

RADIO

REG. U.S. PAT. OFF.

WORLD

The First and Only National Radio Weekly
Twelfth Year *587th Consecutive Issue*

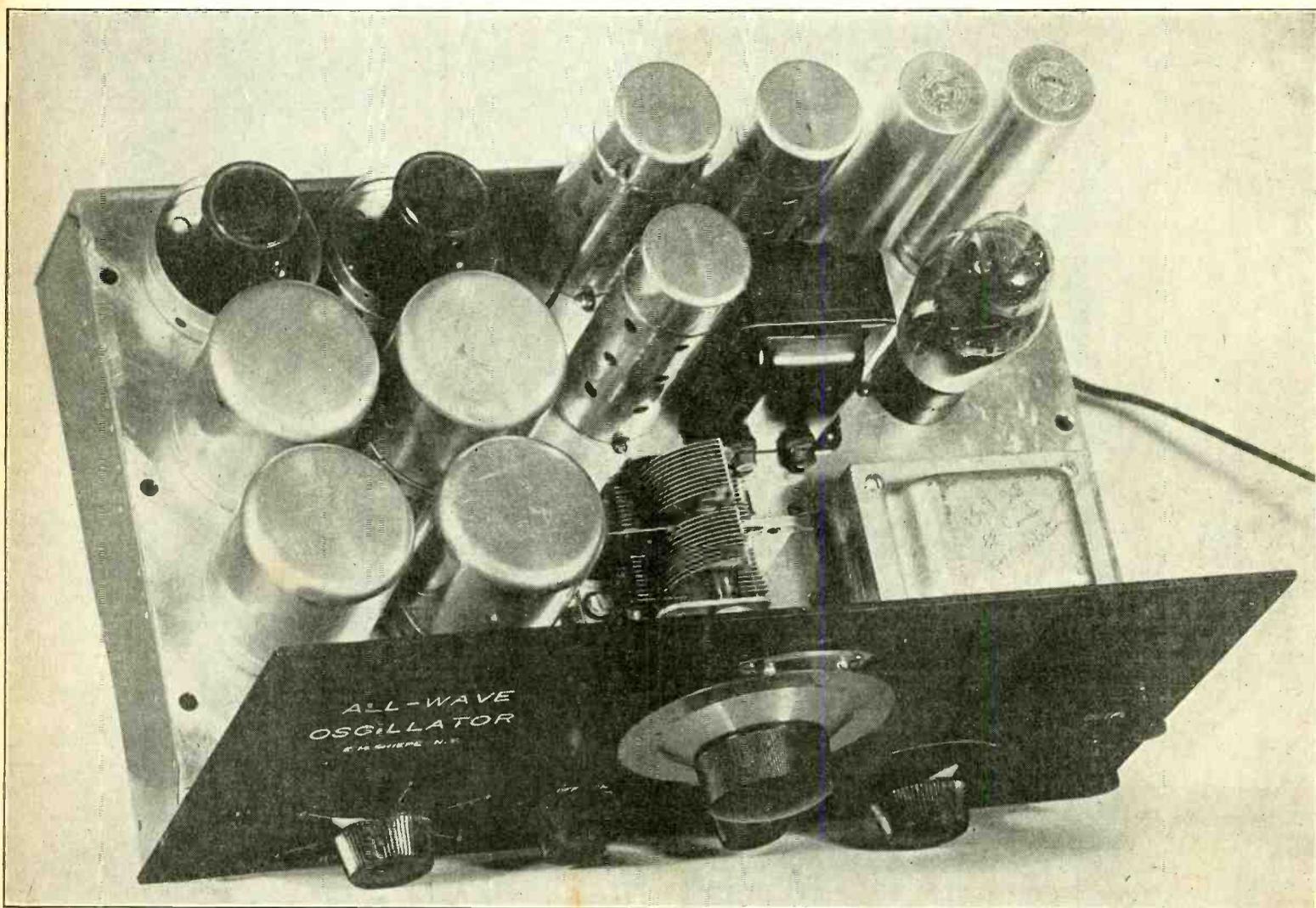
5-TUBE SWITCH-TYPE SHORT-WAVE RECEIVER

JUNE 24th

1933

15c Per Copy

ALL-WAVE MODULATED OSCILLATOR



Edward M. Shiepe, B.S., M.E., designed and built an all-wave modulated oscillator, shown above, shield cover removed. See article, page 8.

**4- AND 5-TUBE
UNIVERSAL
RECEIVERS**

**North American
Conference
Next Month**

**DIAMOND
TROUBLE-
SHOOTING**

THE NEW STAR AC-DC OR BATTERY RECEIVER

AS DESCRIBED IN THIS ISSUE

4-Tube Kit of Complete Parts including ROLA DYNAMIC SPEAKER **\$7.95**
(Less Tubes)

5-Tube Kit of Complete Parts including ROLA DYNAMIC SPEAKER **\$8.95**
(Less Tubes)

Using 1-44, 1-36, 1-37, 1-43, 1-25Z5 Tubes

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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.

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145 West 45th St. N. Y. City

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"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-SH), postpaid. .50s

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Guaranty Radio Goods Co., 145 W. 45th St., N. Y. City

The POWER TONE PORTABLE AC-DC SHORT WAVE RECEIVER

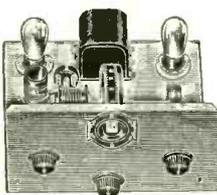


TRY-MO is the exclusive distributor of this Universal Portable Short Wave Receiver. It is a splendid engineering achievement, and both its performance and price should make it one of the most popular S.W. sets this Summer.

Kit is complete down to the smallest nut. Panel and base already drilled. Blueprint very simple to follow. Beautiful black carrying case. Tunes from 15 to 550 meters.

KIT OF PARTS (blueprint, case) **8.95**
Wired \$2.00 extra. Kit of tubes 3.25
Regular broadcast coil 85c

Beginner's Twin S. W. Receiver with Hammarlund Parts



Described in RADIO WORLD, April 15. Acclaimed by RADIO WORLD readers, who have purchased a "TWIN," as the finest short wave set to learn the mysteries of short waves. A letter to N.Y. Sun, May 20th, from one of our customers, states that he received stations in England, Germany, Italy, Africa, Geneva and Spain.

Economical—Uses two 2-volt 230 low current tubes. **7.95**
KIT OF PARTS (blueprints, 4 coils, etc.)
Wired, with 4 coils (15-200 meters) 8.95

Try-Mo Radio Co., Inc., Dept. RW
85 CORTLAND STREET, NEW YORK
178 GREENWICH STREET, NEW YORK
179 GREENWICH STREET, 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.

PUSH-PULL DIAMOND

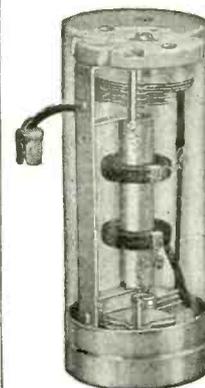
A dual-range receiver, 1550—535 kc, 1525—4200 kc, using a perfected superheterodyne circuit, frequency-stabilized oscillator and electron coupling between modulator and oscillator. Ten tuned circuits, four variable. Two stages of t-r-f, tuned modulator, tuned oscillator, with switch for wave-changing. Output 15 watts from 2A3's in push-pull. Full-wave second detector, with 56 driver of output. 52 mfd. of B filter capacity. Automatic volume control of two i-f tubes. Automatic inter-channel noise suppression. Selectivity enough to blot out strong locals 10 kc removed from distant station. No squeals whatever.

Tubes used: Five 58's; two 55's; one 56; two 2A3's; one 5Z3.
Wired Model of 12-Tube Push-Pull 8-Tube Model, 2A5 output, complete kit, speaker, tubes, \$24; wired, \$29.50.
Super Diamond, including speaker, tubes and everything else, except cabinet. Lined up and padded by experts. Licensed. **\$41.27**

Complete parts, speaker, tubes, everything except cabinet. **\$37.77**

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

NEW \$2.65 INTERMEDIATES



465 kc. model is used in 12-Tube Push-Pull Diamond

Highest grade intermediate transformers, 465 kc or 175 kc, with or without secondary center tap, just released by Hammarlund, use air-core condensers for tuning.

The transformer is of the tuned primary-tuned secondary type, with both plate and grid coils being tuned by air-dielectric variable condensers of special design. These condensers are mounted on an Isolantite panel 1.15-1.6 inches in diameter. The rotor is carried in a single bearing in the Isolantite panel and consists of two circular and three semi-circular brass plates of 3/4 inch radius riveted to the rotor shaft. The stator, also of brass, consists of two circular and two semi-circular plates soldered to stator support rods which in turn are soldered in the bushings in the Isolantite panel. Contact is made to the rotor plates by phosphor bronze spring under considerable tension. No locking device is necessary, as the tension of the contact spring is sufficient to maintain the setting of the rotor even where extreme vibration is present. A screwdriver slot is provided in the end of the rotor shaft to facilitate tuning.

The use of these air variables practically eliminates the variations in gain and selectivity inherent in intermediate transformers in which the coils are tuned by means of adjustable condensers of the compression type using mica as dielectric. The transformers are pre-tuned to the desired frequency. List price, \$4.50; net, \$2.65 each.

Guaranty Radio Goods Co.
143 West 45th Street

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Editor

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Managing Editor

RADIO WORLD

J. MURRAY BARRON
Advertising Manager

The First and Only National Radio Weekly
TWELFTH YEAR

Vol. XXIII

JUNE 24th, 1933

No. 15. Whole No. 587

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

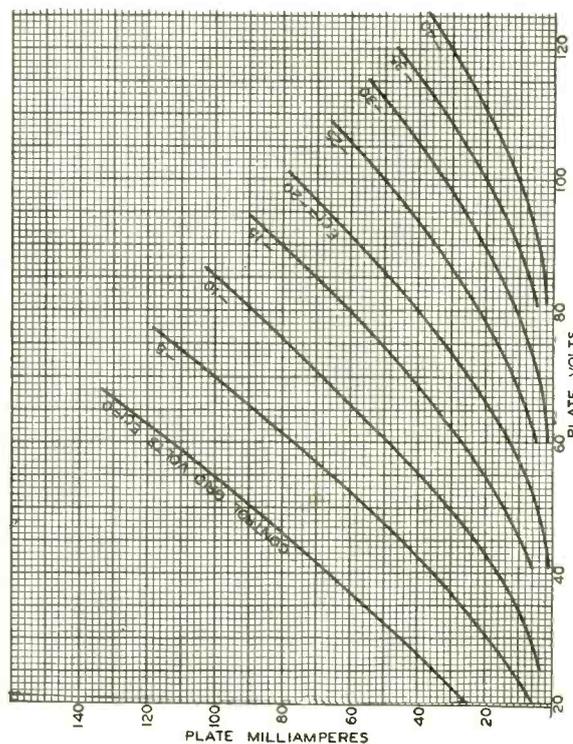
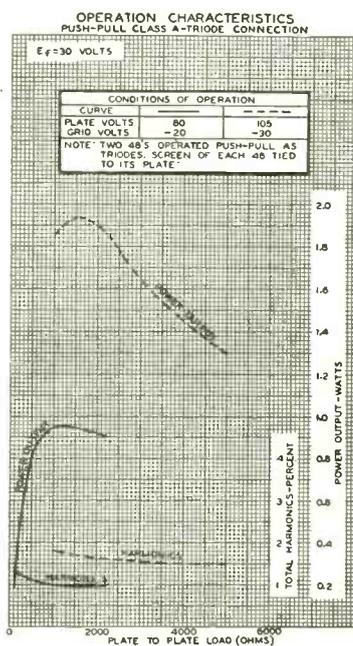
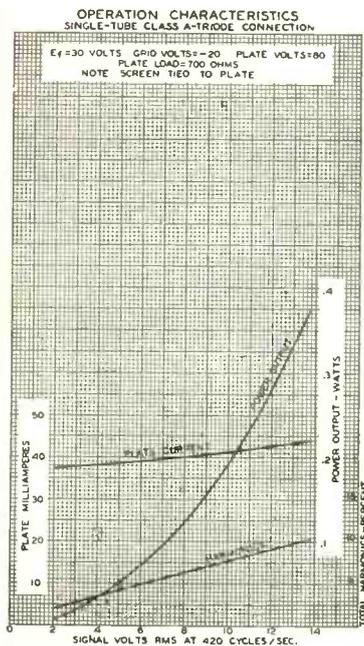
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THE 48 AS A TRIODE

Screen Tied to Plate Improves Quality, Though Sensitivity and Power Output Drop



The 48 tube, a 30-volt heater type, is proposed for single or push-pull output as a triode, with screen tied to plate, where quality is highly important. Fig. 1 (left) shows curves for the single triode, Fig. 2 curves for push-pull triodes. Fig. 3 (right) gives the plate characteristics.

ALTHOUGH the type 48 tube was designed primarily for use as a power amplifier tetrode, certain advantages can be realized by operating it as a triode with the screen tied to the plate. While the power output, for a given plate voltage is reduced from that obtainable with the tube operated as a tetrode, the total harmonic distortion is also considerably lower.

Two type 48 tubes operated as triodes in a push-pull output circuit with 105 volts on the plates are capable of approximately 2 watts output, having a total harmonic distortion of less than 2 per cent, says RCA Radiotron Co., Inc., and E. T. Cunningham, Inc. The power output of two 48's under these conditions compares very favor-

ably with that of two type 38, 41, 42, or 89 pentodes at the same plate volage. The distortion from the 48's, however, is only about one-fifth that of the pentodes. Two type 43's operated as pentodes in push-pull with 100 volts on the plates will give a power output somewhat higher than that of the 48's. However, as in the comparison with other pentodes, the distortion from the 43's will be much higher than that of the 48's.

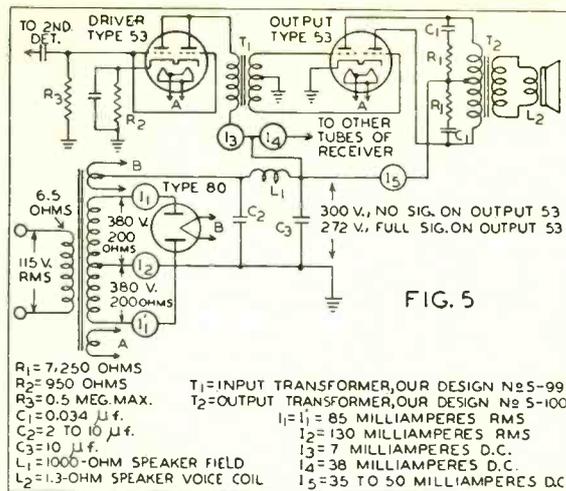
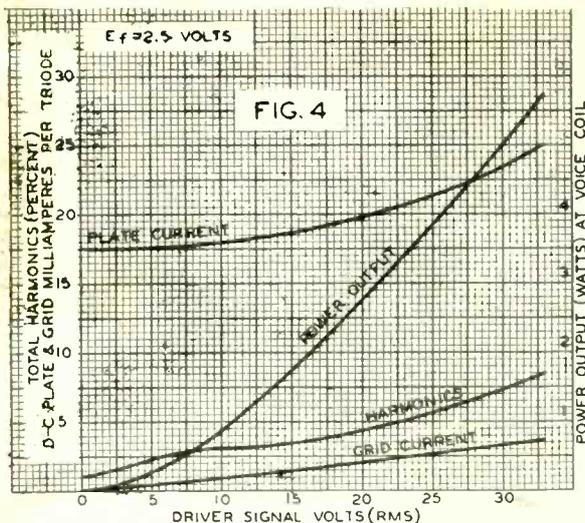
Not for A-C Operation

The 48 operated as a triode, therefore, has interesting possibilities in connection with the design of amplifiers of moderate power-output and low distortion. Foremost among these applications are high-quality

receivers for operation from d-c power lines, and laboratory amplifiers.

The 48 is not suitable for use in small transformerless receivers using a single rectifier tube, since the plate-current requirements are considerably in excess of the rating for the rectifier tubes used in such equipment. Furthermore, the heater of the 48 is not designed for a-c operation.

Fig. 1: curves of power output, plate current, and total harmonic distortion versus input signal for the 48 operated as a triode with 80 volts on the plate. For this condition, the optimum load is 700 ohms, and the grid bias is minus 20 volts. There is an increase in plate current of 7 milliamperes
(Continued on next page)



The 53 Class B amplifier output tube, also useful as driver, was detailed last week, but the repeated diagram at left should have driver signal volts as 0, 0.5, 0.1, etc. volts, to 0.3 volts. See bottom of column 1.

(Continued from preceding page)
 from no signal to full output. The total harmonic distortion for a single tube amplifier stage is approximately 10 per cent at full output.

Fig. 2 shows the operating characteristics of two 48's as triodes in a push-pull circuit. With a plate voltage of 80 volts and a grid bias of minus 20 volts, 0.95 watt output and a total harmonic distortion of only 1 per cent are obtained. At a plate voltage of 105 volts and a grid bias of minus 30 volts, 1.94 watts output can be obtained with 1.7 per cent total harmonic distortion.

C Battery for Bias

When the tubes are used in d-c line operated receivers, the maximum plate voltage available for self-biased 48's is approximately 80 volts. It has been shown that 0.95 watt can be obtained under this condition. In cases where a larger power output is required, it may be desirable to use the full voltage output from the filter for plate supply and to obtain the bias voltage for the 48 from a separate C battery. Since the C battery furnishes practically no current, its life will be long and the inconvenience of changing C batteries will occur at very infrequent intervals.

Driver Stage

Since the input signal required to give full output from the 48's is relatively large, it will probably be desirable to use a stage of audio-frequency amplification ahead of the output stage.

Fig. 2 shows that the optimum plate-to-plate load for the 48's at 80 plate-volts is 1,000 ohms, while at 105 plate volts it is 1,500 ohms. This relatively low value of optimum load simplifies output transformer design.

The plate characteristics of the 48, operated as a triode with screen tied to plate, are shown in Fig. 3.

New Full-Wave Rectifier

RCA Radiotron Co., Inc., recently announced to receiver manufacturers a new type RCA Radiotron designated as RCA-12Z3, a half-wave rectifier. (12.6 volt heater.)

RCA-12Z3 is a high vacuum rectifier tube intended for use in transformerless receivers of the "universal" type designed for its characteristics. The list price will be \$1.20.

DRIVER VOLTS FOR 53

The application note on operation conditions for the type 53 tube, published last week, issue of June 17th, had in Fig. 4 the abscissa values (driver signal volts) as 5, 10, 15, etc. These values should be 0.5, 1.0, 1.5, etc.

New A-C, D-C Power Pentode

The Raytheon Production Corporation, 55 Chapel Street, Newton, Mass., announces the 12-A-5 pentode power amplifier tube.

This tube employs two cathodes with three heater connections to three base prongs so that they can be operated in parallel at 6.3 volts in automobile sets or in series at 12.6 volts for use in combination 110 volt a-c, d-c receivers.

The technical bulletin gives information on the use of the tube at 100, 180 and 200 volts to enable the circuit engineer to design for maximum power output, maximum efficiency or minimum harmonic content, whichever factor he favors most.

The tube has a medium seven-pin base. The numerical pin code (RMA standard) is 1, grid No. 2; 2, plate; 3, heater; 4, heater; 5, heater center; 6, cathode; 7, grid No. 1.

CHARACTERISTICS

HEATER RATING	Series	Parallel	
Voltage	12.6	6.3	Volts
Current	0.3	0.6	Amps.

CLASS A PENTODE AMPLIFIER (Operating Conditions and Characteristics)

Plate	100	180	Volts
No. 2 Grid (Screen Grid) ..	100	180	Volts
No. 1 Grid (Control Grid) ..	-15	-27	Volts
Load Resistance	5000	4500	Ohms
Plate Current	18	40	m.a.
Screen Current	4	9	m.a.
Power Output70	2.8	Watts

CLASS A PENTODE AMPLIFIER SELF BIAS

*Plate and Screen Supply V. ..	200	200	Volts
Load Resistance	4500	6000	Ohms
Cathode Resistance	600	850	Ohms
Power Output	2.7	2.2	Watts
Cathode Current	44.0	36.6	M.A.

The 12A5 is designed for two services. One is operation in a universal receiver operating on 110 volts, a-c or d-c, and on a storage battery. In the case of 110-volt operation the two sections of the heater are operated in series and when used on a six-volt storage battery they are shifted in parallel.

The output on 110 volts is considerably greater than with any conventional 6.3-volt heater tube, as it is approximately 75% of that of the 43 type tube.

The other use is in automobile or home receivers where about 200 volts are available for the total B supply. In the case of automobile receivers where efficiency is of paramount importance a self-bias resistor of about 850 ohms together with a load resistance of about 6,000 ohms are recommended. In the case of an a-c receiver where ample d-c power is available a cathode resistance of 600 ohms and a load resistance of 4,500 ohms are recommended.

The output characteristics with fixed bias are for a 200-volt B supply using a cathode resistance for bias and also 180 and 100-volt

operation are satisfactory. The efficiency shown includes the loss in the screen and the cathode resistance and hence is the overall efficiency of conversion from d-c to a-c.

*This voltage includes drop in cathode resistor.

1-V, New Half-Wave Rectifier for Auto Sets and Universals

The RCA Radiotron Company, Inc., and E. T. Cunningham, Inc., have recently released to equipment manufacturers a half-wave rectifier tube designated as radiotron RCA-1-v and Cunningham C-1-v, respectively.

The 1-v is of the high-vacuum type employing a 6.3-volt heater-cathode. Owing to the electrode structure and spacing, this tube has excellent regulation characteristics which facilitate its use in universal and automobile radio receivers.

1-V HALF-WAVE RECTIFIER TENTATIVE DATA

Heater Voltage (a.c. or d.c.) (See Note 2)	6.3 Volts
Heater Current	0.3 Ampere
A-C Plate Voltage (RMS) ..	350 max. Volts
D-C Output Current	50 max. Milliampers
Maximum Overall Length ..	4 1/4"
Maximum Diameter	1 9/16"
Bulb	ST-12
Base (for connections, refer to Note 1)	Small 4-Pin

Note 1: Pin 1—Cathode Pin 2—Plate Pin 3—Heater Pin 4—Heater

Pin numbers are according to RMA Standards. Note 2: The potential difference between heater and cathode should be limited to 500 volts d.c.

Danish Beauticians Musn't Mar Beauty of Radio Programs

Danish radio authorities do not fool around when it comes to getting action in matters affecting radio reception. Danish radio experts discovered recently that the use of electrical apparatus in native beauty shops and barber shops seriously interfered with radio regulations. Immediately a move was made to bar these shops from using electrical devices unless made to conform with radio regulations. The keepers of shops were told what to do and threatened with punishment unless the changes were made forthwith.

North American Conference Next Month Acts on Interference

Washington.

AN effort to allot the radio channels among countries of North and Central America will be made when the North American Radio Conference meets July 10th at Mexico City.

Because of possible interference of Central American stations and Mexican stations, says Eugene O. Sykes, chairman of the Federal Radio Commission, Mexico has invited El Salvador, Guatemala, Nicaragua, Costa Rica, Honduras, Cuba and Panama to participate.

Chairman Sykes will head the American delegation. Other delegates will be Representative Schuyler Otis Bland (Dem.), of Virginia and Roy T. Davis, American Minister to Panama.

A group of technical advisers will accompany the delegation.

Situation Outlined

The Department of State issued the following statement relative to the conference:

"The International Radio Convention of Washington (1927) and the International Telecommunication Convention of Madrid (1932) leave to regional conferences the solution of problems affecting two or more countries in a single region, but not affecting the entire world. There is no definition in either convention of the limits of regions outside of Europe.

"Those limits are left to be determined by the interested governments in the light of probable interference caused by the operation of stations. In extending the invitation to the North and Central American Regional Conference the Mexican government naturally included all neighboring governments which might license stations capable of interfering with stations in Mexico.

Glad to Accept

"As the problem of interference must be considered as a unit which can be solved only by taking into account all stations likely to cause interference, the United States is glad to participate in a conference representing the governments of North and Central America at the request of the Mexican government. The Acting Secretary of State has accepted this invitation."

At the bottom of the conference is the desire to reduce interference in both the

Regulation System, Prevailing in U. S. and Canada, Proposed for Other Countries—Zoning Plan Under Consideration— End of "Wildcat" Stations Sought.

broadcasting and the technical fields, says "The United States News."

One of the conditions faced by the delegates is the fact that while Canada and the United States are operating under an agreement which shares the broadcast band among the two countries, Mexico, Cuba and other countries on the hemisphere are using the ether as they see fit, unhampered by any sharing of facilities, information reaching the Commission reveals.

In other words, these countries will be expected to give up the present practice of placing stations at will sometimes without regard to possible interference with other countries.

The question of interference is particularly acute in the case of Mexico since several extremely powerful stations operate just over the Mexican border, spoiling reception of licensed stations in the United States.

Mexico Has Its Problem

On the other hand, Mexico has its own problem in the possibility of interference from stations in countries to its south.

So far, broadcasting has not made much progress in Central America. One problem these countries face is the natural difficulties imposed by tropical climate. Static frequently is heavy and atmospheric conditions are not favorable to radio transmission.

These countries, however, have fair reception for short-wave programs sent out from stations in the United States. Usually, these short-wave programs are dispatched over several frequencies and much of the time the listener in Central America can get good results by tuning in the wave which is coming over best at the particular hour.

U. S. Stations Exceed Others

The United States easily leads the continent in the number of broadcasting stations,

tal of amateurs recorded up to that date was 18,232. Today the number is nearly double that.

Byrt C. Caldwell devoted considerable space and a circuit diagram to the subject of how to get the best results from a one-tube regenerative set.

Somebody wanted to know "in the briefest terms" just what was a converter. A member of the editorial staff summed it up thusly: "A converter is a machine used to convert d.c. to a.c. (direct current to alternating current). It is similar to a motor in construction, but is supplied with slip rings instead of a commutator."

Leon W. Bishop, IXP, gave our readers information on how to make a single-circuit regenerative "phantom receiver."

WGY told the story of how a resident of Cohoes, N. Y., who, apparently, had been deaf from infancy, heard for the first time when he listened to a program from the station of the General Electric Co. at Schenectady, N. Y.

The Radio Corporation of America had been granted an injunction restraining the DeForest Radio & Telephone Co. from selling radio merchandise through the usual trade channels of jobber and dealer. Echoes of that suit continued to ring down the corridors of time for several years afterwards.

with more than 600 now operating, Canada has 68 licensed stations. Cuba has 58 stations, according to latest data and Mexico is close behind with 50.

Costa Rica has 15 stations, Newfoundland has eight, Honduras has two, El Salvador and Guatemala one each. Haiti has a station but it was not invited to the conference at Mexico City. The Dominican Republic was not invited but no stations are listed for that country. Puerto Rico comes under the licensing system of the United States.

Three countries offer possibilities of interference with the United States. They are Canada, Mexico and Cuba. The agreement with Canada, signed May 5th, 1932, effectively apportions the broadcast band between the two countries, and the interference problem is not serious.

The Mexican question will come up for considerable discussion in July. At least two Mexican stations, near the border, operate with 500,000 watts power, 10 times the American maximum, with the idea of reaching the American audience. A number of other stations located near the border cover the American field effectively.

Power Limit Suggested

Conference delegates will be given a proposal to limit the power of these stations to prevent their signals from blanketing American broadcasts.

Broadcasting the world over is regulated by the Washington conference agreement of 1927. At the beginning of next year, the Madrid agreement of 1932, quite similar to the Washington plan, will go into operation, if it is generally ratified by the nations. This is confidently expected by radio authorities.

Under these agreements, which designate the purpose for which the radio spectrum may be used, the distribution of channels is left up to regional conferences. The Mexico City conference was called under authority of the Washington agreement and it will attempt to distribute both the broadcasting and the wireless channels.

Zone Idea Suggested

One suggestion which may be given to the conference will be to apportion the ether among the countries according to a zone system, which would take into account both area and population.

In zoning the spectrum, it would be realized that a country such as Newfoundland, which has one station of 500 watts and seven weaker stations, creates no interference with broadcasting in the United States.

Regulation in U. S. and Canada

The same situation applies to Central America. Even the most powerful transmitters on the broadcast band would not bother the United States. On the other hand, they might disturb reception in Mexico.

The regulation of radio in this hemisphere is most complete in the United States and Canada, both of which have Radio Commissions which operate under somewhat similar rules.

BLIND GIRL'S ALTITUDE INTUITION

Laura Gregory, slim little blind girl from Richmond, Virginia, who holds a world record as a stenographer, and who spoke over a transcontinental network when she arrived in San Francisco after a cross-country trip by airplane, knew she was "way up in the air" when she stopped out of the elevator in the NBC studios building. She detects altitude by some sixth sense that amazed pilots all the way across the continent.

Ten Years Ago!

(Looking back at some of the more or less interesting and important of the articles and illustrations that appeared in RADIO WORLD dated June 23, 1923)

A. D. Turnbull wrote about "A Canadian 'Hot Dog' Receiver," described as "something new in flivver circuits." Particular attention was called to the fact that unless extreme care had been taken in the construction of the condenser there would be trouble. Have times changed in that respect?

Everett N. Curtis, lecturer on patent and trade-mark law at Columbia University, told of some of the pitfalls of the radio investigator and inventor.

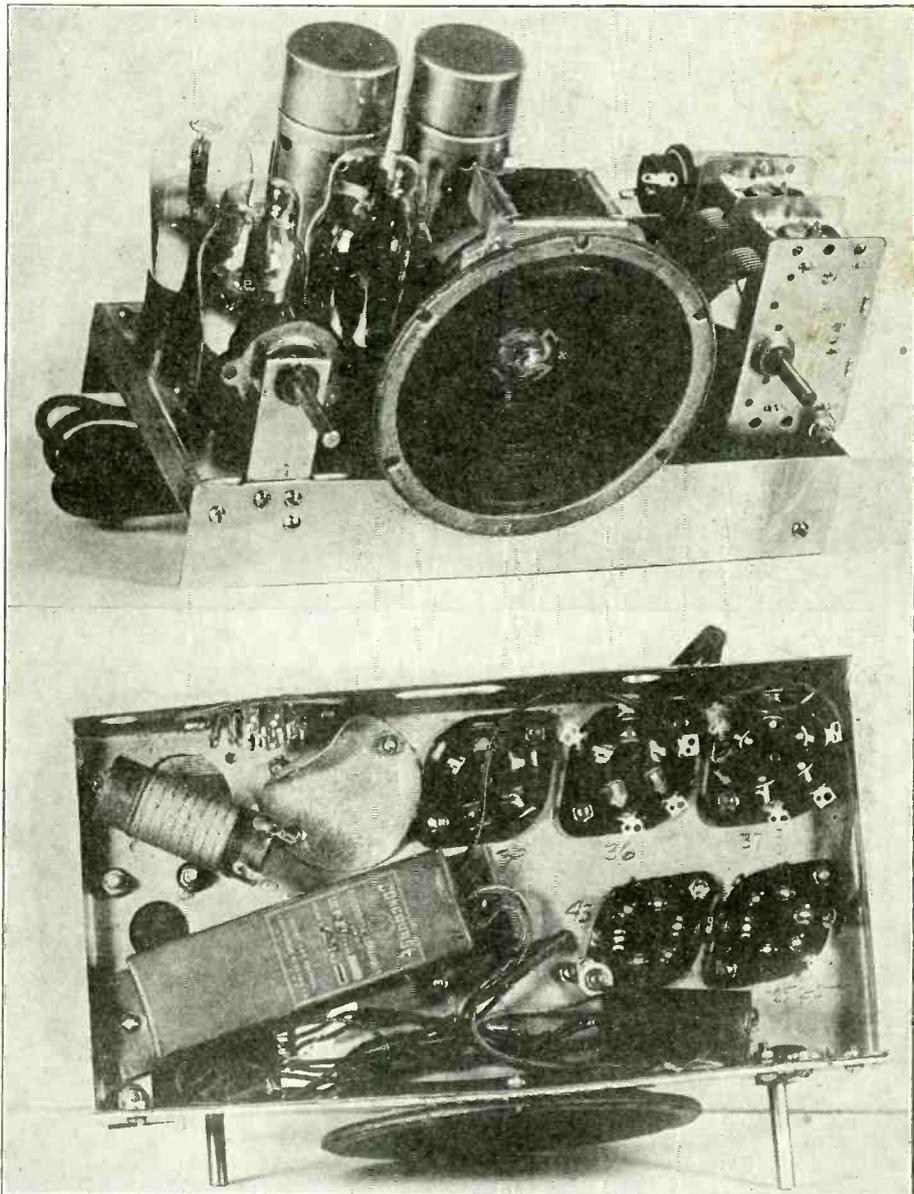
H. P. Davis, of the Westinghouse Electric and Manufacturing Company, was shown unveiling a memorial tablet at the Calvary Episcopal Church, Pittsburgh, Penna. This church seems to have been the first one in this country to broadcast religious services.

Word from Washington, D. C., was to the effect that a total of 1,334 new amateurs had been granted permits in the course of the preceding five months. The Department of Commerce disclosed the fact that the to-

LIST OF PARTS For Five-Tube Set

One Star antenna coil and bracket.
 One star radio frequency coil.
 One 00035 two gang tuning condenser.
 One 200-ohm filter choke.
 One 3,500-ohm field dynamic speaker and 43 output transformer.
 One 250,000-ohm volume control and switch.
 One 300-ohm 1/2 watt resistor.
 Two 50,000-ohm 1/2 watt resistors.
 Three 250,000-ohm 1/2 watt resistors.
 One 100,000-ohm 1/2 watt resistor.
 One 1,500-ohm 1/2 watt resistor.
 One 25,000-ohm 1/2 watt resistor
 One 600-ohm 1 watt resistor.
 Two dual .1 mfd. 200 volt pigtail.
 Two single .05 mfd. 200 volt pigtail.
 One triple 2 mfd. 50 volt electrolytic.
 One dual 8-16 mfd. 175 volt electrolytic.
 .0005 mfd. mica pigtail.
 .006 mfd. pigtail.
 36, 37, 39 43, 25Z5, 7 prong plain wafer sockets.
 170 ohm 25-watt resistor.
 Special Star ambilectric chassis.
 Knobs.
 Bracket to mount between 39 and 36 tubes.
 2 screen grid caps.
 A. C. cord.
 Hardware, hook up wire, etc.

Top and Bottom Views of Five-Tube Chassis



just under the point of oscillation.

The dynamic speaker used has a field resistance of 3,500 ohms and an output transformer to load a single 43. In spite of its small diameter the speaker can handle at least two watts without overloading.

The electrolytic condenser has two sections, one 8 and one 16 mfd. The higher capacity is to insure humless operation on a.c. as well as freedom from commutator ripple on d.c.

Dual sections are used wherever possible to add to the simplicity as well as to save in the cost of materials.

In mounting the parts on the chassis it is common procedure to mount the tube sockets first. In mounting the socket for the 43 tube an insulated lug is fastened with the same screw. All the common high voltage connections can then be brought to this point.

The speaker filter condenser, filter choke, antenna and r-f coils, volume control and tuning condenser can be mounted before wiring. The condenser should be carefully

LIST OF PARTS Four-Tube Model

One Star Antenna Coil and bracket.
 One Star radio frequency coil.
 One two-gang 0.00035 tuning condenser.
 One 200-ohm filter choke.
 One 3,500-ohm field dynamic speaker and 43 output transformer.
 25,000-ohm volume control with switch.
 One 300-ohm 1/2 watt resistor.
 Two 50,000-ohm 1/2 watt resistors.
 Two 250,000-ohm 1/2 watt resistors.
 One 100,000-ohm 1/2 watt resistor.
 One 600-ohm 1/2 watt resistor.
 One dual 0.1 mfd. condenser 200-volt.
 Two 0.05 mfd. condenser 200-volt.
 Triple 2 mfd. condenser 50-volt.
 Dual 8-16 mfd. condenser 175-volt.
 One 0.0005 mfd. mica pigtail.
 One 0.006 mfd. condenser 200.
 36, 39, 43, 25-5 and 7-prong plain wafer sockets.
 190-ohm, 25-watt resistor.
 One Star drilled chassis.
 One bracket for between 36 and 39 tubes.
 Knobs.
 2 screen grid caps.
 A. C. cord.
 Hardware, hook up wire, solder, etc.

The volume control is at left, the speaker at center and the two-gang tuning condenser at right. The compactness can be gauged by the fact that the speaker cone diameter is 6 inches. How few parts are necessary, and how simple the circuit and wiring are, may be judged from the bottom view. The sockets are identified by chassis marking: 39, 36, 37, 43 and 25-Z-5. One radio-frequency coil is in view at top, behind the condenser, the other on bottom, left rear corner.

insulated from the chassis, using a fibre strip and washers.

Other Mountings

The heaters are wired first. The plate leads and screen grid leads come next. Mount all the pigtail resistors so that they form part of the lead, in order to make its length as short as possible. Very little wiring is necessary, as the condensers and resistors form most of the wiring.

To operate either set on batteries, not only are a plug and battery cable necessary but the 43 tube must be changed to a 41. Operation on the a-c or d-c line with the 41 tube, however, will cause serious damage to all the tubes in the set.

A battery switch must also be used, but this can be connected on the cable itself.

The circuits shown are for four- and

five-tube models. An additional tube may be added even to the five-tube model for greater output and tone.

Alignment Directions

To align the receiver, connect the antenna to some source such as a bed spring, telephone, or window screen.

Rotate the tuning condensers until some signal is obtained, leaving them at such a setting to bring in the signal as clearly as possible. Adjust the trimmer on top of the tuning condensers with a screw driver until the signal becomes loudest. Always reduce the volume till it is barely audible so that any change may be more readily detected. For a final adjustment a station about 1,500 kc should be selected and the process repeated, to complete the lining-up process in the receiver.

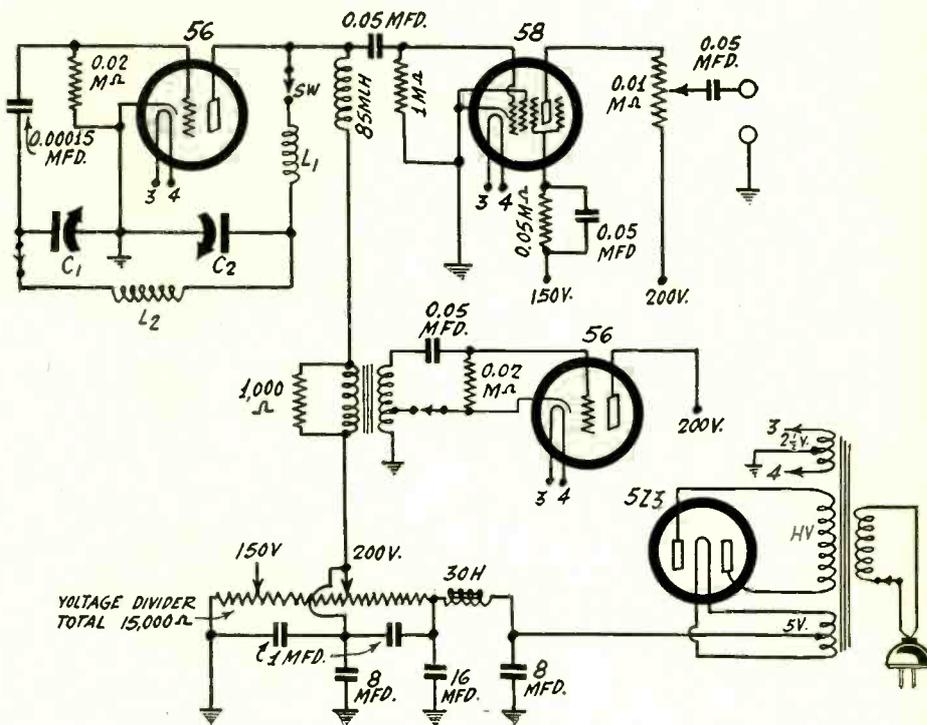
A CUSTOM OSCILLATOR

Modulated Device Covers Intermediates Broadcast and Some Higher Frequencies

By William F. Peck



Mr. Shiepe in a contemplative mood as he views the hinged cover of his all-wave oscillator.



Circuit of Colpitts oscillator with plate stabilization at all frequencies. The tuned coil is L2 at upper left, and is of the same conductance as the stabilizing coil L1. The option of modulation or its absence is provided and the measured circuit does not affect the frequency of the oscillators

THE advantages of a first-class oscillator are rather obvious, but when one is engaged in television work, including the development of a complete transmitting and receiving system, then of course any oscillator used has to be of the very best. Hence Edward M. Shiepe, engineer of recognized standing, was asked to design and construct an oscillator that would be of the modulated type, that would cover specified frequency bands, would provide modulation or not, as desired, and of course would be frequency-stabilized. The result is the outfit illustrated on the front cover, the diagram being printed on this page.

The performance of the oscillator is superb, and the device has every characteristic that was expected or desired, and none of the disadvantages that obtain in inferior oscillators. While it is custom-built, and in its precise aspects may not be just what some others would want, nevertheless it represents a substantial groundwork for those who desire to construct, or have the desire to have constructed, an oscillator of surpassing performance.

Hence the designer and builder has kindly confided to me the details of how he stabilized the circuit, and told me of some other aspects, also giving me permission to publish this information, which I am of course glad to do. I hope many others will benefit from the serious work he performed in perfecting this oscillator.

The circuit itself is not a complicated

one at all, as can be seen from a glance at the circuit diagram. It comprises four tubes, of which the 56 at upper left is the radio-frequency oscillator, the 58 to the right is the amplifier, the 56 below is the optionally-used audio frequency oscillator, and at lower right is the 5Z3 rectifier.

The Colpitts oscillator is used, in conjunction with a leak-condenser circuit. There are two coils, L1 and L2, of which only L2 is in the tuned circuit, L1 serving as a stabilizing coil. The theory of this stabilizing factor is that the phase shifts in the opposite direction, and therefore there is a zero difference in phase shift, another method of expressing frequency stability.

The grid condenser, 0.00015 mfd., is of that value because over a certain portion of the tuning scale it augments the frequency-stabilization, and thus serves a double purpose.

The amplifier tube gives considerable gain, of course, but it is not absolutely needed for this purpose, Mr. Shiepe explains, since there would be sufficient output without it. Yet the tube serves an important purpose in tending to keep the oscillator circuit itself free from effects of any load, since the load is on the amplifier and not on the output tube, hence there is a very high resistance (the tube) between the oscillator and the load. The circuit to be measured or tested is the load, of course.

The 56 radio-frequency oscillator is not

biased, except through the leak, due to grid current. Ordinarily grid-current oscillators, while fairly stable, do not come up to the requirements of grid practice, but in this special circuit, due to the stabilization introduced, the grid current oscillator has a stability of approximately 0.1 of 1 per cent., which is of a high order for general practice.

The 58 is shown as operating at no bias, also, and this would be all right if one desired to have a large harmonic output, as for instance to make some special measurements on fiftieth or even hundredth harmonic, but since this would not be desired in any except a few instances, a resistor of 50,000 ohms may be put in the cathode leg of the 58, between cathode and ground, and bypassed by a condenser that serves radio-frequency purposes, say, 0.1 mfd. up. The capacity may be as large as desired, but it should not be much less than 0.01 mfd. because some of the radio frequencies handled are rather low.

The total frequency range is 160 to 11,000 kc, but of course the same system could be used to extend the frequency range in either or both directions. For the low radio frequencies honeycomb coils are used, of the small type, with outside diameter in general around 1 inch, but in the band higher than the broadcast band solenoids are used. These are wound on plug-in forms, although the coils are permanently in the sockets. One exception is that if any band-spread effects are desired, special coils may be put in.

The purposes of the Peck Television Corporation required that there be such a spread, covering the intermediate television band, so that the effects of amplifiers could be noted, that is, selectivity curves run. In truth they had better be called non-selectivity curves, and what was desired was a broad band passed, as nearly flat top as practical, and certainly more than 100 kc wide, preferably around 150 kc, which in itself is quite a task. This, of course, has nothing much to do with the oscillator, but the oscillator enables accurate measurement of the band passed, and in conjunction with a meter system, the attenuation factor at various radio frequencies on either side of the carrier can be measured or computed.

The modulation transformer is a speaker coupling transformer of the push-pull output type as used in magnetics, around 4,000 ohms secondary. The diagram should be read so that the secondary has the 1,000-ohm resistor across it, the purpose of this resistor being to reduce the quantity of the modulation, otherwise when the audio oscillator is working it will produce a modulation of several hundred per cent., that is, the modulation intensity is several times stronger than the amplitude of the radio-frequency oscillation.

The voltage divider consists of a 25-watt unit of 15,000 ohms, which is connected from the output of the filter choke to ground, and there are sliders that enable obtaining the recorded voltages of 150 and 200 volts. The total rectified output voltage is of course greater, but the desire is to avoid using the total, which may run around 400 volts.

The filtration has to be good, otherwise the hum appears as a constant modulation, that is, there is modulation whether you want it or not. The filtration from a 30-henry choke in a pi-filter, with 32 mfd. capacity, is exceptionally good in this circuit, particularly as very little current is drawn. Bleeder and all, the current is less than 35 milliamperes.

The layout used is shown on the front cover. The chassis and case are aluminum, wrinkle-finished. The reason for using aluminum is that it shields sufficiently and is light.

The bands are selected by the switch, as numbered, except that if bandsread is desired, the extra coil is put in, and switch-point 3 is used for this, as well as for the more regular use on other occasions.

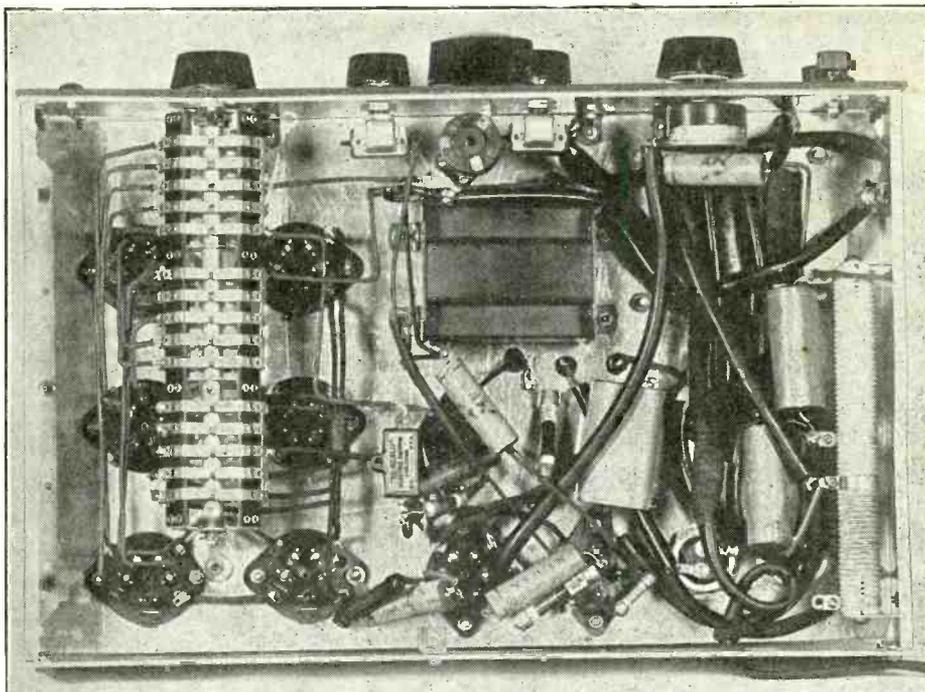
The coils L1 and L2 are tied together and go to C2. A selector switch may be inserted between them and C2 so that different sets of coils may be picked up. This is superior to having all the coils tied together at this point.

I have before me a notation from Mr. Shiepe in which he gives the following information concerning his splendid oscillator:

"In the photograph you intend for the front cover, the six coil-sockets are shown at the left, with two of the coil-shields removed to show the coils. The left-hand vertical row of three sockets represents the stabilizing coils, the right-hand vertical row, the oscillator tank inductances. In all cases, the oscillator and stabilizer coils are equal.

"The oscillator coils must be shielded from the stabilizing coils to minimize the mutual inductance between the two and render effective the stabilizing action. If there is no shielding, an additional disadvantage arises, which is that a double-peaked oscillation wave is generated which can be tuned in at two adjacent points on the detector dial, and this has nothing to do with the closeness of the coupling between the oscillator output and the detector input.

"The coils for the first three wave-bands are small honeycomb coils. The correct number of turns for these coils is most easily found by removing turns from larger coils and testing for frequency response. When doing this, the simplest



Bottom view of the all-wave oscillator designed and built by Edward M. Shiepe. A combination of switching and plugging-in is used. The voltage divider, B supply choke and switch are shown, left to right.

way is to put the whole coil in the stabilizer socket and remove turns only from the oscillator inductance until just a little more than the required inductance (lower frequency response) is obtained. Then the same number of turns is removed from the stabilizer. If the inductance is still too large, repeat the process.

"Here is an example of a sample set of coils:

Wave-Band No.	Inductance, microhenries	kc spread	No. Turns
1	4130	160- 430	25T. #28 enam. on 1 1/8" diam.
2	750	400- 1000	9 1/2 T. #28 on 1 1/8" diam.
3	140	950- 2300	
4	29	2000- 5000	
5	5.8	4600-11000	

"In some cases instability may arise, causing oscillation at frequencies other than the frequencies expected. This is due to the capacity between grid and plate in the oscillator triode, giving to the circuit a capacity other than that due to the variable condenser. The frequencies at which such oscillations occur depend upon the load impedance in the plate circuit of the oscillator, then of the tube, the internal plate resistance of the tube and upon the frequency itself. These dual oscillations may be moved outside of a given band by changing the ratio between inductance and capacity for that band.

"If the inductance is increased, a series condenser is used. If it is decreased, a shunt condenser is used with the variable. Such unstable oscillations may be eliminated by using a screen-grid tube, although the circuit details have not been worked out for this case yet.

"The oscillator generates harmonics of the fundamental frequency, and these harmonics may be used to advantage in calibrating the oscillator. If a radio set calibrating roughly for the broadcast band is at hand, all frequencies up to and including 1,500 kc may be directly calibrated with the aid of the carrier frequencies of the broadcasting stations. Assume we tune in WABC at 860 kc. We start up our oscillator and obtain a zero beat at some unknown frequency. If the oscillator is modulated we now turn the dial on the radio set until we hear the oscillator at another point. Say it comes in at about

1,150 kc. Then we know that the oscillator is oscillating at approximately 1,150-860 or 290 kc. We also know that 860 is an exact multiple of the oscillator frequency. By trial we find that 860/3 equals 286.67 which is our oscillator frequency. This means that the third harmonic of the oscillator is heterodyning the carrier of WABC, and we have established one point on our calibration curve.

"As we approach the higher frequencies, we find that the number of points available from known stations are so far apart that we must obtain more intermediate points so as to run a smooth and accurate curve. We can do this by setting up an auxiliary oscillator at, say, 86 kc. The tenth harmonic of this oscillator will zero beat with the carrier frequency of 860 kc. Thus we can carefully adjust for 86 kc. We set our other oscillator at a known point, as the previously found one of 286.67 kc. In the radio set, we now hear both oscillators zero-beating with 860 kc, one on the third harmonic, and the other on the tenth.

"Keeping the 86 kc oscillator fixed, we slowly decrease the capacity in the other, increasing its frequency, until we again hear a zero beat.

"We know that the oscillator frequency is more than 286.67 kc and less than 430 (which is easily located on the dial because its 2nd harmonic is 860 kc). We also know that the two local oscillators are beating together to generate two new radio frequencies whose harmonics will heterodyne with 860 kc to produce zero beats.

"What frequencies can these be? If we let x be the unknown oscillator frequency and n a whole number representing the order of harmonic, we can immediately write $n(x \mp 86) = 860$. If we use the + sign and put $n=2$ we obtain 344 kc which is within our range. If we use the - sign and put $n=3$ we obtain 372.67 kc which is also within our range.

"Thus between the second and third sub-multiples of 860 we have added two more points to our calibration, and these points are known to a very high degree of precision because they were obtained by the zero-beat method and not by the method of maximum sound. This method of calibration using the harmonics of the beat frequencies between two oscillators to heterodyne a known carrier is very powerful."

screens through a resistor of 60,000 ohms. Also, if the bypass capacity is made quite substantial from screens to ground, correction for oscillation becomes easier. Thus the capacity is shown as 0.5 mfd.

A resistor of 20,000 ohms is connected across the primary of the first intermediate frequency transformer, and usually this is all that is necessary, but if further correction need be applied, it may be done by locating the oscillating circuit in the manner previously outlined, and then putting a low value of resistor in series with the grid return. This return is to a bypassed high resistor, so that the low resistor would go between coil terminal and high resistor, while the bypass condenser would remain at the high resistor. The stabilizing low resistor would be 30 ohms or more, around 50 ohms being in general quite satisfactory.

Also, another remedy is to put another 20,000 ohms resistor in the circuit, this time across the primary of the next or second intermediate transformer.

Circuit Doesn't Become Broad

The introduction of these resistors does not introduce broadness in the tuning, as it is apparent that when a condition of oscillation is present the circuit resistance is negative, and the circuit is unworkable. The resistors should be of such values as to get rid of negative resistance without introducing a condition of comparative positive resistance, hence the advice to make the parallel resistors as high as practical consistent with cure of the trouble, and conversely the series resistors as low as possible consistent with the same aim.

The biasing resistors for the i-f stages may be 3,500 ohms, or even a little higher, and if they are increased in value the tendency to oscillation is reduced. The voltage in the biasing circuit is not abnormally large, as the plate current is low, due to a relatively low screen voltage.

It is intended that the voltages for the plates and screens in the tuner section be around 100 volts and 50 volts, respectively, and if the voltages are much higher, correct for the plates. The screens will take care of themselves. This plate voltage correction may be applied by using more than 0.015 meg. in series with the B feed from the rectifier's filtered output. The 0.015 meg. resistor is 15,000 ohms, and so 20,000 or 30,000 ohms may be used. The values will depend on several conditions, one of them the d-c resistance of the speaker field, another the voltages obtainable from the transformer's high-voltage winding, and another the actual bias on the output tubes.

Additional Aids

Ordinarily this bias would be around 60 volts, if the applied voltage in the plate circuit of the output tube is a little more than the usual 350 volts, as it is with the standard transformer for this circuit.

Additional aids to oscillation stoppage at the i-f level are: a condenser of 0.00025 mfd. from plate of the 55 to ground, and a condenser of 0.0001 mfd. from pointer of the volume-control potentiometer to ground, although it is then well to add a 0.0001 mfd. condenser from pointer to the other side of the resistor as well.

The circuit may hum due to the strong fields of the power transformer and audio transformers, but the correction may be readily applied. If the circuit is built without a resistor of 0.25 meg. (25,000 ohms) from one side to the other of the primary of the second audio transformer, and without the 5,000-ohm resistor across the primary of the first audio transformer, the magnitude of the hum may be noted, and if not objectionable, these two resistors need not be included. But if the hum is objectionable, then the resistors will be found to effectuate a surprisingly complete cure.

No Bypass Condensers Here

Across the biasing resistor of the power tubes, and across the biasing resistor of the

driver stage, no bypass condensers are shown, and none should be needed. A checkup has been made on the assertion that motorboating results from the use of 2A3 output tubes, unless the biasing resistor is thus bypassed, and 8 mfd. are recommended by some, but in none of the laboratory sets has any such condition been countered, and it is confidently asserted that the condensers had better be left out of the present circuit, as in the diagram.

Speaker fields of various values have been shown and discussed, but within a reasonable range of resistance values, for it is not imperative that the values be 2,100 ohms and 700 ohms, but may be somewhat greater or somewhat less, but should not be of the order of only hundreds of ohms.

Of the two types of speakers for this circuit, one has about 3,500 ohms total (2,800 and 700 ohms in series) and the other has a total of 2,800 ohms (2,100 and 700 ohms in series). However, some may have speakers intended for push-pull 45's, with an untapped field, or one tapped at around 500 ohms. It would be better, if such a speaker were to be used, to ignore the tap, and put the full resistance in the B filter circuit, taking off the voltage for the power tubes from the end of the choke, with no intervening choke, although one is in the diagram in case the standard speakers for this circuit are used.

Speakers Reverse Wound

It is quite all right to omit the 700-ohm section, as the hum difference isn't much, but if it is attempted to use general speakers, and have the tap to extreme serve as the equivalent of the 700 ohms, there will be plenty of hum trouble, as the standard speakers for the circuit have the 700 ohm and other part of the field wound in reverse, whereas other speakers have the two sections of the tapped winding wound in the same direction.

Under some conditions, too rare to make necessary the inclusion of the remedy as part of the regular circuit, hum may be reduced by connecting two 0.1 mfd. condensers, one between one side of the power transformer primary and chassis, other from the other side of the transformer primary and chassis. See that any such inclusion keeps these condensers on the set side of the switch.

When No Signals Result

The improvement of sensitivity has been taken up, as it is predicated on a certain condition of the i-f and a-f channels, and the heightening effect is at the r-f and modulator levels. The oscillator is virtually unaffected, as its grid is returned to cathodes any way, and the grid is operated at a positive bias, in familiar grid leak-condenser fashion.

Sometimes it would seem that the set can not be made to work, but this would be due to the high amplitude of oscillation in the intermediate level. This would be due to too high a plate voltage, and the voltage may be reduced in the manner explained, or a resistor of 25,000 ohms, 2 watts, may be connected from the r-f side of the series resistor (0.015 meg.) and grounded chassis. If you haven't just 25,000 ohms, try using any value somewhere around that.

Voltage Measurements

The voltages have been stated in part: 100 volts on tuner plates 50 volts on tuner screens. The plate voltage may be read on the usual voltmeter (1,000 ohms per volt), but the screen voltage actually will be higher than what you read on such an instrument, so use the instrument at the highest practical voltage scale, even if there results a little more difficulty in finding out what the meter reading is, because the meter needle movement isn't much. The reading may be more accurate, despite difficulty in reading closely, because the current drawn by the meter is less than if a lower voltage scale were used.

The bias on the r-f tubes and the modu-

lator will read around 2.5 volts, while the i-f tubes will show a bias reading of 4 to 5 volts. The voltage in the second detector load (0.6 meg.) can not well be read with a meter in parallel, but a relative indication is obtainable on signal, although it has no absolute significance. The bias on the 56's is around 10 volts and that on the output tubes 60 volts. The maximum plate voltage as applied to the output tubes may be 450 to 400 volts, it makes small difference which, and the power transformer and field of speaker will largely determine this. The biasing resistor will take care of the situation in either instance. The drop in the speaker field is around 150 volts.

Squeals from Other Causes

Mention has been made of squeals resulting from other causes than r-f oscillation. If the intermediate amplifier oscillates, then a squeal may be expected at every position on the dial where there is or should be a station.

The only other cause of squeals attributable to the set is mispadding. This may be failure properly to align the oscillator parallel condenser with the r-f at around 1,450 kc, and failure to adjust the series padding condenser (350-450 mmfd.) at or close to 600 kc.

The procedure should be first line up at 600 kc. Then not only may the series condenser be adjusted but also the parallel trimmers at the r-f level. That is, the trimmers have some effect even at 600 kc, and at least an approximation is then reached as to them, avoiding much "fishing" later on. However, the oscillator parallel condenser or trimmer on the main tuning condenser should be at least half way out, as a first approximation, for there is no methodical method of establishing this capacity at the present stage of the lining up.

High Frequency Lineup

After these adjustments are made, the dial is turned to tune in 1,450 kc, the r-f trimmers are carefully turned a bit, to see if the signal can be built up, and then the oscillator's parallel trimmer is adjusted until response is maximum. After that no change is to be made, except to return to 600 kc for a test as to whether the series padding condenser needs a little readjustment due to the change introduced in the parallel condenser in the oscillator circuit.

When the padding condenser is slightly readjusted in this manner the lining up is not only complete but should not be disturbed.

Finally No Squeals

The check for proper line-up and stoppage of r-f and i-f oscillation is that no squeals are heard in tuning the set.

Brunet Is Appointed Engineering Service Head

Appointment of Meade Brunet as manager of the Unified Sales-Engineering Service to Equipment Manufacturers for RCA Radiotron Company, Inc., and E. T. Cunningham, Inc., has been announced by C. R. King, general sales manager.

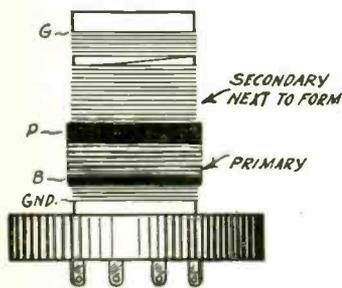
Brunet went from the General Electric Company to the RCA organization in 1921, taking charge of the production and distribution of RCA Radiotrons and Radiolas. Upon the formation of the Radiotron Division in 1926 he was made manager, and when the RCA Radiotron Company, Inc., was founded in 1930, he became sales manager.

WORTH THINKING OVER

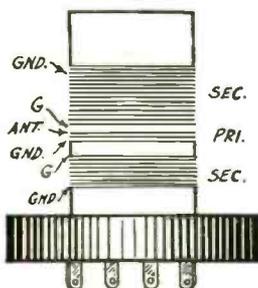
"SHUT Up and Then Keep Still" is the title of a new and more or less popular song. And, strangely enough, it is not dedicated to the American Society for the Prevention of Crooning.

Switch Type SHORT WAVES

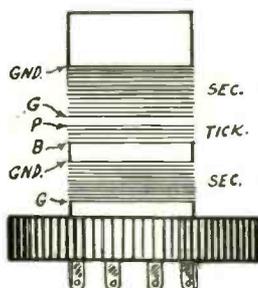
by *W. K. Tully*



R-F TRANSFORMER USED AS I-F COUPLER

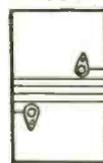


MODULATOR COIL, WITH TAPPED SECONDARIES. TAKES AN INSERT



OSCILLATOR COIL, WITH TAPPED SECONDARIES. TAKES AN INSERT

INSERT



THE HIGHEST FREQUENCY COIL IS WOUND ON AN INSERT AS SHOWN.

Data on the coils used in the five-tube switch type short-wave superheterodyne. The polarities are indicated, except for the insert coil for the oscillator, which will oscillate, in respect to the fixed tickler, only if inserted in a one direction, therefore if oscillation fails on this winding, turn the insert coil around

SWITCHING is not utilized much in short-wave sets, nor is the use of high capacity tuning condensers. Why not? As for switching, the main reason is absence of a satisfactory switch, and in addition the existence of factory-wound plug-in coils. High tuning capacities are avoided for three reasons: first, the greater gain when the ratio of inductance to capacity is high; second, the existence of factory-wound coils intended for a certain maximum capacity, say, 0.00014 mfd.; third, crowding of the dial.

When short waves began to win popularity a few years ago the market was virtually barren of good switches. To-day a few manufacturers turn out fair specimens, and perhaps two make first-class switches. It may as well be admitted that an excellent switch would cost a few dollars. But what of it? Nearly all of the rest of the parts will be reclaimed from the shop, and the coils may be wound or rewound according to directions presently to be given.

Contact Resistance

There may be contact losses, due to resultant resistance, in switches. But is there no contact between a plug-in coil and its receptacle? And no resistance? A good switch can have as low a resistance to radio frequencies as can a socket with its counterpart base pins.

The report that the switching method is all right is not based on assumption. It has been tried and works well. This does not import that plug-in coils don't work as well. Of course they do.

As for high capacity, really the principal reason against it is crowding of the channels, rather than reduced gain, for the gain may be built up in several directions, to attain maximum value. The tuning difficulty would be serious, because at the higher frequencies even with the smaller capacities used the crowding is too great. But mechanical assistance is afforded by a dial with a high ratio, say 30 to 1. While the dial still would be just as crowded, and if frequencies were imprinted on it this would be apparent, the reading of the dial is not so important. It is the tuning of the condenser

that counts. And 30-to-1 ratio it affords greater tuning ease than with 0.00035 mfd. capacity than does 0.00014 mfd. with the usual 4.5-to-1 or 5-to-1 ratio.

Some Progress Reported

What counts most in this set, which is a superheterodyne, is that the oscillator must oscillate. That is by far the most important point raised so far. It has some relationship to the inductance-capacity ratio, but when the ratio is against you, more tickler turns come to the rescue. Therefore a tickler may be larger than ordinarily.

It is admittedly a great deal more convenient to work a switch than to fuss around with coils. If switching results were in all instances as good as plug-in results there would be a wild dash to switching. And it can be made nearly as good, or even as good. The only problem is that those whose work rules the fashions in radio should concentrate on switching long enough to develop the possibilities that exist. The author has done some work along this line, and passes it on to the reader, but not with the assurance that finis has been written. Only one outstanding, expensive, large set for reception that includes short waves uses switching, and while its performance is good, it does not come up to the two other sets in the same economic category, but using plug-in coils. These are the facts. Nevertheless, focusing of attention on switching will tend to bring about the general adoption of this convenience by solution of the problems in months to come. The time can not be far off.

T-R-F Coils as I-F Transformers

As stated, it is intended that most of the parts for this receiver shall be of the reclaimed type, perhaps recaptured from their resting place in some obscure closet in the home or nook in the shop. The mixer coils you may wind yourself. The intermediate frequency transformers may be of the type commonly used for tuned radio frequency work, except that the primaries should be large, and if now skinny should be removed and rewound with 40 turns of any fine wire, over the secondary, with 0.02-inch insulation

between, or three layers of wrapping paper, if you can't do better.

Although the inductance of the secondary may be such as is usually furnished for 0.00035 mfd. use, the lowest frequency would be 530 kc with 250 microhenries, so to establish an intermediate frequency of 465 kc or thereabouts (it is not critical in this case) the capacity should be around 0.00055 mfd. So a fixed condenser of some handy value is used across the secondary, say, 0.0005 mfd. fixed, and a variable put across it and adjusted. This may be a 20-100 mmfd. equalizer or a 15-30 mmfd. equalizer. The important point is to line up the i.f. accurately at some definite frequency, which may be near 465 kc but need not be just that.

The resistors are of standard values, except perhaps 0.06 meg. and 175 ohms, but 0.05 meg. may be used to equal advantage, and moreover 175 ohms may be constituted of two 350-ohm resistors in parallel, or even 150 ohms would suffice, singly or by shunting two 300-ohm resistors.

The circuit consists of a tuned modulator, across which is a manual trimmer that must be on the front panel; a tuned oscillator, padded only for the first short-wave band by the series capacity method, using 0.07 mfd. for the padding condenser, C_p , built up, if need be, from fixed capacities. For instance, two 0.00035 mfd. condensers in parallel would suffice, with a smaller trimmer across the total, or no trimmer, depending on results after tests in the set. This trimmer would not be on the front panel.

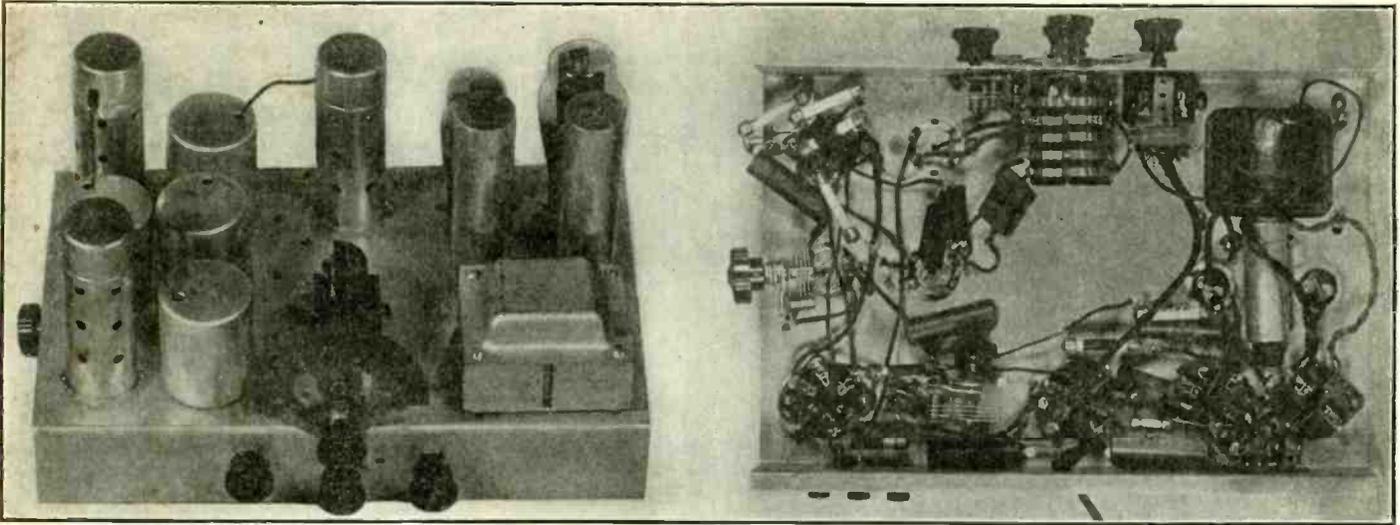
Coil Data

The mixing is done in a single tube, or really two tubes in one envelope.

The "front-end" coils are shielded, and it is intended that of the three coils for each of the tuned circuits, that is, three frequency bands, two will be taken care of by two separate windings on the same 1-inch diameter, the other on an inside winding on $\frac{3}{4}$ -inch diameter.

For the modulator circuit, assuming 0.00035 mfd. tuning condenser, with stray circuit capacity included, and therefore a condition that admits applying 0.00037,

(Continued on next page)



The top view of the wired receiver has parts located as follows: two gang condenser at center, modulator coil to front, at left; oscillator coil behind modulator coil; other two coils are i-f transformers. The tubes are: left front, 2A7; left rear, 58; center rear, 57; at right, 2A5 and 5Z3 in that order. The two electrolytic cans contain two 8 mfd. each. Bottom view is at right.

(Continued from preceding page)

0.00041 mfd. and in-between values, with only a little more overlap, the coil data are as given under the list of parts. The primary is 12 turns No. 24 enamel wire.

As for the oscillator coil, that is the same in two instances, but for the lowest frequency band is 25 microhenries, instead of 29.5, and therefore takes 35 turns of No. 24 enamel. Its padding condenser is 0.007 mfd. The separation between the two coils on the one form should be as much as circumstances permit, considering a tickler of 15 turns of any fine wire, wound between the two others. The shields may be 2 1-16 inch outside diameter, aluminum or copper.

Mounting Feature

Commercial coils for broadcast use, on 1-inch diameter tubing, are popular, and perhaps some will desire to use commercial coils, removing the present winding, and making the substitution. The inside coil, on 3/4-inch diameter bakelite, may be held to the shield cover by any convenient bracket system, or, if a short wooden dowel is pressed inside the small form, the center top of the shield drilled to pass a wooden screw, this screw may engage the dowel and hold the small form in place.

The necessary frequency difference between oscillator and modulator is established in the lowest band by the padding, and the manual trimmer may be left at minimum, although it is so small in capacity as to have no great effect this time. The manual trimmer consists of a midget condenser with all plates removed except one rotor and either one or two stators. Normally the capacity would be around 16 mmfd. Of course at or near the high frequency end of the first or lowest frequency band this condenser will begin to have some effect.

Gain Considerations

The circuit has few tubes, indeed, only five, and therefore sensitivity has to be high in all stages. Fortunately this is not difficult. The first tube, or 2A7, has a high conversion factor, that is, produces a high voltage intermediate frequency output compared to the radio frequency input. The 58 is the sole intermediate amplifier, but may be worked to a gain near 200. A somewhat greater gain than that resulting from following the diagram and the coil data given would be to put the tuned circuit in the plate lead of the 2A7 and use about 1-to-1 ratio for coupling. However, the difference is not so much that one need go to the trouble of making the special coil, if one already has a large primary coil, when the diagram may be followed strictly in this respect.

The value of 175 ohms, or 150 ohms, if that is handier, is consistent with good gain from the single mixer tube, and the bias on the 58 resulting from 350 ohms or so in the cathode leg is also consistent with high gain. But if the gain is too great it may be cut down by the series rheostat, or potentiometer used as rheostat, and this is therefore the volume control.

In the detector circuit the biasing resistor may be a little lower than ordinarily recommended, in the interest of sensitivity and tone, but at all hazards the condenser across it should be as large as practical. A compact 50 mfd. electrolytic condenser is obtainable.

Audio Compensation

For best detection the screen voltage on the 57 detector should be somewhat lower than that on the 2A7, and the resistor of 0.5 meg. takes care of that, the condenser across this resistor being 8 mfd., which makes for greater sensitivity than smaller values, but sometimes introduces hum, whereupon it would be necessary to use a smaller capacity, perhaps even down to 0.1 mfd. However, the large capacity should be tried first.

The late load resistor for the 57 is standard, 0.25 meg. (250,000 ohms), and the stopping condenser had better be larger than usually specified, because the low audio-frequency response should be made as great as possible, to circumvent the accentuation of high audio frequencies otherwise present in the pentode output tube. This presence is a fact, though not seemingly consistent. However, it may be done due in many instances to insufficient bypass capacity across the biasing resistor of the output stage. Here the resistance is 410 ohms, and across it is 50 mfd., which should be all-sufficient.

The grid leak in the pentode stage may be 0.5 meg., but the sensitivity will be greater the higher the value of this resistor. If at all practical up to 5 meg. should be used. The measure of practicality is the plate current. Try 5 meg. or so, and then measure the plate current at no signal. It should be less than 40 ma. When the loudest receivable station is tuned in, note whether the plate current seriously exceeds 40 milliamperes, and if it does, use a lower value of leak, and determine whether the leak lowers the plate current to a safe value, whereupon include the highest value consistent with an adequate safe amount of plate current.

Bias Loss

The reason the plate current might go up would be that grid current flows, and this tends to make the power tube lose bias

quickly. It loses bias anyhow, due to the signal, but if grid current flows, it loses it too fast or too much, with resultant high plate current that is dangerous to tube life, as well as causing some hum accentuation.

Just why the tube should lose its bias may not be apparent when grid current is considered, as the general effect of grid current is considered, as the general effect of grid current through a high resistance is to increase the negative bias. But it must be remembered that the signal has become so great that the grid already is positive when the grid current starts, and that the tube is worked well upon its plate current capabilities even when there is no signal.

There is a tone control in the output stage, and if it is not sufficiently effective the value of the condenser may be increased. It is advisable to have a tone control of this type in short-wave sets, as the action is to reduce the high audio-frequency response. Static sometimes is very annoying in short-wave reception, and the tone control reduces the signal as a whole much less than it does the frequency region in which the static noise prevails, which is the high audio-frequency region.

Hum Reduction

If there is a little hum, an easy experiment is to reverse the connections to the primary of the speaker's output transformer, to determine whether the resultant phase shift reduces the hum. In nearly every instance it will be found that the hum is less when the coil is connected one way, compared to connection the other way.

Naturally, a circuit intended to be built largely from parts you have requires that you have the parts, and if you haven't what substitutions may be made?

The tuning condenser is two-gang. While 0.00035 to 0.00041 mfd. are popular capacities, two-gangs are not so plentiful. Three-gangs are. Of course you may use the three put in the three-gang and use only two sections.

Magnetic Speaker

Another thing, you may not have a dynamic speaker with field coil, but instead a magnetic speaker. There is a problem here, because of the high impedance load required by the 2A5, but still you could get along pretty well with the magnetic, at that, especially one of the 4,000-ohm impedance type.

But a magnetic requires that a B choke be included. Any choke may be used, and its d-c resistance will be a few hundred ohms.

Thus the voltages would be too high, for

around 80 volts or a little more will be dropped in a fixed coil of 1,800 ohms. Any field, 1,800 to 2,500 ohms may be used.

Suppose that the substituted choke has a d-c resistance of 500 ohms. A series resistor may be added, to take up the difference, and may be 1,500 ohms, or thereabouts, of at least 15 watts. A usual rating is 20 watts, but such a resistor, if bought now, would cost under \$1, or you might have one around the shop. The resistor should be put between the joint of the rectifier filament output and 16 mfd., as one point, and the one side of your own choke as the other point.

No substitution of the tubes may well be made, except that instead of the 2A5 the 59 or 47 may be used with about equal results, but there is somewhat less hum with the 2A5 because it is a heater type tube, unusual in output tubes.

Other Alternatives

The condensers marked 0.5 mfd. may be reduced to 0.1 mfd., except that if any choice exists, make the stopping condenser between the detector and power tubes the larger one, and it may be even more than 0.5 mfd., say, 1 md. or so, if you have such paper condensers. Electrolytic condensers may not well be used in such a position.

If the 5-volt winding for the rectifier filament has no center tap, take off the feed from either side of the filament.

If there is no center on the high-current 2.5-volt winding, put a low-resistance potentiometer across the winding, connect grounded B minus to center, and adjust for minimum hum. A fixed center-tapped resistor may be used instead. The resistance value is not critical. Values between 10 and 30 ohms total are commonly used. It may be necessary to put a condenser of 0.01 mfd. or higher capacity at least, across one-half of such a resistor, or even across half of a center-tapped winding for the 2.5-volt feed to the 2A7, 58 and 57, if there is a little oscillation present on occasions and in circuits where it is not wanted.

The circuit has been discussed in the light of an intermediate frequency around or at 465 kc, but it has been tried also with an i.f. of 1,520 kc. In fact, the photographic illustration is that of the receiver as tested on the high intermediate frequency, which accounts for the small Hammarlund two-gang condenser shown.

The circuit worked fairly well even on that high intermediate frequency, but one objection was that there was some interference from local broadcasting stations. It seemed that a better shielded outfit would be required if the intermediate frequency was to be retained at that high level, and therefore it is suggested that the lower intermediate frequency be used, or at least be the first one tried.

Of course if anything like 1,520 kc is to be the i.f., then the primaries on the i-f transformers have to be severely reduced, say, to 15 turns, and moreover the oscillator tickler and secondaries have to be given different inductance values than the one specified. The modulator coil would remain unchanged.

There is an advantage in a high intermediate frequency, in that images are fewer, the natural result of the two frequencies being so far apart. The image response relates to twice the intermediate frequency, so image trouble does not arise until 3,000 kc becomes a relatively small percentage of the signal frequency. However, this condition does develop eventually, for at 15,000 kc of course images would be expected.

Extra Stage of Audio

The volume from a receiver of this kind, no matter which i.f. is used, is fairly good, but those who desire to have their short-wave stations come pounding in perhaps would prefer an extra stage of audio amplification, which may be resistance-coupled, say, using a 56. The plate resistor of the 56 would be 50,000 ohms, the stopping condenser 0.5 mfd., and the grid leak 2 meg. or more. However, hum trouble may develop requiring extra filtration not now necessary.

Radio University

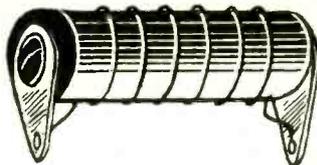
A QUESTION and Answer Department. Only questions from Radio University members are answered. Such membership is obtained by sending subscription order direct to RADIO WORLD for one year (52 issues) at \$6, without any other premium.

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

Winding Shunts for Meters

WILL YOU PLEASE give me some directions for windings shunts for a meter I have? The present range is 0-1 milliamperere. I desire to increase this range, so that I may read 0-10 milliamperes and 0-100 milliamperes. Is it advisable to go higher?—O. F.

It is easy to wind shunts for a meter, but care must be exercised not to have the meter unshunted when large current is flowing and the meter is in circuit, otherwise the meter might be ruined. You may use some current source and an extra meter, say, 0-100 milliammeter, and adjust the current source until 10 milliamperes flow. Then take some fine wire, a foot or so, and use a few inches at the end to serve as a part short across the meter to be calibrated. You know 10 ma are flowing, and now put your own meter in series, with the protecting low resistance shunt in circuit. See what your own meter



Shunt wound on a 3-8-inch diameter dowel, for 100 ma reading on a 0-1 Milliammeter.

reads. It may read nothing. Then use twice as much wire for the shunt, etc., until you get just the right amount to render the reading 10 ma on the dot. The wire length thus determined then may be wound on a spool, or a 3/8-inch diameter insulated dowel, with end holes tapped for machine screws, may be used as the form, with the screws holding lugs, the wire ends soldered to the lugs. Take excellent care to make a faultless soldering job of this, as the resistance of the soldered joint otherwise might upset the accuracy. That is, test for 10 ma again, after soldering, as the error introduced by such resistance should show up. For the 100 ma shunt the same procedure is followed, with 100 ma flowing from the current source, and here even greater care in protection of the meter is necessary, as perhaps only a few inches of wire will be necessary for this particular shunt. The illustration shows the appearance of the finished shunt, when the insulated, threaded dowel is used, with lug connections at ends. Do not go beyond 100 ma.

Series Pilot Lamp

IN THE CONSTRUCTION of an a-c, d-c receiver, I should like to put a pilot lamp in series with the heater line, as I know the resistance of the lamp from its voltage and current rating, e.g., 9 ohms. Some fellow told me that I should not use a lamp at all in this position, as it is dangerous, because the heater voltage would be uncertain. The voltage-reducing resistor I use is 167 ohms, and I would like to know the relationship of the pilot lamp to this resistor, that is, if the lamp is included, shall I amend the other resistor somehow? The lamp is needed, as at present I cannot well see the dial.—U.E.D.
The lamp alone should not be used as

part of the resistance network, because of the uncertainty of the resistance, including the considerable change in resistance with use. It is customary to include a parallel (shunt) resistor across the lamp whenever a lamp is so inserted in the circuit, that is, as part of the heater series network. If a resistor of 10 ohms, of suitable power rating, is used for shunting the lamp, which has a nominal resistance of 9 ohms, you can figure on the basis of a net ohmage of around 4.7 ohms. That is the equivalent resistance of the circuit comprising 9 ohms and 10 ohms in parallel. While it is true that the voltage across the lamp will be the same as before, approximately, the current is approximately halved, and the brilliance will not be great, but it will be sufficient for the purpose. Use a lamp of American manufacture, as the Japanese lamps are troublesome, and have very short life. The effect of the lamp and shunt on the main resistor used for dropping excess voltage need not be considered, under the circumstances, because the additional resistance is so small, compared to the other, and besides the effect is in the direction of reducing the voltage, that is, the change is safe. However, to answer your query for its theoretical value, the net resistance of lamp and shunt (4.7 ohms) should be subtracted from the resistance of the limiting resistor, for the obvious reason that a definite resistance value is required, and 4.7 ohms thereof are contributed by the lamp and shunt, hence are not required in the limiting device. Such limiting resistors have a 10 per cent. tolerance, hence the tolerance is around four times that of the change you will introduce.

* * *

Oscillator Coils

WILL YOU kindly give me directions for the winding of coils for oscillator purposes, so that the coils will oscillate? Sometimes I wind coils and they will not oscillate. What is the reason?—T. H. H.

To obtain oscillation it is necessary that the amount of inductance be fairly large, compared to the capacity tuning it, that the tickler or feedback winding have sufficient inductance, and be not too loosely coupled to the tuned winding (assuming the other is tuned), and that the coil be wound and connected with correct polarity. The coil is to be used with a vacuum tube, it is assumed. If the windings are in the same direction, then, considering the coil from top to bottom, secondary on top, primary or tickler on bottom, the connections could be: top terminal to grid, bottom of that winding to grid return, top of feedback winding to B plus, end of feedback winding to plate. If the feedback coil is not directly in the plate circuit (no d.c. flowing through it) the same rule holds, for any grounded connection is equivalent to B plus, which is of course grounded to radio frequencies. No matter in which direction the two windings are wound, if other things are right, the coil will cause oscillation, when tuned, by reversing the connections on one of the windings, if there is no oscillation at first. Such reversal of connections is to the same effect as reversing the direction of winding. The reason for the necessity of phase shift in the coil is that the tube shifts the phase almost exactly 180 degrees.

RADIO RENDERS BLIND LANDING COMMONPLACE

Washington
The Liaison Committee on Aeronautic Radio Research, established by the Aeronautics Branch of the Department of Commerce, cites progress in aeronautical use of radio aids in a report selects the following examples:

A system of radio aids for blind landing has been developed and demonstrated. Hundreds of completely blind landings have been made by means of this system. Also landings have been made by its aid at a commercial airport during conditions of fog which kept all regular air traffic on the ground.

There has been marked increase in instrument flying. This has been made possible in considerable part by the availability of improved instruments such as the artificial horizon and gyro-compass, and the increasing use and dependability of the airways radio range beacons. The installation of runway localizing radio beacons at a number of airports is expected to facilitate instrument flying still further.

Phone Improvement

There has been marked improvement of two-way plane-to-ground telephone equipment. This has included the incorporation in commercial receiving sets of automatic volume control and quartz-crystal control of frequency. There has been some progress on the design of locked tuning and push-button selection of stations. Apparatus has been improved in respect to convenience, simplification, and weight.

Ground direction finding has been carried on successfully at higher frequencies than formerly. The use of a direction finder at 1,700 kc up to distances of 300 miles has been found satisfactory under certain conditions.

The use of ignition shielding has become standard practice on airplanes equipped with radio, and the performance of ignition shielding equipment has been materially improved.

Fluctuations Overcome

The serious fluctuations of range-beacon courses at night in mountainous country have been overcome by the development of a new transmitting antenna system. This system is so designed as to radiate vertically polarized waves only, and is known as the T-L antenna system.

As to improvements that would be desirable, the report states:

While there have been developments in the field of power supply, the present practice of driving generators and other accessories by direct connection to the engine involves problems which appear to call further efforts in design.

The development of methods and devices for the automatic navigation of airplanes should be continued. There is every indication that this line of development will be a great saving in the energy of the pilot personnel and will also improve the functioning of the aircraft.

Antennas for the Speedy

In addition to developing systems to prevent collisions, the Committee report said that another important problem is the design of antennas for high-speed airplanes. The aerodynamic drag of antennas has not yet received the consideration which it warrants.

As a result of increasing volume of flying through icing conditions the icing of airplane antennas is a serious limitation upon the use

Amateurs Send From Fair, Seek Six More Outlets

Chicago
With amateur stations W9USA and W9USB now on the air with radio code and voice transmissions respectively from A Century of Progress Exposition, the World's Fair Radio Amateur Council, sponsors of the exhibit at the fair, have declared their intention of requesting the Federal Radio Commission for additional licenses with the call signals W9USC, W9USD, W9USE, W9USF, W9USG and W9USH.

These licenses will be used to cover the operation of four stationary transmitters located in different parts of the grounds, now under construction, and also on portable five-meter equipment which will work in conjunction with the fixed stations. A program of experimental as well as communications work is being laid out for the months of the Exposition, culminating in the American Radio Relay League convention to be held at the Fair August 3rd, 4th and 5th.

ADS IN CANADA TIMED TO 5%

Washington

Advertising matter of all kinds in radio programs broadcast by Canadian stations must hereafter be limited to 5 per cent of the time of any program period—45 seconds in a 15-minute program.

Also, "spot" announcements (local advertisements broadcast between program periods) must be limited to 100 words and may not be made at all between 7:30 and 11 p.m.

These regulations have just been adopted by the Canadian Radio Broadcasting Commission, it was announced by the Federal Radio Commission in making public a statement that many of the principal rules adopted for Canadian stations are the same as those in effect for stations in the United States since February 1st, 1932.

Under the Radio Act of 1927, as amended, the Federal Radio Commission has no right of censorship over programs, and the statement issued by the Commission points out an "interesting deviation" in the section of the Canadian rules devoted to "Control of Programs."

It is provided that stations must not use more than 40 per cent of their time on programs imported from foreign countries, and Canadian stations shall not mention or suggest prices in connection with any advertising program.

The use of recorded programs and electrical transcriptions must be confined to such hours and subjects as may be defined for each station by the Commission.

No Rehearsal, No Script, Yet the Show Goes On

There's one program in which the production men at NBC are never sure what to expect and that's the Show Boat Hour, in which Pic Malone and Pat Padgett take the comedy spotlight each week as Molasses 'n' January.

In their latest offering, the boys presented an original conception of Shakespeare's tragedy, "Romeo and Juliet," without a rehearsal and without a script.

EDUCATION BY GOVERNMENT, LAFOUNT PLAN

Washington

Programs by the Federal Government for educational purposes, sent out by Government stations and rebroadcast by others, are proposed by Federal Radio Commissioner Harold A. Lafount. He said:

"A recent study made by the Commission shows that there are approximately 25,000 hours per week of unsold time now being used for sustaining programs. This time is often used to broadcast material of little entertainment and, perhaps, of no educational value.

"Just think of the contributions to the happiness and welfare of the American people that could be made. On a basis of 320 words per page to be broadcast at an average rate of 160 words per minute, 720,000 pages could be put on the air each week. If bound into books, this would make 2,000 360-paged books a week, or 104,000 volumes a year.

Offers Congratulations

"I am not one who believes that radio programs in this country are deteriorating. Economic conditions have necessitated less expensive, but not necessarily poorer programs. The National Broadcasting Company and the Columbia Broadcasting System are to be congratulated for maintaining a high standard of program during this depression period.

"I recognize the fact, however, that many of the 450 stations not affiliated with these chains, and 50 others who broadcast chain programs only a small portion of their time, are having difficulty in providing worthwhile sustaining programs.

"I am not criticizing broadcasters for their failure to make better use of this sustaining time; neither am I criticizing the American public.

Not Appreciative Enough

"The responsibility for the intelligent use of these 25,000 hours must be jointly shared. Sometimes I think that we, as part of the public, do not fully appreciate the broadcasters' problems, particularly his efforts to provide satisfactory programs. With limited incomes and rather high operating costs many stations have maintained high quality programs even when almost superhuman effort was necessary to do so. These are the real radio heroes of this economic emergency.

"There are, however, some shortsighted, selfish station managers who are failing to measure up to reasonable standards of public service.

Offensive Stations

"They have not only failed to build up strong programs from local talent but sometimes have actually offended the public by their cheap, tawdry programs and blatant ballyhoo over the air.

"The public must assume part of the responsibility for the colossal waste of time and energy occasioned by the broadcasting of so many hours per week of unimportant and uninteresting programs."

WNYC ON 810 KC

WNYC, the municipal broadcasting station, New York City, has been transferred to 810 kc from 570 kc, which latter frequency WMCA now has alone in the zone. WNYC is on the air from 8 a.m. to 10 p.m.

Hedges Is Appointed KDKA General Manager

Chicago
William S. Hedges, radio executive, has been appointed general manager of KDKA, Pittsburgh, announced M. H. Aylesworth, president of the National Broadcasting Company, which manages and operates the station. KDKA, first broadcasting station in the United States, is owned by the Westinghouse Electric and Manufacturing Company.

Hedges assumed his new position on June 15th. His radio career started in 1922, when he was named manager of WGU, Chicago, the call letters of which later were changed to WMAQ. Later he became president of the station. In 1928 Hedges was named president of the National Association of Broadcasters. He was reelected in 1929, and in 1931 was made chairman of the executive committee.

KDKA, which Hedges will now direct, is world-famous as a pioneer broadcasting station, and is an important link in the National Broadcasting Company networks. Its programs are well known throughout the United States through these networks, and also all over the world, by means of the station's short-wave transmitter, W8XK.

Electronic Corporation Has Sets For Abroad

Specializing in the manufacture of short- and long-wave receivers, exclusively designed for foreign markets, the Electronic Radio Corporation, of 320 Jackson Avenue, Long Island City, N. Y., has a complete line of six-, eight- and twelve-tube chassis.

The a-c d-c six-tube receiver covers from 200 to 2,000 meters. The eight-tube 200-to-2,000-meter receiver has been widely distributed.

Newly-released 15 to 2,000 meter, six- and eight-tube models are in production.

POLICE CHIEF'S HOBBY

Police Chief William J. Quinn, of San Francisco, looks on radio work as recreation, and classes his radio talks as his "favorite hobby."

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.

Carl J. Hucabee, 702 United Fruit Co. Bldg., New Orleans, La.

W. E. Creed, Southampton, L. I., N. Y.
Charles E. Russell, 106 East 5th Street, Coffeyville, Kans.

James Carl Roller, Seligman, Mo.
Ben Siegel, 3842 N. Arthington St., Chicago, Ill.
P. E. Metzner, 434 North Wenger Ave., Mishawaka, Ind.

W. H. Van Zandt, Maidstone, Sask., Canada.
J. J. Fitzgerald, 17 Morrissetown Rd., Bernardsville, N. J.

S. H. Clarton, 704-1st State Bank Bldg., Waco, Texas.
Chas. S. Parker, 188 Laureston St., Brockton, Mass.

R. P. Unbeuse, R. D. No. 2, Watervliet, N. Y.
D. Van Woert, P. O. Box 37, Station Y, Brooklyn, N. Y.
Leo Wiedeman, 59-34 Woodbine St., Ridgewood, Brooklyn, N. Y.

Arthur Gumm, Route No. 1, Gary, Ind.
John Meehan, 219 Genesee St., Utica, N. Y.
John L. McGinnis, P. O. Box 345, Cosmopolis, Wash.

P. Harrington, Box 1391, Butte, Mont.
L. E. Davidson, Paramount Theatre, Marion, Ind.

ASSIGNMENTS

Marvel Appliances, Inc., 165-26 Jamaica Ave., Jamaica, N. Y., radios and electrical appliances, assigned to William M. Shipley, 39-16 103rd St., Corona, L. I., N. Y.

AIRY FOLK

Sherlock Holmes, as the famous Conan Doyle character has been interpreted over National Broadcasting Company networks by Richard Gordon, has proven so popular throughout the country that several summer entertainment centers have requested that he play the part with various companies during the season. * * *

When Max Baer isn't fighting he is often listening to the radio, and that means that he may be tuning in one of his favorite artists, Jimmie Melton, the tenor. According to Baer's associates, Jimmie is one of the fighter's favorites of the air waves. * * *

Mary Wood, soprano, is an authority on Beau Brummel and what he wears. Because her taste in ties, shirts, socks and other masculine accoutrements is so unerring some of her admirers generally take Mary along when they select a new suit or a tie. * * *

Rush Hughes, the Langendorf Pictorial reporter, who has been looking for an understudy, has several applicants for the job, including a woman listener who writes she'd like to double for the swift-speaking NBC star—"because I know I can talk as fast as you do," she declares. * * *

John and Ned, harmony duo, received an orchid in print the other day from a newspaper columnist who declared:

"They have the tang of youth and the joy of living. They lend a lilt to simple ballads. Their harmony in pleasing. The one feature of the radio during which our food burns on the stove or gets chilly on the table is the fifteen minutes when John, Ned, the guitar and Little Mary are singing and talking." * * *

Al Bernard, the minstrel, has collected songs for fifteen years. He has one of the largest song libraries of any radio artist, using a huge room in his West 50th Street apartment, New York City, to store the music. Bernard is the composer of "Blue Eyed Sally," and "Spring Comes Creeping." * * *

Those "bells" which Joe Green, NBC xylophonist, plays on his programs over NBC networks, are really bars of glass laid upon a xylophone rack. They have tones distinctive from the usual wood blocks of the xylophone. * * *

Know what President Roosevelt's favorite tune is? It's "Home On the Range." He revealed that to Herb Polesie, the Billy Best of the Musical Grocery Store when Polesie attended an informal reception to the press at the White House recently. That's the reason Herb arranged to have his Four Singing Clerks harmonize it. * * *

When Tom Terriss, globe trotter, who has recounted many of his experiences to NBC audiences in past programs, returns from his present jaunt to the Orient and Africa, he will have many interesting and exciting adventures to relate. In a recent letter to an NBC executive, Terriss gives a log of his visit to Morocco, in which he says: "We also photographed scenes in the palace of the Pasha of Marrakech, where we got into a little trouble, inadvertently photographing the gardens of the harem where all we could see was figures in white drifting slowly through the green shrubbery. In this case, knives were drawn and there were a few very unpleasant moments, but we got out all right." * * *

If you'll ask Thomas Belviso, director of NBC's music library, the best way to simulate the sound of a hurdy-gurdy on the air waves is to use a harmonium. It's even better than the real article, says Belviso, who devises many of the unusual musical effects for NBC programs.

DeVry Has New D-C Converter of Wide Use

A new converter is manufactured by Herman A. DeVry, Inc., 1111 Center Street, Chicago, Ill., who are using it in their sound-recording Camera.

This vibratory unit will convert a-c from the car storage battery into a true alternating current at higher voltages. The special material for the contacts eliminates electrolytic action, and the sparking so troublesome to auto sets is reduced practically to zero. The action of the converter is quiet and smooth so that no disturbing radio-frequency waves are generated. This unit will operate from any d-c voltage from 3 volts to 40 volts with the same degree of efficiency. The operation of the 6-volt unit is satisfactory even though the battery voltage drops 3.2 volts or is increased to 9.

This device could operate on flashlight batteries, as the no-load operating current of the converter unit alone at 4 volts is only 30 milliamperes.

The DeVry Company reports that Wells-Gardner have adopted the converter for their Gulbransen auto radio series. Also a favorable report has been received by DeVry from the testing laboratories of the United American Bosch Corporation, of Springfield, Mass.

Professor Describes An Electron Oscillator

At a special open meeting of the Chicago Section of the Institute of Radio Service Men, held at the Hotel Sherman, Prof. Hans U. Hjermsstad of the School of Engineering, Milwaukee, Wis., gave a discussion on the electron-coupled oscillator. This circuit, a late development, is being used in the newer and better sets.

This talk was followed by an illustrated lecture by Kenneth Hathaway, executive secretary of the Institute of Radio Service Men, 510 N. Dearborn St., Chicago, Ill., on the subject of "The Service Man's Relation to the Radio Industry." Mr. Hathaway pointed out the important position the radio service man holds as the contact man between the listening public and the broadcaster, set manufacturer, and radio distributor. The need for the professional service man to conduct his business along such lines as are outlined in the Code of Ethics of Professional Radio Service Men, which code was drawn up and adopted by the members of the Institute, was emphasized.

CAIN IN 'PLANE CRASH

Noble Cain, Chicago NBC production man and director of the Chicago a Cappella Choir heard in the Temple of Song program, crashed his airplane in a wheat field near Hastings, Mich., last week and is in Hastings Hospital with his right leg broken. The family is vacationing there. Neighbors wanted to fly but there is no landing field. Cain crashed alone testing the safety of a wheat field.

REAL CALLIOPE USED

The Show Boat calliope is the genuine article and is played during the Thursday night programs from New York by Phil Wall, pianist with Don Voorhees' Show Boat band. If the old-fashioned wheeze-box sounds a little ancient, that's because it hasn't been tuned in years . . . purposely. The calliope is one of the properties of the sound-effects department of the NBC.

HARMONICA MAN PRAISED

Among the most prized souvenirs in the collection of Larry Adler, youthful harmonica virtuoso heard on networks, are telegrams from Governor Albert C. Ritchie of Maryland and former Mayor William F. Broening of Baltimore, offering congratulations and wishing him success on his opening night with the late Florenz Ziegfeld's "Smiles."

RADIO WORLD

The First and Only National Radio Weekly

Eleventh Year

Owned and published by Hennessy Radio Publications Corporation, 145 West 46th Street, New York, N. Y. Roland Burke Hennessy, president and treasurer, 145 West 45th Street, New York, N. Y.; M. B. Hennessy, vice-president, 145 West 45th Street, New York, N. Y.; Herman Bernard, secretary, 145 West 45th Street, New York, N. Y. Roland Burke Hennessy, editor; Herman Bernard, managing editor and business manager; J. B. Anderson, technical editor; J. Murray Barron, advertising manager.

SCHOOL BROADCASTS IN 25 COUNTRIES

The radio loudspeaker is coming to the aid of school teachers all over the world.

Just how far the use of the radio in teaching has spread is shown by the Office of Education, Department of the Interior, in announcing findings of an investigation of school broadcasting in 25 countries.

Supplementing the work of the teacher, broadcasting broadens school work by bringing outstanding world events into the classroom, permitting children to receive occasional instruction of master teachers in almost every subject taught in the school, the survey points out.

Practical suggestions are given regarding methods of instruction by radio in the classroom, including planning of programs and means of encouraging pupils to make use of radio lessons.

The complete report, "School Broadcasting," is published by the International Institute of Intellectual Cooperation, in Paris.

A special chapter in the 200-page publication is based upon a conference called by the Office of Education. Participating in this conference were representatives of the Federal Radio Commission, Department of Agriculture, National Association of Broadcasters, National Committee on Education by Radio, National Advisory Council on Radio in Education, American Council on Education, National Broadcasting Company and the Columbia Broadcasting System.

Government of Norway to Control Broadcasting

Washington

All broadcasting activities in Norway will be placed under control of the government July 1 after several years of joint private and government control.

This was made known by the Department of Commerce, the information being based upon a report from Trade Commissioner Gudrun Carlson at Oslo.

It is believed that the supervisory personnel will be selected by a Committee of Fifteen to be named by the government's Department of Church and Education.

Daily direction of program broadcasting will be placed under a group of five chosen from the larger Committee of Fifteen. Local program committees may be appointed.

The program administration set up by the church department is to be given as free and independent a position as possible. This department, after conferring with the Department of Trade, is to propose to the next Parliament detailed plans of program activities.

Financial operation of broadcasting shall be based on the idea of being self-supporting. The State budget for broadcasting is to be separate from other budgets.

NEW SQUINT ON NEW DEAL

Tom Howard: I'm against the new deal.
Jeannie Lang: How's that Tom?

Tom: Because my wife gives me the deuce for not bringing home the jack.

CONSIDER THE SPONSOR

WHERE would broadcasting be today without the commercial sponsor? Who would pay for the many fine and entertaining programs if the manufacturers of certain lines of goods were not willing to advertise over the air and hope to get a good return.

Some programs on the air are pretty boresome. However, the listener may tune out something he doesn't want. Especially on the smaller local station does this surfeit of cheap advertising reach its maximum. Sponsors whose programs perhaps are furnished by advertising agencies are, as a rule, giving pretty good entertainment value. A few of them perhaps do not use the keenest judgment in knowing just when to stop talking about their goods. As a rule, however experience and brains point the way to a proportion of entertainment and advertising. But if you tell a sponsor that he can use only one line of advertising for a certain period and this businessman knows that by adopting such a course he just could not afford to advertise over the air—well, he just quits, that's all. Then the station or chain has to get along without that money and if the takings are already pretty skimpy, what can be done except to close up?

This is no brief for advertisers who don't know their business and who help to drive listeners from the radio set. It is merely a plain statement to the effect that if there were no sponsors there would be practically no broadcasting, for it costs a lot of money to keep a station open and the public does not pay a direct toll—as to a theater, for instance.

If there were no sponsors there would not be even any bad programs.

THE COMMISSION'S POWER

FREQUENTLY we hear much about the arbitrary powers of the Federal Radio Commission and bitterness is sometimes expressed because some particular ruling does not please the kickers. Frequently, of course, such resentment is uttered by those who have been caught doing something unethical or even illegal.

Either the Federal Radio Commission should be given a pretty free hand in running radio affairs of this country—always within carefully prescribed and duly considered rules and regulations of course—or else such matters should be delegated to some other body that can be trusted to be always concerned with the greatest justice and service for the greater number.

All of which is brought sternly to public notice by affairs down in Cuba, where recently radio pirates sailed the ether and, by being able to hide their identities for some time, caused indignation and a storm of protest from everybody who believes in orderly government conducted in a sane and methodical manner. This protest had little to do with whether the pirates had even a semblance of right on their side.

Radio, in its very nature, is so odd a thing, so free of access to law-breakers, so easily misused and turned into dangerous weapon against a whole people, that the public must be protected to the utmost. And in our own country that protection should and does come from the proper functioning of the Federal Radio Commission. Therefore that useful body assumes a great obligation, the task of honestly and fearlessly meeting the problems involved.

TWO-WAY POLICE RADIO

IT is believed that the police department of East Chester, a town in Westchester County, N. Y., were the first to adopt the two-way police radio car. These policemen while making their rounds in the department cars carry on a running conversation with the desk sergeant at Police Headquarters.

The East Chester cars are the ordinary small coupe type and the radio receiving units are installed under the dashboards. Short-wave sending apparatus is to be found back in the rumble seat compartments and do not interfere with those who ride in the rear of the coupes. A hollow tube, used as transmitter aerial, is installed in the rear of the car's chassis and it has been found that a maximum of results is attained when the tube is elevated about ten feet in the air, although fairly good results are obtainable when the tube, for any reason, is not raised to the usual maximum of ten feet.

This two-way method will be adopted by other police cars throughout the country just as soon as the East Chester experiment has been tried out to the utmost of its utility.

243 PERSONS GET BUSY AS CHAIN FEATURE IS ANNOUNCED

When sonorous-voiced David Ross announces, "This is the Columbia Broadcasting System," at the conclusion of the Old Gold programs with Fred Waring's Pennsylvanians, 81 monitor-room engineers of 81 radio stations press a button; 81 technicians at 81 transmitters throw a switch; and 81 announcers rise to the occasion with their local call letters.

Because the Waring-Mandy Lou program is broadcast over the world's largest regular network, it serves as the best example of the intricacies that surround every link of a radio chain. In addition to the 243 engi-

neers and announcers who are distinct units in this scheme of things, the telephone company over whose wires the programs are routed has its own engineers stationed along the line, on duty at the "repeaters" or line amplifiers every several hundred miles, with more than 15,000 miles of land wire used to collate the stations. Yet how easy it all seems when you are seated in a comfortable chair at home and a mere flick of the dials brings you the smooth strains of Waring's music and the drawly comedy of Mandy Lou.

Yet it's some one's tough job.

Station Sparks

By Alice Remsen

Breeze on Broadway For "MANHATTAN MOODS"

WABC Sundays, 2:30 p. m., EDST

Wearing silver shoes, the wind goes
Hurrying and flurrying by;
Dodging down the narrow canyon,
Flinging warm kisses to the sky.
Lightly touching blazing banners
Strung above the buildings high,
Darting down to dust the pavement,
Swiftly as a woman's sigh.

Slyly swooping into corners,
Snatching papers from a stand.
Bringing breezes from the river
To this sun-parched, steel-built land.
In this hot mood of Manhattan
Stands the panting Broadway band,
Murmuring in grateful wonder:
"Gee, but ain't that breeze just grand!"
—A. R.

Mark Warnow's orchestra symbolizes, in music, the varied moods of old Manhattan. If you listen to him you'll hear many old-time Broadway favorites, together with the latest tunes. The Do-Re-Mi girls will sing your favorite popular melodies. Altogether a very delightful period; do not miss it.

Radio Rialto

BACK AT GOOD OLD WLW

Back in New York after a flying trip to Cincinnati, where I had the pleasure of singing for several hundred members of the National Stationers Convention, in the Pavillon Caprice of the Netherland-Plaza Hotel. It was just like old-home week for. Did I have a good time? Well, rather! . . . Of course, went out to Station WLW and saw all my old pals—Bill Stoess, general musical director for WLW, looking brown as a berry from playing golf, still the same genial maestro; Grace Clauve Raine, the tiny vocal director; caught her making an arrangement for the studio quartette; she's a little giant in music; Richard "Nicky" Nicholls, head of production, just the same handsome devil as ever, sends his best to all Broadway pals. . . . Pretty little Thelma Kessler is back at WLW. And I saw the Threesome, the Three Shades of Blue; Joe Emerson, the Mooney Brothers, Maurie Neuman, Gladys Thornton, Joe Reis, Stanley Peyton, Frank Henderson, Florence Golden, Don Becker, Lloyd Schaffer, Peter Grant . . . and last, but not least, Paul Stewart, eager as ever and full of new ideas for his "Follies" and "Club Crosley" programs. . . . It seemed as though I had never left Cincinnati and WLW. . . .

LEO CARILLO A GREAT M. C.

The most enjoyable thing I've heard in a long time is Leo Carillo as master-of ceremonies on the Chase & Sanborn program, and his rendition of "The Wreck of the Julie Plante" on the Fleischman Hour last week. On the same program Polly Moran almost wrecked the works; she certainly was funny. And did Rudy play sax with the other Rudy (Wiedoft) and Benny Kreuger? Oh, he did! It was a jolly good show. . . .

"THE VOICE OF EXPERIENCE"
GETS BIG MAIL

"The Voice of Experience" is creating quite a stir among the less sophisticated

listeners on the Columbia chain. He's getting truck-loads of mail; some of the letters are funny, treating the "Voice" as if he were a fortune teller; others are genuine in their desire for advice. Quite an interesting period if you'd like a slant on the lives of other people. . . . Jane Froman had left the Vincent Lopez band at the last rumor. . . . Even though the actual Schmeling-Baer bout was not broadcast for various reasons, a good representation of it was enacted by the Five Star Final over WMCA, bringing a surprise to many of us—but great satisfaction to think that America has still another chance to keep the championship. . . . By the way, did you hear Katherine Perry, the new colored star, on the Fleischman program? That gal has some personality, a marvelous delivery and a good voice thrown in for extra measure; hope she does some more microphone work. . . . Lou Alter has written a new tune, "Morning, Noon and Night," which will be heard plenty over the air-waves this summer. Arthur Swannstrom wrote the lyrics, and Feist is the lucky publisher. . . . Hayes Alvis, the leader of the Mills Musical Playboys, which aggregation replaced Duke Ellington at the Cotton Club, has been christened "Mussolini" by his boys; the inference is obvious. . . .

NEW FOR "EVENING IN PARIS"

A new series of summer programs has been inaugurated by "Evening in Paris," with Nat Shilkret's Orchestra, no vocalists, and Agnes Moorehead retained for her comedy touches. . . . A new series of dramatic sketches, "Happiness House," is heard over WABC each Tuesday from 11:30 to 11:45 a. m. EDST., under the sponsorship of the Household Finance Corporation; Burr Blackburn has the leading role. . . . "Bar X Days and Nights," the Columbia network's weekly dramatic presentation recreating the colorful days of the old West, started on Saturday night at 9:45 p. m., EDST., on June 10th, instead of the Monday evening spot it had occupied for several weeks; Carson Robison and his Buckaroos, whose characteristic rendition of cowboy songs and the music of the plains and hills, add much to the authentic atmosphere of these dramatic episodes, continue on the program; they will portray some of the leading character roles in each episode in addition to their musical contributions; John Battle, Kenneth Daingean, Stephen Fox, and Millie June are among those in the large cast; the episodes are written by Ferrin Fraser, Columbia's continuity director, and Marion Parsonnet supervises the production. . . . Which reminds me that dear old Arthur Q. Bryan, my old side-kick of WOR days, is writing and producing a new commercial series over the Columbia chain, emanating from the studios of WCAU in Philadelphia, sponsored by the Mueller brand of macarone and spaghetti. More power to you, Arthur! . . . Columbia's Tito Guizar recently became a proud father. . . . Met up with Ted Husing in Lindy's one afternoon last week; told me he was looking forward to his visit to Chicago when he will pick up the medley of sounds from the Fair Midway. Ted looked great, tanned up n' everything. He was busy eating dill pickles. . . . Irving Kaufman's "Hot from Hollywood" series has changed schedule. It will be advanced one day and will be heard over the WABC Columbia chain each Monday, Tuesday and Wednesday at 8:45 p. m., EDST. . . .

WHAT THEY LIKE AT WABC

Poking around WABC the other night I found out a few tune preferences from various radio artists, for instance: Frederic William Wile likes "Of Thee I Sing, Baby"; Adele Ronson clings to "Star Dust"; Colonel Stoopnagle registers a fondness for "Without a Song"; Edwin C. Hill and Arthur Tracy both prefer "O! Man River"; Jack Smart surprised me by announcing that he can't resist "I've Got a Right to Sing the Blues"; Will Osborne roots for "Stormy Weather"; Mildred Bailey likes "St. Louis Blues"; Jimmy Meighan says "I've Got the World on a String" suits him; Irvin S. Cobb, without any hesitation, said, "Swing Low, Sweet Chariot," and Phil Regan, romantic CBS tenor, votes for "Farewell to Arms"; could keep on forever at this, but it's too hot. . . . (Sorry, Mr. Editor, but I just couldn't resist that one tiny reference to the weather). . . . Irvin S. Cobb's contract has been renewed and so the noted humorist will continue to be heard over the WABC-Columbia network on Wednesdays and Fridays from 9:00 to 9:15 p. m. EDST. . . . Now I'm going right out to sit under a shady tree and drink iced tea. Won't you join me?

Men of the Moment

Although John White, the Lonesome Cowboy of the Death Valley Days broadcasts, doesn't profess to be a "sure-nough" cow hand, he carries an authentic ranch insignia upon his gee-tar.

The mark is the official insignia of the M Bar V Ranch, operated by his brother, Lewis White, at Wickenburg, Arizona.

Rudy Vallee's teacher of the saxophone, Rudy Wiedoft, was a guest of his former pupil on the Fleischmann Hour over NBC networks.

Teacher Rudy showed the listeners what he knows about saxophone laughter and the imitation of animal sounds.

The music of Larry Adler, harmonica player heard on NBC networks, is cited as proof that the mouth organ is adapted to the classics. Larry became the champion harmonica player of Baltimore in a contest run by the "Evening Sun" when he was fifteen years old, by his playing of Beethoven's Minuet in G. Another favorite is Liszt's Hungarian Rhapsody No. 2.

Irvin S. Cobb's broadcasting contract has been renewed and the humorist from Paducah, Ky., will continue to be heard over an extensive WABC-Columbia network on Wednesdays and Fridays at 9:00 p. m., EDST. Although he has been on the air regularly only since the beginning of May, Cobb has already established a large following for his story-telling and witty comment on the news of the day. It is felt that he is helping to set a new trend in radio comedy, away from the "wisecrack" generally associated with Broadway, and a return to the quieter and more mellow humor characteristic of Mark Twain. Al Goodman and his Orchestra will continue to provide incidental music on the programs.

Frederic William Wile, political analyst of the Columbia network, completed ten years on the airwaves as he took his annual leave of absence from the microphone. Wile is radio's pioneer political commentator, having started his weekly reviews of Washington news in 1923, before the days of chain broadcasting. He joined the Columbia network in 1929. Though others were on the air before 1923, Wile may boast of the distinction of being the only man who for ten successive seasons has discussed the same topic under the same title: "The Political Situation in Washington Tonight." He also blazed the trail of international broadcasting and was the first to use the lapel microphone in interviews with statesmen on Capitol Hill.

PERSONALITIES

Channon Collinge, conductor of such Columbia programs as the Cathedral Hour, Light Opera Gems, Grand Opera Miniatures and the American School of the Air, is the son of a cotton manufacturer in Yorkshire, England. He was taken as an infant to Poona, India, for three years. He spent the next three at sea with his trader uncle. At 6 he was in kindergarten in Yorkshire and at 12 back in India with another uncle. Continued his education in England and worked diligently for a time in the family cotton business, before turning to music as a life work. He had shown a talent for music early, improvising tunes at the piano in tender years. At eight he started to study violin and at ten had organized a children's orchestra. Became a professional musician at 20. Directed many famous Irish choral societies, operatic and light opera productions. Was Professor of Music at Dublin University, teaching courses in conducting, theory and music appreciation. Traveled widely throughout the world during vacations and came to America in 1907. He has stayed here ever since, and during that time has been composer of stage music; adviser, arranger and head of the American orchestra department of an English music publishing house; vaudeville operetta producer; comic strip artist. Shortly after GBS was formed in 1927, he was called to the network as continuity writer and production man, but it was not long before his conducting activities with the network took up all his time. Is regarded as radio's greatest authority on religious music.

Just to see if late listeners would recognize famous quotations, Howard Claney, announcer and formerly a Broadway actor, has been reciting bits from his stage experiences, during late dance band broadcasts.

Contrary to his expectations, Claney has been deluged with letters from listeners in which the writers said they recognized a Shakespearean line or an excerpt from some well-known play.

Pick-ups from Captain Henry's Show Boat: Lanny Ross feels that his singing of "Londonderry Air" recently was one of the best pieces of work he has done since he became a member of Captain Henry's Show Boat. . . . Annette Hanshaw requires special orchestrations for all her numbers. It usually takes two days to work them out. . . . Lanny Ross received a letter from a twelve-year-old girl in upstate New York, saying she would run away from home if he did not write her a long letter. Lanny promptly got off a special delivery letter, advising her against such a step, and the girl has promised to respect his advice. . . . Molasses 'n' January, on a Loew's vaudeville tour, are in the same fix as Amos 'n' Andy are on their tour. They can't do much between shows, because of their black-face makeup. Amos 'n' Andy solved it by forgetting the black-face. . . .

Mary Livingston's imitation of Mae West creeps into the continuity of the Chevrolet program with Jack Benny in a manner that invariably gets "a rise" out of the large studio audience.

Mary's inflections bring a roar of applause and laughter from the studio visitors.

Helen Corbin Heintz, Washington pianist, who started her fourth season as soloist with the United States Marine Band, has had her one real problem in connection with her broadcasts thoroughly and permanently solved.

Before her broadcasts admirers crowd around desiring to meet her personally. Naturally this pleases her, but one day Captain Taylor Branson, leader of the Marine Band, overheard Mrs. Heintz say after a particularly strenuous session of greetings:

"It is lovely, but I wish I could meet them afterwards instead. I never like to talk to anyone just before a broadcast."

"That's easy," said Branson, and starting with the next broadcast had a Marine guard at the door of her dressing room to ask visitors to pay their respects at the end of the program.

A big shirt factory was one of the first concerns to reopen since the upturn in business. Frank Black, NBC's general musical director, points out. He suggests it's because so many people lost their shirts during the depression.

"Lopez speaking" comes through the loudspeaker in a soft, modulated tone to identify Vincent Lopez, NBC pioneer who has been broadcasting since the days of crystal sets. But the first time it was confided to a microphone nobody heard it. That was back in February, 1922, when Lopez and his orchestra undertook to introduce jazz on the air at the old WJZ station in Newark, N. J. It was Sunday and a station executive, suddenly horrified at the thought of syncopation on the Sabbath, ordered the program cancelled. Nothing was said to Lopez, and he played his selections for an hour before a "dead mike."

Annette Hanshaw, blues singer, has received an offer of a gown if she'll send on her measurements to a Massachusetts dressmaker, who claims she never misses a Hanshaw broadcast.

To obtain authentic Chicago exposition atmosphere for the broadcast of the Show Boat Hour, the sponsors sent a crew of writers to the Windy City to take in the Century of Progress. The sounds and atmospheres of the famous project were broadcast by an army of sound technicians from the studios in New York. Some of the equipment included a cabinet from which "Tiny" Ruffner spoke from a blimp cruising over the throng, and the impersonation of well-known officials. The Show Boat "arrived" at the Fair through the Chicago drainage canal, paddling its way from down Memphis way.

"Curtain Calls" is the title of a new WABC-Columbia series of miniature revivals of operettas and musical comedies, presented each Wednesday at 8:15 P.M., EDST, under the direction of Mark Warnow, who was recently elevated to a position as a CBS staff musical conductor. Charles Carlile, tenor, and Rhoda Arnold, soprano, sing the leading roles in the revivals each week. Warnow is adapting the musical shows for radio, writing special continuities, special incidental music and lyrics to condense the productions into 15-minute periods. Among the stage successes of the past the melodies and romance of which will be revived are "Countess Maritza," "Dearest Enemy," "The Red Mill," "No, No, Nanette," "Chu Chin Chow" and "My Maryland."

The Compinsky Trio, two brothers and a sister, resumed their broadcasts of classic chamber music over the WABC-Columbia network and will be heard every Sunday throughout the summer months at 1:30 p.m., EDST.

"Happiness House," a new series of dramatic programs to be presented over the WABC-Columbia network under the sponsorship of the Household Finance Corporation, is heard every Tuesday at 11:30 a.m., EDST.

25 Dance Orchestras will be allotted regular schedules on the WABC-Columbia network these summer days and nights, the music emanating from Eastern cities and

country seashore resorts, from Chicago and the West Coast, to provide dance lovers with an abundance of new and old popular tunes. Pancho and his Orchestra will be heard during a summer engagement at the Central Park Casino, New York; Guy Lombardo brings his Royal Canadians to the Pavillon Royale, Long Island, the first week in July; Isham Jones will be heard from the Hotel Ambassador, Atlantic City, beginning June 30; Ted Lewis and his high-hat have migrated to the Dells, Chicago; Glen Gray and the Casa Loma Orchestra are located at the Glen Island Casino, Westchester; and Abe Lyman and his musicians will return to New York in August after a session at the Coconut Grove, Los Angeles. Other leaders who will direct their respective units over the Columbia chain include George Hall, Jerry Freeman, Ben Pollack, Johnny Hamp, Leon Belasco, Don Bestor, Will Osborne, Joe Haymes, Ozzie Nelson, Eli Dantzig, Claude Hopkins, Freddie Martin, Gus Arnheim, Vincent Travers, Art Coogan, Buddy Harrod, Buddy Wagner, Eddie Duchin and others.

Because the Robin Hood Dell Summer Concerts, to be broadcast over the WABC-Columbia network by the musicians of the Philadelphia Orchestra, starting early in July, will include the production of opera this season, a new amplification system incorporating the most modern improvements in sound engineering is being installed at an expense of many thousands of dollars as an addition to the physical equipment of the natural outdoor auditorium. While the natural acoustics of the Dell were excellent for symphony concerts, the new equipment, designed by one of America's foremost radio engineers, was considered necessary for the faithful transmission of the operatic productions.

Recent program schedule changes for the WABC-Columbia network include "Bar X Days and Nights," weekly dramatic presentation recreating the colorful days of the old West, with Carson Robison and his Buckaroos, now heard from 9:45 to 10:15 p.m., EDST, on Saturdays, instead of on Monday evenings; the "Hot from Hollywood" feature, with Irving Kaufman, singing comedian, and the Abe Lyman Orchestra, now heard at 8:45 p.m., EDST, Mondays, Tuesdays and Wednesdays, instead of Tuesdays, Wednesdays and Thursdays; and Kate Smith's periods of song, now heard at 8:30 p.m., EDST, Mondays, Tuesdays and Wednesdays, instead of Tuesdays, Wednesdays and Thursdays.

Although Alois Havrilla, one of the best-known announcers, has participated in many special broadcasts during his microphone career, he had never flown in a plane until recently. Havrilla took his first trip by air to Detroit, where he participated in the making of an industrial movie for Chevrolet.

"Am I on time?" is the first question Mayor Angelo Rossi, of San Francisco, asks when he arrives at the NBC studios for a talk.

The Boswell Sisters were back at the CBS New York headquarters after two personal appearance tours involving several months and several thousand miles of travel. But, gypsy-like, they didn't stay long in the heat of Manhattan. They sailed to follow co-worker Morton Downey to London, where they'll entertain for several weeks at the Palladium. The Mills Brothers, inactive since brother John was laid low with pneumonia two months ago, resume vaudeville activities in New York July 7. Nick Dawson, of "The Magic Voice," is broadcasting under difficulties, now that heroine Elsie Hitz has recovered from scarlet fever. While boating Nick fell and dislocated both shoulders. Incidentally, Jim Norman and June Armstrong, the characters Nick and Elsie portray—a favorite romance team with radio listeners—were married recently.

Zenith Adds 500 To Employe List

Zenith Radio Corporation, Chicago, has gone into production of sets on a larger scale. This is unusual at this time of the year. The radio season is still three months away.

The Zenith employment office received instructions to add 500 workers at once to enable the factory to step up production. The company announced:

"In the midst of President Roosevelt's New Deal there are definite signs of the return of business to normalcy. This is heartening reward for the patience and courage the American workman has shown during the past few years.

"When national manufacturers—such as Zenith—increase production, the effect on labor is far-reaching. First, the manufacturer must buy tremendous quantities of raw material. In the case of Zenith, thousands of pieces are used in the manufacture of a radio set. Lumber must be purchased—tons of steel, wire, lacquers, etc., are used, so that indirectly, in addition to the Zenith factory workers, hundreds and thousands of other individuals are given employment."

Federated Announces An Auto Amplifier

A self-contained triple push-pull three-stage auto amplifier, known as the Acratone model 770, has been developed by Federated Purchaser, Inc., 23-25 Park Place, N. Y. City. This amplifier is designed to operate directly from any six-volt storage battery.

The new Acratone amplifier uses two '36 tubes in push-pull in the first stage coupled in resistance bridge arrangement to two '37 tubes in push-pull, transformer coupled to two '42 pentodes in push-pull in the output stage.

A motor-generator is incorporated within the unit, which supplies 320 volts at 100 milliamperes. This is noiseless in operation.

The undistorted power output is 7 watts, to drive from two to six speakers to normal maximum speaker undistorted output and it has ample voltage amplification to work directly from a double button carbon microphone, without additional pre-stages.

The new 770 amplifier is equipped with a built-in microphone and phonograph matching transformer which matches any single or double button microphone. Connections are provided for pick-ups of different impedances, varying all the way from low impedance pick-ups to pick-ups of 5,000 ohms impedance.

29.2% Drop in Sets Used by Iowa Farmers

Only about one Iowa farm in three has a radio set in operation now, although at the beginning of 1931 nearly half of the farms had radios.

Reports of township assessors, just made public by the Iowa State Department of Agriculture, show that farm-owned radios decreased 29.2 per cent in the year ended January 1st, 1933.

The large decrease in active radio sets, the department said, is a good barometer of the ready cash on farms. In almost every instance, it was explained, the discontinuance of the radio set was due to inability of the farmer to provide replacement batteries and tubes.

"It is believed," the statement continued, "that because radio contact with the outer world is the most efficient means of relieving the isolation of the farmer, it is about the last of his luxuries that he would give up.

"Under normal economic conditions the radio is almost an indispensable adjunct to a farmer's marketing program. The general sluggishness of marketing farm products is

TRADIOGRAMS

By J. Murray Barron

At some time or another most of us have given time to the study of human nature. Possibly when riding in the subway or at some other public place when crowds gather we have been attracted toward some particular person either by accident or because we intentionally select some character to study.

You know there is a great number of persons who make the study of types an interesting pastime. Not every one can do this successfully, for many reasons. Some have not sufficient insight into human nature, nor the keenness of observation.

The particular type that should interest the radio fan or experimenter is the individual buyer of odds and ends of radio parts. Take the fellow who has "played" with radio over a number of years and remembers "away back when." He's the type that jumps with joy at the sight of some well-known coil or gadget offered at practically nothing at the bargain counter. He senses a real buy, even though he hasn't any particular present use for it, as his mind goes "away back when" and in those days he'd have to pay many dollars for the same item.

Do not be mistaken that there are not some excellent buys of this type for those who can use them, but the point is that the experimenter is so carried away with the value offered that he can hardly get the change out of his pocket quickly enough. These types are not always boys, but quite the contrary often successful business and professional men. During an actual observation at Thor's Bargain Basement, 167 Greenwich Street, New York City, there were seen a well-known broker, a salesman of securities, an engineer from an experimental laboratory and an officer of a foreign steamship and an executive from a downtown business office. These with the usual representatives of other trades and professions made up the gathering on this day. Naturally most of them were after the latest in radio, but all were experimenters and builders of radio apparatus. This hobby to some is sometimes costly in dollars and cents, yet they perhaps do not spend extra money on activities that attract others. On the whole the average experimenter and fan is a very keen fellow, knows what he wants and understands his business.

* * *

C. R. King was appointed general sales manager of E. T. Cunningham, Inc., and

R.C.A. Radiotron Company, Inc., as announced by G. K. Thockmorton, president of Cunningham, and vice-president of Radiotron. Mr. King has been equipment sales manager. In his letter to the trade, announcing the appointment, Mr. Thockmorton said that Mr. King's many years in the radio tube field make him well qualified for this position. Mr. King joined the Cunningham Company in 1923.

* * *

That folk are buying radio merchandise right now is amply proved by real mail order reports as furnished in two specific instances and for the same firm across the counter. North Radio Co., 172 Washington St., New York City, reports a good response to the sale of its self-powered short-wave converter, and incidentally excellent reports on its performance. In the other case Postal Radio Corp., 135 Liberty Street, New York City, reports a continued demand for its four and five-tube ac-dc universal receivers not only in the United States and Canada, but also to some export trade.

* * *

The French import quota of American radio products for the second quarter of this year has been reduced by ten per cent. The reduction is reported due to contentions of French Government officials that radio activity at this season is reduced. The radio industry, however, is making representations to the French Minister of Commerce for a more liberal license of American imports. No further efforts to tax import licenses are reported.

300,000 Net Gain Among German Radio Clients

Washington.

Despite cancellation of 200,000 regular subscriptions to the federal radio broadcasting service in Germany, the total number of subscribers increased during the first quarter of 1933.

According to a report from Vice Consul C. T. Zawadski, Berlin, made public by the Commerce Department, this unusual situation was brought about by the registration of approximately 500,000 new subscribers during the first three months of the year.

At the end of the first quarter of this year the total number of subscribers approximated 4,500,000, it is reported, an increase of about 225,000 compared with the preceding quarter.

Much political talk by government officials is heard on the nationalized German radio system.

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)

NEW MODEL SHIELDED TEST OSCILLATOR!

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 $9\frac{1}{4}$ " wide x $8\frac{1}{2}$ " deep x $4\frac{1}{2}$ " 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.

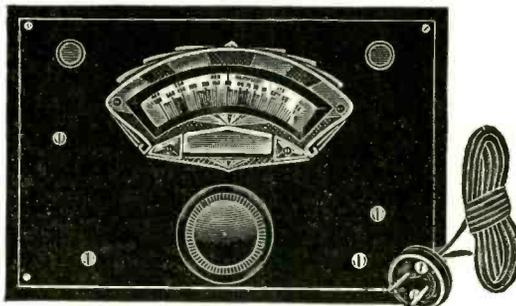
The modulation in the a-c model is the a-c line frequency, 60 cycles, effected by using the line voltage on the plate of the tube. In the cabinet there is a very high resistance between the shield cabinet and the a-c, a double preventive of line-shorting and application of a-c line voltage to the user.

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 3% 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.

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



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).

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

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 230 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, if otherwise. At resonance the hum will be heard. Off 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.

Special Summer Trial Subscription Offer

FOR

NEW SUBSCRIBERS

Send \$1.00 in cash, check, P. O. money order or stamps, and receive Radio World postpaid from now until Sept. 2.

Sub. Dept., Radio World, 145 West 45th St., N. Y. City

Quick-Action Classified Advertisements

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

AUTOMOBILE BLUEPRINTS, using latest type tubes. All practical working circuits. Five blueprints, 25c, or 12, 50c (coin). Super Engineering, 1313 40th St., Brooklyn, N. Y.

GERMAN, WITH BEST REFERENCES, intends migrating to Spain; wishes to represent well-known American export radio concern. Kurt Prager, Roscherstr., 15, Charlottenburg, Berlin, Germany.

URUGUAY STAMPS—100 different stamps, \$1.00. 200 different stamps, \$3.50. Stamps will be shipped direct from Uruguay. Heriberto Meyer, care Radio World, 145 West 45th St., New York City.

BARGAINS in first-class, highest grade merchandise. Phono-link pick-up with vol. control and adapter, \$3.32; 00025 mfd. Dubilier grid condenser with clips, 18¢. P. Coben, Room 1214, at 143 West 45th Street, New York City, N. Y. C.

"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

1-WATT PIGTAIL RESISTORS @ 5c EACH in following ohmages: 350; 800; 1,200; 20,000; 50,000; 100,000; 250,000; 2,000,000; 5,000,000. Direct Radio Co., 145 W. 45 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

NEW RADIO AMATEUR'S HANDBOOK, 180,000 words, 207 illustrations, 218 pages (10th edition, issued 1933). 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.

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.

Broadcasts to Patrons in Stores is Envisaged

An organization known as the Point-O'-Purchase Broadcasting System, Inc., which controls a patented synchronous radio receiving set whose operation is governed from the broadcasting station, has recently been formed in Detroit.

The Point-O'-Purchase plan is said to include the installation of these receiving sets in retail outlets, especially those of chain organizations, on a nation-wide scale. This development, according to the sponsors of the plan, will enable national advertisers to deliver timely sales messages to the buying public at the actual point of purchase in addition to reaching the home audience.

Officers of the Point-O'-Purchase Broadcasting System are: Chairman of the Board and Treasurer, George B. Storer; President, Joseph H. Neebe; Vice-President, Thomas R. Walton; Secretary, Edward E. Rothman.

Headquarters have been established in the Union Guardian Building, Detroit.

ZONA GALE AIDED MISS FLYNN

Bernardine Flynn, the Sade of NBC's Vic and Sade, obtained her first Broadway engagement through the intercession of Zona Gale, the author whose "Friendship" stories are now being broadcast. Miss Flynn's work in a student production of Miss Gale's "Miss Lulu Bett" so impressed the playwright that she urged Producer Brock Pemberton to assign her a role in his "Strictly Dishonorable" company.

Carter Has New Small Auto B Eliminator

A. J. Carter, president of the Carter Genemotor Corp., of 361 West Superior Street, Chicago, Ill., is presenting to the trade a new Genemotor in which he incorporates his latest invention, known as the "double reflex circuit."

This invention has enabled the size of the Genemotor to be reduced to $4\frac{1}{4}$ " by $4\frac{1}{4}$ ", and has at the same time greatly simplified the mechanism. Mr. Carter states, adding that this is the smallest B supply unit for auto radio sets now on the market.

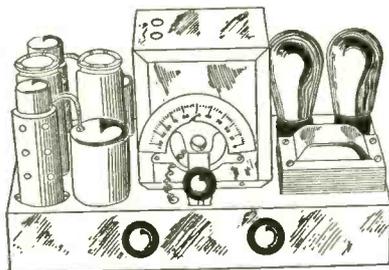
It can be easily installed on either side of the bulkhead, under the seat or in the old battery box.

The double-reflex circuit is built in as an integral part of the motor, and increases the efficiency, improves regulation, adds to the power output and improves the volume and tone quality of the radio set, he says.

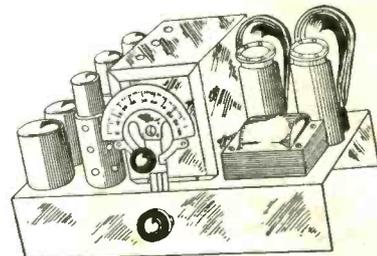
There are three models, two for auto radio sets using 180 volts and 135 volts—both at \$16.50 list, and one for 32-volt farm light plants, list \$20.

PERSONAL SIDELIGHTS

Snapshots from NBC's family album: Wayne ("Waltz") King is married to Dorothy Janis, movie actress. The right name of Julia Sanderson is Julia Sackett. She is the daughter of Albert Sackett, well remembered by playgoers of another generation. Jane, Helen and Patti Pickens, home-loving girls, live in a New York apartment presided over by their mother, who still regards them as her "babies."



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 Milliampere D.C.....	No. 325
0-50 Milliampere D.C.....	No. 350
0-100 Milliampere D.C.....	No. 390
0-300 Milliampere D.C.....	No. 399
0-400 Milliampere 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 SERVICE EQUIPMENT



Cat. 907 WLC De Luxe Analyzer Plug, with 5-ft. 8-lead cable attached. Price \$3.23

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 pins, with 8-lead 5-foot cable attached. (adapters extra). Cat. 907-WLC @ \$3.23



Cat. 976-D8 New Plug-in adapter, 7-hole top, 6-pin base, with locking stud that fits into 907-WLC latch. Price .73

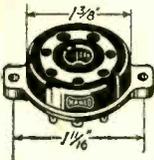


Cat. 975-D8 New Plug-in adapter, 7-hole top, 8-pin base, with locking stud that fits into 907-WLC latch. Price .73



Cat. 974-D8 New Plug-in adapter, 7-hole top, 5-pin base, with locking stud that fits into 907-WLC latch. Price .73

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. Price .25



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 \$.73

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 opener, 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. 2N89-KP-9-B9 \$ 2.63
Double pole, nine throw switch. Cat. 2N89-KP-9 @ \$2.18

DIRECT RADIO CO.
143 West 45th St., 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 RECEIVERS.

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 84 D. C. screen grid; Bakelite Model F. Crosley 20, 21, 22 screen grid; Eveready series 58 screen grid; Eola 224 A. C. screen grid; Peerless Electrostatic series; Philco 76 screen grid.

Subscribe for Radio World for 3 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 cross here to expedite extending your expiration date.
Radio World, 143 West 45th St., New York, N. Y.

TROUBLE SHOOTER'S MANUAL, Nos. I and II

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. 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

BLUEPRINT

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 W. 45th St., New York, N. Y.

Coated Filament Type Pigtail RESISTORS

Finest Grade Fixed Resistors Made.
RMA Color Coded

1 Watt, 11c Each		COLOR CODE		
RESISTANCE	Ohms	Body	End	Dot
175	0.000175	Brown	Violet	Brown
350	0.00035	Orange	Green	Brown
800	0.0008	Gray	Black	Brown
1,200	0.0012	Brown	Red	Red
2,000	0.002	Red	Black	Red
2,700	0.0027	Red	Violet	Red
3,500	0.0035	Orange	Green	Red
4,200	0.0042	Yellow	Red	Red
5,000	0.005	Red	Black	Red
10,000	0.01	Brown	Black	Orange
20,000	0.02	Red	Black	Orange
25,000	0.025	Red	Green	Orange
50,000	0.05	Green	Black	Orange
60,000	0.06	Blue	Black	Orange
100,000	0.1	Brown	Black	Yellow
250,000	0.25	Red	Green	Yellow
500,000	0.5	Green	Black	Yellow
600,000	0.6	Blue	Black	Yellow
1,500,000	1.5	Brown	Green	Green
2,000,000	2.0	Red	Black	Green
5,000,000	5.0	Green	Black	Green

2 Watts, 16c Each
3,500 0.0035 { Not Color Coded, but Marked. Size 1 1/2" long x 3/8" diameter.

3 Watts, 24c Each
2,000 0.002 { Not Color Coded, but Marked. Size 2 1/2" long x 1/2" diameter

5 Watts, 42c Each
775 0.00775 { Not Color Coded, but Marked. Size 2 1/2" long x 5/8" diameter.

DIRECT RADIO COMPANY
143 WEST 45TH STREET
NEW YORK, N. Y.

DIAMOND PARTS

Tuned Radio Frequency Sets FIVE-TUBE MODEL

A-C operated circuit, 50-60 cycles, 105-120 volts, using two 58 t-r-f stages, 57 power detector and 47 output, with '80 rectifier. Three gang shielded condenser and shielded coils in a sensitive, selective and pure-tone circuit. Dynamic speaker field coil used as B supply choke. Complete kit of parts, including 8" Rola speaker and all else (except tubes and cabinet). Cat. D5CK @ \$15.69
Wired model, Cat. D5CW (less cabinet) @ 17.19

Kit of five Eveready-Raytheon tubes for this circuit. Cat. D5T 4.97

FOUNDATION UNIT, consisting of drilled metal subpanel, 13 3/4 x 8 3/4 x 2 3/4"; three-gang Scovill 0.00035 mfd., brass plates, trimmers, full shield; shields for the 58 and 57 tubes; six sockets (one for speaker plug); two 8 mfd. electrolytic condensers; set of three coils. Cat. D5FU 6.19
Super Diamond parts in stock.

FOUR-TUBE MODEL

The four-tube model is similar, except that there is one stage of t-r-f, and a two-gang condenser is used. Tubes required, one 58, one 57, one 47 and one '80. Complete kit, including 8" Rola dynamic speaker (less tubes, less cabinet). Cat. D4CK \$13.59

Kit of four Eveready-Raytheon tubes for this circuit. Cat. 4D.TK \$3.89

FOUNDATION UNIT, consisting of drilled metal plated subpanel 13 3/4 x 2 1/2 x 7"; two-gang 0.00035 mfd. SFL condenser; full shield; two shields for 58-57; center-tapped 200-turn honeycomb coil; five sockets (one for speaker plug); two 8 mfd. electrolytics; set of two shielded coils; 20-100 mmfd. Hammarlund equalizer for antenna series condenser. Cat. D4FU \$5.48

INDIVIDUAL PARTS



Travelling light vernier dial, full-vision, 6-to-1 vernier, projected indication prevents parallax; takes 3/4" or 1/2" shaft; dial, bracket, lamp, escutcheon.

0-100 for 5-tube Diamond, Cat. CRD-0, @ \$6.91.

100-0 for 4-tube Diamond, Cat. CRD-100, @ \$9.91.

[If dial is desired for other circuits state whether condenser closes to the left or to the right.]

8 mfd. Polymet electrolytic, insulating washers, extra lug. Cat. POLY-8 @ \$.49
Rola 8" dynamic for 47 with 1800 ohm field coil tapped @ 300 ohms. Cat. FP @ 3.53
2 coils for 4-tube. Cat. DP @ .90
3 coils for 5-tube. Cat. DT @ 1.35

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