

The instability of oscillators has been recently associated with the presence of harmonics. Get rid of the harmonics and the frequency-stability is said to be complete. This would require a linear oscillator, as prevention of the generation of harmonics should be accomplished, rather than mere suppression of communication externally of harmonics already produced.

HINTS for Getting Results from Short-Wave UNIVERSAL

By Herman Cosman

Try-Mo Radio Corporation

UNIVERSAL receivers are rapidly gaining popularity. Now the universal principle has been applied to short-wave receivers, and successfully, too. We are showing herewith the Power-tone universal short-wave receiver. This circuit employs only three tubes, a 78 as regenerative detector, a 43 as power tube, and a 25Z5 as rectifier for the power supply.

As in all universal sets, the heaters of the tubes are connected in series, which in this case can be done without complications because all the tubes required the same heater current, namely, 0.3 ampere. The 78 requires a terminal voltage of 6.3 volts and each of the other tubes a voltage of 25. Therefore the total voltage is 56.3 volts. If the line voltage is 115 volts, which is a fair average, there is an excess voltage of 58.7 volts, which must be dropped in a ballast resistor. If the current is to be 0.3 ampere, it would require a ballast resistor of 196 ohms to drop the excess. A resistor of 200 ohms is specified and used, for this is the nearest commercial value.

20-Watt Resistor

The wattage dissipation in this ballast resistor will be 17.6 watts. The resistor specified and used is capable of a dissipation of 20 watts without undue heating, and therefore there is ample margin.

The 25Z5 is used as rectifier when the circuit is used on an alternating current line, and it is left floating when the circuit is used on a direct current line. While its use is essential when the supply is alternating it is not a dead weight when the supply is direct, because the tube helps to filter out the noise on line.

In a regenerative receiver thorough filtering is required if the hum is to be kept out of the signal. This is particularly the case when the circuit is used to receive short wave signals and also when the heaters are operated on alternating current. It is for this reason that three high-inductance choke coils are used in the positive lead of the B supply circuit. These chokes are particularly effective because the total current through them is extremely low, as there is no saturation effect in the cores.

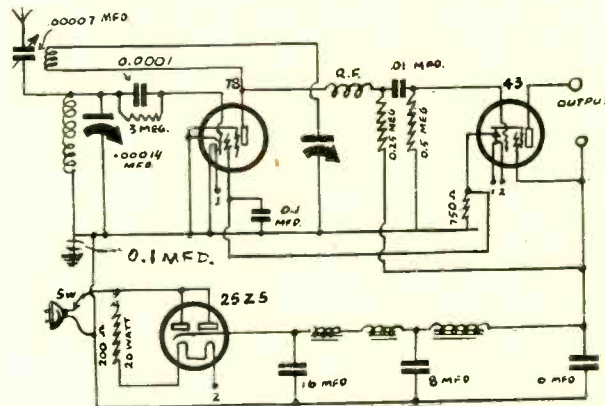
By-pass and Filter Capacities

But these chokes alone are not sufficient. Very large by-pass condensers are also used. Next to the rectifier tube is a 16 mmfd. electrolytic condenser. Another of 8 mfd. is connected between the junction of the second and third chokes and ground, and finally one 16 mfd. is put across the output of the filter. There is a total by-pass capacity of 40 mfd. That and the thorough choking are enough to remove every trace of hum even when the regeneration is pushed to the ultimate limit.

The heart of any short-wave receiver is really the tuning system. The coils used must be efficient. The tuning condenser must be easily turned, and it must not be too large. The regeneration must be smooth and must not be subject to body capacity. All these requirements are met satisfactorily in the Powertone short-wave circuit.

There are four large plug-in type coils to cover the entire short-wave band. They are known as Octoform coils because there are eight equi-spaced ribs on which

A condenser in series with ground and another in series with aerial to protect the tuned circuit and prevent line shorting in the universal-short wave receiver.



the wire is wound. Thus the wires are practically wound on air, for it touches the form at only eight points for each turn. Moreover, the turns are spaced so that capacity between adjacent turns is practically nil. This form of winding makes the most efficient coil practicable.

Color Identity

The forms are of different colors to identify the wave band. The largest coil is red, the next brown, the next blue, and the smallest green.

The plate of the regenerative tube is parallel fed. The tickler is connected in series with the control condenser between the plate and ground. The plate voltage is supplied through a 250,000-ohm plate coupling resistor and a radio frequency choke. The purpose of the choke is to prevent radio frequency current from escaping through the stray capacity in the resistance-capacity coupler and the grid-to-cathode capacity of the power tube. It serves this purpose primarily at the very highest frequencies, but, of course, it is there for the lower frequencies as well.

It will be noticed that a grid leak of 3 megohms is used in the detector circuit and that it is shunted by a condenser of 0.001 mfd. This combination has been found to give exceptionally high sensitivity for the 78 tube when operated in the manner of this circuit.

Suppressor Grounded

The suppressor grid is connected to the cathode, which is also ground. In view of the fact that the resistance in the plate circuit of the tube is very high, a comparatively low screen voltage is required on the tube to make it function most efficiently. The simplest way of getting the required positive voltage for the screen is to connect the screen to the cathode of the power tube. This makes the effective screen voltage approximately 15 volts positive, which is a good value for this tube when operated in this manner.

The tuned coil is put in the antenna circuit. However, to remove the uncertainties of the antenna constants, or inconstants, a small adjustable condenser having a maximum capacity of 70 mmfd. is put between the antenna lead and the tuned circuit. In practice, a smaller value than this will give best results, in general. To provide easy accessibility of this condenser it is mounted on the subpanel so that it can be reached from the top with a screwdriver. It is not necessary to make continual adjustments of this condenser,

but only one each time the antenna is changed. The adjustment should be made on a signal tuned in with one of the medium size coils, preferably the second smallest coil. The condenser is not at all critical, however, just so it is smaller than 70 mmfd.

This condenser serves another purpose. It acts as a safeguard against short circuits in case the antenna should touch any grounded object. In this connection it is well to point out that the receiver should not be grounded actually, as this would not be safe in all instances. It is not at all necessary to ground the circuit because it is grounded well enough through the power line. If, however, an external ground is desired, it can be made perfectly safe by connecting a small condenser between the chassis and the ground.

Of the two controls on the bottom row of the panel, the right is the regeneration control and the right is the line switch.

All other parts are mounted underneath the chassis. The 40 mfd. electrolytic condensers are contained in a single block. The 200-ohm ballast resistor mounted between the line switch and the 25Z5 heater lug with stiff wires so that it is held in the air clear of all other parts. This is important because it is the only part of the circuit that gets really hot. Since it is entirely free from other parts there is plenty of ventilation to keep it reasonably cool and it cannot damage anything else by heat radiation or conduction.

The Four Binding Posts

At the rear of the set are four binding posts, two for the output and two for the antenna and ground. As cautioned above the ground post should not be connected to an external ground unless a condenser is put in the lead. A mica condenser of 0.001 mfd. is suitable or a paper condenser of 0.1 or 0.25 mfd. is just as good.

The regeneration control is a simple knob, but the condenser turns so easily that there is no difficulty in precise adjustment of the volume. Besides, the rotor of the regeneration condenser is grounded, as will be noticed by the diagram of the circuit. Therefore there is no body capacity to make adjustment difficult. This feature is of utmost importance in any short-wave regenerative receiver, for if the regeneration cannot be controlled easily and positively maximum results are impossible.

Radio University

A QUESTION and Answer Department. Only questions from Radio University members are answered. Such membership is obtained by sending subscription order direct to RADIO WORLD for one year (52 issues) at \$6, without any other premium.

RADIO WORLD, 145 WEST 45th STREET, NEW YORK, N. Y.

Pilot Lamp Burns Out

IN A D-C SET that I am building I have inserted a pilot lamp in series with the heaters, but it gets too bright, and does not last long. Will you please tell me what to do?—H. C. S.

The current of 300 milliamperes or more passed through the pilot lamp is too much. Therefore a resistor should be put across the pilot lamp, whereby the resistor will carry part of the current, preferably around half. Pilot lamps have different current requirements, but none commercially obtainable takes less than 150 milliamperes, and the more usual types take around 200 milliamperes, but will be bright enough at somewhat less than that. A resistance of 10 ohms is commonly used in parallel with the pilot lamp.

* * *

D-C Set Precaution

IS THERE ANY SAFEGUARD against the use of wrong polarity in a d-c set using electrolytic condensers? I am afraid that the condensers may blow if the positive voltage is applied where the negative should be. How can I determine the line polarity?—L. S.

One way is to have a relay that is thrown by the reverse current, but this is seldom used. The polarity of the line may be determined with a suitable voltmeter (range exceeding 110 volts). The meter terminals are marked plus and minus, or one is marked plus, the minus unmarked. The polarity of the line is the same as that of the meter terminals when the meter needle deflects to the right, that is, in the correct direction. It would be well to test the outlets for polarity

and put on a red paint dot to denote positive, and engrave the positive prong of the line plug in the set's cable, informing all members of the household that the plug must be connected into outlets only one way, and informing them what that way is.

* * *

Batteries and Frequency Stability

I HAVE READ in a Bureau of Standards publication ("Radio Instruments and Measurements") that it is quite easy to attain high values of accuracy, around 0.1 per cent., in an oscillator, using batteries. The circuits shown are simple and familiar ones, with no attempt at frequency stabilization. Since there has been so much work done on frequency-stabilized oscillators, will not the use of batteries solve the problem, as the Bureau intimates?—J. H.

No, the use of batteries is no solution, particularly since most of the frequency-stabilization work refers to battery-operated circuits. The Bureau of Standards publication set forth that the accuracy could be of the order named, but implied that the terminal voltages had to be kept constant. It specifically pointed out that if two tubes are used from the same A source, the insertion of the second would change the voltage and thus upset the calibration, hence recommended a separate A source for each tube. Frequency-stabilization is the maintenance of the calibration despite these voltage changes, provided they are not enormous. The circuits shown in the Bureau's publication are unstable. That is proved by the fact that the terminal (battery) voltages must not be varied even a little.

Loudspeaker Network

HOW CAN MEASUREMENT be made of receiver performance without the speaker in the circuit? Are there constants available?—K. C. S.

A network is used that is intended to approximate the loudspeaker characteristic. It is not pretended that this represents even the average, but it is a suitable basis for running tests, and is widely used. An inductance of 0.9 henry is in series with a non-inductive resistor, the total d-c resistance, coil and resistor, being 180 ohms. Therefore if the coil d-c resistance is 30 ohms the series resistor is 150 ohms. The free end of the resistor goes to the B plus connection, the free end of the coil to a stopping condenser. A vacuum tube voltmeter is connected between the free side of the condenser and B plus. The value of the stopping condenser for 5,000-ohm VTVM load is 0.45 mfd. and for 2,000-ohm load is 0.65 mfd.

* * *

Filters Defined

WILL YOU PLEASE give me the definitions of the various types of filters, such as low-pass, band-pass, etc.?—W. S.

A filter is a selective network designed to pass currents within a continuous band or bands of frequencies, or direct current, and substantially reduce the amplitude of undesired frequencies. A low-pass filter is a filter designed to pass currents of all frequencies below a critical or cut-off frequency and substantially reduce the amplitude of currents of all frequencies above this critical value. A high-pass filter is the reverse of a low-pass filter. A band-pass filter is a filter designed to pass currents of frequencies within a continuous band, limited by an upper and lower critical or cut-off frequency, and substantially reduce the amplitude of currents of all frequencies outside that band. A ripple filter is a low-pass filter designed to reduce the ripple current, while freely passing the direct current, from a rectifier or generator.

* * *

Audio Oscillation

IN A SET I have just completed, which includes some resistance-coupled audio, there is a steady gurgling sound that at first I thought was radio-frequency oscillation, but now I have confirmed it as being audio-frequency oscillation. It is of a low audio frequency.—K. W.

Reduce the resistance of any one of the grid leaks in the audio circuit. Sometimes it is necessary to use a resistor of very much less resistance than normally recommended to stop this oscillation. There is no reason why the low value of resistance should not be used, either, although this statement seems contrary to the general idea. If there is gurgling then there is over-accentuation of some low frequencies, or distortion in other words, and the lower resistance besides rendering the receiver satisfactorily operative also is a quality factor.

* * *

Calibration Changed

HAVING BUILT a simple detector and audio stage for measuring oscillations put in, I find that the calibration that should hold has been achieved, but does not stay put. I tried out the test oscillator I use with this out of outfit and find that now there is a somewhat different reading for every frequency. I have tried again and again and the new set of circumstances prevails.—C. B.

There has been a change either in the test oscillator or in the measuring rig. Perhaps the test oscillator condenser became displaced a bit, or the dial shifted, or either of these or other facts might be true of the testing circuit itself. Since the new set of conditions prevails, why not recalibrate on that basis, and see if the new calibration does not hold continuously, if you cannot ascertain what was displaced and thus remedy the trouble at the source?

Two for the price of One

Get, EXTRA, one-year subscription for any One of these magazines:

- POPULAR SCIENCE MONTHLY.
- RADIO-CRAFT (monthly, 12 issues).
- RADIO INDEX (monthly, 12 issues), stations, programs, etc.
- RADIO (monthly, 12 issues; exclusively trade magazine).
- EVERYDAY SCIENCE AND MECHANICS (monthly).
- RADIO LOG AND LORE. Bi-monthly; 5 issues. Full station lists, cross indexed, etc.
- AMERICAN BOY—YOUTH'S COMPANION (monthly, 12 issues; popular magazine).
- BOYS' LIFE (monthly, 12 issues; popular magazine).
- OPEN ROAD FOR BOYS (monthly, 12 issues).

Select any one of these magazines and get it free for an entire year by sending in a year's subscription for RADIO WORLD at the regular price, \$6.00. Cash in now on this opportunity to get RADIO WORLD WEEKLY, 52 weeks at the standard price for such subscription, plus a full year's subscription for any ONE of the other enumerated magazines FREE. Put a cross in the square next to the magazine of your choice, in the above list, fill out the coupon below, and mail \$6 check, money order or stamps to RADIO WORLD, 145 West 45th Street, New York, N. Y. (Add \$1.50, making \$7.50 in all, for extra foreign or Canadian postage for both publications.)

Your Name.....
 Your Street Address.....
 City..... State.....

**DOUBLE
VALUE!**

- If renewing an existing or expiring subscription for RADIO WORLD, please put a cross in square at beginning of this sentence.
- If renewing an existing or expiring subscription for other magazines, please put a cross in square at the beginning of this sentence.

RADIO WORLD, 145 West 45th Street, New York. (Just East of Broadway)

Short-Wave Coil Rig

WILL YOU PLEASE let me know how to wind coils for short-wave coverage, so that I may use them in the mixer of a superheterodyne, and have two coil forms in one shield?—P. E. S.

The rig is illustrated herewith. The oscillator windings are at left (vertical), and the secondaries are numbered 1, 2, 3 and 4, while the ticklers are T. Two ticklers will suffice, as one each may serve two windings. If there is no oscillation in one of the secondaries thus served, then reverse the connections thereto. The modulator secondaries are at right, also numbered. Secondaries 1 and 2 may have the same number of turns, for the usual intermediate frequencies (lower than 500 kc), while oscillator windings 3 and 4 would have fewer turns than the companion modulator secondaries. The intimate data can not be given, as you do not state the intermediate frequency or the capacity.

Simple Super

CAN ENOUGH sensitivity be obtained from a simple superheterodyne of few tubes for general broadcast reception, and if so will you suggest the tubes?—J. W.

Yes, indeed. The tubes suggested are 58 r-f, 2A7 modulator-oscillator, 58 i-f, 57 detector and pentode output (2A5, 59 or 47). With an 80 rectifier you have a good five-tube set.

Oscillation Persists

NO MATTER WHAT I try I can not get rid of oscillation in the intermediate amplifier of the superheterodyne I built. The audio is transformer-coupled, the speaker a dynamic, the B voltage on the i-f is 180 volts and the screen voltage is taken from the positive filament of the output tube (utilizing the 50-volt bias on the output tube in the opposite direction). What do you suggest?—T. R. D.

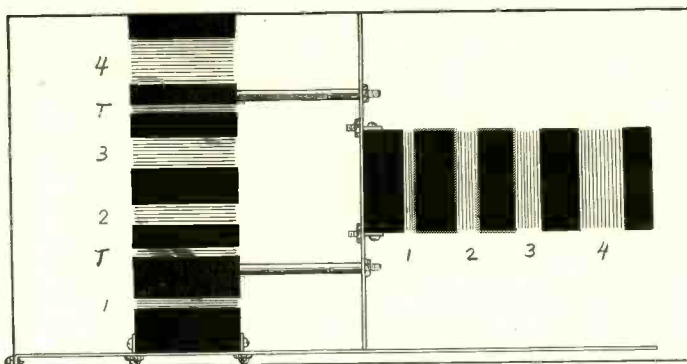
If you will omit the present screen method and put a series resistor between B plus 180 volts and the screens, and bypass both the plate and screen feeds with a large capacity, around 0.5 mfd., or more, you should get rid of the oscillation trouble, or at least reduce it greatly. The series resistor may be around 50,000 ohms. Do not take as accurate the screen voltage as you may now read it on an ordinary voltmeter, as actually the voltage will be higher than read. An r-f choke in each i-f plate lead, between the return of the winding and B plus, and bypassed by 0.002 mfd. or larger capacity, also may be used additionally if the foregoing does not constitute a complete cure, and besides the grid bias may be increased.

Audio Tests

HOW MAY I test a radio receiver as to its audio response at the standard frequencies? Please state these frequencies.—J. L. O'C.

A radio frequency oscillator is used and is modulated 30 per cent. with an audio tone derived from any source, such as a beat oscillator. If only one audio frequency is used it is 400 cycles. The general run of frequencies for audio tests is 40, 100, 200, 400, 1,000, 2,000, 4,000 and 10,000 cycles. These should be tested also at various radio frequencies. If three radio frequencies are used they should be 600, 1,000 and 1,400 kc. If five are used they would be 600, 800, 1,000, 1,200 and 1,400 kc. The reason for the tests at selected radio frequencies (and the stated selections are standard also) is that the selectivity of the receiver may be great enough to affect the tone. The usual test is made with a speaker network, which has been described in answer to another's question. If an actual speaker is to be used, the difficult sound-pressure test is preferable, and filter networks could be introduced so that the audio would be compensated, and a perfect reproduction achieved.

Shield assembly for mixer coils for short waves only. The coil system at left is for oscillator, the one at right for modulator. The tuned windings are 1, 2, 3 and 4. T and T are ticklers.



An Epic of the Air

A Boy's Life Ebbing, A Call for Help, A 2000-Mile Relay, A Plane and a Happy Ending

Dots and dashes hurtled through the ether high above the Arctic storm. From remote Alitak, Alaska amateur radio flashed the urgent plea to save a life.

In Seattle, early that Thursday morning, Ed Stevens, operator of amateur station W7BB, heard the call for help. He engaged in conversation with the operator at Alitak, more than 1000 miles away. At lonely Lazy Bay on Kodiak Island, five-year-old Henry Loof lay near death with appendicitis.

Stevens described the little lad's symptoms to Dr. A. H. Seering of Harbor View hospital, Seattle. The physician diagnosed the case, gravely warned of the danger of peritonitis, urged that the boy be taken to a hospital at once.

"I can't reach Anchorage because of bad weather," the Alitak amateur flashed back. "Please send a message to Anchorage for help," he pleaded.

Stevens called the United States Army Alaska Telegraph, which employs both wireless and cable, and the message was relayed through to Anchorage, a circuit of 2000 miles. Pilot Harry Blunt at once took off through the storm with Dr. A. S. Walkowsky.

Twice the seaplane was forced down. Twice the intrepid duo again roared into the gale. Late that afternoon they reached Lazy Bay, 400 miles from Anchorage. They were just in time to save the little boy's life.

KEEPING THE SOLDERING IRON CLEAN ALL DAY

Quite a few readers work at radio and thus keep a soldering iron going all day. Even if they work in a set factory they most likely have to supply their own irons. The tip of the iron should be protected from becoming pitted. Also, the tip must not become oily or slimy. Therefore it has been found after considerable experimenting that flux must be kept off the tip when the iron is not in use for

joining. This is sufficiently accomplished if the tip is wiped with a rag numerous times during the day. The real trick, not generally known, is to maintain the soldering iron at less than the temperature resulting from line voltage. Start at line voltage for quick heating, then insert a series resistor of sufficient power capacity. For a 65-watt iron a 20-ohm resistor is usually about right.

Join Radio World's

UNIVERSITY CLUB

And Get Free Question and Answer Service for the Coming 52 Weeks.

THIS SERVICE FOR UNIVERSITY SUBSCRIBERS ONLY

Subscribe for RADIO WORLD for one year (52 numbers). Use the coupon below or write on a separate sheet of paper, if preferred. Your name will be entered on our subscription and University Club lists by special number and you will be apprised of the number. When sending questions, put this number on the outside of the forwarding envelope (not the enclosed return envelope) and also put it at the head of your query. If already a subscriber, send \$6 for renewal from close of present subscription and your name will be entered in Radio University.

NO OTHER PREMIUM GIVEN WITH THIS OFFER

[In sending in your queries to the University Department, please paragraph and number them. Write on one side of sheet only. Always give your University Club Number.]

RADIO WORLD, 145 West 45th Street, New York City.

Enclosed find \$6.00 for Radio World for one year (52 nos.) and also enter my name on the list of members of RADIO WORLD'S UNIVERSITY CLUB, which gives me free answers to radio queries for 52 ensuing weeks, and send me my number indicating membership.

Name

Street

City and State

A 10-Tube All-Wave

Full Data on Construction, Including

By Richard
Casanova's Radio

INTEREST in short waves is gaining rapidly and the all-wave sets are becoming increasingly popular. A usual demand is that the circuit be the most sensitive possible, capable of amplifying the feeble signals received from stations thousands of miles away, at the same time be selective and have good loudspeaker volume and good tone.

To meet all these requirements would be an impossibility if the designer were restricted as to tubes and associate parts. The advent of the new auto tubes has made possible great strides in d-c set design never dreamed of before. The circuit diagrammed in Fig. 1 is a 10-tube all-wave d-c superheterodyne in which practically every available radio improvement has been incorporated. In looking over the circuit diagram of this all-wave receiver it will be noticed that nothing has been left out that serves a useful purpose.

Image interference is the weak point in every single-control superheterodyne, and the more the designer of a circuit succeeds in suppressing it the better the receiver will be turned out. To make the use of single r-f tuner practical in the broadcasting band it is necessary to use a high intermediate frequency (in this case 420 kc) for in this way any signal that would cause image interference is 840 kc removed from the desired frequency, therefore a single tuner is quite able to suppress the interfering carrier.

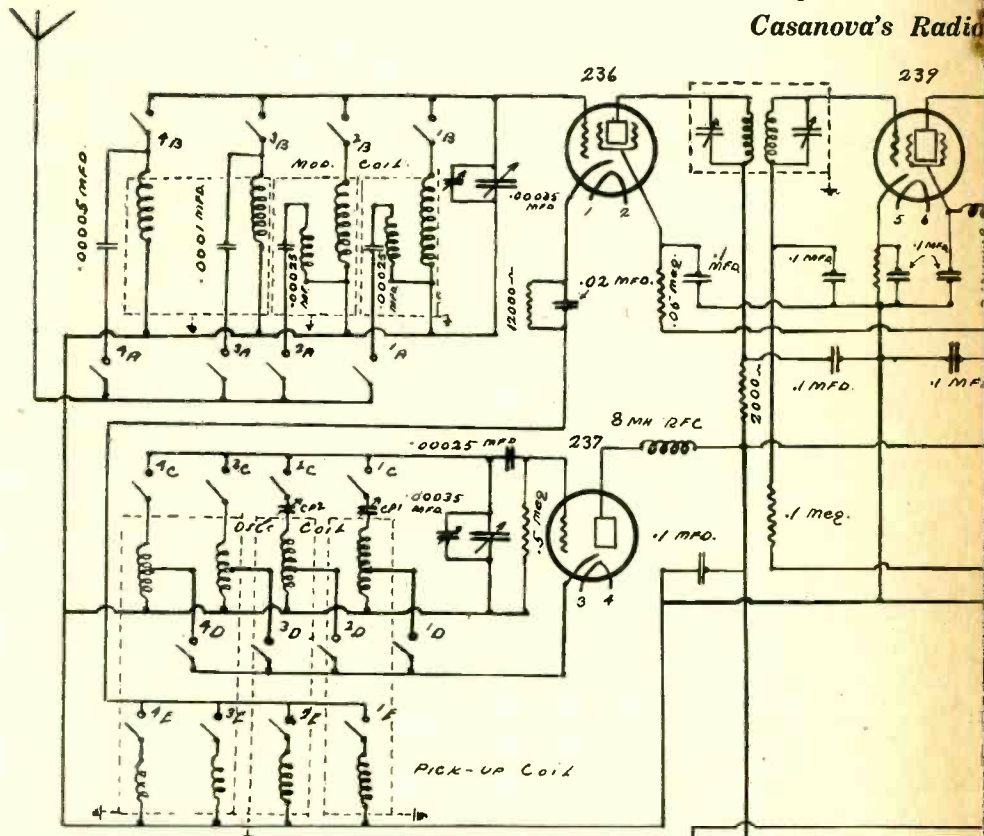
Three Intermediate Stages

There are four intermediate coils, all doubly-tuned transformers peaked at 420 kc. The fourth of these has a center-tapped secondary. It is advisable to have at least one of them, the first one coupling the modulator to the first intermediate tube, loosely coupled. The three intermediate tubes are of the 239 tube operated in typical fashion with separate biasing resistors of 800 ohms connected in the cathode lead of each tube and shunted by a 0.1 mfd. condenser.

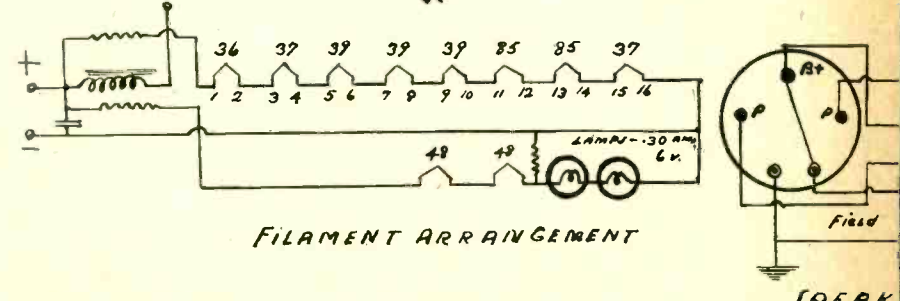
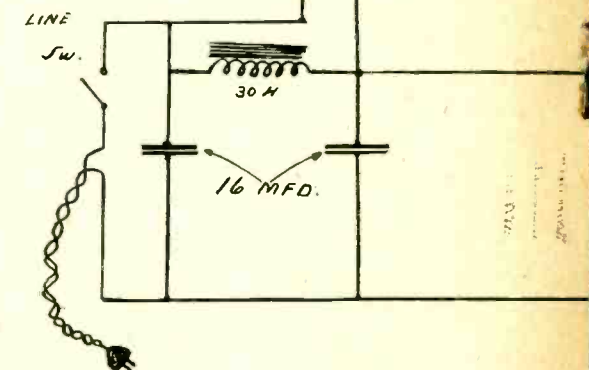
The grid returns of these three tubes are connected to the a.v.c. voltage source. The biasing resistors for these three tubes are somewhat higher than ordinarily used, because there are three intermediate tubes and the selected value of resistance helps in stabilizing the circuit. The plates and screen voltages are little lower than usual for the purpose of stabilization, but with four coils, three high-gain tubes and high intermediate frequency, oscillation may be encountered in the intermediate channel.

The first thing to ascertain, once there is oscillation trouble in the intermediate amplifier, is what tube or tubes are oscillating. From past experience it might be supposed that this is the second intermediate stage. However, it is advisable to be sure which is the oscillating tube, rather than rely on assumption. The oscillating tube will run a higher plate current than the other, and this is one indication. Another is that putting a wet finger at plate of the tube or grid cap will stop the oscillation with a decided pop. By putting a resistor across the secondary of the offending tube the oscillation may be stopped. The resistor should be as high as practical, consistent with oscillation stoppage.

There is no reason for doing away with the switching system, as far as poor con-
(Continued on next page)



ALL-WAVE D.C.
—SUPER HETERODYNE—
CASANOVA'S RADIO SERVICE
LABORATORY
Designer
R. CASANOVA
AW-10 #15 - 7-25-33



Casanova's 10-tube d-c all-wave superheterodyne, using
(four i-f coils), two diode detectors, a. v.

D-C Superheterodyne

ing Coils Used in Wave-Switching

Ed Casanova
Service Laboratory

LIST OF PARTS

Coils

Four coils for the first two bands each in separate shielding can, as described and two modulator windings on one form and two oscillator windings on another form. (See coil data.)
 Four shielded intermediate frequency transformers picked at 420 kc.
 Four R.F.C. of 8 mh. each.
 One R.F.C. of 39 mh.
 One R.F.C. of 85 mh.
 One 30 henry B choke, d-c resistance about 300 ohms.
 One Dynamic Speaker 1,800 ohms field or any resistance up to 2,500 ohms with output transformer match for P.P. 48 with 10.5 inches diameter.

Condensers

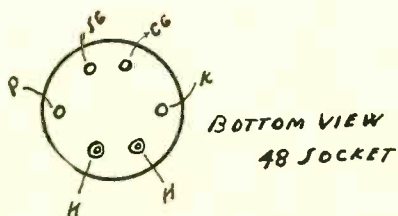
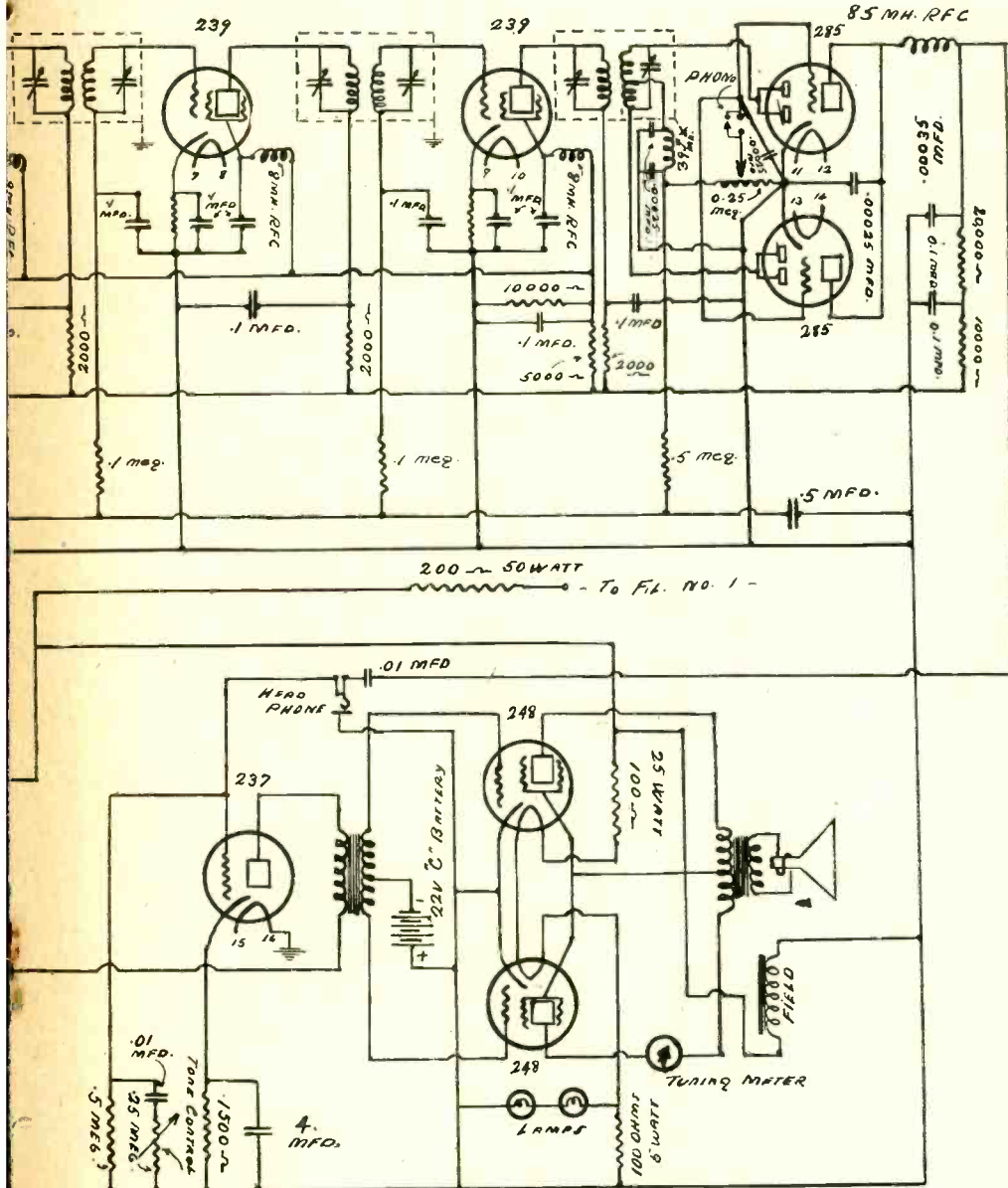
One two-gang straight frequency line tuning condensers with trimmers.
 One .00025 grid condenser with clip.
 Six .00025 mfd. fixed condensers.
 One .02 mfd. fixed condenser.
 One .0001 mfd. fixed condenser.
 One .00005 mfd. mica fixed condenser.
 Two .01 mfd. fixed condensers.
 Four shielded blocks, each block containing three 0.1 mfd. by-pass condensers.
 Two 0.1 mfd. by-pass condensers.
 One 4 mfd. by-pass condenser.
 One 0.5 mfd. by-pass condenser.
 Two 16 mfd. electrolytic condensers.
 Two padding condensers on isolantite base 350-450 mmid.

Resistors

Four .002 meg. (2,000 ohms) pigtail resistors.
 One 0.0015 meg. (1,500 ohms) pigtail resistor.
 Three 800 ohms bias resistors.
 One 0.05 meg. (50,000 ohms) pigtail resistor.
 One 0.02 meg. (20,000 ohms) pigtail resistor.
 Two 0.01 meg. (10,000 ohms) pigtail resistors.
 One 0.005 meg. (5,000 ohms) pigtail resistor.
 Three 0.5 meg. (500,000 ohms) pigtail resistors.
 Three 0.1 meg. (100,000 ohms) pigtail resistors.
 One 12,000 ohms pigtail resistor.
 One 200 ohms 25 watt resistor.
 One 100 ohms 25 watt resistor.
 One 100 ohms 5 watt resistor.
 Two 250,000 ohms potentiometers (for tone and volume control).

Other Requirements

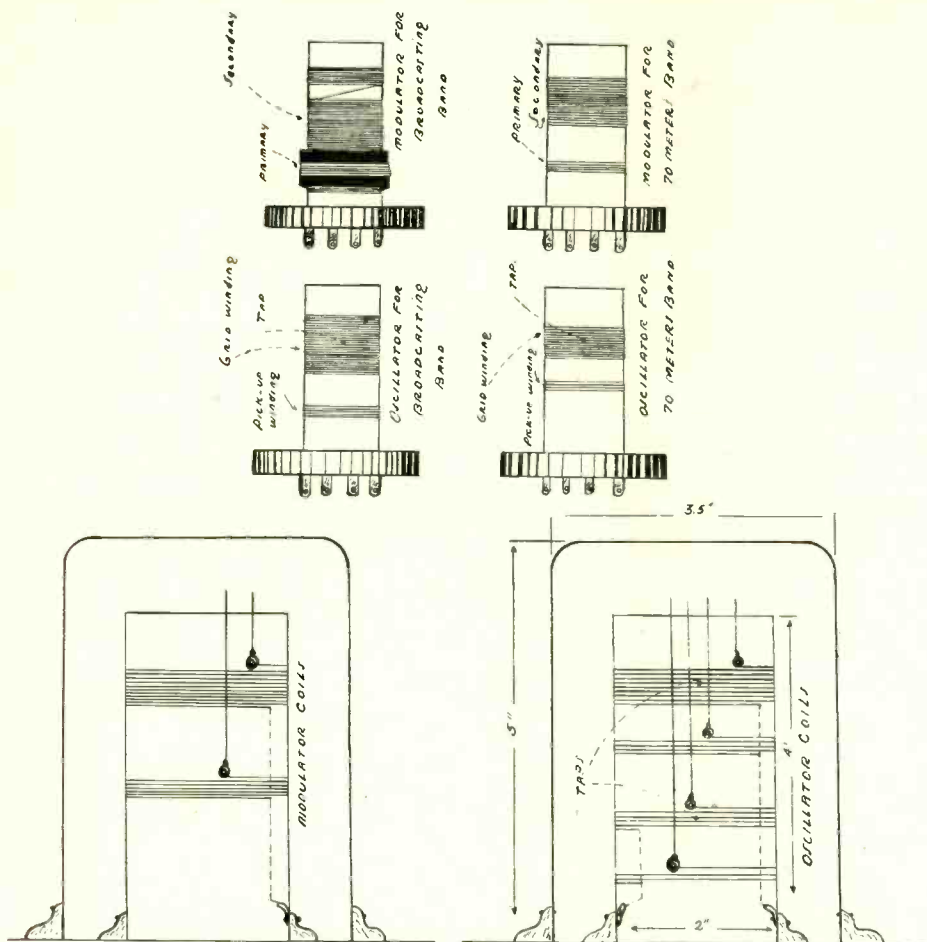
One chassis 18 inches by 10 inches front to back 3/4 inches elevation.
 One drum dial.
 One 22.5 volts C battery.
 One antenna ground binding post assembly.
 11 sockets, four six pin type and 7 UY, the extra one for the speaker plug.
 Seven tube shield.
 One five-deck four position band shifting switch.
 Two six volt pilot lights.
 One tuning meter.



**BOTTOM VIEW
48 SOCKET**

ER PLUG

a switch for band-shifting, three intermediate stages
c., driver and 48 output in push-pull.



Four separate coil assemblies are used for the modulator and oscillator function of Bands I and II (broadcast and next highest bands). Two separate coil assemblies are used for the remaining two bands. See coil data given in detail in the text.

(Continued from preceding page)
 tact resistance is concerned, for plug-in coils are subject, more or less, to the same trouble. The only possible objection in the switching method would be the complication in the hook-up. For this receiver a switching system is used, and it has proved to be on a par with plug-in coils and the convenience for changing bands is far greater. Of course, to accomplish this a good switch should be used.

Speaker Stands the Gaff

The use of a dynamic speaker capable of withstanding power in excess of the output tubes is recommended, for this is one important reason for the faithful reproduction. Perhaps the greatest cause of distortion and poor quality in most multi-tubes receivers today using the duplex diode-triode type 85 and the duplex diode-pentode type 6B7 as well as those using 55 and 2B7 (for a-c) is overloading of the diode detector and in some instances the r-f stages. In this condition the r-f grids draw current due to positive grid swing and act as detectors. When this happens in the r-f the trouble is not so serious and could be easily checked, but when the overloading occurs in the diode, because more is put into it than it could well handle, then other complications arise. Having this in mind and because four intermediates are used in the set, it was necessary to use two duplex diode-triode type 85 tubes in parallel as full-wave diode detectors, in this way almost doubling the capability of voltage handling, avoiding overloading and preserving tone quality. Adequate filtration is advisable to keep r-f out of the amplifier unit of the 85, hence a high inductance choke of 39 millihenries is used and two fixed condensers of 0.00025 mfd. are placed from the two choke terminals to ground.

The voltage developed in the load resistance of the diode is utilized for automatic volume control and it is applied to the intermediate frequency amplifiers. Three 0.1 meg. resistors are used as part of the filter system in the a-v-c branches, being high enough to prevent any serious reduction of the effective value of the load circuit on the second detector. A 0.25 meg. potentiometer is the load resistor of the full-wave diode detectors, the moving arm being connected to the grids, so volume is controlled by the amount of voltage taken off the load.

The D-C Circuits

There are ten tubes in the circuit in the following arrangement: one 237 oscillator, one 236 modulator, three 239 intermediate frequency amplifiers, two 85 duplex diode-triode full-wave detectors and automatic volume controls, one 237 first audio stage and two 248 output power tubes in push-pull. To hook up the filament of all these tubes some special arrangements have to be used, because only 115 volts are available from the d-c power lines and if all the heaters are connected in series, including the pilot lights, they would require 122.4 volts, hence a series parallel system was chosen. The eight tubes requiring 0.3 ampere were connected in one series with a ballast resistor of 200 ohms. The drop in this resistor is 59.6 volts, assuming the line to be 110 volts, but in most cases the d-c lines are a little higher than that and a little allowance was made to compensate for this. Any 200-ohm resistor rated at 50 watts will do, this being a very popular commercial value. In any instance these tubes will stand from 6 to 7.5 volts. The other parts of the heater circuit are the two 248's and the two pilot lights. Each of the 48's takes 30 volts and each of the pilot lights 6 volts, so 72 volts are needed. In this case a simple series circuit will not

do, for the 48 tubes require 0.4 ampere, whereas the pilot lights require only 0.3 ampere. The ballast resistor for this circuit is 100 ohms rated at 25 watts and the drop in it is 38 volts.

As the pilot lights require only 0.3 ampere we must put a shunt resistor across these lamps and adjust it so that it will take the extra 0.1 ampere. This shunt resistor is given in the diagram as 100 ohms and its dissipation is only 1.2 watts. These pilot lights are used for the dial and tuning meter and the resistor in shunt with them may be decreased in value to protect them, as all lights are not the same. When the power is first turned on the two lamps will burn brilliantly, but will dim as the tubes heat up, attaining the steady state.

Coil Data

For the broadcasting and the 70-meter bands separate coils are used, each in shielding cans 2-1/16" x 2 1/2", on 1" diameter tubing.

BAND I (540 TO 1,500 KC)

R-F secondary inductance, 246 microhenries; 123 turns No. 32 enamel wire.

R-F primary inductance, 7 microhenries; 12 turns of No. 32 enamel wire wound over the secondary, on the ground end.

Oscillator: Grid winding inductance, 145 microhenries; 76 turns No. 30 enamel wire tapped at 38 turns.

Oscillator: Pick-up winding 10 turns No. 32 enamel wire wound near the bottom with a separation of about 0.25 inch from the grid winding.

BAND II (1,500 TO 4,285 KC)

R-F secondary inductance, 35 microhenries; 26 turns No. 30 enamel wire.

R-F primary inductance, 3.7 microhenries; 7 turns No. 30 enamel wire, wound near the bottom with a separation of 0.25 inch from the secondary.

Oscillator: Grid winding inductance, 29 microhenries; 22 turns No. 30 enamel wire tapped at 11 turns.

Oscillator: Pick-up winding 5 turns No. 30 enamel wire wound near the bottom with a separation of about 0.25 inch from the grid winding.

BANDS III AND IV (4,285 TO 10,000 KC, 10,000 TO 30,000 KC)

For the next two bands special coil forms should be used and large wire diameter. The four windings (two for the modulator and two for the oscillator) are on two separate forms as follows:

Outside diameter of coil forms, 2 inches.
 Length of coil forms, 4 inches.
 Aluminum shields, 3 inches diameter 5 inches high.

Two coil forms and two shields required.

Modulator: (1) inductance, 4.6 microhenries; 7.8 turns No. 18 enamel wire.

Modulator: (2) inductance, 0.7 microhenries; 2.8 turns No. 18 enamel wire.

Separation between these two coils must be about 1 inch.

Oscillator: (1) inductance, 4.1 microhenries; 7 turns No. 18 enamel wire.

Oscillator: (2) inductance, 0.7 microhenries; 2.8 turns No. 18 enamel wire.

Oscillator: (1) pick-up winding 3 turns No. 18 enamel wire wound on the ground end with a separation of about 0.5 inch.

Oscillator: (2) pick-up winding 2 turns No. 18 enamel wire wound on the ground end with a separation of 0.5 inch or more.

Padding Considerations

It will be noticed from the coil winding data that the inductances for the two smallest coils are the same for the modulator and oscillator purposes, and this is satisfactory because padding for the broadcasting band has been done in such a way that the small trimmer condenser across the oscillator main tuning capacitance is set almost at minimum capacity while the modulator is near maximum, raising in this way the oscillator

frequency over the modulator in the short-wave bands and at the same time reducing the minimum capacity of the oscillator tuning condenser, which is a most important factor if we want to dip to frequencies equivalent to about 10 meters (30,000 kc).

The modulator for the broadcasting band tunes from 540 to little over 1,500 kc and to cover this band of frequencies with 420 kc intermediate the oscillator has to tune from 960 to 1,920 kc. The two tuning condensers (0.00035 mfd.) are ganged, therefore the oscillator will have to be padded. A commercial type of padding condenser 350-450 mmfd. will serve the purpose. The tuning range of the modulator for the second band is from 1,500 to 4,285 kc while the oscillator has to tune to frequencies 420 kc higher or 1,920 or 4,705 kc. The same type of padding condenser may be used for this band. The range of the next band (third coil) is from 4,285 to over 10,000 kc, while the smallest coil will dip to frequencies equivalent to about 10 meters if special care is exercised in the layout of parts and wiring, because some uncertainties affect this end of the spectrum and they have to do with many factors, including position of wires, switch capacity, condenser minimum capacity, etc. Care should be taken, when making the padding for the broadcasting band, that the small trimmer condenser across the oscillator tuning capacity, is set almost at minimum, if we want to reach 30,000 kc.

Broadcast Line-up

Do not attempt to wire in the switch and all the coils at first, but be content to get the set working satisfactorily on the broadcast band before proceeding to higher frequencies. Once you get the receiver working, the adjustment of the padding can be done in the regular way.

That is, the circuit is first adjusted at about 1,450 kc by setting the main tuning condensers at about 92 on the dial and then tuning in the signal by means of the trimmers on the two tuning condensers sections. (This dial setting for that frequency is recommended only if the same dial, capacity and inductance are used.)

Then the circuit is converted to a t-r-f set and a signal of about 600 kc is tuned in and the dial setting noted, then without touching the tuning condensers the circuit is restored to a superheterodyne and the same 600 kc signal is tuned in with the padding condenser Cp-1 (Cp-2 for the second band) till it comes in the same setting.

This adjustment is best done by using a modulated signal from a laboratory oscillator, but in the absence of such an oscillator the padding may be done on any signal that can be brought in around that frequency.

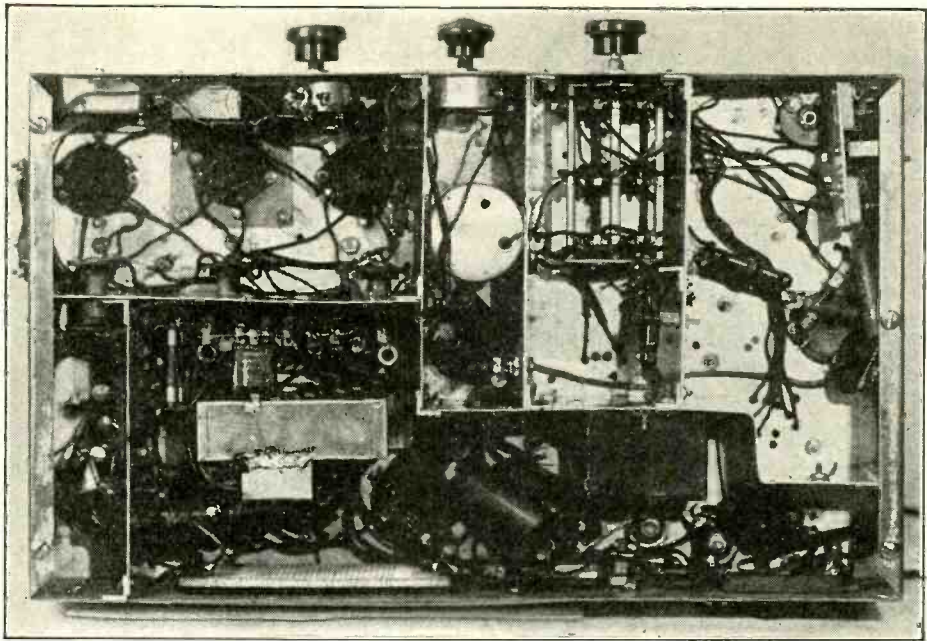
If the padding was done right both circuits will track throughout the band and the sensitivity will be the same in both extremes.

If reception is weak with many squeals and a mushy sound throughout, this is an indication that the intermediate channel is oscillating.

The same method may be used when padding for the second band.

Filtration of B Feed

The B supply must be well filtered, for in short waves particularly this is important. There is one 16 mfd. electrolytic condenser connected in each side of the filter choke and the B supply for all the plate currents are passed through this choke, except the power tubes that gets the plate voltage directly from the line, it being only filtered by the first 16 mfd. condenser. Each intermediate tube has a resistor of 2,000 ohms by-passed by a 0.1 mfd. condenser and each screen grid an r-f choke of 8 millihenries with a 0.1 mfd. by-pass condenser. It will be no-



Underneath view of the wired receiver. Brackets and shields create five compartments.

ticed that each of these tubes have a separate bias resistor shunted by a 0.1 mfd. condenser, all this filtering being necessary to avoid undesirable coupling between the different circuits that will affect the stability of the set. It is not prac-

tical to pass the plate supply of the 48's through the filter choke, due to the high plate current of these tubes, unless a very "heavy" choke is used. A 22.5 volts "C" battery supplies the bias for the power tubes.

TRADIOGRAMS

By J. Murray Barron

Already higher price tags are beginning to show in the radio retail stores and some of the mail order firms have sent out flyers announcing an increase in prices. Naturally those co-operating under the NRA, with shorter hours, added help and higher wages will find the cost of business higher and this is carried out right down to the source of the raw material, so inasmuch as profits do not warrant taking this additional cost out of the business, it must become a part of the operating expense. However, there is no need to try to make capital out of the situation and add a margin on the price tags of merchandise bought before the event of the NRA.

* * *

Pierce Airo, Inc., 512 Sixth Ave., New York City, announces a new motor car radio. New models in the DeWald No. 61 are in production now. The Motortone embraces new features. Literature may be had by addressing the organization direct.

* * *

The radio experimenter and home constructor should now come into his own in the matter of purchasing radio parts and the finished set. That more people will have more money to spend this Fall and Winter can hardly be safely denied, for already most of us know of many who are now in that position already and as the majority of folk really enjoys spending money it should not be out of order to assume that the radio business will get its share. However as prices will be higher one will naturally be more particular as to purchases and rightfully so. What could be more fitting than to patronize the better-type retailer and mail order houses and to avoid the "gyp," the substituter and any whose signs or advertising are not absolutely clear and understandable. Let that type of radio

organization disappear with the depression. One should not only avoid them, but warn others against them.

* * *

Although radio receivers may be had to-day in about any combination of tubes or source of supply and variety of design, the days of set construction are by no means over, but there is a large number who not only buy kits and build both for themselves and others, but is constantly seeking new circuits and kits for further construction. There is a considerable market for kits, as testified by those who now supply them. Home constructors and others should find a ready market for custom-built radio receivers in their own communities.

* * *

Those who may want to install an automobile set in their car and will want something satisfactory, it would be well carefully to consider just what one wants and not be lead astray by even nationally-known names. Some who have bought various types of auto receivers that came from the factory of big organizations have been terribly disappointed at results, including the effect on the operation of the car. The capacity of the set and what it will actually do is the first essential. If it actually performs well and the material is high-grade, the name plate is secondary. You must have power behind it. This is also one of the reasons so many like to build their own or have it built for them. A well-designed circuit of the superheterodyne class is meeting with favor and kits are sought eagerly by constructors. A receiver of this type was installed in a car that just recently returned from a 3,000-mile tour, including Canada and the World's Fair at Chicago, and throughout the trip New York City was picked up with excellent volume.

WORLD MOVING TO TELEVISION; BIG PROGRESS

At all the radio shows, or scientific conventions affecting radio, wherever held throughout the world's leading centers, evidence is presented of the advance of television. The results are almost unanimously reported to be excellent, thus giving weight to the general impression that economic conditions, rather than backwardness of development, are holding up commercial television.

The latest development is that in Germany, exhibited at the radio show at the Kaiserdamm Fairgrounds, Berlin. The previous 90 lines per picture have been doubled, and the picture size has been increased to a square 15 centimeters on each side, or about 6x6 inches. There are 25 pictures per second, or 45,000 lines per second.

Improved Detail

The doubling of the number of lines increases the detail, while the light source has been so improved that the enlargement provides as much unit illumination as did the smaller-sized pictures of the past.

The tendency in the United States is to use 24 pictures per second in the newer developments, to coincide with the picture frequency of the movies, especially as movie film may become an important factor in television, with sound on film. Moreover, 120-line pictures are common in the improved methods, and it has been stated that there is no reason why the number can not be increased.

Of outstanding importance in television was the recent announcement by Vladimir Zworykin, of RCA Victor Laboratories, of electrical scanning at the transmission end. A cathode ray tube is used, but instead of the fluorescent screen there is an area comprising 3,000,000 photo-cells. The companion apparatus is a fluorescent screen tube at the receiving end.

No Moving Parts

Thus all mechanical means are dispensed with. In foreign countries, while some work has been done on electric methods, the mechanical ones are in the ascendancy, and these were the type demonstrated recently in Berlin.

Several German scientists have made important contributions to television and at least one of them, Baron Wilfred von Ardenne, has made some progress with electric scanning at the receiving end.

In the United States RCA Victor, Philco, several colleges, and a few broadcasting stations and commercial concerns have been doing television experimental work. The trend is toward the use of the ultra frequencies for carriers, as then the required wide band width can be accommodated, and also sight and sound may be transmitted in the same wide channel.

A THOUGHT FOR THE WEEK

STATION WBNX announced that its program presented on August 21, consisted of "vital statistics, such as births, deaths, marriages and confirmations" and "the latest shrieks in shrouds, coffins and layettes." Further information was to the effect that "So far as we know, this is the only program of its kind presented over the radio."

We sincerely hope so!

CBS Enacts 'Don'ts' for Its Announcers

The Columbia Broadcasting System has promulgated rules for announcers, including the following:

"After a speech has been given over the network, do not turn to the speaker and say: 'Thank you, Mr. So-and-So' or 'We appreciate your having spoken' or any comment of that nature.

"Rather, make just a straight announcement of what has been on the air. In other words, 'You have just listened to Mr. So-and-So talking on such-and-such a subject,' without any additions such as 'the brilliant talk of' or the 'the interesting address of' or anything else.

"Avoid the use of such phrases as 'You have been enjoying the music of' or 'You are being entertained by.' Nor should you say: 'We hope you have enjoyed so-and-so as much as we have here in the studio.'"

WSB IS READY FOR ITS 50 KW

Atlanta, Ga.—WSB, Dixie's first broadcasting station, will dedicate its new 50,000-watt transmitter Saturday evening, September 9th, with an elaborate program of entertainment furnished by the National Broadcasting Company. The dedicatory program will continue from 9 to 10 p.m., Central Standard Time, and will bring many celebrated artists before the microphone.

WSB first went on the air March 15th, 1922 with a 100-watt transmitter. The station's power has been increased five times. WSB now takes its place with the leading super-power stations in the United States. The station is owned and operated by "The Atlanta Journal."

Lambdin Kay, general manager of WSB, has directed the station's activities since its earliest days and is at present a member of the board of directors of the National Association of Broadcasters.

As the first broadcasting station in the South and the second newspaper-owned broadcasting station in America, WSB is credited with many innovations. It was the first station to adopt a slogan—"The Voice of the South"—and was the first to use chimes as a means of identification in addition to the call letters. "The WSB Radi-owls" was the first radio club of the air and the "Transcontinental Broadcast," at 10:45 p.m., was the first late night broadcast regularly scheduled by any American broadcaster.

Business Periodical Added to Radio List

"Radio Business," a weekly publication devoted to the commercial aspects of radio, made its first appearance with the August 19th issue, consisting of 16 pages, 9 $\frac{1}{4}$ x12 inches, four columns to a text page. News about stations, sponsors, performers and advertising agencies is featured.

The paper is published by Radio Business, Inc., 310 East Forty-fourth St., New York, N. Y. The personnel follows: H. P. Brown, editor; H. E. Tillotson, general manager; Harold E. Tillotson, president; Harold P. Brown, treasurer; Bernard L. Miller, secretary. Trudy Schweitzer, Henry V. Walker, Ainslie Harris and Florence Aaronson, staff.

AIR NOTABLES IN NEW GROUP ASSISTING NRA

Kate Smith, singer of popular songs, has been appointed head of a committee of seven stars of the entertainment world to mobilize the talent of radio, screen, theatre and concert fields in a nationwide cooperative effort to aid the campaign of the National Recovery Administration.

Miss Smith received her appointment from Louis J. Alber, Chief of the Speakers' Bureau of the National Recovery Administration, as chairman of the group, which includes Dr. Walter Damrosch, Marion Davies, Otis Skinner, Lawrence Tibbett, Rudy Vallee and Peggy Wood. The group will be officially known as the NRA Committee of Radio, Screen and Stage, and will maintain headquarters at the Waldorf-Astoria Hotel in New York City.

On Tap for a Call

The committee will be part of the NRA national organization and will function under the Speakers' Division. Every actor and entertainer in the United States, every singer and orchestra conductor will be asked by the committee to become part of its organization and will be card-indexed as to his or her availability at any moment for duty at NRA radio broadcasts or mass meetings.

Behind the "Four Minute Men" of the Speakers' Division will be ranged the powerful support of artists of the entertainment world who have risen to success through their ability to capture and hold the attention of audiences. As in war days—and the great days of the Liberty Loan drives—actors, actresses and musicians whose names are household words will strive by speech and slogan to do their part for the Blue Eagle. Memories of the moments in 1918 and 1919 when Elsie Janis, Marie Dressler, Charles Chaplin, Douglas Fairbanks, William S. Hart and Mary Pickford, and scores of others of that time, swayed street corner and auditorium audiences for the Liberty Bond appeals will be recalled.

Wide Audience Now

Wherever there is a mass meeting or a great city movement for NRA, such as that addressed by General Johnson in St. Louis recently, the services of the artists of the entertainment world will be marshalled for the occasion. But, differing from 1918, when there was no radio and 50,000 people was a vast audience indeed, it will be possible through radio for today's popular favorites to gain the attention of millions of people at one time.

Crowe Has Two New Controls for Car Sets

Crowe Nameplate and Manufacturing Co., 1749 Grace Street, Chicago, announces two remote tuning controls for automobile radio sets. The size is 3 $\frac{3}{8}$ x 4 $\frac{1}{8}$ inches overall. The catalogue numbers are 101, for the better-looking job, and 102, for the same type instrument but with less attractive finish, being lower-priced.

The dial is scaled over 270 degrees for use with 360-degree geared condensers now made by several manufacturers. The scale and direct pointer are completely exposed to view. Steering post clamps and brackets are obtainable.

Station Sparks

By Alice Remsen

ZAZU PITTS ON DECK

Zazu Pitts is the latest screen star to try for radio. Miss Pitts was included in an NBC program which gave an audition for Woodbury last week. It was an ambitious program, embracing a tenor, soprano, full orchestra and Miss Pitts with comedy touches, in the sappy sort of character for which she is famous. Have not yet heard whether the program was accepted. . . . It's a boy and a girl at the Tim Sullivan domiciliary edifice, and Tim is walking on air as befits the proud papa of twins. . . . Jane Froman and her hubby, Don Ross, will be featured in the new edition of the Ziegfeld Follies now being assembled; a precedent will be established, as this is the first time a radio couple has made a Broadway show together. . . . There is a vaudeville and musical comedy trouper who would be a great bet for master of ceremonies on a commercial program—Harland Dixon is the name; a fine personality with a great flow of English, intelligent, well-educated and polished; knows show business in all its phases; why doesn't somebody get hold of him?

PETER DIXON IN HIS STRIDE

There's another chap by the name of Dixon—Peter I mean; he is just getting into his stride so far as radio writing is concerned; you'll hear from this boy in a big way very shortly. . . . There's to be a wedding in Cincinnati this Fall; two friends of mine at WLW, Don "Ukulele" Becker, and Florence "Dramatic" Golden; Don and Florence have been that way about each other for months, n' months, n' months. . . . Arthur Pryor, Jr. is back from his vacation looking fine and brown and all ready to tackle that big business this Fall. . . . Nyra is holding up a great many programs; until all codes are in and fixed, many firms hesitate to commit themselves—even though they have already bought time; program details must wait, so everything will be at least a month late this year, but don't let that fool you—business is going to be good. . . . You'll be able to buy Ben Bernie phonograph records again this year, but they'll be marked Columbia instead of Brunswick; the lad has changed his affiliations.

CHANGES IN PROGRAMS

Quite a few of the old stand-bys are to be heard this winter; Bond Bread, Daggett & Ramsdell, Woodbury, A. & P. Gypsies and Cities Service are just a few. . . . Evening in Paris will be back again, but will have two fifteen-minute periods on WABC, with Nat Shilkret's Orchestra and Agnes Moorehead's comedy; no vocalists. . . . A big audition was given at WABC last week for Linit; it was a pot-pourri of most everything, including Jane Froman and Rosa Ponselle; Miss Ponselle could be made into excellent radio material if she would only listen to reason and sing the more simple classics; her voice is delightful. . . . Rumor says that Mae West is considering the air; so don't be surprised to hear her dulcet voice requesting you to come up and see her some time. . . . Ethel Waters is better and is singing again. . . . Jack Arthur is the latest radio star to take up flying in real earnest; hope he has better luck with his plane than he had with his boat, which was always going wrong. . . . Sponsors are considering Chic Sale for a spot this winter; his dry brand of humor should go well with the customers. . . . Peter Dixon suggests that Joe Cook would be fine air material; and why not? His versatility is unbounded.

ANDRE DESERVES IT

Columbia shows excellent judgement in allowing Andre Kostalanetz to dominate their air-lanes with his fine sense of musical balance. . . . Wish they would give Willard Robison more time. . . . Theo Karle is doing great singing these days on those CBS Artist programs; if you haven't yet heard him tune in, do so, by all means. . . . And speaking of good work, Goldman's Band put over Ravel's Bolero the other evening; I sat in the Mall at Central Park and was all of a dither over that strange piece of tempoistic writing, and the tumultuous climax left me shivering; very excellent work, Mr. Goldman! . . . And have you heard Captain Dobbsie—WEAF, Wednesday's at 10:30 p.m. EDST? What a great microphone personality that man has. John Charles Thomas was his guest last week, and how I enjoyed his rendition of "Trees"! It was perfect. . . . Morton Downey is being considered again for a big commercial account. . . . Kate Smith's sustaining series starts September 18th; Kate will draw down five hundred per from Columbia. . . . Ben Bernie will continue to entertain his listeners for another fifty-two weeks. . . . You'll hear these Harms tunes a great deal over the air this winter: "Moonlight and Pretzels," "Shame on You," "To Be or Not to Be in Love," "Free," "Moon Over Monterey," and a new song which they have just acquired from Europe, "Love is the Sweetest Thing"; and by the way, the new Harms address is 1674 Broadway, and Will Rockwell is still the debonair professional manager. . . . Jan Garber, that extremely popular young band leader, used to be a baseball catcher before he became a professional musician; he's a lad that can really play a fiddle.

VAUDEVILLE TO A B S

Some old friends of vaudeville days will be on the staff of Ed Wynn's new amalgamated station; Rita Gould, McIntyre and Heath, John Steele, Fred Fradkin, and of course, the redoubtable Wynn himself. . . . Plenty of cigarettes and tobacco will be touted on the air this Fall. . . . The Boswell Sisters have a new schedule of sustaining periods—each Wednesday and Friday at 10:30 p.m., EDST. . . . The Mills Brothers will also be heard each Tuesday and Thursday evening at 7:30 p.m., EDST. . . . Walter Drey has a new series of educational programs for children on WMCA, three times weekly at 5:30 p.m., EDST. . . . Britain has gone crazy over Bing Crosby's style and every British band has its "Bing imitator". . . . WHOM has a new children's program, each Thursday at 12:45 p.m., conducted by Jean Norwood, former director of the Young People's Theatre in Minneapolis; the new program is known as the Play-It Club. . . . "The Silver Dust" evening program moves to a network on September 8th and will be heard over WABC and ten other stations, instead of just locally, as before; time will be the same—Mondays, Wednesdays and Fridays at 7:15 p.m., EDST; talent will be as before—Jeannie Lang, Scrappy Lambert and Jack Denny's Orchestra. . . . Swanee Taylor is instructor and pilot for many radio folk who are air-minded; among his pupils are Fred Waring and Kate Smith.

LIKE THE GOOD OLD DAYS

Maria Cardinale is doing quite a bit of work on NBC sustaining programs these days; on August 28th, Maria was on a program with me, "The Revolving Stage," WEAF, 2:00 p.m., EDST; it was like old times for us. . . . Joe White, the Silver

Quick-Action Classified Advertisements

7c a Word—\$1.00 Minimum

MANUSCRIPTS, typed, paragraphed and corrected, 75c 1000 words. Sylvia Camos, 1107 Chouteau, St. Louis, Mo.

AIR CORPS TRAINS 600 MEN yearly free; flying, radio, mechanics. Information for appointment, 25c. Lieut. Carroll, Box 533R, Taunton, Mass.

RADIO WORLD AND POPULAR MECHANICS MAGAZINE—Radio World is \$6.00 a year, and Popular Mechanics Magazine is \$2.50 a year. Popular Mechanics Magazine does not cut rates, but Radio World will send both publications to you for one year for \$7.00. Radio World, 145 West 45th St., New York City.

"AMATEUR MOVIE CRAFT," by James R. Cameron. A book dealing with the making and showing of 16 m/m pictures and equipment necessary for same. Paper cover, \$1.00; Cloth, \$1.50. Radio World, 145 W. 45th St., New York, N. Y.

NEW RADIO AMATEUR'S HANDBOOK, 180,000 words, 207 illustrations, 218 pages (10th edition, issued 1933). Issued by the American Radio Relay League. Price, \$1.00 per copy. Radio World, 145 West 45th Street, New York, N. Y.

THE FORD MODEL—"A" Car and Model "AA" Truck—Construction, Operation and Repair—Revised New Edition. Ford Car authority. Victor W. Page. 708 pages, 318 illustrations. Price \$2.50. Radio World, 145 W. 45th St., New York.

"THE FORD V-EIGHT-B-FOUR-BB-TRUCK," by C. B. Manly. A New and Practical Book for Everyone Interested in the Construction, Adjustment, Upkeep and Repair of The New Fords. Over 250 pages, 125 illustrations. Complete cross index. Pocket size, flexible leatherette cover. Price \$2.00. Radio World, 145 W. 45th St., New York, N. Y.

Masked Tenor, is sing better than ever; caught him the other afternoon on WJZ and enjoyed his work immensely. . . . Donn Ross, husband of Jane Froman, is an old-timer in show business; as a member of the act of Brooks and Ross Don was known all over the country; he played vaudeville and picture houses, and was featured in the "Greenwich Village Follies"; for several seasons both Brooks and Ross were on the Chicago staff of the Columbia Broadcasting System. . . . Oh, yes; Don's full name is Donald McKaig Ross, and he was born at Osakis, Minnesota, on July 15th, 1905. . . . If it's all the same to you, I'll call a halt 'till this time next week.

The Magical Marconi

I LIKE a man as William is,
Who's fit for dance or foray,
Who graces science with his feats—
The famous Senatore.

From sluggish dawn to trembling night
With fearless force and vigor
In radio's exalted spheres
He cuts a looming figger.

He sent the letter S across
The whipped and tamed Atlantic
To show us all when we were kids
An unpedantic antic.

And now that we are old enough
To wear tux and mustaches
He forages in ether-space
With ultra dots and dashes.

He trains the quasi-optic waves
To do his sternest bidding.
And when he says he's turned the trick
We know he isn't kidding.

He forces ultra frequencies
To pierce reluctant mountains,
Endows his sending aerials
With spray of magic fountains.

For he's a genius high to whom
Big obstacles seem petty,
The man who bends the ultra waves
Like pretzels and spaghetti.

—H. B.

National Industrial Recovery Code

for the

Electrical Manufacturing Industry

ELECTRIC CODE NOW IN EFFECT FOR RADIO, TOO

The National Recovery Administration issued the following:

"The Radio Manufacturers Association has today withdrawn its request for exemption from the Code of Fair Competition for the Electrical Manufacturing Industry and has notified the Administrator that the Radio Industry will comply with all the provisions of the Electrical Industry Code.

"The Code of Fair Competition for the Radio Industry, which had been submitted to the Administrator on July 29, 1933, was accordingly withdrawn, and all manufacturers of radio apparatus and parts, including—

Radio Receiving and Television Sets,
Radio and Television Tubes, Electric
Tubes and Valves,
Parts, Cabinets, Accessories,
Loudspeakers, Condensers and also
Sound Distribution Equipment

shall from this date fully comply with all the provisions of the Code of Fair Competition for the Electrical Manufacturing Industry which was approved by the President on August 4, 1933, and became effective August 15, 1933.

"W. L. ALLEN, Deputy Administrator."

Use of Blue Eagle

Radio Manufacturers Association, Inc., is advised by the National Recovery Administration that withdrawal from the Administration of the proposed RMA code for the radio industry and the immediate application of the electrical manufacturing code to radio manufacturers does not affect the use of privileges of the NRA Blue Eagle Insignia for radio manufacturers who have already signed the President's Reemployment Agreement, or voluntary blanket code, as it is sometimes called. For such manufacturers who have signed the President's Voluntary Agreement no further action is necessary except full compliance with and conformance to all provisions of the code for the electrical manufacturing industry.

The NRA also instructs that employers who have not yet signed the President's Voluntary Agreement, in order to obtain the right to use the NRA Blue Eagle Insignia, shall comply with the electrical code and shall file with their local postmaster the following certificate of compliance:

"We have complied with the operative provisions of the code for the electrical manufacturing industry, approved by the President of the United States on August 4, 1933."

Notification Telegram

Fred D. Williams, president of the Association, advised its membership of the situation in the following telegram:

"To avoid extensive delay, controversy and public hearings over wages and hours and other subjects upon which our industry

To effectuate the policy of Title I of the National Industrial Recovery Act, the following provisions are established as a National Industrial Recovery Code for the Electrical Manufacturing Industry:

I. DEFINITIONS: The term "electrical manufacturing industry" as used herein is defined to mean the manufacture for sale of electrical apparatus, appliances, material or supplies, and such other electrical or allied products as are natural affiliates. The term "person" as used herein shall include natural persons, partnerships, associations, trusts, trustees, trustees in bankruptcy, receivers and corporations. The term "employer" as used herein shall include every person promoting, or actively engaged in, the manufacture for sale of the products of the electrical manufacturing industry as herein defined, *provided, however*, that organizations or groups of employers representing a substantial part of any branch or subdivision of the industry may be exempted by the Administrator from the provisions of this code. The term "effective date" as used herein is defined to be the eleventh day after this code shall have been approved by the President of the United States.

II. As required by Section 7 (a) of Title I of the National Industrial Recovery Act, the following provisions are conditions of this Code:

"(1) That employees shall have the right to organize and bargain collectively through representatives of their own choosing, and shall be free from the interference, restraint, or coercion of employers of labor, or their agents, in the designation of such representatives or in self-organization or in other concerted activities for the purpose of collective bargaining or other mutual aid or protection; (2) that no employee and no one seeking employment shall be required as a condition of employment to join any company union or to refrain from joining, organizing, or assisting a labor organization of his own choosing; and (3) that employers shall comply with the maximum hours of labor, minimum rates of pay, and other conditions of employment, approved or prescribed by the President."

III. (a) On and after the effective date employers shall not employ anyone under the age of sixteen years.

(b) On and after the effective date the minimum wage that shall be paid by any employer to any employee engaged in the processing of the products of the electrical manufacturing industry and in labor operations directly incident thereto shall be 40c per hour, unless the rate per

hour for the same class of labor was on July 15, 1929, less than 40c, in which case the rate per hour paid shall be not less than the rate per hour paid on July 15, 1929, but in no event shall the rate per hour be less than 32c per hour, and provided, also, that learners may be paid not less than 80 per cent of the minimum rate paid determined in the manner above provided, but the number of learners receiving less than such minimum rate so determined shall not exceed 5 per cent of the total number of employees engaged in the processing of products and in labor operations directly incident thereto.

(c) On and after the effective date the minimum wage that shall be paid by any employer to all other employees, except commission salespeople, shall be at the rate of \$15 per week; provided, however, that office boys or girls, and learners may be paid not less than 80 per cent of such minimum wage, but the number of such office boys or girls, and learners paid at a rate of less than \$15 per week shall not exceed 5 per cent of the total number of employees covered by the provisions of this paragraph (c).

(d) The minimum rate of wages provided in this Article shall apply to all employees in all localities unless the Administrator or his representative shall fix a lower rate for particular localities.

(e) Not later than ninety (90) days after the effective date the electrical manufacturing industry shall report to the Administrator through the Board of Governors of National Electrical Manufacturers Association the action taken by all employers in adjusting the hourly wage rates for all employees receiving more than the minimum rates provided in paragraph (b) of this Article.

IV. On and after the effective date employers shall not operate on a schedule of hours:

(a) For employees engaged in the processing of products of the electrical manufacturing industry, and in labor operations directly incident thereto, in excess of 36 hours per week.

(b) For all other employees, except executive, administrative and supervisory employees, and traveling and commission salespeople, in excess of 40 hours per week.

Provided, however, that these limitations shall not apply to those branches of the electrical manufacturing industry in which seasonal or peak demand places an unusual and temporary burden upon such branches; in such cases such number of hours may be worked as are required by the necessities of the situation, but at the end of each calendar month every employer shall report to the Administrator through the Board of Governors of Na-

is not agreed, your officers on unanimous recommendation and your code committee by authority and direction of board of directors today withdrew the proposed RMA code submitted to administrator July 29th. Also withdrew requests to exempt radio industry from electrical manufacturing industry code.

"This enables administrator to put radio manufacturing industry under electrical manufacturing code approved by the President August 5th. Formal order of administrator making electrical code effective immediately for radio manufacturing industry as permanent code during Recovery Act ex-

pected tomorrow, and announcement in press Saturday.

"Hereafter electrical code is effective for all radio manufacturers in place of President's voluntary agreement and temporary labor provisions of RMA code. One result will be to raise July, 1929, minimum wage rate from 30 to 32 cents. Adopting electrical code does not affect RMA as an organization and no member of radio industry need join NEMA unless he desires. All administration of code will be under NEMA supervision. Planning to hold radio industry meeting within fortnight.

"FRED D. WILLIAMS."

tional Electrical Manufacturers Association, in such detail as may be required, the number of man hours worked in that month on account of seasonal or peak demand requirements, and the ratio which said man hours bear to the total number of man hours of labor during said month; and

Provided, further, that these limitations shall not apply in cases of emergency, but at the end of each calendar month every employer shall report to the supervisory agency, hereinafter provided for, in such detail as may be required, the number of man hours worked in that month for emergency reasons and the ratio which said emergency man hours bear to the total number of man hours of labor during said month.

V. National Electrical Manufacturers Association is hereby designated the agency for administering, supervising and promoting the performance of the provisions of this code by the members of the electrical manufacturing industry.

With a view to keeping the President of the United States and the Administrator informed as to the observance or non-observance of this code and as to whether the electrical manufacturing industry is taking appropriate steps to effectuate in all respects the declared policy of the National Industrial Recovery Acts, each employer shall, not less than once in each year, prepare and file with the Board of Governors or the Executive Committee of National Electrical Manufacturers Association an earnings statement and balance sheet in a form approved by said Board of Governors or said Executive Committee or in a form acceptable to any recognized stock exchange. Each employer shall likewise prepare and file with such person or organization as the Board of Governors or the Executive Committee of National Electrical Manufacturers Association may designate and at such times and in such manner as may be prescribed, statistics of plant capacity, volume of production, volume of sales in units and dollars, orders received, unfilled orders, stocks on hand, inventory, both raw and finished, number of employees, wage rates, employee earnings, hours of work, and such other data or information as the Board of Governors or the Executive Committee of National Electrical Manufacturers Association may from time to time require.

VI. Except as otherwise provided in the National Industrial Recovery Act all statistics, data and information filed in accordance with the provisions of Article V shall be confidential, and the statistics, data and information of one employer shall not be revealed to any other employer except that for the purpose of facilitating the administration and enforcement of the provisions of this code, the Board of Governors or the Executive Committee of National Electrical Manufacturers Association, by their duly authorized representatives (who shall not be in the employ of any employer affected by this code), shall have access to any and all statistics, data and information that may be furnished in accordance with the provisions of this code.

VII. Any employer may participate in any endeavors of National Electrical Manufacturers Association in the preparation of any revisions of, or additions or supplements to, this code by accepting the proper pro rata share of the cost and responsibility of creating and administering it, either by becoming a member of National Electrical Manufacturers Association or by paying to it an amount equal to the dues from time to time provided to be paid by a member in like situation of National Electrical Manufacturers Association.

VIII. Every employer shall use an accounting system which conforms to the principles of and is at least as detailed

and complete as the uniform and standard method of accounting set forth in the Sixth Edition of the Manual of Accounting, prepared and published by National Electrical Manufacturers Association, and a costing system which conforms to the principles of and is at least as detailed and complete as the standard and uniform method of costing to be formulated or approved by the Board of Governors or Executive Committee of National Electrical Manufacturers Association, with such variations therefrom as may be required by the individual conditions affecting any employers or group of employers and as may be approved by the Board of Governors or the Executive Committee of National Electrical Manufacturers Association and made supplements to the said Manual of Accounting or method of costing.

IX. No employer shall sell or exchange any product of his manufacture at a price or upon such terms or conditions that will result in the customer paying for the goods received less than the cost to the seller, determined in accordance with the uniform and standard method of costing hereinabove prescribed, provided, however, that dropped lines, seconds, or inventories which must be converted into cash to meet emergency needs may be disposed of in such manner and on such terms and conditions as the supervisory agency may approve and as are necessary to move such product into buyers' hands, and provided further that selling below cost in order to meet existing competition on products of equivalent design, character, quality or specifications shall not be deemed a violation of this Article if provision therefor is made in supplemental codes for any branch or subdivision of the industry, which may be hereafter prepared and duly approved by the Administrator.

X. If the supervisory agency determines that in any branch or subdivision of the electrical manufacturing industry it has been the generally recognized practice to sell a specified product on the basis of printed net price lists, or price lists with discount sheets, and fixed terms of payment which are distributed to the trade, each manufacturer of such product shall within ten (10) days after notice of such determination file with the supervisory agency a net price list or a price list and discount sheet as the case may be individually prepared by him showing his current prices, or prices and discounts, and terms of payment, and the supervisory agency shall immediately send copies thereof to all known manufacturers of such specified product. Revised price lists with or without discount sheets may be filed from time to time thereafter with the supervisory agency by any manufacturer of such product, to become effective upon the date specified therein, but such revised price lists and discount sheets shall be filed with the supervisory agency ten days in advance of the effective date, unless the supervisory agency shall authorize a shorter period. Copies of revised price lists and discount sheets, with notice of the effective date specified, shall be immediately sent to all known manufacturers of such product, who thereupon may file, if they so desire, revisions of their price lists and/or discount sheets, which shall become effective upon the date when the revised price list or discount sheet first filed shall go into effect.

If the supervisory agency shall determine that in any branch or subdivision of the electrical manufacturing industry not now selling its products on the basis of price lists with or without discount sheets with fixed terms of payment the distribution or marketing conditions in said branch or subdivision are similar to or the same as the distribution or marketing conditions in a branch or subdivision of the industry where the use of price lists with or without discount sheets is well recognized, and that a system of

selling on net price lists or price lists and discount sheets should be put into effect in such branch or subdivision, each manufacturer of the product or products of such branch or subdivision shall within twenty (20) days after notice of such determination file with the supervisory agency net price lists or price lists and discount sheets as the supervisory agency may direct containing fixed terms of payment showing his prices and discounts and terms of payment, and such price lists and/or discount sheets and terms of payment may be revised in the manner hereinabove provided.

No employer shall sell directly or indirectly by any means whatsoever any product of the industry covered by the provisions of this Article at a price lower or at discounts greater or on more favorable terms of payment than those provided in his current net price lists or price lists and discount sheets.

XI. Aggregations of employers having a common interest and common problems will be grouped by National Electrical Manufacturers Association for administrative purposes in various subdivisions or product classifications and report of such grouping made to the Administrator.

XII. In each subdivision or product classification there will be a supervisory agency approved or appointed by the Board of Governors or the Executive Committee of National Electrical Manufacturers Association and report thereof made to the Administrator. If formal complaint is made to National Electrical Manufacturers Association that the provisions of this code have been violated by any employer, the proper supervisory agency shall investigate the facts and to that end may cause such examination or audit to be made as may be deemed necessary.

XIII. The President may, from time to time, cancel or modify any order, approval, license, rule, or regulation issued under Title I of the National Industrial Recovery Act.

XIV. Such of the provisions of this code as are not required by the National Industrial Recovery Act to be included herein may, with the approval of the President of the United States, be modified or eliminated as changed circumstances or experiences may indicate. This code is intended to be a basic code, and study of the trade practices of the electrical manufacturing industry will be continued by the Board of Governors of National Electrical Manufacturers Association with the intention of submitting to the Administrator for approval from time to time, additions to this code applicable to all employers in the electrical manufacturing industry and supplemental codes applicable to one or more branches or subdivisions or product classifications of the electrical manufacturing industry, such supplemental codes, however, to conform to and be consistent with the provisions of this code as now constituted or hereafter changed.

XV. If any employer of labor in the electrical manufacturing industry is also an employer of labor in any other industry, the provisions of this code shall apply to and affect only that part of his business which is included in the electrical manufacturing industry.

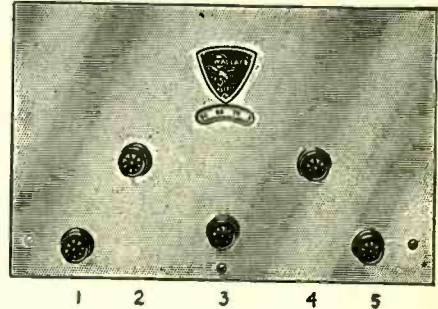
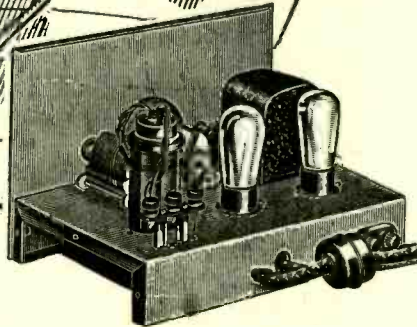
Subscribers! Important!

Note subscription expiration date on wrapper containing your copy of **RADIO WORLD**. If nearing expiration date, please send in renewal so that you will not miss any copies. Subscription Dept., **RADIO WORLD**, 145 W. 45th St., New York City.

POWERTONE WALLACE Short Wave Receiver



HOOVER CUP PRIZE WINNER



- Control No. 1—"On" and "Off" Switch.
- Control No. 2—Band Spread Switch.
- Control No. 3—Tuning Dial.
- Control No. 4—Antenna Tuning Condenser.
- Control No. 5—Regeneration Control.

Made By Powertone Electric Co. Exclusively

DESIGNED by Don C. Wallace, W6AM-W6ZZA, internationally known short wave expert and amateur. Under competitive tests he was able, when using this receiver, to hear more D.X. stations, and many which were entirely inaudible on any other. As a result he was awarded the "Hoover Cup" for premier short wave design and performance. The receiver is finely built of precision parts throughout. Proper circuit design and layout is the result of much painstaking labor. Each part has a definitely set purpose—and functions at peak efficiency at all times. Band spread tuning of the important amateur bands, 160, 80, 40, 20 meters, is controlled by means of a single panel switch.

The receiver, while fundamentally simple has been refined to the last degree. It produces an extremely high ratio of signal to noise. A control is provided for each important circuit, resulting in peak efficiency under all conditions. Heavily cadmium plated sub-base with black crackle metal front panel.

CIRCUIT:—

Ultra low-loss design to produce peak efficiency from aerial to headphones. A special system is used, which tunes the aerial circuit to the exact frequency of the sending station. Thus none of the energy is wasted, and at the same time considerable additional selectivity is obtained.

Special flat-wound silvered ribbon inductances are employed throughout, producing the highest possible circuit efficiency. A unique panel controlled inductance switching system suits the receiver to amateur "band spread" tuning or short wave listener requirements at will. Thus this receiver answers all short wave requirements.

Employs two 230 tubes. Requires two volts D. C. for filament operation, 45—90 volts of "B" battery.

FEATURES:—

- *Band Spread and Continuous Tuning.
- *Ultra Low-Loss Silver Ribbon Coils.
- *A Control for Each Circuit.
- *Tuned High Efficiency Antenna System.
- *HAMMARLUND Dual Section Isolantite Tuning Condenser.
- *Precision HAMMARLUND Tuning Dial.
- *HAMMARLUND Regeneration Control.
- *Highest Quality Audio Transformer.
- *Precision HAMMARLUND R. F. Choke.
- *Ultra Low-Loss HAMMARLUND Isolantite Sockets.
- *Beautiful Black Crackle - Finished Panel.
- *Rigid Steel Chassis.
- *Equally Suited to Amateur or Short Wave Listener Uses.
- *Precise Layout—The Result of Many Experiments.
- *Zero Body Capacity.
- *15 to 200 Meter Tuning Range.

- No. 1 Coil:— 20- 32 Meters
- No. 2 Coil:— 40- 60 Meters
- No. 3 Coil:— 75-150 Meters
- No. 4 Coil:—150-200 Meters

Price of complete kit of parts, including drilled panel and base, a choice of any one of the four plug-in coils and clear constructional blue print **\$14.70**

Completely wired and tested **\$3.23** extra Each Coil **\$1.18**

RELIABLE RADIO CO.

145 West 45th Street,

NEW YORK CITY