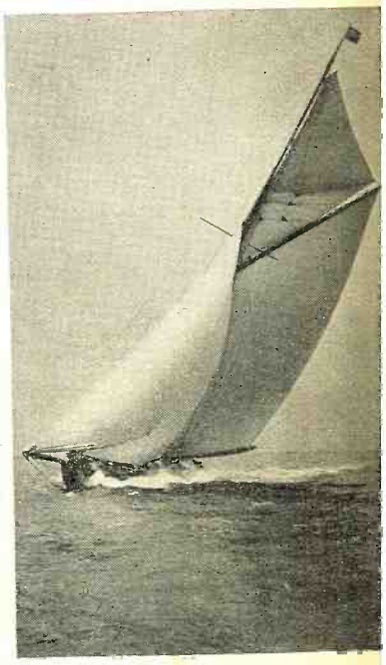
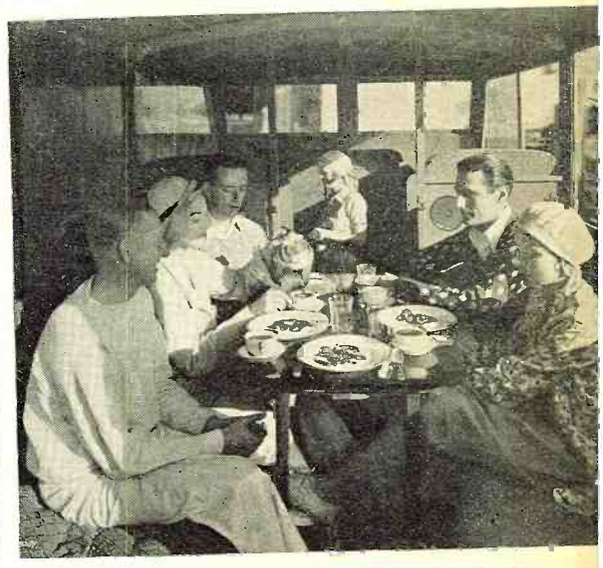
SHORT-WAVE TIME TABLE

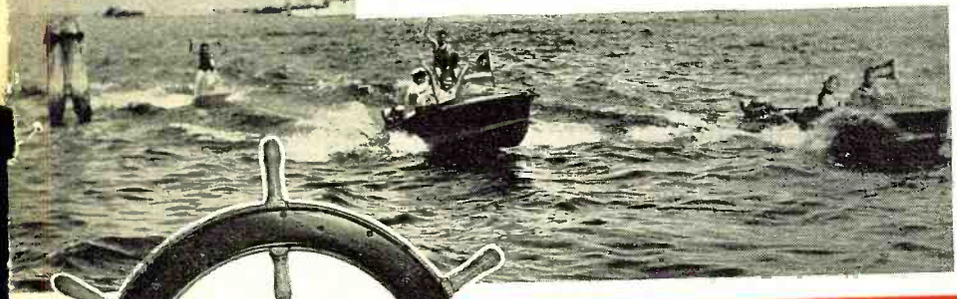
RADIO NEWS and The SHORT-WAVE

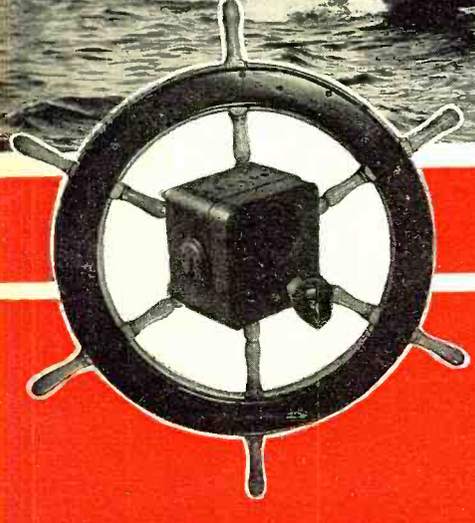
JUNE, 25¢



PUT RADIO ON YOUR BOAT







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Elementary Radio Theory

Lesson 1 tells briefly how broadcast transmitters and receivers work and gives an explanation of the detector, audio-frequency and radio frequency amplification, radio symbols, circuit diagrams and antenna systems.

Theory of the Detector Tube

Lesson 2 covers the elements and functions of the detector tube and tells how to build the detector unit of a five tube receiver. Wiring layouts, drilling layouts, circuit diagrams and battery hook-up diagrams are all included.

Audio-Frequency Amplifiers

Lessons 3 and 4 describe artificial magnets, magnetism, electromagnetism, the assembly and functions of audio-transformers, and give full instructions for adding a two-stage audio-frequency amplifier to the detector unit already built.

Radio-Frequency Amplifiers

Lessons 5 and 6 show what a radio-frequency amplifier is, how it is used, and how to add a two-stage radio-frequency amplifier to the three tube section of the receiver already built.

A Short-Wave Converter

Lesson 7 gives complete constructional details of a simple, 1-tube converter which may be used with the broadcast receiver to tune in short-wave programs.

Fundamentals of Radio

Lesson 8 answers the question, "How does a radio station send out its signals?" and tells how to construct a simple crystal receiver for headphone reception.

Symbols and Circuits

Lesson 9 describes radio symbols in detail as used in the preparation and reading of circuit diagrams. Simple charts and elementary circuits are included for study purposes.

Building the RN Six

Lessons 10, 11 and 12 tell how to build a six tube receiver, section by section, with complete constructional details for the beginner.

B-Power Units

Lesson 13 explains the difference between alternating and direct current and the use of B-Power Units.

Changing A.C. to D.C.

Lesson 14 gives the radio fan the elementary facts on the working of a B-Power Unit and tells how half-wave and full-wave rectifiers are used.

The Amateur Game

Lesson 15 describes an easy method of connecting up a buzzer, key and battery permitting one or more beginners to practice the continental code

A Low-Power Transmitter

Lessons 16 and 17 give complete details for building and operating the Hoffman split-Colpitts circuit for code transmission.

How the Vacuum Tube Works

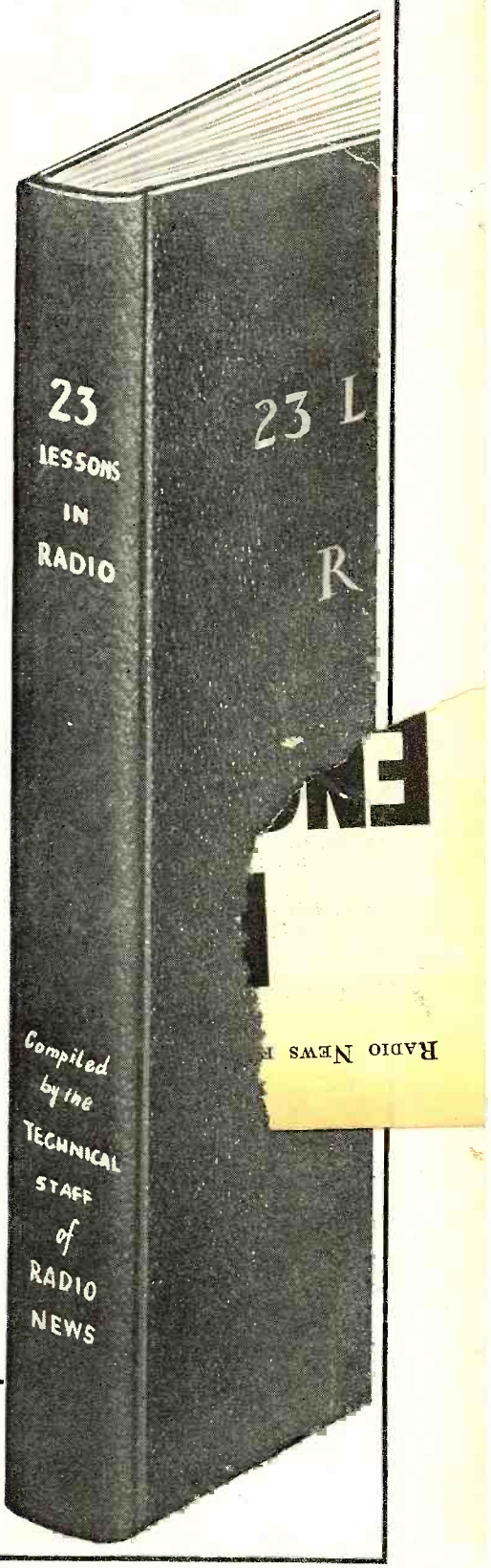
Lessons 18 and 19 describe how vacuum tubes work, what they consist of, and how the different elements are used in radio reception.

Batteries

Lessons 20 and 21 show the construction of a battery, how the energy is created and released and what types of batteries are available.

Analyzing Receiver Circuits

Lessons 22 and 23 present brief descriptions and diagrams of the one-slide tuner, the loose coupler, regeneration, the neutrodyne, the superheterodyne, band-pass and screen-grid.



"23 Lessons In Radio" will be found invaluable to beginners, young or old, desiring to build up a background of knowledge in preparing to take advantage of the many opportunities opening up for men and women in the radio field. Get your copy of this cloth-bound, 124-page book today *while the supply lasts!*

Radio News

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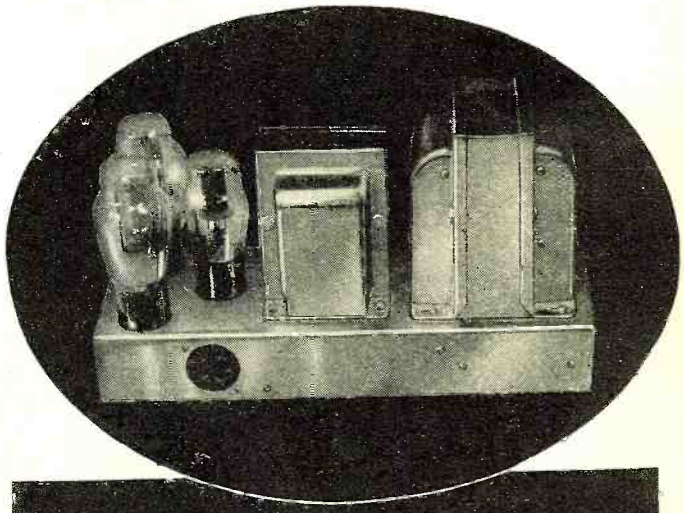

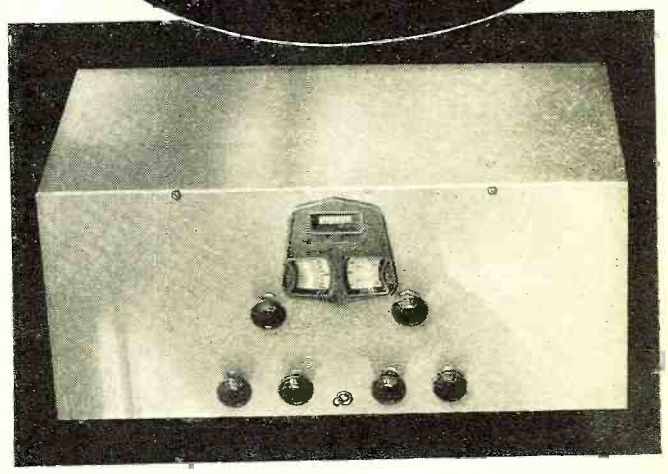

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Vol. XV
No. 12

RADIO NEWS

June, 1934

THIS MONTH—

Marine Radio

Short Waves

Time Tables

Service Data

Set Building

NEXT MONTH—

Vacationists: Watch for the July issue. It will shed light on the many ways radio can be used during summer holidays. Also automobile radio data.

For Servicemen: New measuring instruments, new methods of servicing. Don't miss them.

For Short-Wave and DX Fans: The DX Corners with their ever-growing interest. A new European station list. New world distance charts.

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Kendall Clough, Chief Engineer Clough-Brengle Co. (Radio Engineers and Manufacturers)
Karl Hassel, Chief Engineer, Zenith Radio Corporation,
Homer Hogan, Gen. Manager, Radio Station KYW, Chicago;
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DOTS and DASHES

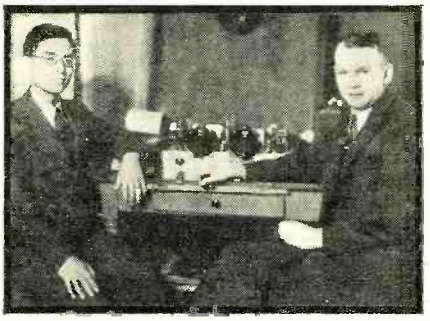
Short but Interesting Items from the Month's Radio News

Radio on Private Yachts

LOS ANGELES, CALIF.—Ben McGlashan, owner of the yacht *El Perrido* and also of station KGFJ, has recently installed a new short-wave transmitter aboard the craft. It was originally installed to pick up the Los Angeles harbor regatta events and to broadcast these to KHJ and KGFJ for rebroadcasting on their usual frequencies. Freeman Lang, Hollywood transcription producer and film premier master of ceremonies, has installed similar radio equipment aboard his power cruiser, the *Deirdre*, Victor Dalton, owner of KMTR, has equipped his yacht, the *Gloria D*, with similar apparatus, as has also Tay Garnett, film director. The movement is spreading to other Southern California boats, of which number many are owned by radio people, including Don Lee's *Melody*, Clarence Juneau's cruiser, and others. In the meantime station KUO, owned by the Southern California Telephone Company, is ready for operation as a land station for communication with private vessels. It will be possible not only for the craft to communicate with one another but also, through this land station and via the land wires, with any other part of the world through the regular telephone communication systems.

A Distinguished Radio Guest

STRUTHERS, O.—Johnny McAllister, a mail carrier with a hobby for short-wave radio, picked up a distant transmitter's signals—the station J1AA in Japan. Although he could hardly believe his ears, he wrote



to the station with a report on the reception. A few days ago, Hidewo Kikutani, chief engineer of the Japanese station, walked into his home and spent the evening with him trying out for distance. Mr. Kikutani is on a world tour as a good-will ambassador for radio for his country.

Big Ben Goes on Strike

LONDON—Big Ben, who recently was scheduled for a month's rest while being repaired, astonished Londoners (just before actually being taken out of service) by stopping of its own accord. The great bell ceased chiming and the clock stopped. It was out of operation for a quarter of a day until a policeman noticed it had stopped. Big Tom, the great bell in St. Paul's Cathedral, has been taking the place of Big Ben during the British Empire short-wave transmissions.

Radio News
June, 1934

MARINE RADIO

(The Editor To You)

We point out that radio now enters the marine field for pleasure craft. Can radio be successfully installed in your cruiser, sailboat, motor sportster, launch or canoe? Read this editorial and tell your boating neighbors, your radio dealer and serviceman, your boat club assistants to get a copy and read it too. It contains news and information of importance to all of them!

ALMOST 1,000,000 pleasure craft awaiting radio installations! These include motor craft of all sizes, sail boats and motor auxiliaries. And this is the first year in radio's history that the job can be done really well, without a large amount of hand-made changes in receiving set design and without a great deal of individual research into the proper antenna installation in each case. This is true because the problems of radio motor-boat installations follow closely in the path of the problems already solved in the motor-car radio installations. In fact, the job is made easier by the usually greater space to work involved in the motor boat than on the ordinary motor car.

Since the development of auto-radio sets that are self-contained and that work on a storage battery alone, the problem has been virtually solved for marine radio. RADIO NEWS takes this opportunity of bringing this new field to the attention of not only the dealers and servicemen who can do this job, but also to the manufacturer of suitable radio equipment now already on the market. At the same time, we are pointing out, to the individual owners of marine craft, as well as to boat yards and yacht clubs throughout the United States and foreign countries, that boats *can now be equipped with suitable radio apparatus for broadcast reception* at very little expense.

One article in this issue points out the general problems for installing radio equipment on marine pleasure craft of various sizes and types. Another article points out a method for harbor "paging," from a yacht club's dock or clubhouse, direct to the boats and their guests by means of a suitable Public-Address system. This same idea may be applied to the boats themselves, if the owner desires a means of talking to shore, successfully, without bursting the lungs with an old-time megaphone. Another article points out numerous types of radio apparatus both of the radio receiver and public-address designs as well as "power" loudspeakers for out-of-door use.

Servicemen and dealers located near waterways should immediately investigate these possibilities and should contact their local Yacht or Motor-boat clubs, Canoe clubs and Beach clubs as well as Boat-yards, in pushing this idea of installation of radio apparatus for marine use. There is a big opportunity here and at the same time practically no competition. And there surely is a great amount of misinformation or non-information about this field that they can clear up as no one else can. The Editor, in making a round of a number of these clubs, has found a large amount of enthusiasm on the part of boat owners to install such apparatus. But they are lacking in information and in some cases have been told that it could not be done satisfactorily. Get busy, you servicemen and dealers! Wade into (*Continued on page* 771)

PUT RADIO ON YOUR BOAT

Everett M. Walker

AT this season of the year the yachting enthusiast and boat owner is seriously asking these questions: "Is it possible to install a radio-receiving set on my boat?" "What are the problems involved?" With the advancing progress each year, the fields of practical radio application are consistently being widened, and so today, for the first time, there are radio sets available for every marine use.

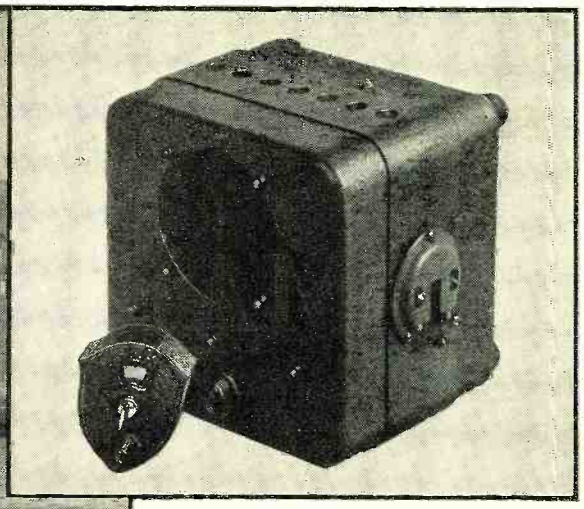
¶ Are you in a quandary as to what type of radio, if any, can be installed on your boat for making your summer vacation more enjoyable? This article tells you all about it

IN helping to decide what type of apparatus to use on boat, let us first consider the various classes of boats. And in order to solve the problems of installation of radio aboard boats it is a good plan to divide these classes into groups and explain the problems encountered and the methods of installation in each group.

Essentally, boats may be divided into six classes as follows: Class 1, small boats such as row-boats and outboard-powered craft; Class 2, inboard runabouts and speedsters; Class 3, motor cruisers; Class 4, auxiliaries; Class 5, straight sailing craft; Class 6, yachts of all types with large electric-power capacity.

Starting on these in the reverse order, Class No. 6, almost any type of radio receiving set may be installed on the larger yachts. Large cruisers of more than 45 or 50 feet in length are usually equipped with separate lighting units not directly connected with the engine. In many cases they are gasoline-electric powered units which supply current directly to the lighting mains from the output of an electric generator. These units are usually one of two types: one type generating 110 volts d.c. and the other 110 volts, 60 cycle, alternating current. In cases where 110 volts d.c. is supplied by the lighting system, any standard make of receiving set for use on direct-current lighting lines may be employed. Where 110 volts a.c. is in use, a standard type of receiver or one including both long- and short-wave reception from 110 volts a.c. may be used. On boats of this large class, the installation of an antenna follows the lines of standard marine practice. The antenna may be a single, double, triple or quadruple arrangement stretched between spreaders and installed between the two masts.

In the category of Class No. 5, straight sailing craft, the installation of radio will be the same as for the larger yachts if the sailing craft contains a 110-volt lighting circuit. Some of these craft, however, work with a 32-volt lighting system similar to those available for use on farms. These units consist of a bank of storage batteries and a charging unit working on a gasoline engine. The power available is ample for providing the radio receiving set, in addition to the normal function of providing power for lighting, operation of pumps and other auxiliary equipment. There are, at the present time, only a few receiving sets available for operating directly from 32-volt d.c. sources of power. However, equipment is available which makes it possible to convert this 32-volt d.c. source to 110 volts a.c. These units are termed "converters" or "motor-generators." They have a small d.c. motor, driving a 110-volt a.c. alternator, which (*Continued on page* 716)

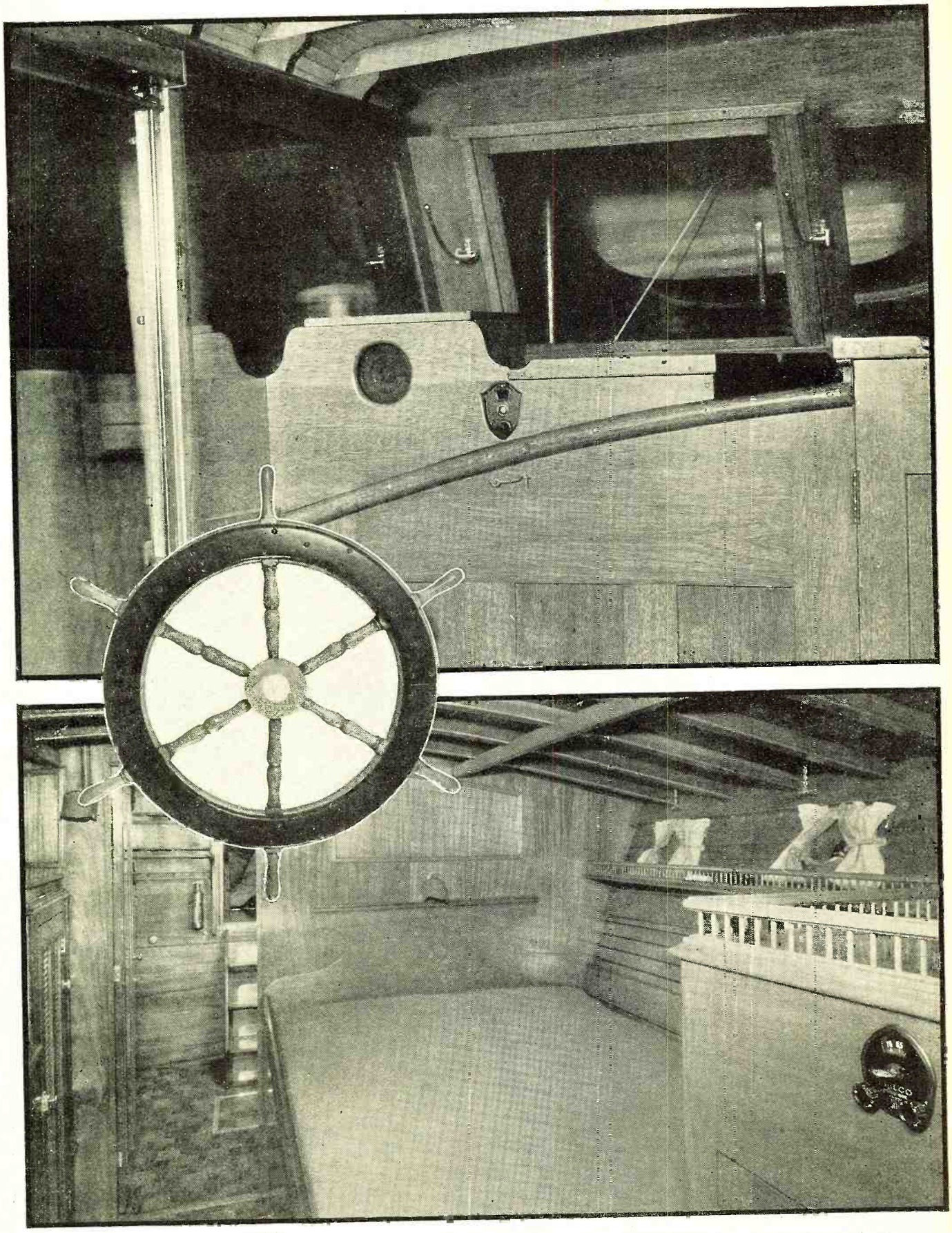


A COMPLETELY ENCLOSED UNIT

This is the type of self-contained auto-radio receiver which is being so successfully applied in marine pleasure boat installations. Photo on next page shows it installed

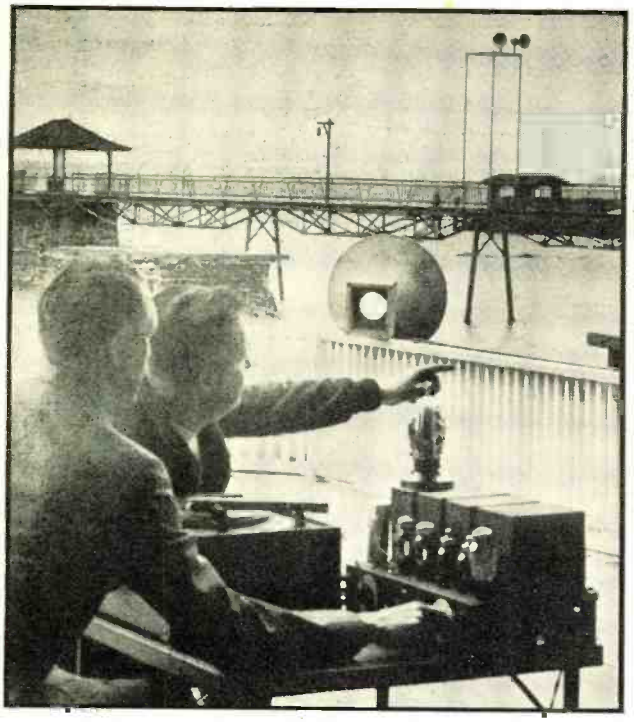
A MIDGET FOR YOUR CANOE

A midget radio receiver, with a tiny battery case, makes summer canoeing hours more enjoyable



TWO SHIP-SHAPE RADIO INSTALLATIONS

Unobtrusive, but handy and well planned, is the installation of an auto-radio receiver, shown at top, in the cabin of a staunch motor cruiser. Visible parts are the tuning-control panel and the loudspeaker unit. Below: a cozy cabin on the 42-foot motor yacht "Sis" showing another first-class installation. The tuning dial is visible, with the loudspeaker installed on the opposite side of the bulkhead, facing the stern of the cruiser and not visible here



PORTABLE P. A. FOR MARINE SPORTS

Public-address systems will be used on the waterfront to a greater extent this year than ever before, in Yacht Clubs, Boat Clubs, as well as Beach Clubs

furnishes enough power to operate a standard type of home receiving set.

Still another type of equipment that can be used on a boat such as this is the automobile-radio type of receiver. It can operate off of three cells (6 volts) of the storage battery and employs a wire-mesh antenna, similar to the standard automotive radio installations. Simple switching arrangements can be installed to change the particular cells in use at various times to prevent uneven drain on the complete bank of batteries.

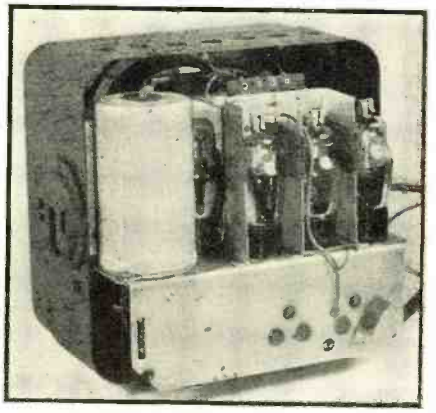
Sailing boats of this class can also use the midget type of battery receiver, with dry cells and small "B" batteries. Another type of set that can be used is the battery-operated type generally used on farms and in homes not equipped with any power source. Such sets use 2-volt tubes and operate either from dry cells of the bell-ringing type (for the filament) and large "B" batteries (for the plate supply) or they use the new "Air Cell" type of battery designed especially to operate the filaments of these 2-volt tubes. This Air Cell unit will supply more than enough power to operate a 6- or 8-tube receiver for about a year—at least over the yachting season. There is one precaution that should be taken wherever "B" batteries are used aboard a boat. These batteries are subject to deterioration when exposed to moisture and they should be kept in a metal box, closed at all times, with just the necessary wire leads coming out through closely fitting insulated bushings. "B" batteries for this latter type of set should be of a heavy duty type. Such batteries will last through the normal yachting season. They should be tested frequently with a voltmeter and when the 45-volt size runs down to 38 volts—it should be replaced. Batteries should not be allowed to remain aboard the boat for the winter season.

Where sailing craft are too small to allow the use of a second mast for the antenna, it may consist of a copper strip, nailed to the mast and run up vertically a number of feet, flush with the surface of the mast, with a lead-in running to the set close to the deck as shown in one of the drawings accompanying this article.

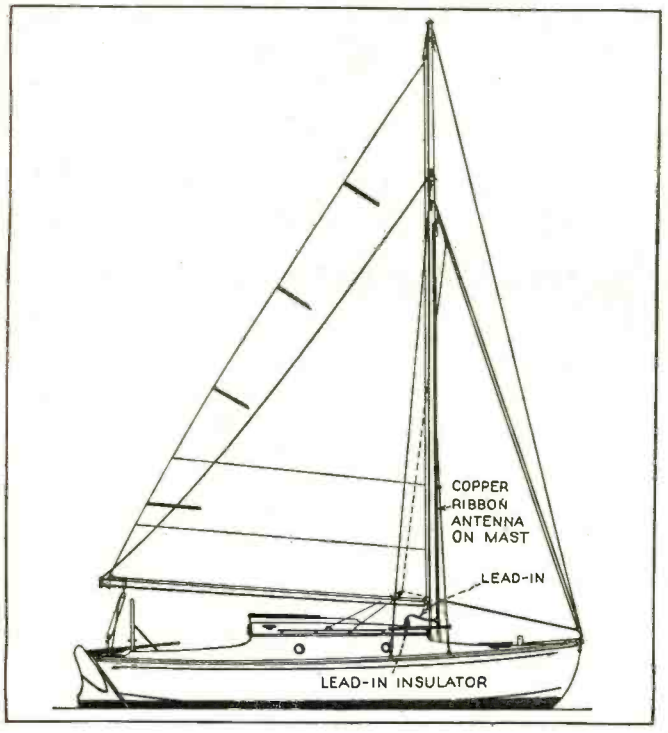
What has been said for straight sailing craft is usually true for auxiliary sailing vessels, Class No. 4, except that the problem of elimination of ignition noises from the motor must be taken into account. For this purpose, automobile-radio receivers are well suited and the self-B-powered, 6-volt storage-battery type will be found entirely suitable, with a wire-mesh antenna. The precautions for eliminating ignition noises are the same as for installation on a motor-car, and your local serviceman or dealer can do this job excellently. For either of

INTERIOR VIEW

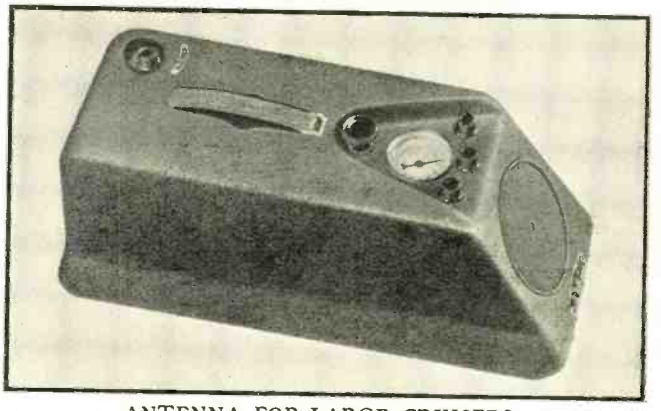
This shows the "insides" of an auto-radio suitable for marine installation



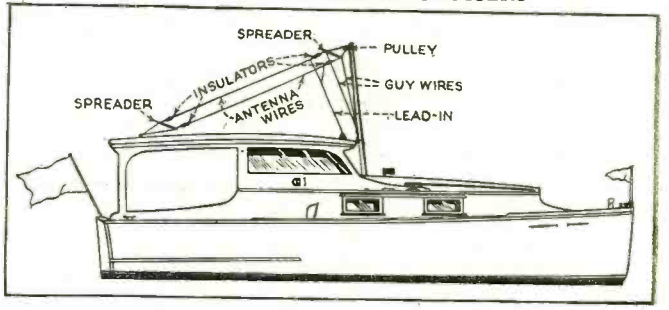
ANTENNA FOR SMALL SAIL BOATS



LATEST SELF-CONTAINED PORTABLE

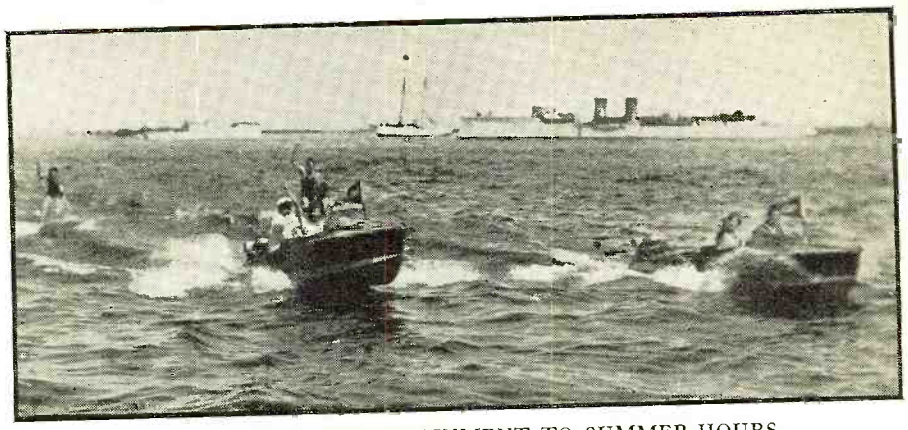


ANTENNA FOR LARGE CRUISERS



these two types of boats a copper plate, attached to the outer side hull and connected by a copper strip, will form an excellent ground. This method of "grounding" has been used for years on many small and large types of boats and is found to be one of the best. Its major advantage seems to be that it supplies an adequate ground connection and at the same time tends to further isolate the radio apparatus from the ignition system of the engine—and thereby adds to the quietness of reception. In cases where boats in this class have a separate 6-volt storage battery for supplying lights and where this battery is not connected to the engine for charging, the storage-battery type of set should not be used, as it might draw too much current from the battery and might leave the boatman to pilot his craft (on some bad night) without running lights, a condition both dangerous and illegal. However, most auxiliary motors of this type contain a charging generator and the battery is continuously being replenished so that this condition does not often hold true.

In Class No. 3, those of motor cruisers, there is often supplied a 32-volt lighting source of power. Installations for such use have already been described above. In most cases, however, there is also available a 6-volt storage battery which is either continuously being charged, or there are two sets of 6-volt batteries that are charged alternately. Automobile-radio type of receivers are also exceptionally well adapted for use in this type of pleasure craft. These sets have been designed especially to operate under conditions where interference from ignition is likely to be encountered. These sets are very carefully shielded and are furnished with suppressor systems for the motor ignition. Accompanying this article is a page of illustrations showing automobile-radio installations in two cabins of this type of craft. A wire-mesh antenna may be installed (preferably some distance away from the engine) either underneath the foredeck or under the cabin deck. Or in cases where a jury mast is available, one of the guy wires may be insulated at both ends and used for the antenna.



RADIO ADDS ENTERTAINMENT TO SUMMER HOURS

Imagine yourself speeding through cool waters, far away from thoughts of business, but still in touch with land through radio broadcasting.

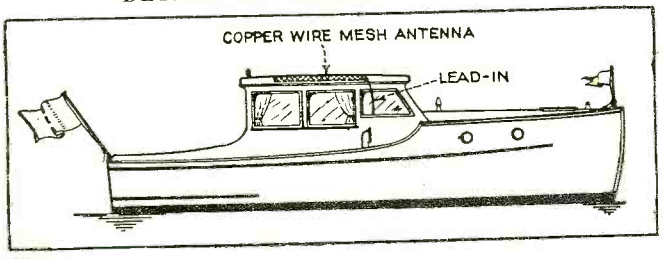
Some motor cruisers have space available for a regular antenna installation as shown in one of the accompanying drawings. A radio dealer or serviceman will be glad to make these installations for you. Or you can have it done through these same agencies connected at your local boat yards or boat clubs.

In Class No. 2, inboard runabouts and speedsters, the automobile-radio type of set is again exceptionally well suited. These speed boats and launches are usually designed, as far as controls, engines and other facilities are concerned, along the same lines as modern automobiles. Therefore the same installation rules apply. Sets may be installed on the dashboard with the control unit on the steering-wheel shaft. The mesh-type antenna is installed under the cowl or stretched on both sides of the bow, on the ribs, as shown in one of the drawings. It is always desirable to keep the antenna as far away as possible from the engine, to avoid ignition interference. This is not such a large problem as at first may be thought, as the experience gained by radio servicemen and dealers in installing similar equipment in much smaller space available on the (*Continued on page* 770)

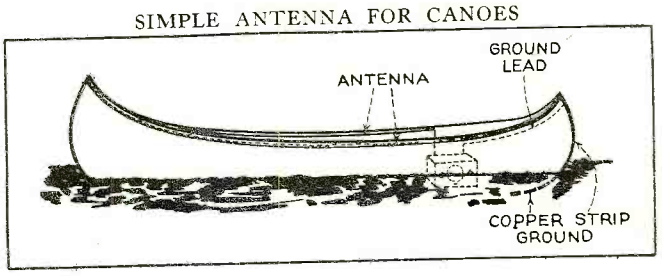
"ALL WAVES" FOR LARGE YACHTS

Phillips Lord, famous radio personality, and a modern all-wave receiver accompanying him during the two-year world cruise of the Seth Parker expedition

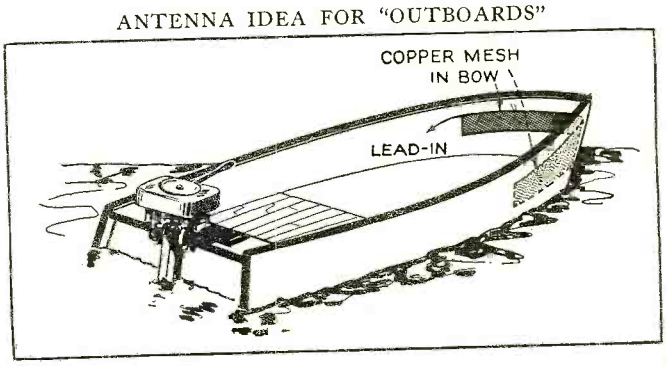
DETAILS OF WIRE-MESH ANTENNA



SIMPLE ANTENNA FOR CANOES



ANTENNA IDEA FOR "OUTBOARDS"



BRING YOUR YACHT CLUB AND BOAT *UP-TO-DATE* *with* MARINE RADIO

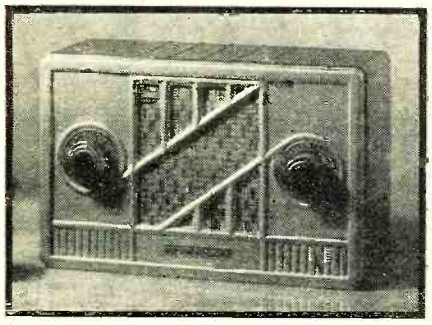
Hard-to-get information on suitable radio equipment for marine installations —information obtainable through no other single agency. For further details see your local dealer or your serviceman

ADDS TO SUMMER PLEASURE

A radio installation on a boat helps to make those pleasant holiday hours even more enjoyable

Battery Receiver for Small Craft

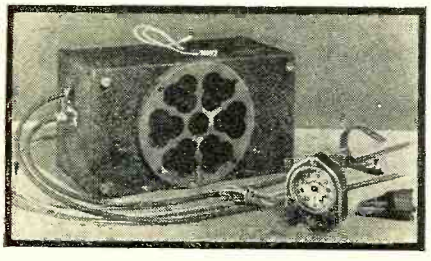
Motorboat fans will welcome the new General Electric three-tube model C-30 table type battery-operated receiver. The battery requirements are a 6-volt storage battery and three 45-volt B blocks. It is



designed for extremely low current drain, employs a five-inch magnetic type speaker and the tube equipment consists of one –78, one –77 and one –38 type tubes. The metal cabinet measures 9¾ inches wide by 6¾ inches high by 5⅛ inches deep.

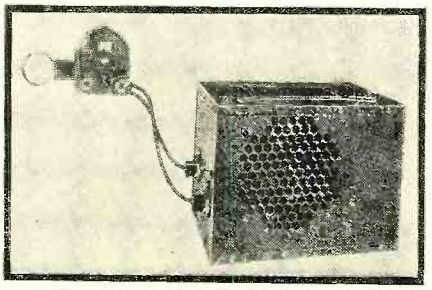
Compact Six-Tube Receiver

Marine radio enthusiasts will be interested in the new Atwater-Kent model 666 six-tube motor-car superheterodyne set employing the new type tubes and incorporating the latest developments, which include single-unit construction, automatic volume control, special noise filter and a local-distance switch. The receiver comes complete with ignition noise suppressors. The set employs two type 6D6 tubes for the tuned r.f. stage and intermediate-frequency amplifier, one type 6A7 for the combined oscillator and first detector; one type –85 for combined second detector, automatic volume control and first audio; a type –41 tube for the power stage and the type –84 for rectification.



Five-Tube Superheterodyne

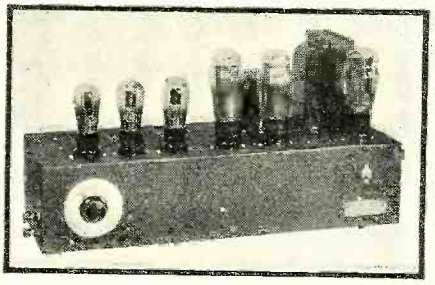
The new Crosley Roamio model 103 motor-car set with single-unit construction, simplicity of installation and ease of tuning should find wide application for marine



radio. The receiver chassis, power supply and speaker are all enclosed in the one metal cabinet which measures 10½ inches by 7¾ inches by 7½ inches. The features of this set include the new synchronode B eliminator, automatic volume control, tone control and a six-inch dynamic type speaker. The tube equipment comprises one –78 as a radio-frequency amplifier, one –78 for the combined oscillator and first detector, one 6B7 as a combined intermediate-frequency amplifier and second detector, one –78 audio-frequency amplifier and one –41 power output tube.

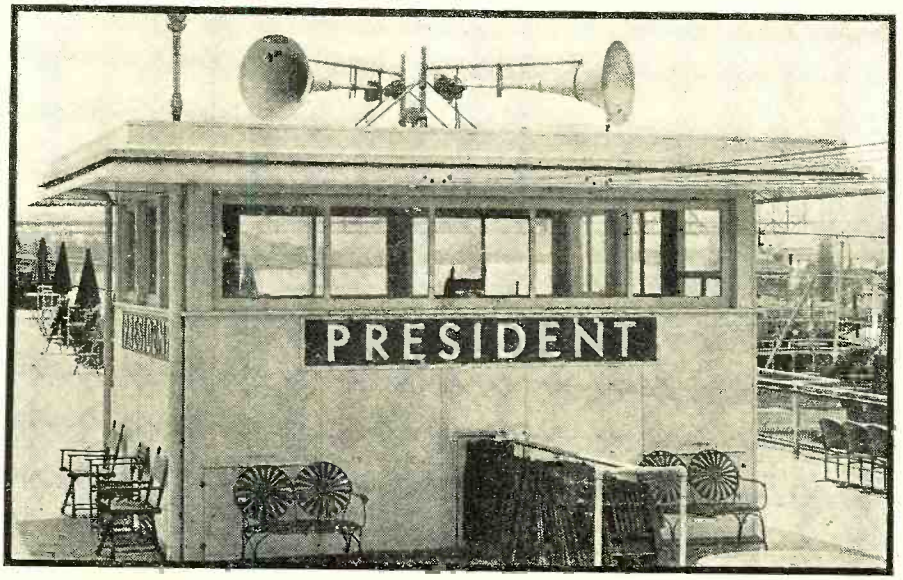
Compact P. A. System

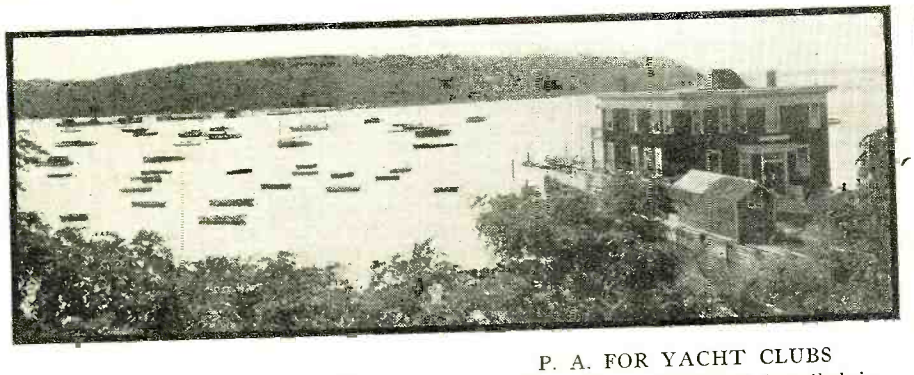
The Gates model 550-B sound-reproducing system illustrated below is suitable

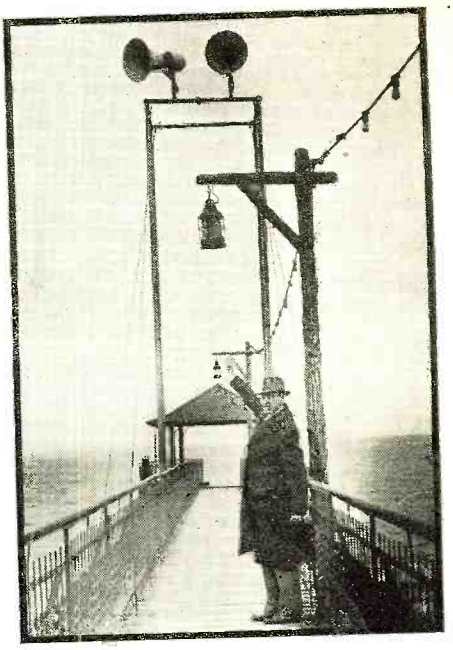


A MARINE PUBLIC ADDRESS INSTALLATION

A powerful public address equipment installed on the S. S. President can be used for dancing and deck and also for communication while docking. Powerful Bud trumpets and units are mounted on the pilot house







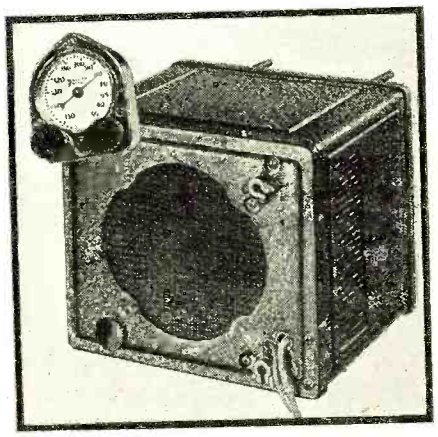
P. A. FOR YACHT CLUBS

Public address equipment installed in yacht clubs makes communication between boats in the harbor and the main office an easy thing for paging and for messages. Upper photograph shows a typical yacht club, while photo at right shows the loudspeaker mounted on a tall frame on the dock

for installations in boat clubs. The tube equipment comprises three –56's, two 2A3's and a 5Z3 type rectifier. It employs a Class A amplifier circuit designed to provide 15 watts power output. The output transformer has impedances of 8, 16 and 500 ohms to match both dynamic and magnetic type speakers. The dimensions of the chassis are 7 inches wide by 9 inches high by 19 inches long.

New Single-Unit Receiver

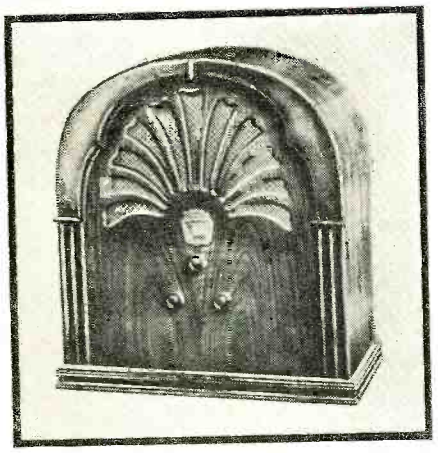
The illustration below covers the attractive new Zenith compact six-tube auto set



which is particularly suitable for installation in cabin cruisers, launches and yachts. The set is equipped with all the latest developments and the tuning unit has the new airplane type of dial. The following type tubes are used: one 6F7, two 6D7's, one –42, one –75 and one 6Z4 rectifier.

Midget Receiver

The new Wholesale Lafayette model B59 six-tube superheterodyne, battery-operated, table-type receiver meets marine radio requirements for sailboats and other craft without any source of power supply. The circuit utilizes the following type tubes:



two –34's, one –30, one –32, one –19 and one type 6AA filament ballast tube. For the filament voltage, the receiver can use either a storage battery, dry cell or an Eveready Air Cell. The remaining batteries required for its operation are three 45-volt B blocks and a single 22½-volt C battery. It is designed for low current drain.

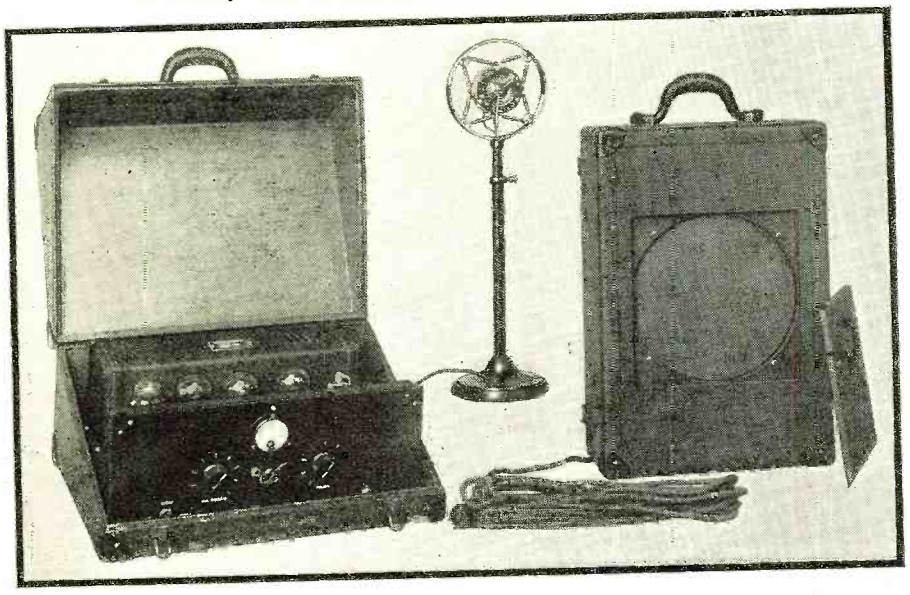
Powerful Sound System Suitable for Boat Clubs

This new Federated Acratone model 418, 100-watt public-address system is an ex-

cellent sound system for use in boat clubs, large yachts and wherever a high-gain reproducing system is required for marine or other installation. It will be noted at once that, for a powerful amplifier it is extremely compact, measuring only 17 inches by 12 inches by 11½ inches. The shipping weight is 65 pounds. Push-pull amplification is employed throughout. Two type –57's are used in the first stage, followed by two type 2A3's, and the last stage employs the new RK-18's. The type –80 rectifier is utilized in supplying the operating voltages to the –57's and the 2A3's and a new type rectifier, the RK-19 provides the rectified direct current to the RK-18's. The gain of the amplifier is 78 db.

PORTABLE P. A. FOR BOATS AND CLUBS

This is a powerful Webster portable type HB59, Class B, public address system in its entirety ready to be placed in instant action on land or sea

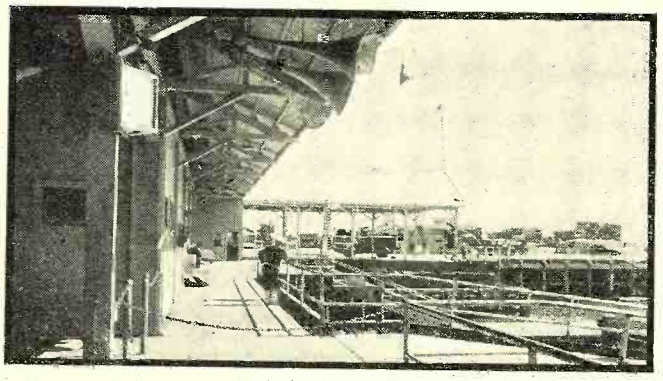


Multi-Wave Midget Receiver

Description—The Radio City Labs. new model W eight-tube multi-wave superheterodyne receiver is illustrated below. It has a wavelength range from 13 to 2500 meters and is equipped with automatic volume control, tone control and an illuminated vernier dial using different colors to designate the five different wavebands covered. The tube equipment comprises one –37, two –42's, three –78's, one –85 and one –80 type rectifier. The cabinet measures 16 inches high by 15 inches wide

SHORT WAVES "ON BOARD"

A short-wave installation installed on a large yacht sailing around the world



NAVY USES P. A. FOR PAGING

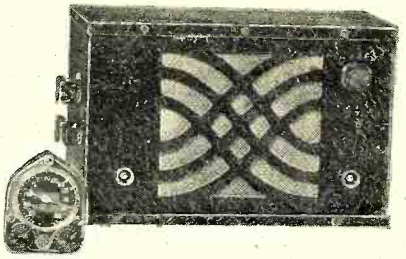
A view of the high-powered horns installed at the Navy landing docks at Long Beach, Calif.

by 8½ inches deep and the total weight packed for shipment is 27 pounds. The

set is adaptable to 25-cycle and 220-volt a.c. supply.

6-Tube Receiver with 4 Watts Output

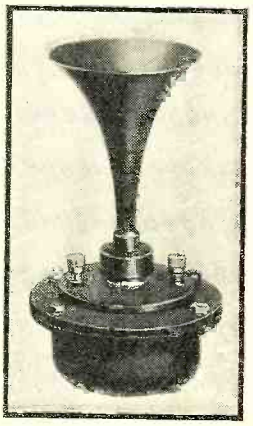
Announcement is made of the new Federated Acratone model 92 superheterodyne car set which is equally well suited for installation in cabin cruisers and yachts. It is equipped with airplane type tuning dial, automatic volume control, tone control and six-inch dynamic type speaker. The receiver, power-supply and speaker are housed in one compact metal case. The receiver circuit takes advantage of the latest type tubes utilizing one 6D6 as a radio-frequency pentode, one 6D6 as a combined oscillator and first detector and one 6D6 in the intermediate-frequency stage, one 6B7 as a combined diode detector and first a.f. amplifier and one –41 for the power output stage. The type –84 is used for rectification. No B or C bat-



teries are required. It is only necessary to make two connections to the storage A battery and the set is ready for operation.

High-Frequency Loudspeaker

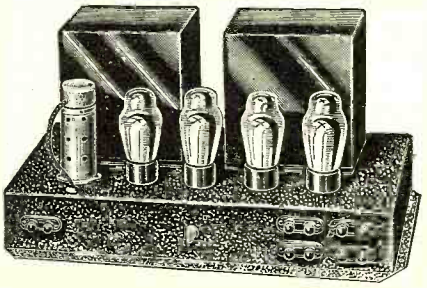
Description—The new Racon electrodynamic high-frequency reproducer is de-



signed to cover the frequency band from 3000 to 12,000 cycles. Special units are available for reproduction up to 18,000 cycles and the manufacturer advises that a special type of unit is made for radio receiver manufacturers that will produce the full range of broadcast transmission without overlapping into the noise area encountered at the higher audio frequencies. The loudspeaker may be coupled in the output circuit in several different ways. Where a separate winding is provided to match the voice coil impedance of 15 ohms, only a blocking condenser is required. Where special acoustic conditions are to be met, a dual path filter network is available. The speaker is made for either 6- or 110-volt field supply and the voice-coil impedance is 15 ohms. The complete weight is 3 pounds and the overall height is 6¾ inches. The bell of the horn measures 3 inches.

28-Watt Class B Amplifier

Boat clubs requiring a high-power sound system for reproduction of music and announcements will read with interest of this



new Wholesale "Lafayette" five-tube 28-watt Class B amplifier. It has a gain of

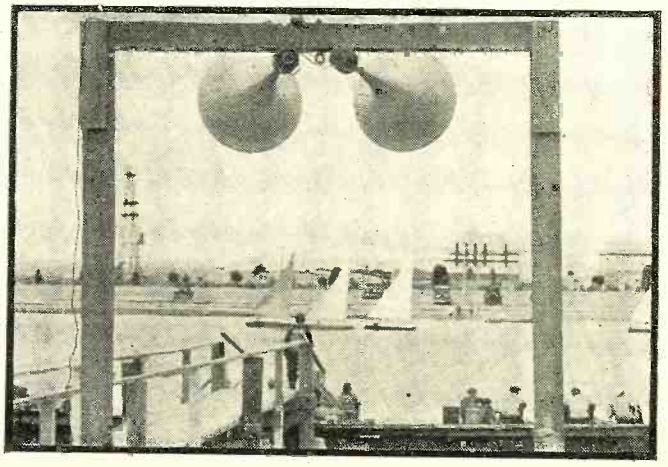
(*Continued on page 751*)

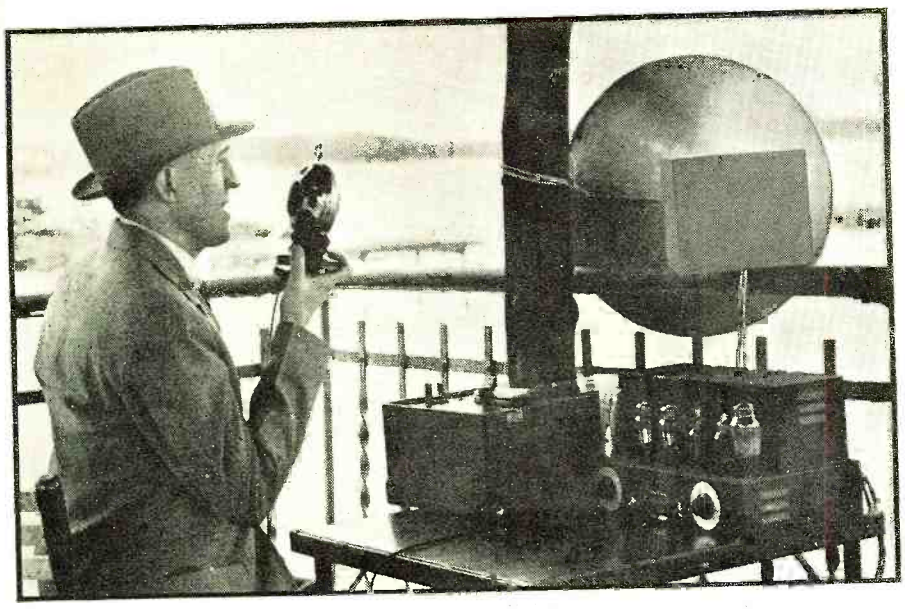
"PORTABLE" GOOD ANYWHERE

This is the new RCA Portette that can be used afloat or ashore

INTERNATIONAL RACES

This shows a loudspeaker installation at the International cruise races at Long Beach, California, installed on the official dock before the starting line. Racon "storm-proofs" were used





A PORTABLE P. A. *for* YACHT CLUBS

(A. C. or Battery Supply)

Leon J. Littmann

THE demand for dual-powered public-address systems has been increasing ever since its inception about 18 months ago. In this intervening time there have been many new developments in tube design, power equipment, etc., which can be advantageously employed for producing dual sound systems to provide greater power, more compact design, reduced battery drain on d.c. operation, more economical operation and better quality.

In the past the major objectionable features in portable battery-operated P.A. systems has been high current drain, low power output, no provisions for a.c. operation and, in dual-powered systems, when the amplifier worked on 6-volt power supply there were objections to noisy and unstable operation.

In the 6-tube, 13-watt universal amplifier described in this article, which operates from either 110-volt, 60-cycle a.c. or a 6-volt storage battery, the above defects have been eliminated and many improvements and developments incorporated to recommend it to the sound engineer, serviceman and radio dealer.

In the first place, both the 6-volt and the 110-volt, 60-cycle a.c. supplies are installed and mounted on the same chassis as the amplifier. The chassis, measuring 18½ inches long by 10 inches wide by 9¾ inches high, is of portable size and could be easily transported in a carrying case.

The 6-volt power supply used in this amplifier is the new RCA-Victor vibrator type converter-rectifier consuming only about one-half the battery current previously required for a 6-volt battery supply of this type. The new vibrator rectifier is noiseless and does not radiate any electrical interference. Farther on in the article the remaining features and the operation of this power device will be discussed.

For optional operation on either 6- or 110-volt operation it is only a matter of inserting the amplifier connector plug (ACP) into the socket on which the amplifier is to work. Socket VT7 is the output of the 110-volt supply and socket VT8 delivers all voltages as required under battery operation. Using this design and type of construction, there are no tubes to change or remove, and no alterations are necessary in the circuit.

Phase inverters, resistance push-pull coupling and of push-pull driver circuits in the amplifier make it possible to obtain enjoyable quality from Class B tubes. The –79 and the –53 twin-triode amplifier tubes utilized contain two high-mu triodes combined in one glass envelope.

The amplifier is equipped with a tone control R15, a pilot light, switches for both power supplies and terminal connections to the input grid circuit and to the plate output of the power tubes. The output transformer provides proper impedance-matching for single or multiple dynamic type speakers. Figure 3 provides information on multiple speaker connections.

For field excitation of the dynamic speakers, either one of two methods are suggested; one way is to employ 6-volt field speakers exclusively and for their field current use a storage battery or a 6-volt exciter operating from 110-volt a.c. power line. The second method is to use dual-field speakers; that is, one of the field windings could work from a storage battery and the other field could operate from the power pack of the amplifier.

When the amplifier is operated from 110-volt line supply there are provisions for providing field excitation for two 1000-ohm, 110 ma. speakers. Excitation can be supplied to four 1000-ohm, 60-ma. speakers by connecting the field windings in a series parallel arrangement. *(Continued on next page)*

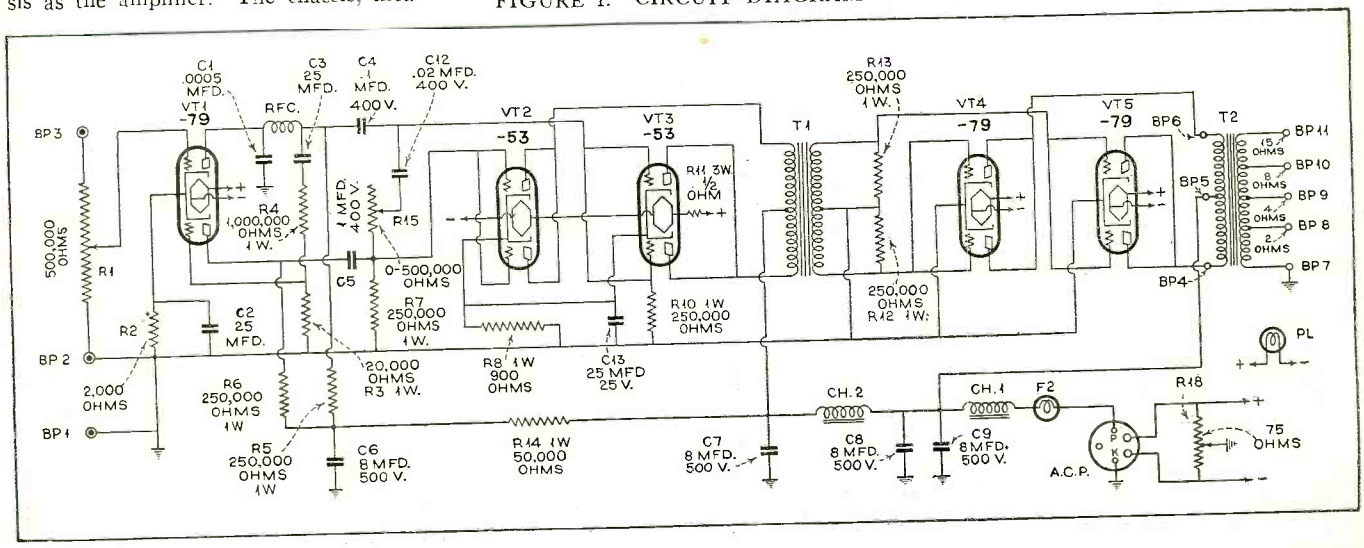


FIGURE 1. CIRCUIT DIAGRAM

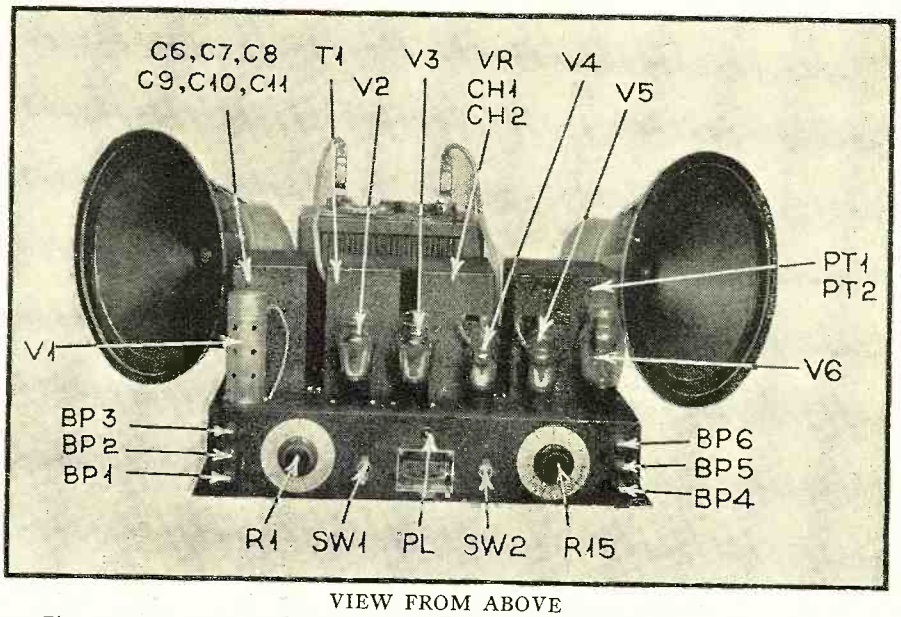
Perhaps the outstanding development of this sound system is its efficient operation from a 6-volt storage battery. As previously stated, this is made possible by the use of the RCA-Victor vibrator type converter-rectifier. This unit transforms the 6-volt d.c. battery source into 6 volts a.c. which is impressed on the primary of the step-up power transformer PT1. The secondary of this transformer delivers approximately 295 volts a.c. to the rectifier of the device and its output is 275 volts at 75 ma. It is an extremely compact unit, measuring 4½ inches long with a diameter of 2½ inches. The total weight for the entire device, including the transformer PT1, is 7 pounds. With this high output voltage and current the same power output of 13 watts is obtainable on 6-volt operation as on a.c. operation.

The vibrator rectifier is housed within two metal and felt-lined shields providing quiet operation and preventing interference with the other circuits.

The average power consumed from the battery is only 6½ amperes. A vital advantage in a power amplifier using this type of supply when installed in an automobile is that it will not impose a burdensome drain on the car's storage battery for the simple reason that the car generator should have no difficulty in charging back the 6½ amperes required for the P.A. system. This means that for car installation there should be no necessity for removing the battery for overnight boosting.

The illustration at the head of the article shows the equipment as installed in a yacht club on Long Island Sound. The P.A. system in this installation was operating from 110-volt, 60-cycle line supply. By referring to the photograph, it will be seen that the new Astatic crystal phonograph pick-up was employed. This unit is of high impedance and is connected directly to the input grid circuit of the amplifier. The operator is using a Universal microphone and the Racon stormproof horn is shown to the right of the installation.

This compact, high-powered dual amplifying system opens up a new and profitable field, for temporary or permanent installation in boat clubs, steamships, auditoriums, sound trucks, etc.



VIEW FROM ABOVE

Figure 4. The completed amplifier shown with storage battery and dual speakers

The Circuit

Referring to the circuit diagram, Figure 1, the input posts BP2 and BP3 are connected directly through a 500,000-ohm potentiometer R1 to the first grid G1 of the –79 type tube, VT1. This tube is employed as a phase inverter, which means that part of its audio-frequency output is fed through a blocking condenser, C3, and a series resistor, R4, to the second grid, G2, of the same tube. This makes the output of the second plate, P2, 180 degrees out of phase with respect to the output in the first plate, P1.

The two plates of the two triodes of this first –79 are coupled through two condensers, C4 and C5, to the grids, G3 and G4, of the two –53 tubes which are employed as triodes in resistance-coupled push-pull operation. The grids of these tubes are alternately excited by two voltages 180 degrees out of phase.

To obtain perfectly balanced push-pull operation, the value of the grid resistor R3 is so chosen that the voltages impressed upon the grids G3 and G4 are identical in magnitude. A large by-pass condenser, C2, is placed across their common cathode to prevent regeneration and motorboating.

Both –53 tubes are used as triodes, in which plates and grids of each tube are placed in parallel. Being in push-pull, their plates are connected to a push-push input driver transformer, T1. Ths transformer has a step-down ratio of 5 to 1, which is required to obtain best results and to match the plate impedance of the driver tubes.

The use of this push-pull driver arrangement has the advantage not only of providing more and better driving power, but also of eliminating the distortion usually introduced by the saturation effect caused in medum size transformers by the unidirectional flow of the plate current in single-tube driver transformers. In the push-pull driver arrangement as employed here, the d.c. plate current flows through the primary windings of the transformer in opposite direction and thereby cancels and eliminates the distortion due to that saturation effect.

Grid resistors R12 and R13 are placed across the secondary winding of the transformer (*Continued on page* 751)

FIGURE 2. THE POWER SUPPLY CIRCUIT

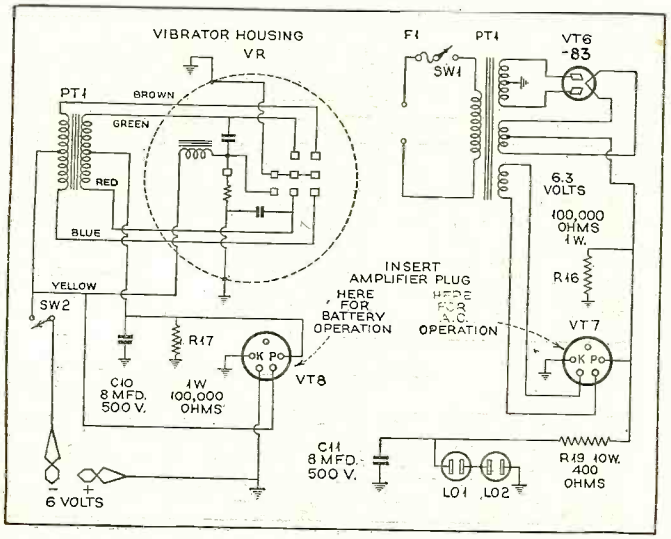
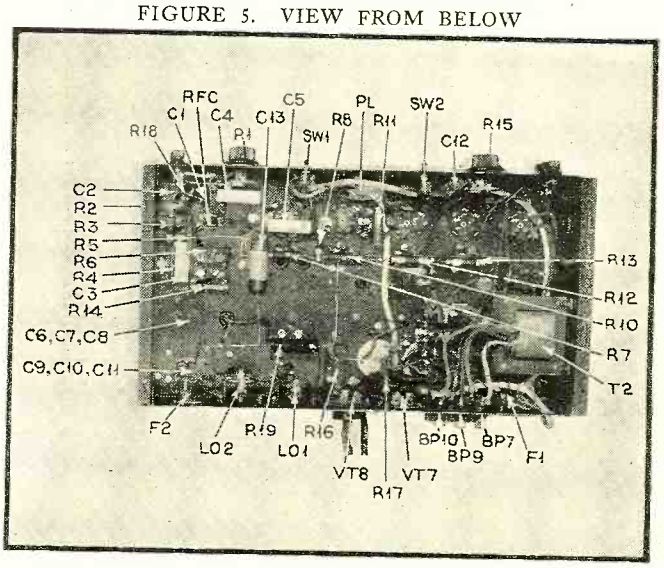
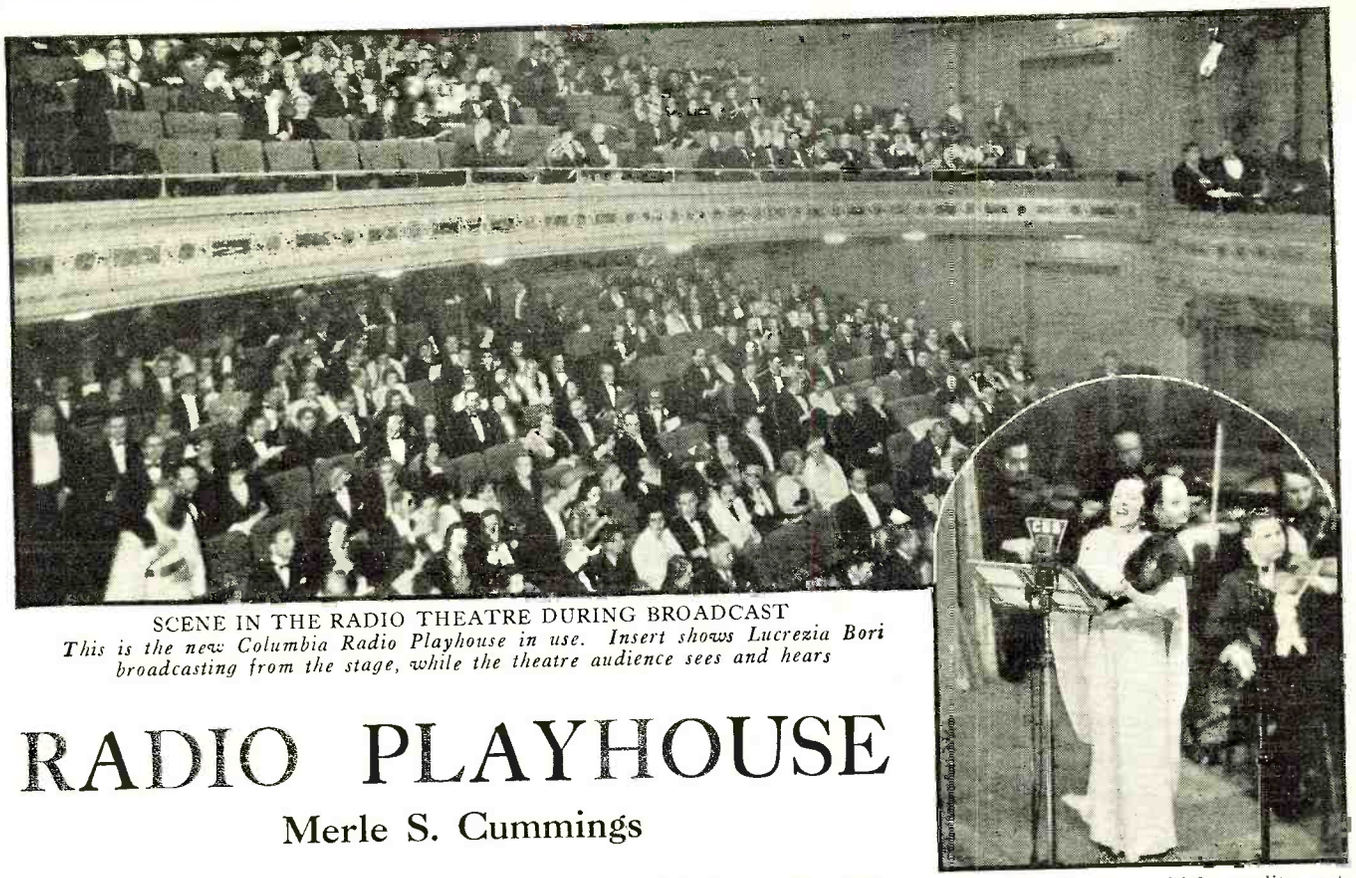


FIGURE 5. VIEW FROM BELOW





SCENE IN THE RADIO THEATRE DURING BROADCAST
This is the new Columbia Radio Playhouse in use. Insert shows Lucrezia Bori broadcasting from the stage, while the theatre audience sees and hears

RADIO PLAYHOUSE

Merle S. Cummings

ALTHOUGH there has been much argument of late over the value of large audiences at broadcast entertainments, the two major networks are continuing to provide elaborate facilities for the attendance of massed onlookers at featured radio programs. The Auditorium Studio of Radio City accommodates about 1500 guests, while the other New York NBC broadcasting chambers also have facilities for large numbers of onlookers. The Columbia Broadcasting System, long feeling the need for its own auditorium type studio, has solved the problem by leasing a famous Broadway theatre—the Hudson—and converting it into a modern broadcasting chamber permitting the presence of 1100 onlookers at each broadcast. With the acquisition of the theatre, the auditorium was renamed the Columbia Radio Playhouse.

William S. Paley, CBS president, gave two reasons for the acquisition of the theatre by the network. One is his recognition of the *growing participation of the stage in some of the finest radio entertainment*, and the second is the *growing eagerness on the part of the public to witness broadcasting operations* with their rapid and interesting technical developments.

CBS engineers had to work fast to complete the transformation of the theatre into a broadcasting studio. The entire reconstruction was completed in less than two weeks in order to have everything in readiness for the gala inaugural program.

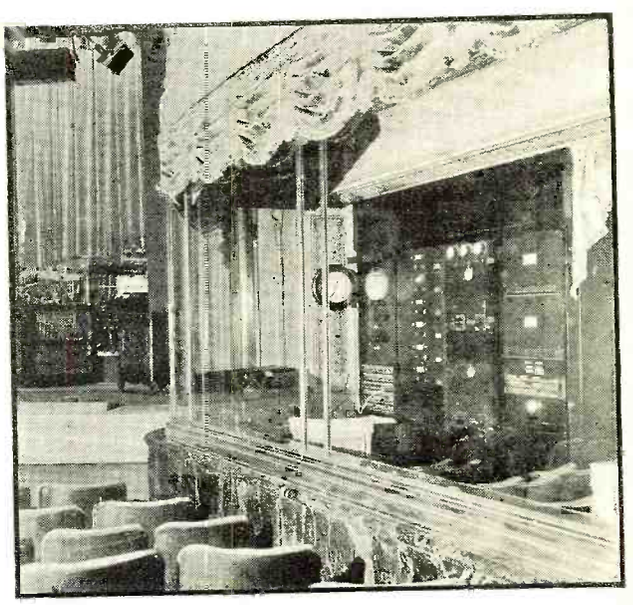
The theatre was selected by CBS after a close study of its acoustic properties. It was explained that the acoustics were so good that virtually no additional treatment was necessary to alter the sound measurements of the auditorium.

One of the chief changes the radio playhouse required was the installation of a control room. Believing that visitors would be just as anxious to see the technical side of broadcasting as the studio side, CBS executives decided to place the control room in full view of the audience. At the same time, the selected site had to fulfill every requirement of a *point of control,* possessing clear vision of the stage and the auditorium. After considerable deliberation, the engineers selected the right-hand stage box for this purpose.

The entire box was walled in with double plate glass. This arrangement permitted the control men to observe all studio activity while hearing the sounds reproduced by loudspeakers. The left-hand stage box was similarly enclosed in glass and converted into a "commercial" room to accommodate clients and their representatives who desire to watch the studio proceedings but, at the same time, wish to hear the program over loudspeakers exactly as it would sound over the air on a high quality set.

The auditorium was equipped with the most modern wide-band, high-fidelity transmission apparatus. Velocity microphones are utilized for most studio pick-ups. Parabolic microphones supplement the ribbon type devices. The loudspeakers in the auditorium are of the "double-coil dynamic" type also used in the NBC Radio City studios.

Edwin K. Cohan, technical director of CBS, explained that the Columbia Radio Playhouse equipment represented the greatest advance to date in wide-band, high-fidelity pick-up and reproduction. "Whereas," he explained, equipment used heretofore was limited largely to the transmission of those frequencies lying between (*Continued on page* 751)



THE AUTOMATIC THEATRE GOER
This is the glassed-in box at the right-hand side of the Radio Playhouse stage, showing the control and monitoring apparatus in this new kind of theatre

PIONEERS

Official RADIO NEWS Listening Post Observers

LISTED below by States are the Official RADIO NEWS Short-Wave Listening Post Observers who are serving conscientiously in logging stations for the DX Corner.

In the United States of America:

Alabama, J. E. Brooks; **California,** E. G. DeHaven, C. H. Canning, E. S. Allen, A. E. Berger; **Colorado,** Wm. J. Vette, F. Erich Bruhn; **Florida,** E. M. Law, James F. Dechert; **Georgia,** James L. Davis, S. H. Armstrong; **Illinois,** Philip Simmons, E. Bergeman, Robert L. Weber; **Indiana;** Freeman C. Balph, J. R. Flannigan; **Iowa,** J. Harold Lindblom; **Kansas,** C. W. Bourne; **Kentucky,** Wm. A. McAlister, George Krebs; **Maine,** R. I. Keeler; **Maryland,** Howard Adams, Jr., James W. Smith; **Massachusetts,** Armand A. Boussy, J. Walter Bunnell, Harold K. Miller, Donald Smith, Elmer F. Orne, Arthur Hamilton, Roy Sanders; **Minnesota,** Dr. G. W. Twomey; **Mississippi,** Dr. J. P. Watson; **Missouri,** C. H. Long; **Nebraska,** P. H. Clute, G. W. Renish, Jr., Harold Hansen; **New Hampshire,** P. C. Atwood, A. J. Mannix; **New Jersey,** William Dixon, R. H. Schiller, William F. Buhl; **New York,** R. Wright, I. H. Kattell, Donald E. Bame, Albert J. Leonhardt; **Nevada,** Don H. Townsend, Jr.; **North Carolina,** H. O. Murdoch, Jr., W. C. Couch, E. Payson Mallard; **Ohio,** Oker Radio & Electric Shop, R. W. Evans, C. H. Skatzes, Donald W. Shields; **Oklahoma,** H. L. Pribble, Robert Woods; **Pennsylvania,** Edward C. Lips, K. A. Staats, C. T. Sheaks, George Lilley, John A. Leininger, F. L. Stitzinger; **Tennessee,** Charles D. Moss, Adrian Smith; **Texas,** Heinie Johnson; **Utah,** Harold D. Nordeen; **Vermont,** Joseph M. Keeley, Eddie H. Davenport; **Virginia,** Gordon L. Rich, G. Hampton Allison, D. W. Parsons; **Washington,** A. D. Golden, Glenn E. Dubbe, Chas. G. Payne; **West Virginia,** Kenneth Boord, R. E. Sumner; **Wisconsin,** Willard M. Hardell, Walter A. Jasiorkowski.

Applications for Official Observers in the remaining States should be sent in immediately to the DX Corner. Listeners outside of the United States who feel that they would like to serve in this capacity are also requested to file their applications as soon as possible before final appointments are made.

S. W. TIME SCHEDULE

LAURENCE M. COCKADAY

IN this fifteenth installment of the new DX Corner we find the leading feature, entitled "World Short-Wave Time Table," in which are listed the Month's International Short-Wave Best Bets. This Time Table contains a list of short-wave stations logged during the last month in the RADIO NEWS' Westchester Listening Post. Another feature is seen below, entitled "Short-Wave Sure-Shots." It lists (for American listeners) a number of short-wave stations easily received and indicates the time of their best transmissions, both a.m. and p.m. Wavelengths and frequencies for these calls are shown in the station location list.

Reception Conditions This Month

The recent month has given us some excellent reception, as we forecast in the last month's issue. The 19- and 25-meter bands are coming in with tremendous volume from all over the world, during the mornings. The 31-meter band and some of the intermediate wavelengths have also been excellent, from noon on. The 49-meter band has been good only during the evening hours, but it, too, has been exceptionally strong at that time. Next month we look for even greater improvements on the shorter waves and the great distances that they can bring in to our waiting receivers.

Outstanding Short-Wave Reception Features

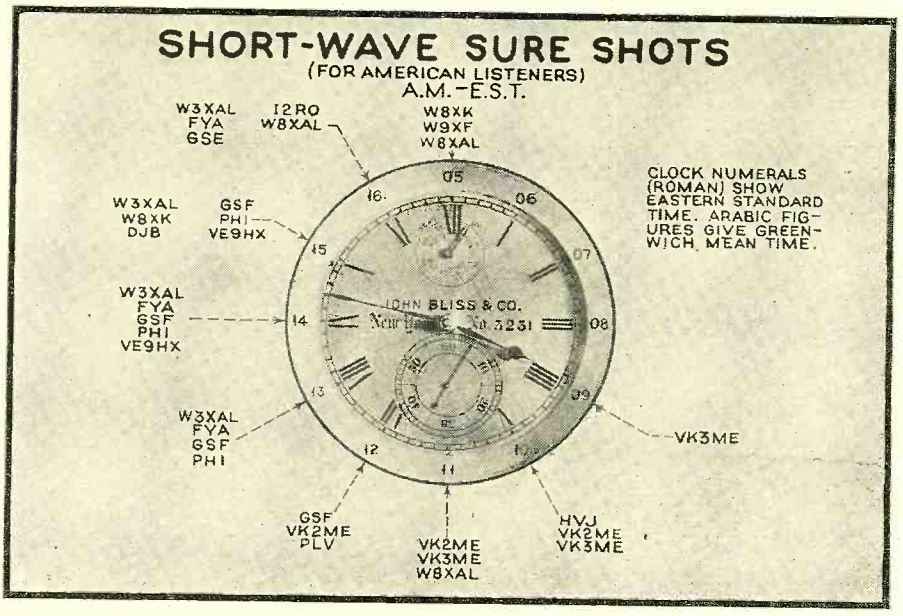
The Byrd broadcasts and rebroadcasts from KFZ, LSX, as well as the replies from W6XI, WQN and W2XBJ, have made mighty interesting listening. Also a number of new Japanese test stations have been broadcasting programs and have been reported by our West Coast and Middle West listeners. The rebroadcasts of I2RO by IRW and IRM have also been interesting listening.

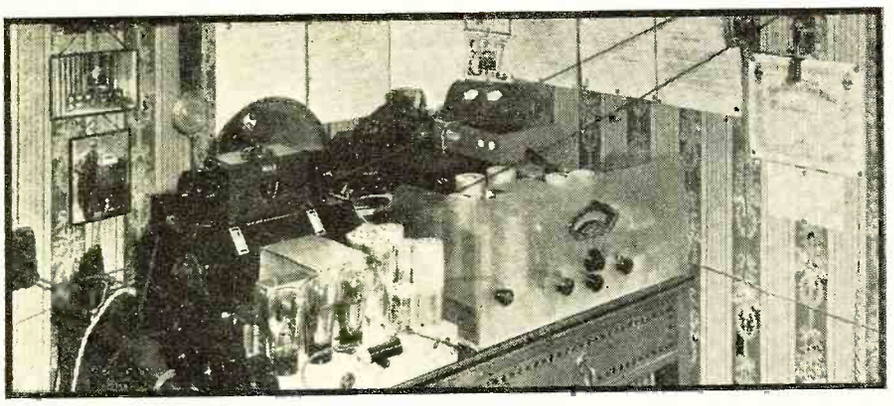
British Empire Transmissions

An official communication from the British Broadcasting Company states that the Empire transmissions will be as shown in this month's Short-Wave Time-Table with the following alternatives: GSC or GSA may be substituted for GSB, GSE may be substituted for GSD, or vice versa.

YV3BC Transmissions

An official communication from station YV3BC at Caracas, Venezuela, gives the following information: The name of the station is Radiodifurosa Venezuela, YV3BC. They transmit daily from 10:40 a.m. to 1:10 p.m., E.S.T., and from 4:40 p.m. to 10:10 p.m., E.S.T., on 6150 kc. On Sundays they have special broadcasts from 9:25 to 10:10 p.m., E.S.T., and broadcast lottery games from 1:25 p.m. to 3:40 p.m., E.S.T., and from 6:40 p.m. to 9:40 p.m.,





OUR SHORT-WAVE LISTENING POST FOR SWITZERLAND

This is the Swiss-Transatlantic test receiving station of Official S.W. RADIO NEWS *Observer Dr. Max Hausdorff, located at Lugano-Viganello, Switzerland. Dr. Hausdorff utilizes a double super using screen-grid variable-mu and push-pull pentode*

E.S.T. On Tuesdays and Thursdays they broadcast a lottery game at this latter time. The early Sunday morning program is a broadcast of the baseball games or programs for dancing.

Moscow Transmissions

A report from Radio Center, Moscow, reports the following broadcast schedules: Sundays, Mondays, Wednesdays and Fridays from 21 to 23 G.M.T. on a wavelength of 50 meters. On Sundays from 11 to 12 G.M.T. on a wavelength of 25 meters and from 20 to 21 G.M.T. on 25 meters. Each broadcast includes news and sometimes music.

Short-Wave Observers and Other Readers, Please Note!

Listed below is some partial information regarding stations heard in our listening posts. Can you supply actual time schedules for them? Here is a chance for you to try your skill on logging these stations correctly. There are some hard ones among them and a verification card would be a proud possession.

KNRA, the Seth Parker Yacht World Cruise reported as heard talking to KEE, WQN, W2XBJ and to W6XI. They have been reported on 6660 kc. as well as 8440 kc.

An Oriental station on 7895 kc. broadcasts "queer" music.

JYS, believed to be a Japanese station transmitting on 9840 kc.

IRM, Rome, 30.5± meters, relays 12RO. Birds sing between some pieces.

YV5BMO. Who hears him transmitting on his 31-meter wavelength?

KFZ, Little America, heard on 22.6 meters. Can you get them?

JYK, reported as a Japanese on 22 meters.

JOA, reported as a Japanese on 19.03 meters.

K6XO, 16030 kc. Kokohead, Hawaii.

ORK, a Brussells, Belgium, station on 10320 kc., heard from 3 to 4:15 p.m., E.S.T.

JYT, another Japanese station testing on 19 meters.

KFZ has also been reported on about 50 meters, and on 13230 kc., and on 8218 kc. on Sundays from 3 to 5 p.m., E.S.T.

LSX is reported on 28.98 meters rebroadcasting Byrd on Saturday nights and also with a program from 3 to 4 p.m., E.S.T.

TI4NRH has moved to Granada, Nicaragua, and is said to be broadcasting programs from 3 to 4 p.m., E.S.T. Their new call is YNCRD and they transmit on 7170 kc.

Who knows who CSN is? They announce as Roseland, British Columbia.

The Mexican mystery station has been solved. It is a Mexican postal station with the call letters XDA and its announcer says "Hello, Merida" (not hello, America). It calls the station XAM at Merida, Yucatan, who in return plays records, usually at about 12 to 1 p.m., E.S.T., and says, "Bueno, Mexico, bueno, Mexico."

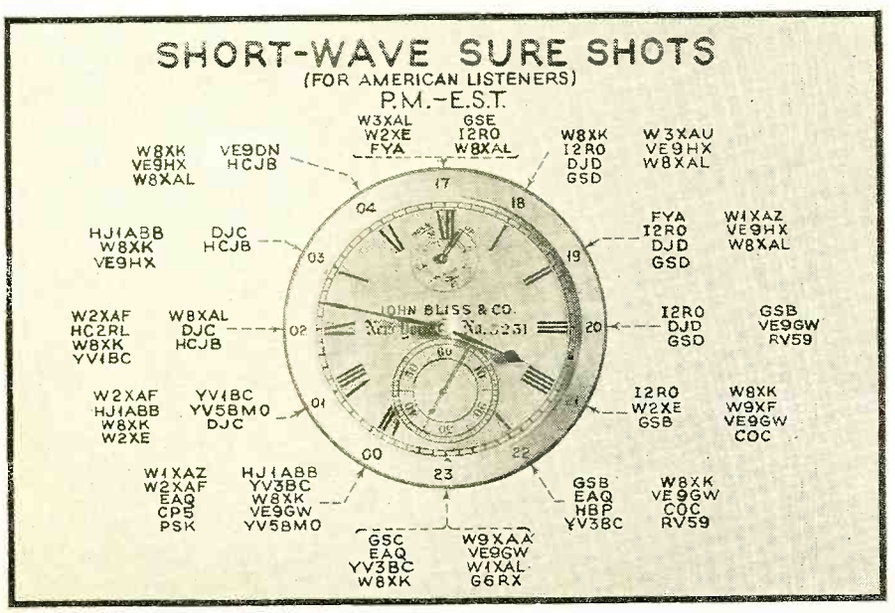
IRW, reported as a new Roman station on 15.2+ meters broadcasting from 10 to 11 a.m., E.S.T. It rebroadcasts the I2RO programs.

CQN, Macao, China, reported on 49.8 meters, Sundays from 6:45 to 7 a.m., E.S.T.

ZTJ, the South African station located at Johannesburg, on about 49 meters, has been reported as signing off at 10 p.m., E.S.T. Can you get its correct time schedule?

OER2, at Vienna, on 49.5 meters, broadcasting Tuesdays and Thursdays, but is interfered with by OXY.

JAN, reported as another Tokyo, Japan, station testing on 43.10 meters. Have you heard them?



A Report from Lancashire, England

Mr. Alan Barber of Bispham, reports the following stations for this month: CT1CT, DJC, DJA, DJD, DJB as well as DJE he reports as transmitting on 17760 kc. LCL, I2RO, RV59, HVJ, EAQ, OXY, W8XK, all the British Empire stations, W3XAL, W1XAL, PHI. His log is always a welcome one.

A Report from California

Capt. Henry L. Harris, Jr., of the U.S. Army, retired, reports excellent reception from PLE testing with KWU at Dixon. He also reports "Radio Splendid" at Buenos Aires (LSX). He hears them on 16.4

(*Continued on page 728*)

PIONEERS

Official RADIO NEWS Listening Post Observers

LISTED below by countries are the Official RADIO NEWS Short-Wave Listening Post Observers who are serving conscientiously in logging stations for the DX Corner:

Australia, C. N. R. Richardson.

Brazil, W. W. Enete.

British Guiana, E. S. Christiani, Jr.

British West Indies, E. G. Derrick.

Canada, Douglas Wood, Jack Bews, A. G. Taggart, W. H. Fraser, Robert Edkins.

Cuba, Frank H. Kydd.

England, Kenneth Judd, C. L. Wright, John L. Maling, Alan Barber, Donald Burns, L. H. Plunkett-Checkemian, L. H. Colburn, Norman C. Smith and John Parkinson, Norman Nattall.

France, J. C. Meillon, Jr.

India, D. R. D. Wadia.

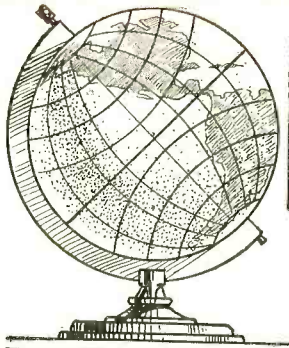
New Zealand, Dr. G. Campbell MacDiarmid.

South Africa, C. McCormick, Mike Kruger.

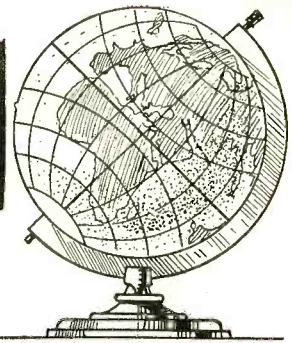
Switzerland, E. J. de Lopez, Dr. Max Hausdorff

Venezuela, Francisco Fossa Anderson.

Applications for Official Observers in the remaining countries should be sent in immediately to the DX Corner. Listeners outside of the United States who feel that they would like to serve in this capacity are here requested to file their applications as soon as possible before final appointments are made.



WORLD SHORT WAVE TIME-TABLE



The schedule of short-wave broadcasting stations listed below includes only those that are received best in RADIO NEWS LISTENING POSTS. This new schedule is from 9 G. M. T. up to 06 G. M. T. Both wavelength and frequency are noted for each station. Station locations are found on page 728.

International Short-Wave "Best Bets"

Wavelengths in Meters	*Call Letters*	*Frequency in k.c.*
9 G. M. T. 4 A. M. E. S. T.		
31.5 Wed., Sat.	VK3ME	9510
49.9+ Ex. Tu., Th., Sat.	RV59	6000
70.2 Except Sun.	RV15	4273
10 G. M. T. 5 A. M. E. S. T.		
19.8+	HVJ	15123
30.5	J1AA	9870
31.2+Sun.	VK2ME	9590
31.5 Wed., Sat.	VK3ME	9510
42.9+	LCL	6984
52.9+	XQAJ	5660
70.2 Except Sun.	RV15	4273
11 G. M. T. 6 A. M. E. S. T.		
13.9+	LSN	21540
16.8	GSG	17790
19.7	DJB	15200
19.8	GSF	15140
25.1+ Sun.	RV50	11924
30.5	J1AA	9870
31.2+ Sun.	VK2ME	9590
31.3+	DJA	9560
31.5 Wed., Sat.	VK3ME	9510
42.9+	LCL	6984
49.4+ Irregular	W8XAL	6060
52.9+	XQAJ	5660
70.2 Except Sun.	RV15	4273
12 G. M. T. 7 A. M. E. S. T.		
13.9+	LSN	21540
13.9+	W8XK	21540
16.8+	GSG	17790
19.6+	FYA	15243
19.7	DJB	15200
19.8	GSF	15140
23.3+ Sun.	CNR	12830
24.5+ Sun.	CT1CT	12229
25.5+ Ex. Tues., Wed.	PIH	11730
31.2+ Sun.	VK2ME	9590
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.8	PLV	9415
42.9+	LCL	6984
49.2 Fri., Sat.	VE9GW	6095
49.4+ Irregular	W8XAL	6060
52.9+	XQAJ	5660
70.2 Except Sun.	RV15	4273
13 G. M. T. 8 A. M. E. S. T.		
13.9+	LSN	21540
13.9+	W8XK	21540
25.3	GSE	11865
25.4	I2RO	11810
25.6 Except Sun.	VE9JR	11720
26.8 Sun.	CT3AQ	11180
31.2+ Sun.	VK2ME	9590
31.3+	W1XAZ	9570
31.5+	GSB	9510
40.5 Except Sun.	HJ3ABD	7402
42.9+	LCL	6984
47.8 Tues., Fri.	HI1A	6272
49.0+ Sun.	YV1BC	6112
49.0+ Except Sat., Sun.	VE9HX	6110
49.2 Fri., Sat., Sun.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.4+ Irregular	W8XAL	6060
49.5 Tues., Thurs.	OER2	6060
49.6 Sun.	W1XAL	6040
50.2	HJ2ABC	5973
17 G. M. T. 12 Noon E. S. T.		
13.9+	LSN	21540
13.9+	W8XK	21540
16.8+	W3XAL	17780
17.3+ Fri.	W3XL	17300
19.6+	W2XE	15270
19.7	W8XK	15210
23.3	HJ1ABB	12800
25.2	FYA	11900
25.3	GSE	11865
25.4	I2RO	11810
25.5	DJD	11760
25.6 Sat.	VE9JR	11720
25.6 Irregular	FYA	11720
26 Irregular	XAM	11530
30.6+ Irregular	GCW	9790
31.2+	W3XAU	9590
31.2+ Sun.	VK2ME	9590
31.3+	W1XAZ	9570
31.5+	GSB	9510
40.5 Except Sun.	HJ3ABD	7402
42.9+	LCL	6984
45.3+	RV72	6611
47.5 Sun.	HIZ	6315
47.8 Tues., Fri.	HI1A	6272
49.0+ Ex. Sat., Sun.	VE9HX	6110
49.2 Fri., Sat., Sun.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.4+ Irregular	W8XAL	6060
49.5 Tues., Thurs.	OER2	6060
49.6 Irregular	W1XAL	6040
49.8+	DJC	6020
18 G. M. T. 1 P. M. E. S. T.		
13.9+	LSN	21540
13.9+	W8XK	21540
16.8+	W3XAL	17780
17.3+ Fri.	W3XL	17300
19.7	W8XK	15210
19.8	GSF	15140
49.4+ Irregular	W8XAL	6060
49.5 Tues., Thurs.	OER2	6060
49.5 Temporary	OXY	6600
49.8+	DJC	6020
49.8+ Irregular	COC	6010
49.9+	RV59	6000
21 G. M. T. 4 P. M. E. S. T.		
17.3+ Fri.	W3XL	17300
19.7	W8XK	15210
25.2	FYA	11900
25.2	W8XK	11870
25.3+	W2XE	11830
25.4	I2RO	11810
25.5	DJD	11760
25.5	GSD	11750
29.0+	ORK	10330
30.5+ Irregular	IRM	9820
30.6+ Irregular	GCW	9790
31.2+ Tues., Fri.	CT1AA	9590
31.2+	W3XAU	9590
31.5	GSB	9510
37.3 Sun.	CNR	8035
42.9+	LCL	6984
47.5	HIZ	6315
47.8 Sun.	HI1A	6272
48.8+	W8XK	6140
49.0+ Sun.	YV1BC	6112
49.0+	VE9HX	6110
49.1 Except Sat.	W9XF	6100
49.2 Except Fri., Sat.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.3+ Temporary	YV5BMO	6070
49.4+ Irregular	W8XAL	6060
49.5 Temporary	OXY	6060
49.8+	DJC	6020
49.8+	COC	6010
49.9+	HIX	6000
49.9	RV59	6000
22 G. M. T. 5 P. M. E. S. T.		
24.5 Thurs.	CT1CT	12229
25.2	FYA	11900
25.2	W8XK	11870
25.4	I2RO	11810
25.5	GSD	11750
26.8	CT3AQ	11180
30.4	EAQ	9860
30.5+ Irregular	IRM	9820
31.2+ Tues., Fri.	CT1AA	9590
31.2+	W3XAU	9590
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.5	GSB	9510
38.4+ Sat.	HBP	7790
45.0+ Sun.	HC2RL	6668
46.5 Sun.	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
48.7+	YV3BC	6150
48.8+	W8XK	6140
49.0	W2XE	6120
49.0+	YV1BC	6112
49.0+	VE9HX	6110
49.1+ Sat.	W3XAL	6100
49.2 Except Fri., Sat.	VE9GW	6095
49.3+	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.3+ Temporary	YV5BMO	6070
49.4+	W8XAL	6060
49.4+	W3XAU	6060
49.6	W4XB	6040
49.6 Irregular	W1XAL	6040
49.5+ Sun.	COC	6010
50.2	HJ2ABC	5973
50.4 Irregular	HJ2ABA	5880
50.6 Except Wed., Sun.	HJ4ABE	5860
69.4 Irregular	G6RX	4320
01 G. M. T. 8 P. M. E. S. T.		
25.2	W8XK	11870
25.5	DJD	11760
25.6	FYA	11720
25.6 Except Sun.	VE9JR	11720
31.2+	XETE	9600
31.3+	W1XAZ	9570
31.4+	W2XAF	9530
32.8+	CP5	9120
36.6+ Irregular	PSK	8185
37.5	HC2JSB	8000
40.5+ Except Sun.	HJ3ABD	7402
46.1	HJ5ABD	6504
46.5	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.8	HI1A	6272
48.5+	TGW	6180
48.7+	YV3BC	6150
48.8+	W8XK	6140
49.0	W2XE	6120
49.0+	YV1BC	6112
49.0+	VE9HX	6110
49.1+ Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2 Except Fri., Sat.	VE9GW	6095
49.3+	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.3+ Temporary	YV5BMO	6070
49.4+	W8XAL	6060
49.4+	W3XAU	6060
49.6 Sun.	W1XAL	6040
49.6	W4XB	6040
49.8	DJC	6020
49.8+	COC	6010
49.9+	HIX	6000
50.1 Irregular	YV4CSG	5984
50.2	HJ2ABC	5973
50.4 Irregular	HJ2ABA	5880
50.6 Mon., Wed., Fri.	HJ4ABE	5860

THE WORLD SHORT

WAVE TIME TABLE

16.8+	W3XAL	17780
16.8+	GSG	17790
17.2	J1AA	17380
19.6+	FYA	15243
19.7	DJB	15200
19.8	GSF	15140
23.3+ Sun.	CNR	12830
24.5+ Sun.	CT1CT	12229
25.1+ Sun.	RV50	11924
25.3	GSE	11865
25.5+ Ex. Tues., Wed.	PHI	11730
31.2+ Sun.	VK2ME	9590
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.8	PLV	9415
49.2 Fri., Sat.	VE9GW	6095
49.4+ Irregular	W8XAL	6060
49.5 Tues., Thurs.	OER2	6060
49.5 Sun.	OXY	6060
52.9+	XQAJ	5660
70.2	RV15	4273

14 G. M. T. 9 A. M. E. S. T.

13.9+	LSN	21540
13.9+	W8XK	21540
16.8+	W3XAL	17780
19.6+	FYA	15243
19.7	DJB	15200
19.8	GSF	15140
25.3	GSE	11865
25.5+ Ex. Tues., Wed.	PHI	11730
25.6 Except Sun.	VE9JR	11720
31.2+ Sun.	VK2ME	9590
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.8	PLV	9415
42.9+	LCL	6984
49.1+ Sun.	VV1BC	6112
49.0	VE9HX	6110
49.2 Fri., Sat.	VE9GW	6095
49.4+ Irregular	W8XAL	6060
49.5 Tues., Thurs.	OER2	6060
49.6	W1XAL	6040
70.2	RV15	4273
80 Sun.	CT1CT	3750

15 G. M. T. 10 A. M. E. S. T.

13.9+	LSN	21540
13.9+	W8XK	21540
15.2+	IRW	19700
16.8+	W3XAL	17780
19.6+	FYA	15243
19.7	W8XK	15210
19.7	DJB	15200
19.8	GSF	15140
19.8	VE9DN	15130
19.8+ Irregular	HVJ	15123
25.3	GSE	11865
25.4 Sun.	I2RO	11810
25.5+ Ex. Tues., Wed.	PHI	11730
26.8 Sun.	CT3AQ	11180
31.2+ Sun.	VK2ME	9590
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.8 Irregular	PLV	9415
42.9+	LCL	6984
49.0+ Sun.	YV1BC	6112
49.0+ Except Sat., Sun.	VE9HX	6110
49.2 Fri., Sat.	VE9GW	6095
49.4+ Irregular	W8XAL	6060
49.5 Tues., Thurs.	OER2	6060
49.6	W1XAL	6040

16 G. M. T. 11 A. M. E. S. T.

13.9+	LSN	21540
13.9+	W8XK	21540
16.8+	W3XAL	17780
17.3+ Fri.	W3XL	17300
19.6+	W2XE	15270
19.7	W8XK	15210
23.3	HJ1ABB	12800
25.2	FYA	11900
25.2	FYA	11900
25.4	I2RO	11810
25.5	DJD	11760
25.5	GSD	11750
25.6 Sat.	VE9JR	11720
30.4 Sat.	EAQ	9860
30.6+ Irregular	GCW	9790
31.2+	W3XAU	9590
31.3+	W1XAZ	9570
42.9+	LCL	6984
47.5 Sun.	HIZ	6315
47.8 Sun.	HI1A	6272
49.0+ Except Sat., Sun.	VE9HX	6110
49.2 Fri., Sat., Sun.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.4+ Irregular	W8XAL	6060
49.5 Tues., Thurs.	OER2	6060
49.5 Temporary	OXV	6060
49.6 Irregular	W1XAL	6040
49.8+	DJC	6020
73.0+ Except Mon.	HCJB	4107

19 G. M. T. 2 P. M. E. S. T.

17.3+ Fri.	W3XL	17300
19.5 Ex. Tu., Th., Sat.	W2XAD	15330
19.7	W8XK	15210
19.8	GSF	15140
25.2	FYA	11900
25.4	I2RO	11810
25.5	DJD	11760
25.5	GSD	11750
25.6 Except Sat., Sun.	VE9JR	11720
30.4 Sat.	EAQ	9860
30.5+ Irregular	IRM	9820
30.6 Irregular	GCW	9790
31.2+	W3XAU	9590
31.3+	W1XAZ	9570
37.3+ Sun.	CNR	8035
41.0 Sun.	HAT2?	7300
42.9+	LCL	6984
47.5 Sun.	HIZ	6315
47.8	HI1A	6272
49.0+ Sun.	YV1BC	6112
49.0+ Except Sat., Sun.	VE9HX	6110
49.2 Except Thurs.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.4+ Irregular	W8XAL	6060
49.5 Tues., Thurs.	OER2	6060
49.5 Temporary	OXY	6060
49.8+	DJC	6020
49.9+	RV59	6000
50.2+	HVJ	5969
73.0+ Except Mon.	HCJB	4107

20 G. M. T. 3 P. M. E. S. T.

17.3+ Fri.	W3XL	17300
19.5+ Ex. Tu., Th., Sat.	W2XAD	15330
19.7	W8XK	15210
25.1+ Sun.	RV50	11924
25.2	FYA	11900
25.3+	W2XE	11830
25.4	I2RO	11810
25.5	DJD	11760
25.5	GSD	11750
25.6 Except Sat., Sun.	VE9JR	11720
28.9+	LSX	10350
29.0+	ORK	10330
30.4 Sat.	EAQ	9860
30.5+ Irregular	IRM	9820
30.6+ Irregular	GCW	9790
31.2+	W3XAU	9590
31.3+	W1XAZ	9570
31.5	GSB	9510
37.3 Sun.	CNR	8035
41.0?	HAT2?	7300
42.9+	LCL	6984
47.8 Sun.	HI1A	6272
49.0+ Sun.	YV1BC	6112
49.0+ Except Sat., Sun.	VE9HX	6110
49.2	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.3+ Sun.	VE9CS	6070
47.5	HIZ	6315
47.8	HI1A	6272
48.7+	YV3BC	6150
48.8+	W8XK	6140
49.0+	YV1BC	6112
49.0+	VE9HX	6110
49.1+ Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2 Except Fri., Sat.	VE9GW	6095
49.3+	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.3+ Temporary	YV5BMO	6070
49.4+	W8XAL	6060
49.4+	W3XAU	6060
49.5 Temporary	OXY	6060
49.6	W4XB	6040
49.6 Irregular	W1XAL	6040
49.8+ Sun.	COC	6010
49.9+	HIX	6000
49.9+	RV59	6000
50.4	HJ2ABA	5880
50.6 Irregular	HJ4ABE	5860

23 G. M. T. 6 P. M. E. S. T.

15.9+ Except Sat., Sun.	PLE	18860
25.2	W8XK	11870
25.5	GSD	11750
25.6	FYA	11720
26.8 Tues., Thurs.	CT3AQ	11180
30.4	EAQ	9860
30.5+ Irregular	IRM	9820
31.2+ Tues., Fri.	CT1AA	9590
31.3	GSC	9585
31.3+	W1XAZ	9570
31.3+	DJA	9560
38.4+ Sat.	HBP	7790
45.0+ Sun.	HC2RL	6668
46.1	HJ5ABD	6504
46.5 Sun.	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
48.7+	YV3BC	6150
48.8+	W8XK	6140
49.0	W2XE	6120
49.0+	YV1BC	6112
49.0+	VE9HX	6110
49.1+ Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2 Except Fri., Sat.	VE9GW	6095
49.3+	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.3+ Temporary	YV5BMO	6070
49.4+	W8XAL	6060
49.4+	W3XAU	6060
49.5 Temporary	OXY	6060
49.6	W4XB	6040
49.6 Irregular	W1XAL	6040
49.8+ Sun.	COC	6010
50.6 Tues., Thurs., Sat.	HJ4ABE	5860
69.4 Irregular	G6RX	4320

00 G. M. T. 7 P. M. E. S. T.

15.9+ Except Sat., Sun.	PLE	18860
25.2	W8XK	11870
25.5	GSD	11750
25.6	FYA	11720
25.6 Except Sun.	VE9JR	11720
28.9+	LSX	10350
30.4	EAQ	9860
30.5+ Irregular	IRM	9820
31.3	GSC	9585
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.4+	W2XAF	9530
32.8+	CP5	9120
36.6+	PSK	8185
38.4+ Sat., Irregular	HBP	7790
40.5	HJ3ABD	7402
45.0+ Sun.	HC2RL	6668
46.1	HJ5ABD	6504
46.5	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.8	HI1A	6272
48.5	TGW	6180
69.4 Irregular	G6RX	4320
73.0+ Except Mon.	HCJB	4107

02 G. M. T. 9 P. M. E. S. T.

25.2	W8XK	11870
25.5	DJD	11760
25.6 Except Sun.	VE9JR	11720
31.2+	XETE	9600
31.3+	W1XAZ	9570
31.4+	W2XAF	9530
32.8+	CP5	9120
36.6+ Irregular	PSK	8185
40.5+ Except Sun.	HJ3ABD	7402
45.0+ Tues.	HC2RL	6668
45.3 Thurs.	PRADO	6618
46.1	HJ5ABD	6504
46.5	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.5 Sat.	HIZ	6315
47.8	HI1A	6272
48.5+	TGW	6180
48.7+	YV3BC	6150
48.8+	W8XK	6140
49.0	W2XE	6120
49.0+	YV1BC	6112
49.0+	VE9HX	6110
49.1+ Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2 Except Sun.	VE9GW	6095
49.3+	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.3+ Temporary	YV5BMO	6070
49.4+	W8XAL	6060
49.4+	W3XAU	6060
49.6	W4XB	6040
49.8	DJC	6020
49.8+ Sun.	COC	6010
49.9+	HIX	6000
50.1 Irregular	YV4CSG	5984
50.2	HJ2ABC	5973
50.4 Irregular	HJ2ABA	5880
50.6 Mon., Wed., Fri.	HJ4ABE	5860
69.4+	G6RX	4320
73.0+ Except Mon.	HCJB	4107

03 G. M. T. 10 P. M. E. S. T.

25.1+	RV50	11924
25.2 Sun.	W8XK	11870
25.5 Irregular	DJD	11760
25.6	FYA	11720
25.6 Sat.	VE9JR	11720
31.3+	W1XAZ	9570
31.4+	W2XAF	9530
32.8+ Irregular	CP5	9120
40.5+ Except Sun.	HJ3ABD	7402
45.0+ Tues.	HC2RL	6668
45.3 Thurs.	PRADO	6618
46.5	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.5 Sat.	HIZ	6315
47.8	HI1A	6272
48.5	TGW	6180
48.7+	YV3BC	6150
48.8+	W8XK	6140
48.9+	ZTJ	6122
49.0	W2XE	6120
49.0+	YV1BC	6112
49.0+	VE9HX	6110
49.1+ Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2 Except Sun.	VE9GW	6095
49.3+	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.3+	YV5BMO	6070
49.4+	W8XAL	6060
49.4+	W3XAU	6060
49.6	W4XB	6040
49.8 Irregular	DJC	6020
49.9+ Sat.	HIX	6000
50.1 Irregular	YV4CSG	5984

(Continued on next page)

50.6	Mon., Wed., Fri.	HJ4ABE	5860
69.4+	Irregular	G6RX	4320
73.0+	Except Mon.	HCJB	4107
	04 G. M. T. 11 P. M. E. S. T.		
25.2	Sun.	W8XK	11870
25.5		GSD	11750
25.6		FYA	11720
25.6	Sat.	VE9JR	11720
31.3+		W1XAZ	9570
31.5		GSB	9510
45.0	Fri.	TGW	6180
45.0+	Tues.	HC2RL	6668
46.6+	Fri.	W3XL	6425
48.8	Sat.	VE9CL	6150
48.8+		W8XK	6140
49.0+		VE9HX	6110
49.1+	Sat.	W3XAL	6100
49.1+	Except Sat.	W9XF	6100
49.2	Thurs., Fri., Sat.	VE9GW	6095
49.3+	Sun.	VE9CS	6070
49.4+		W8XAL	6060
49.4+		W3XAU	6060
49.6		W4XB	6040
49.9+		VE9DN	6005
49.9+	Sat.	HIX	6000
73.0+	Except Mon.	HCJB	4107
	05 G. M. T. 12 Midnight E. S. T.		
19.7		DJB	15200
25.2	Sun.	W8XK	11870
25.5		GSD	11750
31.3+		W1XAZ	9570
31.5		GSB	9510
48.8+		W8XK	6140
49.0+		VE9HX	6110
49.1+	Except Sat.	W9XF	6100
49.4+		W3XAU	6060
49.4+		W8XAL	6060
49.8	Sat.	COC	6010

Station Locations

Wavelengths in Meters		*Call Letters*	*Frequency in k.c.*
13.9+	LSN	21540	Buenos Aires, Argentina
13.9+	W8XK	21540	Pittsburgh, Pa.
15.2+	IRW	19700	Rome, Italy
15.9+	PLE	18860	Bandoeng, Java
16.8+	W3XAL	17780	Bound Brook, N. J.
16.8+	GSG	17790	Daventry, England
17.2+	J1AA	17380	Kemikawa-Cho., Japan
17.3+	W3XL	17300	Bound Brook, N. J.
19.5	W2XAD	15330	Schenectady, N. Y.
19.6	FYA	15243	Pontoise, France
19.6+	W2XE	15270	New York, N. Y.
19.7	W8XK	15210	Pittsburgh, Pa.
19.7	DJB	15200	Zeesen, Germany
19.8	GSF	15140	Daventry, England
19.8	HVJ	15123	Vatican City
23.3	CNR	12830	Rabat, Morocco
23.3	HJ1ABB	12800	Bogota, Colombia
24.5+	CT1CT	12229	Lisbon, Portugal
25.1+	RV50	11924	Moscow, U. S. S. R.
25.2	FYA	11900	Pontoise, France
25.2	W8XK	11870	Pittsburgh, Pa.
25.3	GSE	11865	Daventry, England
25.3+	W2XE	11830	New York, N. Y.
25.4	I2RO	11810	Rome, Italy
25.5	GSD	11750	Daventry, England
25.5	DJD	11760	Zeesen, Germany
25.5+	PHI	11730	Huizen, Holland
25.6	FYA	11720	Pontoise, France
25.6	VE9JR	11720	Winnipeg, Canada
26.8	CT3AQ	11180	Funchal, Madeira
28.9+	LSX	10350	Buenos Aires, Argentina
29.0+	ORK	10330	Brussels, Belgium
30.4	EAQ	9860	Madrid, Spain
30.5	J1AA	9870	Kemikawa-Cho, Japan
30.5+	IRM	9820	Rome, Italy
30.6+	GCW	9790	Rugby, England
31.2+	XETE	9600	Mexico City, Mexico
31.2+	W3XAU	9590	Philadelphia, Pa.
31.2+	VK2ME	9590	Sydney, Australia
31.2+	CT1AA	9590	Lisbon, Portugal
31.3	HBL	9580	Geneva, Switzerland
31.3	GSC	9585	Daventry, England
31.3+	W1XAZ	9570	Springfield, Mass.
31.3+	DJA	9560	Zeesen, Germany
31.4+	W2XAF	9530	Schenectady, N. Y.
31.5	VK3ME	9510	Melbourne, Australia
31.5	GSB	9510	Daventry, England
31.8	PLV	9415	Bandoeng, Java
32.8+	CP5	9120	La Paz, Bolivia
36.6+	PSK	8185	Rio de Janeiro, Brazil
37.3	CNR	8035	Rabat, Morocco
37.5	HC2JSB	8000	Guayaquil, Ecuador
38.4+	HBP	7790	Geneva, Switzerland
40.5+	HJ3ABD	7402	Bogota, Colombia
41.0?	HAT2?	7300	Budapest, Hungary
42.9+	LCL	6984	Jeloy, Norway
45.0+	HC2RL	6668	Guayaquil, Ecuador
45.3	PRADO	6618	Riobamba, Ecuador
45.3+	RV72	6611	Moscow, U. S. R. R.
46.1	HJ5ABD	6504	Cali, Colombia
46.5	HJ1ABB	6450	Barranquilla, Co.
46.6	W3XL	6425	Bound Brook, N. J.
47.5	HIZ	6315	San Domingo, D. R.
47.8	HI1A	6272	San Domingo, D. R.
48.5	TGW	6180	Guatemala City
48.7	YV3BC	6150	Caracas, Venezuela
48.8	VE9CL	6150	Winnipeg, Man.
48.8+	W8XK	6140	Pittsburgh, Pa.
48.9+	ZTJ	6122	Johannesburg, Africa
49.9	W2XE	6120	New York, N. Y.
49.1+	YV1BC	6150	Caracas, Venezuela
49.0+	VE9HX	6110	Halifax, N. S.
49.1+	W3XAL	6100	Bound Brook, N. J.
49.1+	W9XF	6100	Chicago, Ill.
49.2	VE9GW	6095	Bowmanville, Can.
49.3+	W9XAA	6080	Chicago, Ill.
49.3+	VE9CS	6070	Vancouver, B. C.
49.3+	YV5BMO	6070	Maracaibo, Venezuela
49.4+	W8XAL	6060	Cincinnati, Ohio
49.4+	W3XAU	6060	Philadelphia, Pa.
49.5	OER2	6060	Vienna, Austria
49.5	OXY	6060	Skamlebaek, Den.
49.5	GSA	6050	Daventry, England
49.6+	W4XB	6040	Miami, Fla.
49.6+	W1XAL	6040	Boston, Mass.
49.8	DJC	6020	Zeesen, Germany
49.8+	COC	6010	Havana, Cuba
49.9+	VE9DN	6005	Montreal, Quebec
49.9+	HIX	6000	San Domingo, D. R.
49.9+	RV59	6000	Moscow, U. S. S. R.
50.1	YV4CSG	5984	Caracas, Venezuela
50.2	HJ2ABC	5973	Cu Cuta, Colombia
50.2+	HVJ	5969	Vatican City
50.4	HJ4ABA	5880	Tunja, Colombia
50.6+	HJ4ABE	5860	Medellin, Colombia
52.7	XQAJ	5660	Shanghai, China
69.4	G6RX	4320	Rugby, England
70.2	RV15	4273	Khabarovsk, Siberia
73.0	HCJB	4107	Quito, Ecuador
80.0	CT1CT	3750	Lisbon, Portugal

The DX Corner (Short Waves)

(*Continued from page 725*)

meters. He also reports JYT and JYK 'phone stations testing with KKP and KWO and also with Manila. HJ1ABB comes in very strong every evening. FYA and the Daventry stations are well heard in the mornings.

A SHORT-WAVE ENTHUSIAST AND HIS THOROUGHBREDS

A. B. Baadsgaard, of Ponoka, Alberta, Canada, an enthusiastic short-wave DX "hound," with two of his "pals." They may be DX hounds, too, but they look like regular thoroughbreds to us

Another British Report

Mr. C. R. Wright of Leicester, England, reports on the German transmissions, confirms the transmission of G6RX as the Rugby experimental transmitter on 69.44 meters testing with Yamachiche. His Best Bets are: W2XE, LSX on 28.9+ meters, W8XAL, PLV on 31.8+ meters, HBL, Y3VBC, DJA, FYA, DJC, HVJ, all the Daventry transmissions, W8XK, W8XAL, W3XAL, W1XAZ, W2XAD, W2XAF, W9XF, W4XB, RV50, RV59, I2RO.

A Report on a New Station—from Greenwich

Robert LeJeune of Greenwich, Connecticut, reports hearing the Brussels station ORK on 10330 kc. and sends in a quantity of their program material.

A Report from Nevada

Mr. D. H. Townsend, Official Observer for Nevada, reports the following Best Bets on his Midwest receiver: XIG, GSE, GSD, GSB, FYA, HJ1ABB, K6BAZ, OCI, LSX, EAQ, XETE, VK2ME, HC2RL, COC, CNR, IRM, I2RO, YV3BC, OA4B, J1AA, YV5VMO.

A Report from Georgia

Observer C. A. Armstrong of Atlanta, Georgia, sends in a very fine report on the South Americans. His Best Bets there include HJ3ABD, HJ5ABD, YV3BC, HJ3ABI on 49.6 meters, YV4CSG, HJ4ABB on 41.6 meters, YV1BC, HJ4ABE, PRADO, HJ3ABF on 48 meters, YV5BMO, HJ2ABA, HJ2ABC on 50.2 meters. He also reports HAS, HAT as 30 miles southwest of Budapest on a wavelength of 48.6 meters and 21.92 meters. He states it is a quartz-controlled 5 kw. transmitter, transmitting at 23 G.M.T.

RADIO NEWS Listening Post Observer with Byrd—Almost!

Dr. G. C. MacDiarmid, our Official Short-Wave Observer for New Zealand, reports that the official doctor with Admiral Byrd was taken ill and had to be returned to New Zealand. They had to find a doctor in New Zealand to replace him and about a dozen men applied, among them being Dr. MacDiarmid. He was second choice and was picked to go as assistant medical officer, but at the last minute it was decided that one doctor would be enough. Dr. MacDiarmid says that if he had gone to Little America he sure would have taken his short-wave set with him.

A Report from Michigan

Mr. E. M. O'Sullivan sends in the following list of Best Bets received on his Sparton model 60 converter with a twelve-tube broadcast receiver: W1XAZ, EAQ, W2XAF, GSC, VE9GW, W8XAL, W3XAU, GSA, HJ1ABB, XETE, CNR, HJ4ABE, DJC.

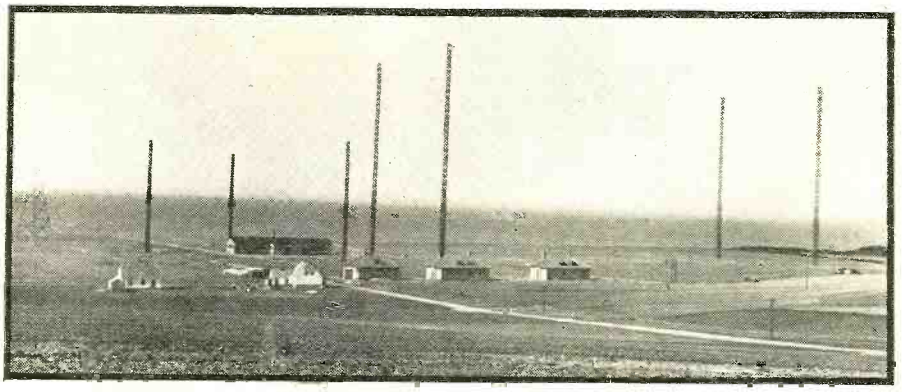
A Report from Oklahoma

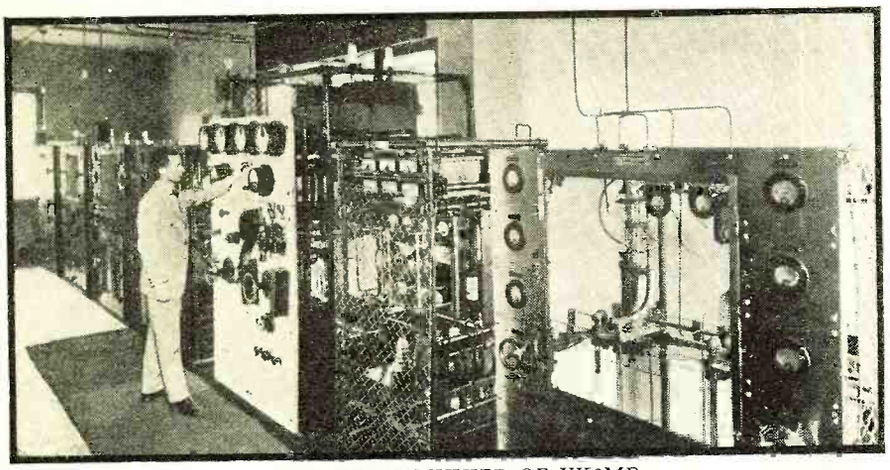
Robert Woods of Sand Springs, Okla-

(*Continued on page 760*)

THE SHORT-WAVE TRANSMITTER AT SKAMLEBAEK

Here is shown an interesting view of the complete antenna array and buildings for the Skamlebaek, Denmark, transmitter with the call letters OXY





20 KW. TRANSMITTER OF VK2ME

VK2ME — VK3ME

(Famous S. W. Broadcasters)

George Lilley

THERE comes a supreme thrill when you tune in, from your own home, voices radiated from what is close to the most distant point on earth. And when a means of radio-wave propagation offers such fascinating experiences to everyone, is it little wonder that modern short wave reception has become so alluring? Stations VK2ME and VK3ME, Sydney and Melbourne, Australia, are the two world's pioneers in this "supreme thrill" business, as far as American low-wave listeners are concerned. These two stations on the far sides of the South Pacific are not only more distant than China or Strait's Settlements or India, measured as radio signals fly, but they also have a peculiar habit of greeting their distant friends on this continent in better style than many waves that need travel just a fraction of 10,000 airline miles. Fans with efficient sets who rise with the sun to search the 31-meter spectrum are almost always rewarded with unusual programs from the "land-down-under."

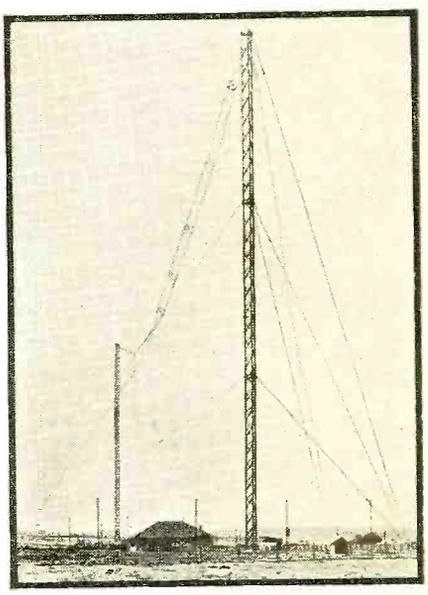
Fourteen miles outside of Sydney is Pennant Hills. Here on forty acres of land are located more wireless transmitters under one roof than to be found at any other place in the Southern Hemisphere. In all there are fifteen stations; outstanding among them is VK2ME, owned, as are all the others, by Amalgamated Wireless of Australasia, Ltd. The main tower of this broadcasting center is 400 feet high and suspended from it to smaller masts are other aerials, each system providing a different service. "The Voice of Australia," VK2ME, has an aerial dissipation of 20,000 watts and is the largest transmitter in Australia. Mounted in seven separate units, as shown above, are 22 large oil and air-cooled tubes which actually require 60 kw. (input) to operate. The studios of VK2ME are situated at the A.W.A. headquarters on York Street, Sydney, and from here all programs are run by land lines to Pennant Hills.

On July 5th, 1931, A.W.A. inaugurated through VK2ME the first regular world-wide broadcasting service. Here, for the first time, was put into practice the "zone plan" of international transmitting such as has been followed by the British Broadcasting Company, in the Empire broadcasts from Daventry. Each Sunday there are four different sessions put on the air at times that will be most favorable for reception in countries throughout the globe. The 1st period of broadcasts is intended to cover western portions of North and South America (but actual results show that both continents are covered completely). The 2nd embraces Southern and Eastern Australia, New Zealand, Papua, New Guinea, Fiji, New Caledonia, the New Hebrides and other islands. Session No. 3 is conducted for listeners in Western Australia, China, Japan, Philippine Islands, the Strait Settlements and most of India. The last transmission of the day, which carries into Monday morning at Sydney, is directed to Great Britain, Western Europe, South Africa, Rhodesia and Egypt.

After two years of experimenting, the 75 engineers of A.W.A. have worked out the time of day and night that VK2ME is best heard in various corners of the world. In light of this information, programs are radiated at the following hours each Sunday—Eastern Standard Time: 1st session, midnight to 2 a. m.; 2nd session, 4:30 to 6:30 a. m.; 3rd session, 6:30 to 8:30 a. m.; 4th session, 10:30 a. m. to 12:30 p. m. As can be seen, each period of transmission is for two hours. Although the 1st session is often enjoyed by American set owners, especially those on the West Coast, it is the second and third broadcasts that are heard best by fans in the East. It is also possible to pick up the European and African transmissions, but as a general rule the reception at this time of the day is weak because of the fact that the sun has been up a bit too long in most parts of the United States for 31-meter results from across the Pacific.

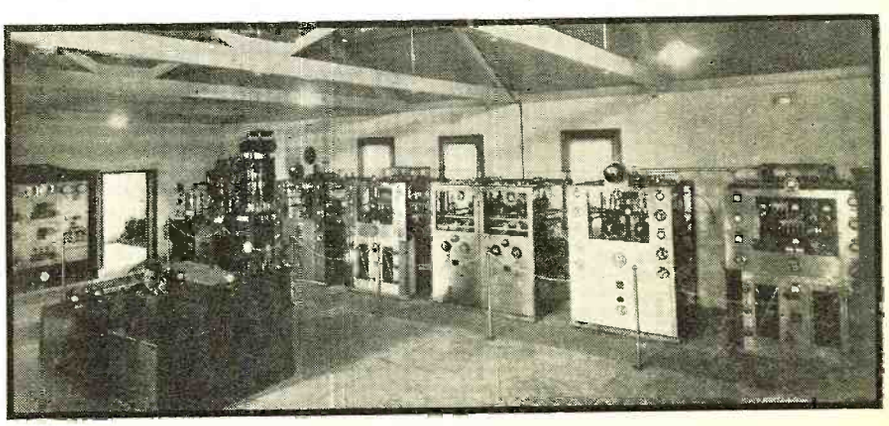
The programs of VK2ME comprise both classical and semi-popular musical items. A few waltz compositions are used, while much of the speech consists of interesting talks on many phases of Australian life. Many of these are prepared by the Australian National Travel Association and include stories about the charming but strange Antipodean nature life.

Many novel and progressive records have been established by the Sydney station. They broadcast the first Empire program on (*Continued on page* 747)



VK3ME

The antenna and transmitter from which programs are heard the world over



USE IT FOR SHORT-WAVE RECEPTION

Figure 6. This simple receiver plus your set provides highly satisfactory short-wave reception

GETTING ACQUAINTED *with* SHORT WAVES

(2-Tube S.W. Converter)

In this sixth installment the author shows how to make a converter for receiving short waves on your present receiver. The converter changes your set into a superheterodyne

James Millen

THE various methods of short-wave reception were outlined in the second article of this series, and it was explained that any standard broadcast receiver can be used in conjunction with an "adapter" or a "converter" on short-wave programs. It was pointed out that, while the adapter presents the more simple of the two systems, it is far less efficient than the latter, due to the fact that the adapter utilizes only a few of the tubes in the broadcast set. The converter uses them all, obtaining the full amplification and sensitivity inherent in the combination. A converter operated in conjunction with a good broadcast receiver compares favorably with a multitube short-wave set.

The action of the converter is adequately described by its name. It converts the short waves into longer waves within the normal tuning range of the broadcast radio. It accomplishes this by means of a heterodyne action, which was described briefly in article number four of this series. We have by now progressed sufficiently far in our study of short-wave phenomena and radio in general to consider such things as heterodynes, inductive coupling and tuned circuits without kinking any of our cerebral functions. So let us go into this matter of the converter and get the theoretical lowdown on just how it works.

We understand, from the first article in this series, that it is sometimes helpful to think in terms of frequency—cycles, kilocycles and megacycles—rather than in terms of wavelength or meters. Of course, we must never lose sight of the fact that for every frequency there is a corresponding wavelength. For instance, a frequency of 6,000,000 cycles (6000 kilocycles or 6 megacycles) per second is the frequency characteristic of a wave 50 meters long.

In our last article we considered what happened when two different frequencies existed simultaneously in one circuit, and became acquainted with the beat-frequency phenomenon long known to science. When two frequencies are "mixed" (or heterodyned) in an adequate circuit, we immediately create two additional frequencies, equal to the sum and the difference of the original frequencies. For example, if we are receiving a station operating on a frequency of 300 kc. and set up a local oscillator at 475 kc., two other frequencies will be set up, namely, the difference, 175 kc., and the sum, 775 kc. These extra frequencies carry the program just as well as the original 300 kc. signal, and, if we design a particularly efficient r.f. amplifier operating at 175 kc., we can amplify that signal in the most effective manner. This is exactly what is done in the superheterodyne, in which all signal frequencies are changed to one intermediate frequency, usually 175 kc. The advantage has already been implied. It is easier to attain high amplifying efficiency if an amplifier is designed to operate on only one frequency, rather than necessitate retuning for every different signal.

The reader may ask why not use the sum of the two frequencies rather than the difference. This can, of course, be done, and receivers, notably the "Infradyne," have been designed in which the lower ("infra") wave is used. However, the characteristics of the lower *frequency* are more amenable to efficient amplification. As a matter of fact, the superheterodyne was invented with the idea of getting around the difficulties associated with high radio-frequency amplification.

The converter operates in exactly the same manner as the superheterodyne. The broadcast receiver is tuned to a predetermined intermediate frequency, say 600 kc.—500 meters. A short-wave signal is tuned in on the converter—at 50 meters, for example. This corresponds to a frequency of 6000 kc. The local oscillator is now adjusted to either 6600 kc. or 5400 kc. (usually the latter or lower frequency—again the lower frequencies are easier to handle). The frequency difference is 600 kc.—the fre-

FIGURE 1. THE SCHEMATIC DIAGRAM

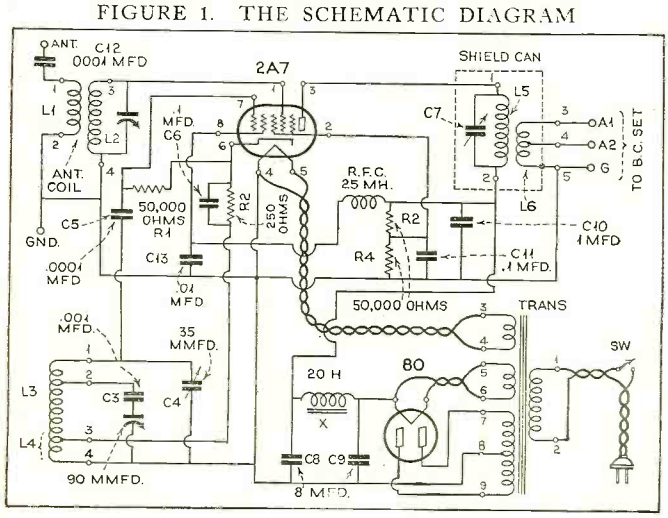
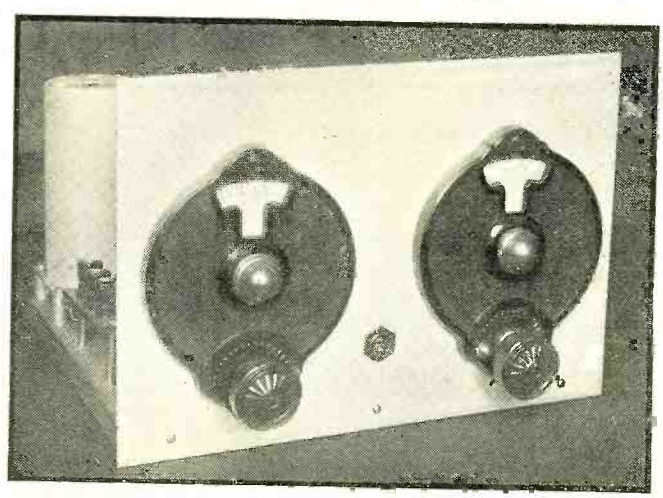


FIGURE 5. THE FRONT VIEW



quency to which the receiver is tuned—and this 500-meter output of the converter is duly amplified and made audible in the broadcast set.

With these general principles in mind, let us investigate the action of the simple converter diagrammed in Figure 1. The converter is here represented in the usual radio symbols, which by now should be quite as lucid as the picture diagram of Figure 2. Coils L1 and L2 will be readily identified by the reader who studied the last article as the antenna primary and the secondary, or grid coil, respectively. A signal in the antenna circuit will be transferred to the grid circuit, tuned by means of the condenser C1 to the desired frequency, and impressed upon the grid of the tube to reappear in an amplified form in the plate circuit of which L5 is a part.

Coil L3 may not be quite so familiar to us. This is the oscillator coil—the part of the circuit which generates the local frequency. However, if we inspect the circuit carefully, we shall observe a similarity with the detector system employed in the simple short-wave receiver described in article number four of this series. The portion of the coil between connections 1 and 3 corresponds to the grid or secondary coil in the short-wave receiver. It will be observed that connection 1 leads through to a grid (connection 7 on the tube), employing the conventional grid condenser, C5, and grid leak, R1. The lower end of this part of the coil connects to the cathode of the tube (connection 6) through the biasing resistor, R2, which is by-passed by condenser C6. These resistors and condenser contribute to the efficiency of this portion of the circuit.

The part of the coil designated as L4 (between connections 3 and 4) corresponds to the plate coil, or tickler, on the short-wave receiver, and leads through to another grid in the tube—connection 8. This grid really functions as a plate, but is made in the form of a grid so that the electrons given off by the hot cathode, 6, can pass through to the other grids,, 1 and 2, many of them eventually reaching the plate, 3.

Obviously the plate and grid portions of the coil are closely coupled, as they are merely different sections of the same coil. This coupling results in sufficient regeneration, or feedback, to sustain oscillations in this circuit, as described in the preceding article. It will be recalled that oscillations are accompanied with periodic plate current variations. Any such changes between tube elements 6 and 8 must necessarily affect the total plate current between elements 6 and 3, and which passes through coil L5, giving rise in this coil to oscillations identical in frequency to those in the oscillating circuit proper.

But the signal frequency also sets up oscillations in L5. Therefore we have existing in this plate coil two different frequencies, which, combining according to the heterodyne principle, provide us with a third or intermediate frequency to which L5 is sharply tuned (by condenser C14) and which is passed on to the broadcast receiver by transfer to coil L6. This method of combining the two different frequencies has been called "electronic" coupling for reasons that are quite apparent. The 2A7 tube actually performs three functions. It amplifies the signal, generates the local oscillations and mixes the two frequencies. It is desirable, for stability and reliable operation, that coupling be effected only by means of the electronic action; the choke coil, RFC, prevents any stray transfer of local oscillations to the plate circuit. C12 is a by-pass condenser.

The tuning of the oscillator circuit is necessarily more complicated than that of the simple signal circuit, L1-C1. The oscillator circuit must "track" so that it will always be the intermediate frequency below the signal circuit when the dial setting of C1 and C2 are the same. This is to simplify logging. This is accomplished by means of the "padding" condensers C3 and C4 and the manner in which the coil is tapped.

Condensers C1 and C2 are tuned separately. The converter could, of course, be made single control by mounting these condensers on a common shaft or by otherwise "ganging" them—hooking them together mechanically so that one dial turns both of them. However, circuit adjustment and design are considerably complicated by such an arrangement, and it was judged best, at least in a beginner's converter, to stick to the more simple construction.

The remainder of the circuit is conventional and will be readily understood by the short-wave student who has followed us so far. The voltages are supplied by the transformer, Trans. The plate and grid voltages are rectified by the -80 tube. (*Continued on page* 766)

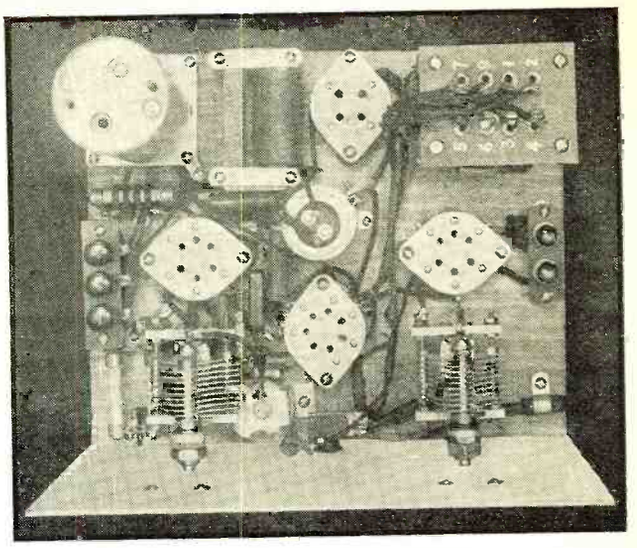


FIGURE 4. THE TOP VIEW

FIGURE 2. BEGINNER'S PICTURE WIRING DIAGRAM

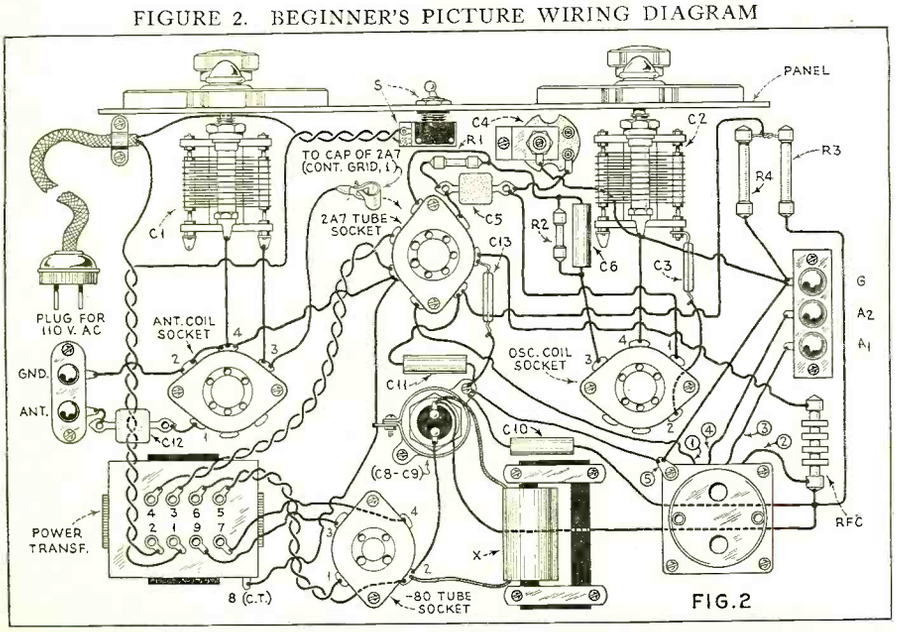


FIG. 2

SWITCHING DETAILS

Figure 7 shows a single-pole-double-throw switch making possible instant selection of short and long waves. Figure 8 shows a double-pole-double-throw arrangement for use where Figure 7's arrangement results in loss of volume on the broadcast band

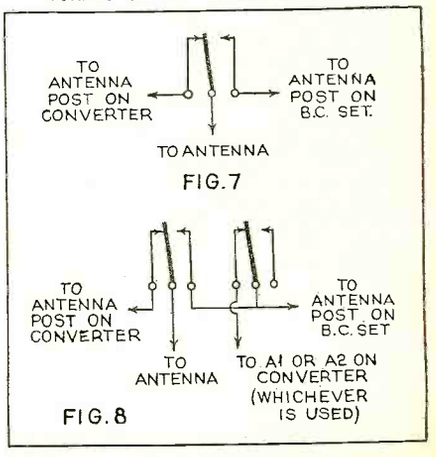
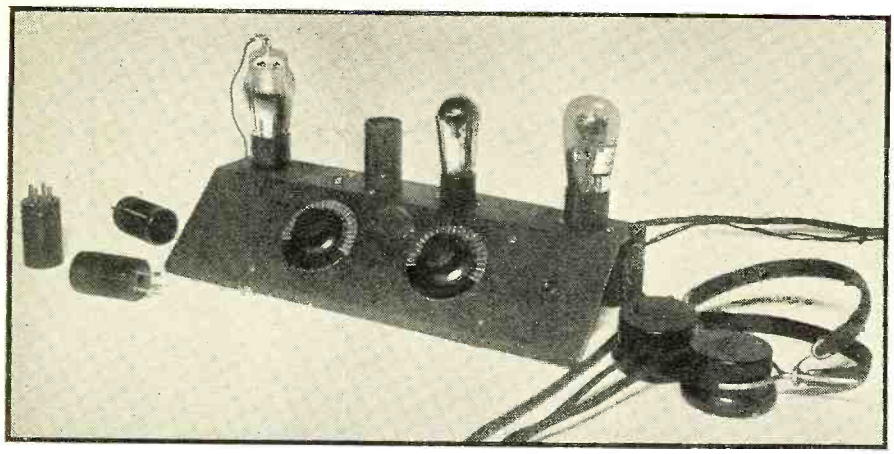


FIG. 7

FIG. 8



An R. F. Amplifier for the ONE-TUBE SET *

A. G. Landres and B. J. Montyn

Part Three

A CONSIDERABLE improvement in performance of a regenerative receiver can be obtained by adding a radio-frequency stage. The advantages gained are: increased sensitivity, elimination of radiation, elimination of the antenna trimmer condenser and its troublesome adjustments, and smoother control of regeneration.

By placing the amplifier stage ahead of the detector, it is possible to increase the strength of the weak stations sufficiently so that the detector can rectify them and they become audible. How many stations will be added this way depends on the amount of amplification provided by that stage.

When the detector oscillates, a regenerative receiver becomes a miniature transmitter which may have a range of several blocks. This is a great drawback, because the improper manipulation of this type of set may cause interference in other receivers in the neighborhood. When such a detector is oscillating at a frequency of one broadcasting station, then anyone tuning to this station will find that it is accompanied by a heterodyne whistle which cannot be tuned out. The addition of a radio-frequency stage isolates the detector from the antenna and therefore prevents this radiation.

The third advantage will become clear to anyone who has made the set described in the previous installments. It will have been noted that the little condenser in the antenna circuit had to be adjusted critically for best results each time the coils were changed or there would be dead spots on the dial. The radio-frequency stage overcomes that difficulty because this condenser is no longer in the circuit.

An attempt was made, naturally, to obtain as much amplification as possible out of one stage, so a type −34 tube was employed. It is true that a tuned stage would deliver a healthier signal, but an additional tuned circuit would greatly complicate the operation, for it would add another tuning control and another set of plug-in coils. The radio-frequency stage is therefore untuned and no adjustments are necessary in the antenna circuit.

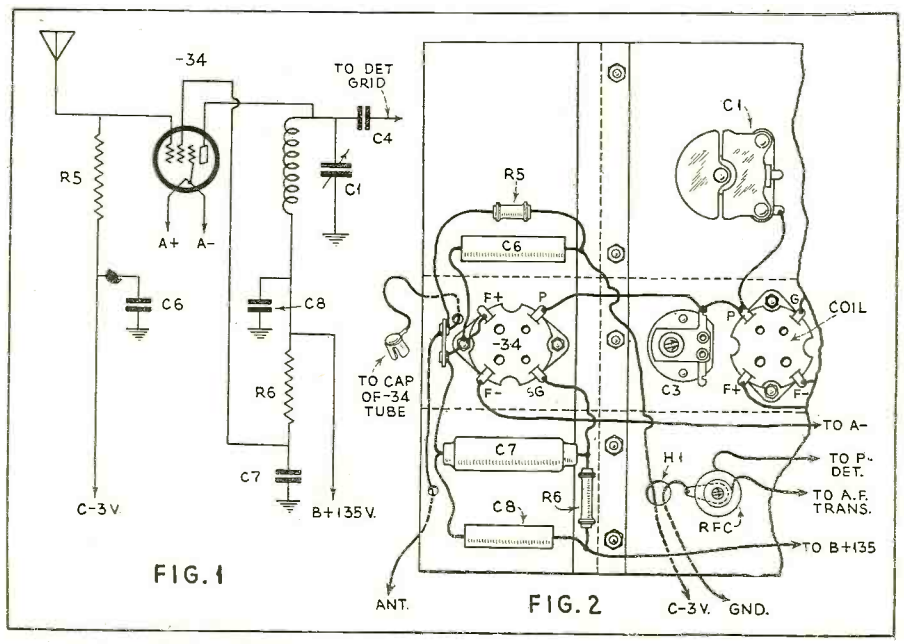
The type of coupling between the radio-frequency stage and the detector deserves some mention. This is called impedance coupling. In order to make the change as easy as possible, this type of coupling was chosen. The radio-frequency pentode delivers the greatest amount of amplification when it has a parallel-tuned circuit as a load, therefore the coil which was previously in the antenna circuit is now connected in series with the plate lead. This will place a high voltage on the stator plates of the tuning condenser, C1, and since the rotor is connected to the chassis, it cannot go to the lower terminal of the coil. The problem is solved by adding the condenser C8 and leaving all connections on C1 as they were. The tuned circuit now consists of the coil, L, and the condensers C1 and C8, which are in series. C8 is so large in comparison with C1 that it has very little effect on the tuning capacity across the coil. The high voltage is prevented from being put on the grid of the detector by the grid condenser, C4.

The addition of the radio-frequency stage interferes very little with the existing wiring. The only part that has to be changed in the old unit is the filament resistor, mounted on the filament switch. Since a tube is added, this resistor should now be somewhat smaller. The proper value is now 2.6 ohms; this will drop the voltage just the right amount.

Another section of chassis should be obtained which has the same shape as the previous ones and can therefore be attached to form the long chassis shown in the illustration. Such a section is available with all holes drilled and with a lid for easy attachment to the main chassis.

Mount the socket in the proper position with the terminal lug attached to the proper mounting screw. Do not forget to scrape the chassis where electrical connections are made to it. The socket should be placed with the small holes toward the old chassis section. The small section can now be attached to the main chassis.

Connect the positive filament terminal on the socket to the terminal which is connected to the mounting lug. (See Figure 2.) The other filament terminal should be connected to the negative terminal on the detector socket. The second terminal on the strip has several wires leading to it. First take a wire of about six inches, bring it through the hole just below the terminal strip and fasten it to the free terminal. Connect the grid-clip to the free end of this wire. The aerial wire should be disconnected from the small antenna-coupling condenser and then be connected to the last mentioned terminal. This brings the antenna direct to the grid of the first tube. (*Continued on page 757*)



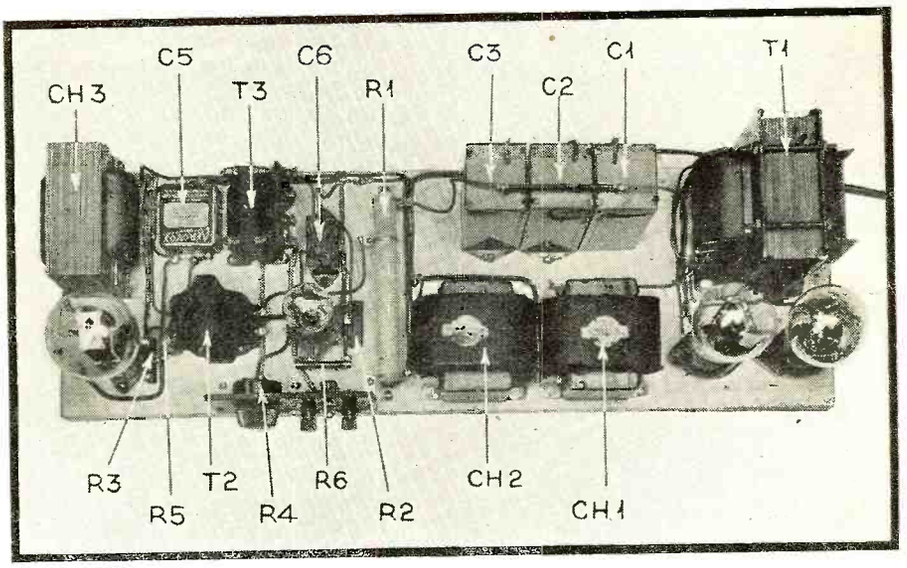
* See pages 598, April issue and 673, May issue.

5 METER POWER SUPPLY

(Including Modulator)

By popular request the author presents a power supply and modulator unit suitable for use with the 5-meter transmitter described in a previous issue

Garo W. Ray

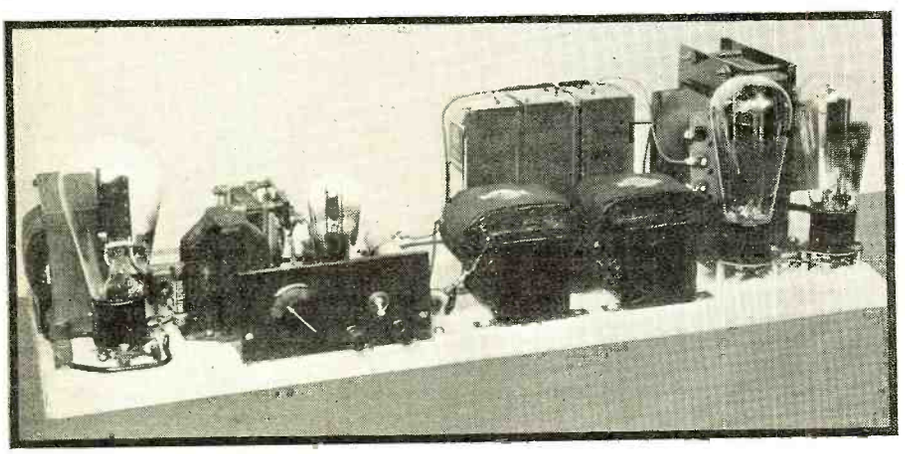


THE unit described here was designed and assembled at the request of RADIO NEWS readers who asked for further details on a modulating system for the 5-meter transmitter described in the December, 1933, issue.

It is a compact modulator and power supply for any transmitter with tubes rated at not more than ten watts (radio frequency) to be modulated, and is particularly suitable for the 5-meter transmitter described last December. It will furnish the 5-meter oscillator with both filament and plate supply in addition to providing a very satisfactory method of modulation for communication by 'phone.

As a matter of fact, the unit as described can be used in conjunction with all sorts of experimental layouts of 'phone transmitters. It is only necessary to build the radio-frequency end of these experimental transmitters. The power supply and modulator circuits are almost always standard, therefore all one needs to do is to hook up this power supply and modulator unit to the radio-frequency unit to be modulated.

The power supply comprises the following components: One power transformer with two 7.5-volt windings of fairly large current-carrying capacity, one 2.5-volt winding, and a high-voltage, center-tapped winding for plate power. The voltage of this latter winding need only be as high as the requirements for the modulator tube. In the case of the unit illustrated, this voltage is 1100 volts, such that after it is rectified by a full-wave rectifier, consisting of two half-wave rectifier tubes of the -81 or similar type, d.c. plate voltage of 450-500 volts is available.



A brute-force filter consisting of two 30-henry chokes in series, capable of carrying about 200 milliamperes, and three condensers of 1000-volt d.c. working voltage rating with a capacity of two microfarads each, smoothes out the output of the rectifier to a very satisfactory degree.

A voltage divider is necessary to provide a termination for the filter and to provide the intermediate voltage used in the first audio stage. In the unit illustrated, this divider is rated at 75 watts and has a resistance of 25,000 ohms.

The amplifier section consists of a microphone input stage, and a modulator or output stage. The first tube is a type -56 with an amplification factor of 13, and the output tube is a type -50. The two tubes are transformer-coupled. This transformer can be of any standard make and is (*Continued on page* 764)

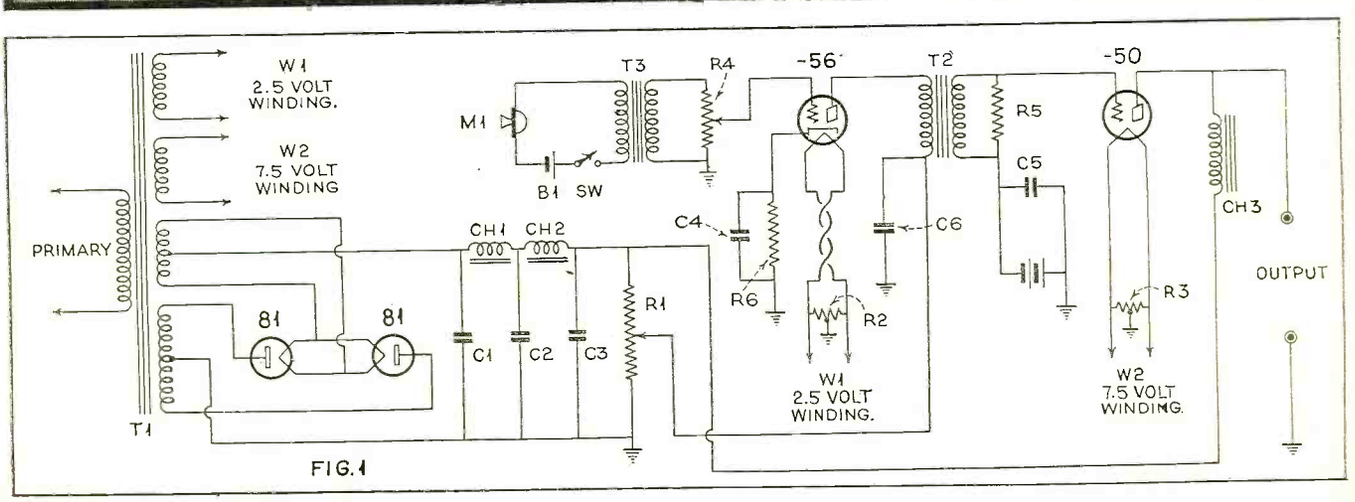


FIG. 1

Additional Hints On

R. F. AMPLIFIERS

FOR AMATEUR TRANSMITTERS

The author, owner and operator of the well-known amateur radio station W2BRB, adds a few notes to an earlier article for obtaining optimum power transfer in oscillator-amplifier circuits and transmitters

Part Two

[*By* Edward M. Glaser]

IN starting the process of neutralizing, we assumed that the oscillator was functioning properly. However, should the grid meter refuse to read, the trouble is either very low oscillator output or excessive amplifier grid bias. Of course, it may be a combination of the two. In this second article of the series, dealing only with amplifiers, it would be out of place to go into a detailed description of what might cause low oscillator output. Suffice to say that the trouble might rest in the crystal itself (assuming, of course, we are using crystal control) or in the r.f. choke in the grid circuit. A milliammeter in the plate circuit should show a snappy dip as the plate condenser is tuned into resonance with the crystal. If such is the case, the trouble lies in insufficient coupling. If such is not the case, either the crystal is N.G., the coupling excessive, or the plate by-pass condenser, C1, is too small. (Don't forget the grid r.f. choke, which has already been mentioned.) If the oscillator is of the self-controlled type, it should be relatively easy to get it working satisfactorily. Adjusting for proper feedback and grid excitation and, incidentally, watching for inductive grid leaks and defective r.f. chokes, should render the oscillator stable. Of course, a reasonably high C/L ratio should be used to further frequency stability.

Obtaining Optimum Power Transfer

It was previously stated that the grid meter would indicate relative values of exciting voltage and, therefore, might be used to adjust the oscillator for maximum output. In this case, we adjust the amplifier grid bias until the meter reads about 1 to 2 scale divisions, leaving lots of room for improvement! It is desirable that we also have an oscillator plate milliammeter in the circuit when we are making these adjustments so that we can have some idea of the oscillator efficiency. For instance, it would be foolish to double the oscillator input to get less than 20% increase in grid mils. Remember that the grid meter reads output current, and power is I^2 (the current squared), so that it would take four times the oscillator output to double the grid current. Again, if we double the oscillator input, the grid reading should increase 41% (the square root of 2 being 1.41). This was the basis for the previous statement that the reading should increase at least 20%, this figure indicating that the efficiency was dropping off but was still within reason if a little extra power were needed.

In practice, if the source of "C" supply has almost no resistance, this bit of mathematics will hold true, as checked with a vacuum-tube voltmeter at W2BRB. However, if a rectifier is used for grid bias, or if a grid leak is used to contribute to the bias, or if a high-resistance milliammeter is used, this may not hold true. This is because one of the points of the test was to set the "C" bias at some value and let it remain there. If there is any resistance in the circuit at all, increasing grid current will produce greater voltage drops in the resistance which will add to the bias with which we started. This means that we might have to multiply our power by—say, five—to double the grid reading. What actually happens, of course, is that, as the bias is increased, the input impedance rises, and to force a given current into a higher impedance requires a higher voltage and, therefore, more power.

Now at the maximum power output of the oscillator, the efficiency of power transfer to the amplifier will be about 50%. This is the point at which the load impedance (oscillator tank circuit coupled to amplifier grid circuit) is equal to the oscillator plate impedance. At this point half of our precious r.f. power is being absorbed by the plate. (Incidentally, the plate impedance is not the same as that listed in tube data sheets, because we are dealing with oscillators and Class B and C amplifiers and not with common audio, or Class A amplifiers. This impedance is an elusive thing, that is anything but constant, but we don't care a whole lot just what the value is, because we're looking for an outfit with a decent efficiency, not one where impedances are matched to give only 50% efficiency.) Now, we don't want to use good r.f. power to light up the plate, because, if we need light, a flashlight lamp and a dry cell will do a much better job. Keeping our plate voltage constant, suppose we decrease our power somewhat by loosening the coupling to the amplifier, which may be done by replacing the coupling condenser with a smaller one or by moving the clip X away from the plate. At ¾ maximum power output, the efficiency will rise to 75%; at half power the efficiency will be around 85%, and so on until at—say, one-tenth power—we might expect an efficiency of as much as 95%. However, this is purely theoretical and doesn't always hold good, for it might take one-tenth of our power to overcome the losses in the plate and coupled circuits. At any rate,

POWER OUTPUT VS. EFFICIENCY

Figure 1. These two curves show efficiency in percent and power output plotted against load impedance

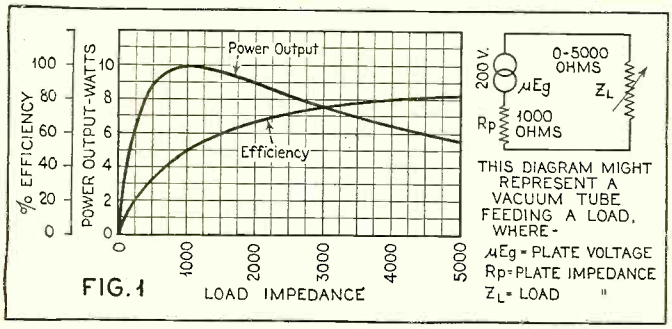


FIG. 1

THE AMPLIFIER COUPLING SYSTEM

Figure 2. Shows the form of inductive coupling to an amplifier stage for frequencies of 14 mc. or higher

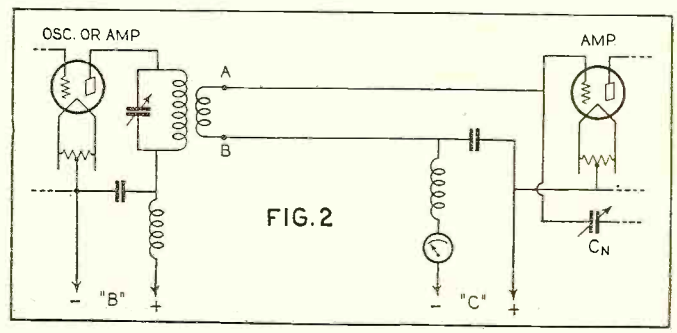


FIG. 2

the reader would do well to become *very* familiar with Figure 1, as the explanation of countless phenomena associated with radio and electrical subjects lies within its borders. In making full use of Figure 1, we would do well to memorize it, always having a picture of it in our minds. First, we will consider a common phenomenon.

Loose vs. Tight Coupling

How many amateurs have tightly coupled an antenna to their transmitter and found that, if they loosened the coupling, the antenna current would rise? How many have wondered why this was so? An antenna, we'll say, has a resistance of 50 ohms at our particular frequency. The plate circuit of our tube (oscillator or amplifier) has a resistance of several thousand ohms. If we tightly couple the antenna and retune it, we will be operating around the lower left-hand part of the power transfer curve of Figure 1. Most of our r.f. power will be wasted in the tube and the efficiency will be less than 50%; probably much less! Both the plate and antenna circuits will tune very broadly. This is because we have, in effect, short-circuited the plate impedance with 50 ohms—the antenna resistance. Now suppose we loosen the coupling. The input power to the tube will decrease, the tube will operate cooler and the antenna current will increase. We are now around the top of the curve! Loosen the coupling still further, always retuning, and we find that the d.c. input drops a great deal, although the antenna current drops only slightly —and the tube operates *cold!* No question about it—we are now on the right-hand side of the picture—where we should be for decent efficiency. *We can now increase the plate voltage and boost the antenna current much higher than it was when we were operating on the top of the curve without increasing the heat dissipation in the tube over what it was in the former case.* Actually, most amateur operators have found this out by experience, although few are aware of just what goes on.

We now have to apply this last paragraph to our oscillator-amplifier arrangement described in Part 1 which we are using as an example. The author used the antenna phenomenon simply as a comparison, bearing in mind that most transmitting amateurs would be familiar with the antenna coupling problem, while few would know well the idiosyncrasies of coupling two r.f. units. While most of us use inductive, are magnetic, coupling to our antenna, it has become usual practice to use capacity coupling to r.f. amplifiers. Inductive coupling might well be used, however, as is shown in Figure 2. There is one decided advantage in this system, namely, that series feed is used in the grid circuit, which obviates the necessity of having a near-perfect r.f. choke to hold back all the valuable r.f. exciting voltage. Another obvious advantage is the eliminating of the coupling condenser, C2, which must stand the oscillator plate voltage plus the amplifier grid-bias voltage. A still further advantage comes to light when we are working on the real high frequency bands (14 mc. and higher). The reader will remember that the amplifier input and neutralizing circuits, in series with C2 (which is usually quite large), are in parallel with the oscillator plate-tuning tuning condenser. This means that the tuning capacity will have to be much smaller than it would be were the amplifier loading effect removed. It is obvious that, to preserve a sensible ratio of L and C (in the bands mentioned), the tuning capacity would be so small that it would be hard to guess the proper number of turns in the plate coil to properly couple the amplifier and still have the condenser cover the whole band. When working with r.f. amplifiers or crystal oscillators, it is always advisable to use as high an L/C ratio as is possible, because this gives the greatest efficiency. With the capacity-coupled arrangement there is too much loading, already, to permit taking advantage of the high L tank circuit, so that we welcome the change to magnetic coupling which permits us to use greater inductance with consequent greater efficiency. Were we using a self-controlled master oscilaltor, we should be obliged to use a high C tank circuit to further frequency stability, in which case the foregoing statements would not fit. The inductive-coupled arrangement at the author's station will be described in detail later. However, since the condenser coupled system is so popular, we will continue the story with Figure 1 (Part 1).

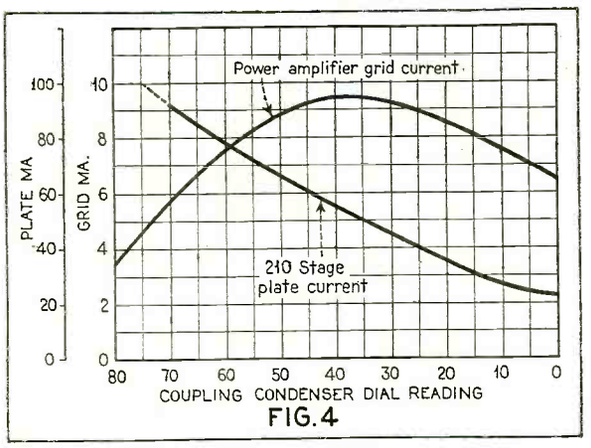


FIG. 4

CHECK ON CALCULATIONS

Figure 4. These two curves were made on an actual set-up at 7000 kc. to check the theoretical curves shown in Figure 3

Checking Theory and Practice

Suppose we are working on 3800 kc. and C2 happens to be a 2000 mmfd. condenser (a popular size). Let us put the clip, X, right on the plate. This gives us maximum coupling. Carefully recording the oscillator plate current and the amplifier grid current, we proceed to move the clip down toward the "cold" end of the plate coil, stopping at each turn and retuning each time. If we plot the curves, they should resemble Figure 3, although they will differ considerably with different layouts. In curve "a" we note that, as the coupling is loosened, the plate current drops rather fast at first and then more slowly as we come down the curve. On the other hand, the grid current rises rapidly at first, slowing down as it reaches a maximum and then gradually tapering off toward zero. The reader should recall the paragraph on antenna coupling—substituting antenna current for grid current. It might be well worth while to also glance back at Figure 1 and try to correlate these facts and figures. Remember that Figure 3 represents one application of the important Figure 1. (The next time you play with the transmitter, have these figures handy—they might help).

Getting back to Figure 3, it is at once obvious that, with maximum coupling, we are getting poor results, indeed, for our plate input power is very high and our exciting voltage is much below maximum. Under certain conditions, such as, for instance, where we had a limited plate voltage, it might be reasonable to work at point X, where the grid current is a maximum, but, in most cases, it would be much more sensible to work to the right of point X at some such point as Y. It should be noted that, alalthough the grid current is somewhat less at Y than at X (12%), the plate current is a lot less (25%) and, therefore, the efficiency is much better. If the oscillator plate voltage can now be increased, the grid current of the amplifier may be brought as high as it was at the peak, and even higher, with less heating of the tube. This, then, is the proper way to operate an r.f. amplifier — with high voltage and loose coupling. (The same is true for any type of oscillator.) Figure 3 was calculated mathematically and is theoretically true. In order to check this in practice, (*Cont'd on page 771*)

CALCULATED INPUT—OUTPUT CURVES

Figure 3. These curves show theoretical changes in input and output currents plotted against variation in coupling

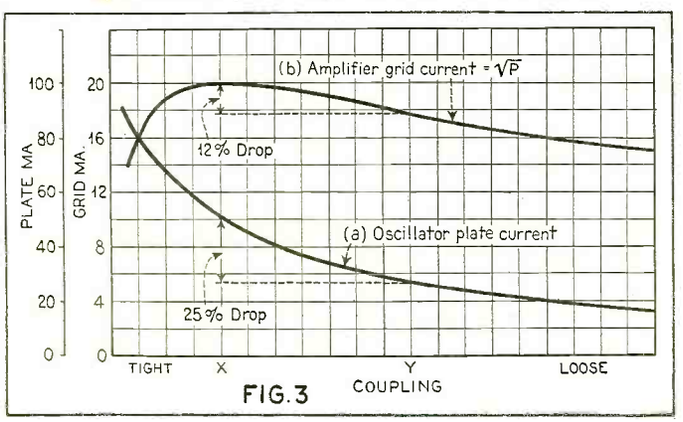


FIG. 3

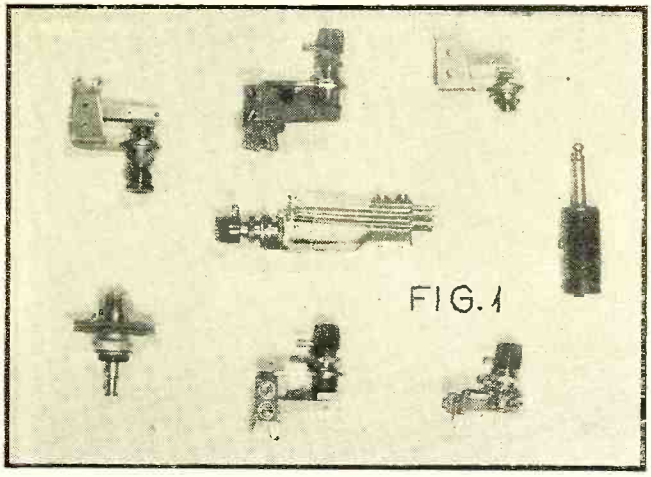


FIG. 1

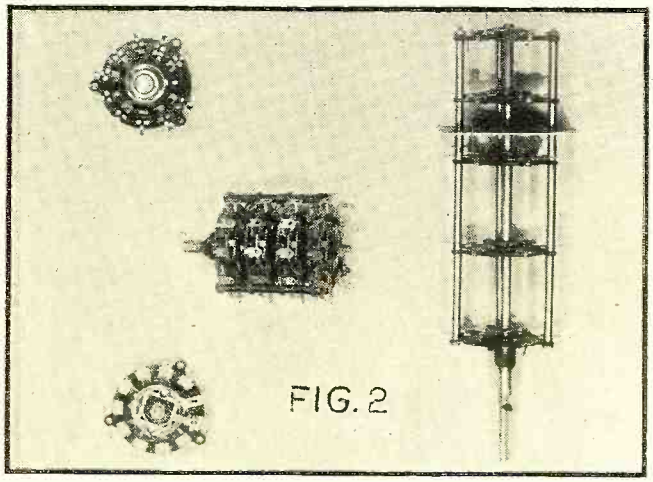


FIG. 2

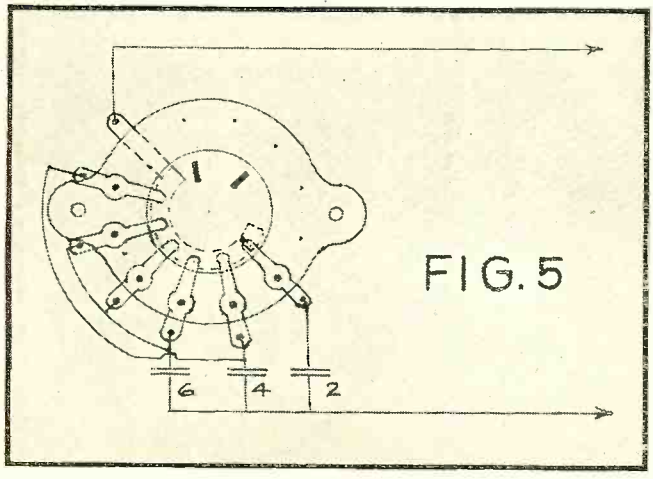


FIG. 5

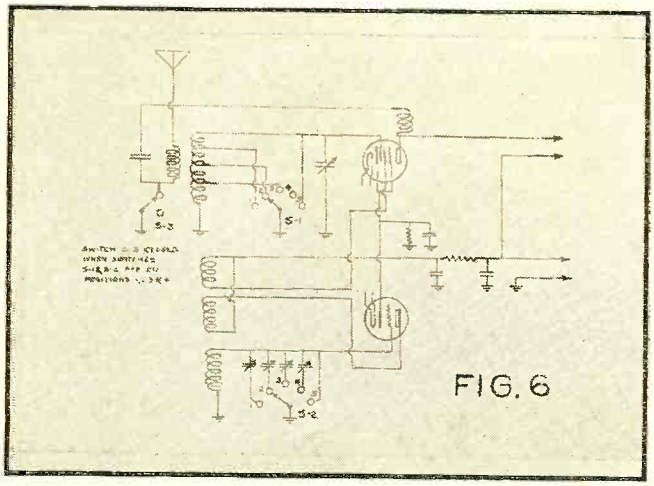


FIG. 6

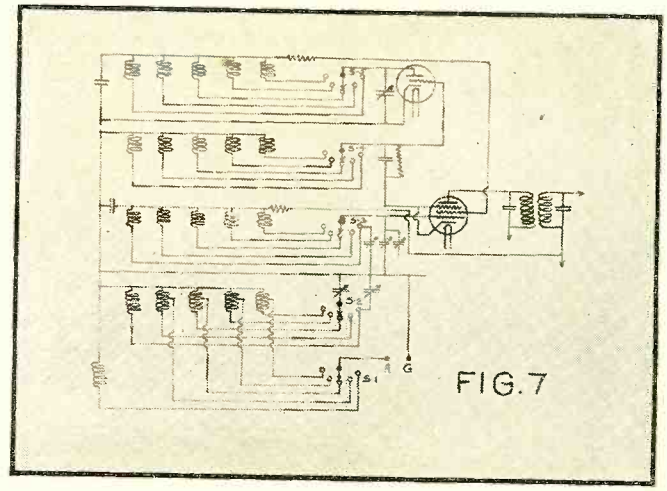


FIG. 7

Radio Applications of MODERN SWITCHES

The popularization of dual-band and all-wave radio sets has brought the problem of efficient switching systems to the fore. This article points out the numerous switch types available and shows some of their applications

P. G. Andres

CIRCUIT selector switches constitute a major factor in communication engineering and particularly in automatic telephony. Their design and circuit application have been extensively studied and perfected to such a degree that these switches perform their function with remarkable speed and reliability. It is but natural that the radio engineer review this field when considering the use of switches to accomplish circuit changes in radio receivers and associated apparatus.

The radio switch requirements are different insofar as they are manually operated, radio and audio frequencies are used, losses often must be reduced to a minimum, and space is a paramount factor; however, many of the problems are similar, such as, the characteristics and performance of contacts, contact springs, methods of mounting and so forth. This paper is intended to give an outline and review of radio circuit selector switch development and to show how in design and application with the advancement of radio circuits such switches have developed into a specialized field.

The phone jack and jack switches were early switch applications. They were and are still extensively used in audio circuits and are identical or very similar to the equivalent devices used in the telephone industry. Jack switches find application as power switching devices for battery type receivers where numerous circuits are operated simultaneously. In early receivers such switch mechanism was often made part of the filament rheostat but gradually such switching has been incorporated in a separate switch. Figure 1 illustrates a number of jack switches used in audio circuits and battery receiver power circuits. A recent development of such a switch is shown at the lower right of the figure. This switch is designed for automobile receiver application and is so arranged that the actuator which is of the push in type acts as a key. When removed it prevents operation of the receiver. Modified forms of such jack and key switches known

as anti-capacity switches have been developed for radio frequency circuit application but these have gradually been superseded by rotary type switches to be mentioned later.

Aside from radio receiver application jack switches and push-button switches are used in service equipment and set analyzers. In this case by means of the switch one or more meters are made universal by inserting series multipliers or shunts in the circuit to be measured. In broadcast and speech amplifier work such switches are used to insert meters in the circuit without interrupting the circuit.

These switches are mounted to the chassis or panel by means of the conventional threaded bushing and nut. An eccentric cam moves the contact springs on the ends of which the contacts are either riveted or welded. The springs are generally made of nickel silver, phosphor bronze or berrylium bronze while the contacts are platinum, coin silver, silver alloy or low resistance non-corrosive, non-errosive alloys. Care is exercised in the design to insure definite and uniform contact pressures and a wiping action during operation maintains a positive contact. As an illustration of electrical values, a jack switch such as mentioned above having coin silver contacts, conical in form with a rounded end, a spring pressure of 300 grams and a lift of 0.040 inches has a direct current resistance of 0.0030 ohms and a capacity of 12 micro-micro-farads at 1000 cycles. The resistance of the contacts after 50000 cycles of operation at a speed of twenty cycles per minute measured 0.0038 ohms.

While jack switches have been developed and used primarily for audio circuit applications, the fact that the capacity between springs is detrimental when applied to radio-frequency circuits, and the limited operative positions of the switch, have resulted in a special development of circuit selector switches for use on radio-frequency circuits and in particular for those circuits where short-wave switching is required. Early multiple contact switches for use in radio-frequency circuits followed along the tap switch design. With the development of receivers capable of receiving signals in the bands from twelve to twenty megacycles, and associated complex circuit requirements, these tap switches have received much development and redesign to obtain low capacity and resistance, together with flexibility to obtain the necessary circuit functions in a commercial design. Figure 2 shows a number of switches designed for such service. In isolated cases switches have been built in as part of the chassis or integral with the inductances which are interchanged in the circuit.

Figure 3 shows the mechanical details of a four section circuit selector switch. The switch is mounted to the chassis by means of the bushing and in case of long switches additional support is obtained by either a rear bracket or shield plate. The index mechanism is located back of the front plate and is obtained by a ball bearing held in a spring and which drops into indentations in the front plate.

The contacts, provided with definite locating lugs to prevent movement, are riveted solidly to a high grade bakelite base. One or more common or ground terminals are fastened on the opposite side of the plate. A circular disc which contains the floating contactors is caused to rotate between the terminal contacts and the ground terminals. Provision is made to place the contactors in a (*Continued on page* 743)

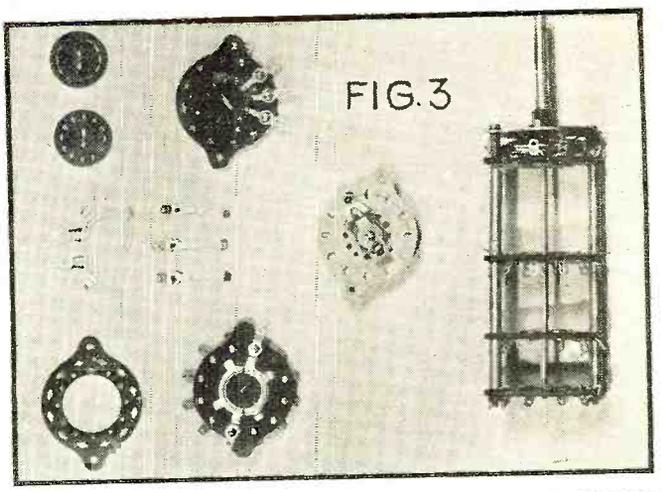


FIG. 3

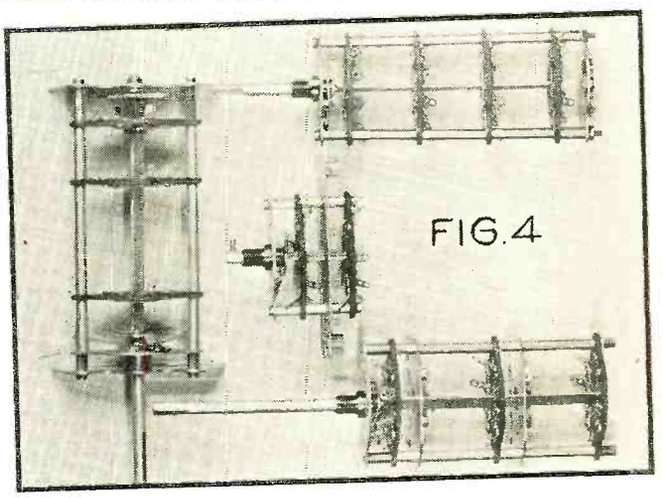


FIG. 4

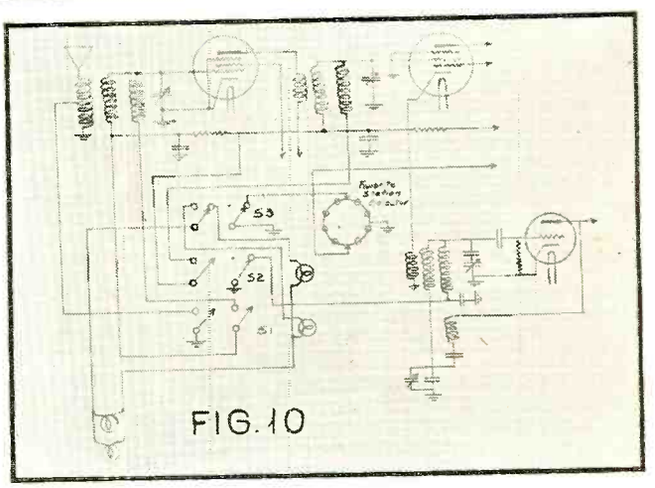


FIG. 10

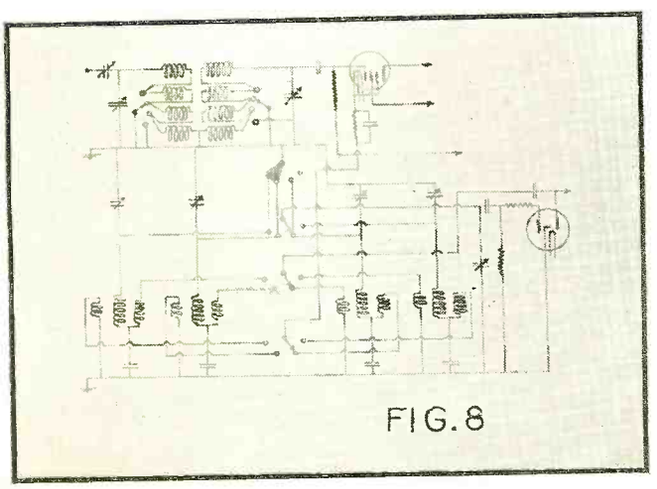


FIG. 8

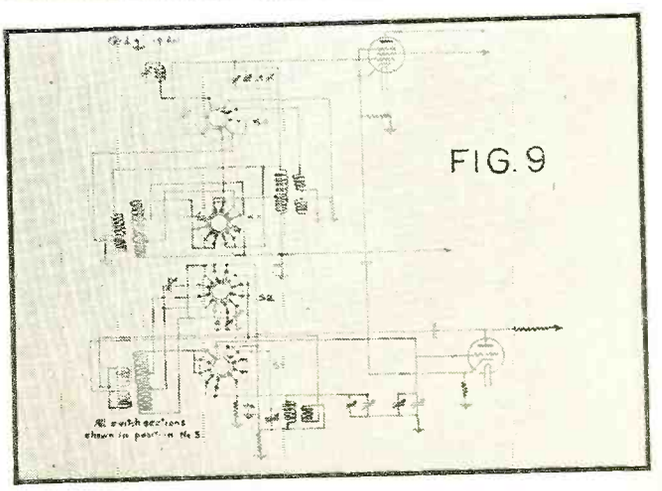
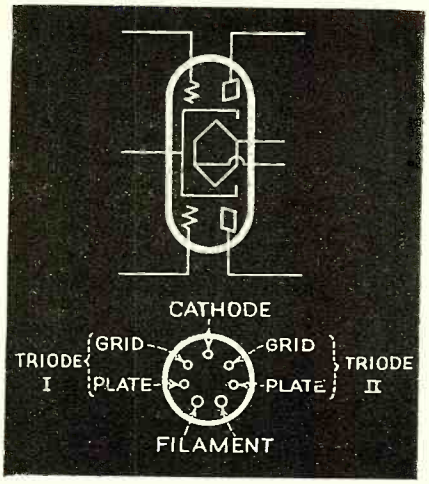


FIG. 9



TECHNICAL DATA ON THE "53" TUBE

(Twin Class B Amplifier)

J. van Lienden

THE type –53 tube consists of two high-mu triodes with a common cathode in a single glass envelope. This twin amplifier is designed primarily for use as a Class B output tube where both halves of the output stage are provided within a single tube. The same tube can also be used as a Class A amplifier. With both grids and both plates connected together, it makes an excellent driver for the Class B output stage. An output of approximately 10 watts can be obtained with a plate supply of 300 volts. This new tube greatly simplifies the wiring in a radio receiver and also reduces the number of parts, saving space. It is claimed that the distortion introduced by the Class B system is no higher than that which would result if pentodes were used delivering the same power. Like all Class B systems, the total plate current will fluctuate considerably while the tube is in operation. However, the static plate current of type –53 is rather high, so that the increase of plate current is materially less. A power supply employing high-vacuum rectifiers can be employed if the filter has been designed with a low resistance. Besides the use in Class B amplifiers, type –53 lends itself to several other uses. The two triodes can be used independently, so that it becomes possible to employ the combination as a detector and amplifier or as a two-stage amplifier or as a phase inverter.

Characterstics for type –53 when used as a Class B amplifier are shown in Table I. A family of plate characteristics is found in Figure 6. These curves apply to each triode unit and shows the plate current plotted against plate volts and grid current against plate volts for different grid bias values. In normal use the tube requires no grid bias, because the plate current at zero bias is already relatively low. During operation of the tube as a Class B amplifier the grids alternately become positive and require considerable power to be delivered by the driver. In order to keep distortion low, the transformer between the driver and the output stage should have a step-down ratio ranging between 1.5 to 1 and 5.5 to 1 (ratio of the primary to one-half of the secondary). The resistance of the secondary windings should be low in order to reduce the voltage drop across them. The load on the driver tube is generally chosen twice as large as it would be for normal Class A operation. For a push-pull triode driver stage its minimum plate-load per tube should be approximately equal to the plate resistance of an individual tube. This ratio for push-pull operation is permissible because of the elimination of second harmonic distortion. A high step-down ratio of the

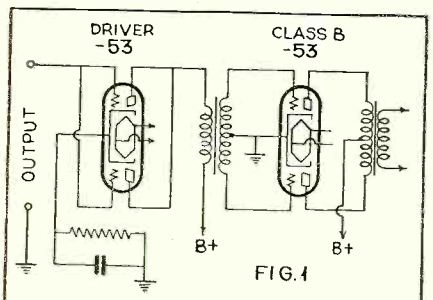


FIG. 1

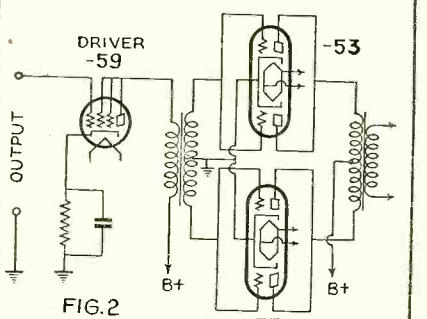


FIG. 2

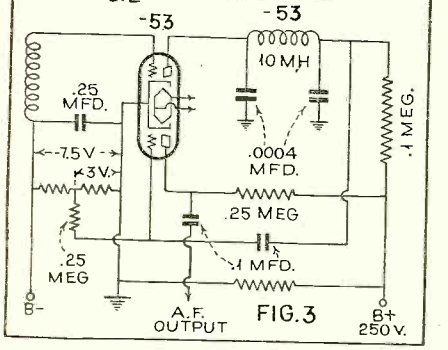


FIG. 3

TABLE I			
Ef	2.5 VOLTS		
If	2.0 AMPERES		
LENGTH	4 11/16"		
MAX. DIAMETER	1 13/16"		
BASE	MEDIUM 7 PIN		
CLASS "B" SERVICE			
Ep	300 MAX.		VOLTS
Ip PEAK (PER PLATE)	125	"	MA.
PLATE DISSIPATION (AVERAGE)	10	"	WATTS
TYPICAL OPERATION:			
Ep	250	300	VOLTS
Eg	0	0	"
Ip STATIC (PER PLATE)	14	17.5	MA
LOAD RESISTANCE (PLATE TO PLATE)	8000	10,000	OHMS
POWER OUTPUT WITH AVERAGE POWER INPUT OF 350 MW. BETWEEN GRIDS.	8	10	WATTS
CLASS "A" DRIVER			
Ep	250	294	VOLTS
Eg	-5	-6	"
μ	35	35	
rp	11,300	11,000	OHMS
Gm	3100	3200	MICROMHOS
Ip	6	7	MA.

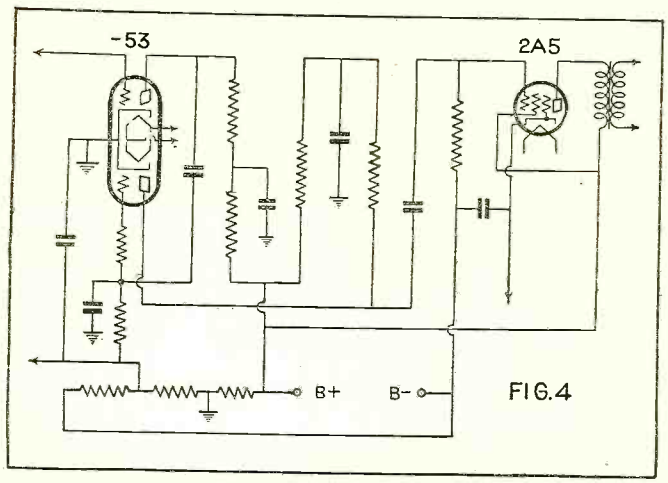


FIG. 4

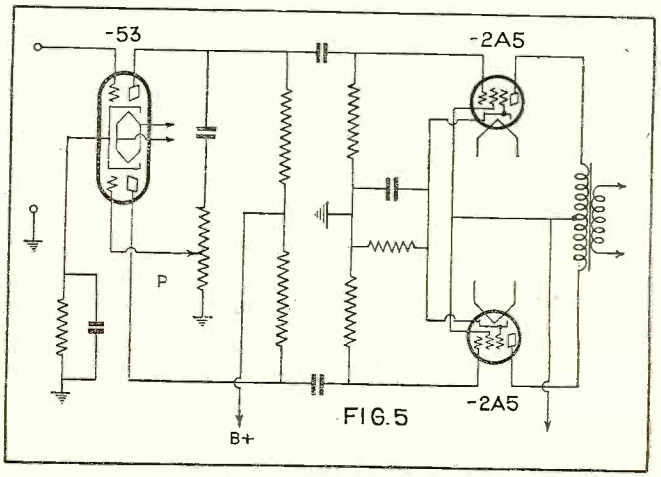


FIG. 5

transformer causes low distortion in the Class B input circuit, but it reduces the available signal. Therefore transformers are generally designed to make use of a grid distortion which will cancel the distortion caused in the plate circuit of a Class B stage. The step-down ratio does not have to be so great in that case.

The –53 may be employed as a Class A driver stage. When operated in this way, with a plate supply of 300 volts and a grid bias of —6 volts, it is capable of delivering upwards of 400 milliwatts. The required load impedance will vary, depending on the design of the Class B system as well as on the voltages employed. It will generally vary between 20,000 to 40,000 ohms. When self-bias is employed with a –53 tube operating as a Class A amplifier, the resistance in the grid circuit should not exceed 0.5 megohms. With fixed bias, the grid circuit resistance should never be more than 100,000 ohms.

Type –53 tubes employ the 7-prong socket of medium size (the larger one of the two, similar to type –59); the diameter of the pin circle equals .855 inch.

The circuit for the –53 tube as a Class B amplifier, with another –53 tube as a driver, is shown in Figure 1. Characteristic curves showing the power output, plate current, harmonic distortion and grid current plotted against input voltage are shown in Figure 7. Characteristics of the type –53 used as a Class A amplifier (driver) with both triodes connected in parallel are shown in Figure 8. It is also possible to employ a type –56 tube as a driver. Curves showing the same characteristics of the combination –56 and –53 tubes are shown in Figure 9.

The triode section of a type –55 can be used as a Class A driver employing a plate supply of 250 volts. Curves for this combination showing the influence of the input voltage on power output, plate current, harmonics and grid current are shown in Figure 9.

It is possible to employ two –53 tubes in the Class B stage, thereby doubling the output. For each side of the amplifier a single –53 is employed with its plates and grids connected together. Approximately 20 watts upward can be obtained from the two tubes employing a plate supply of 300 volts. It is claimed that (*Continued on page* 765)

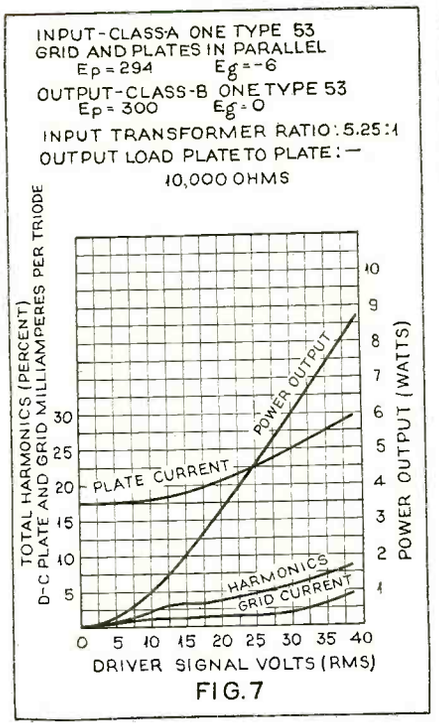


FIG. 7

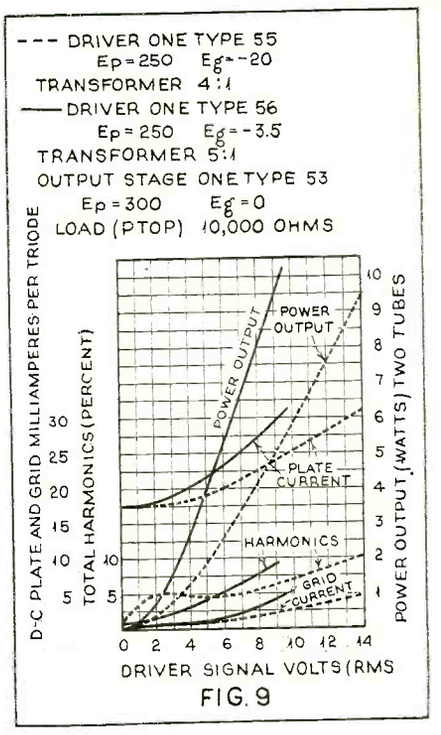


FIG. 9

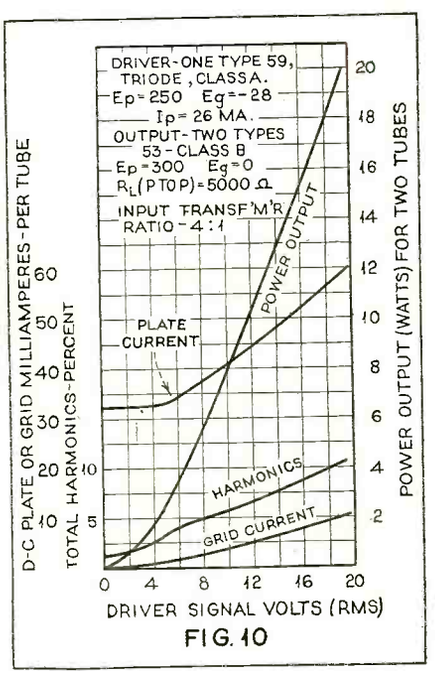


FIG. 10

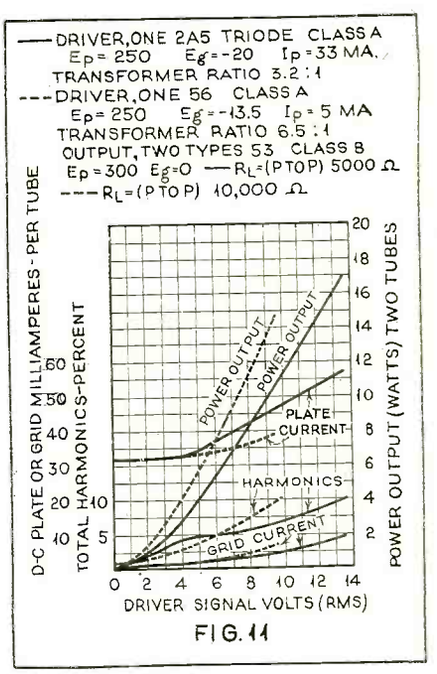


FIG. 11

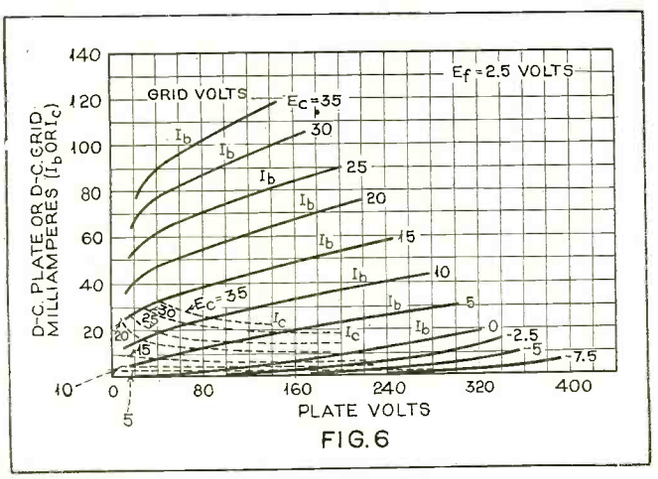


FIG. 6

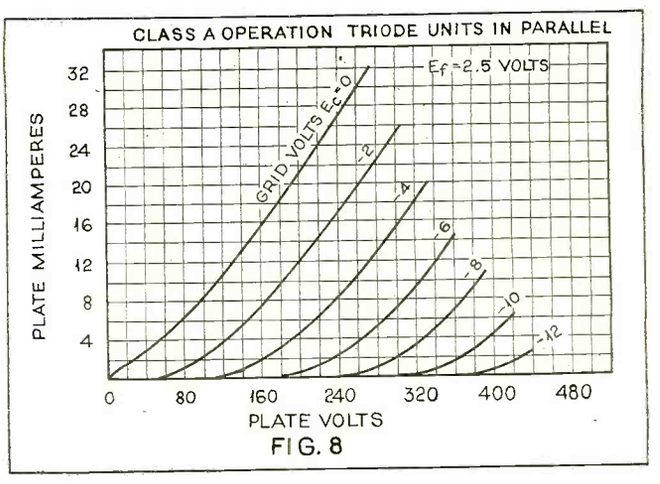
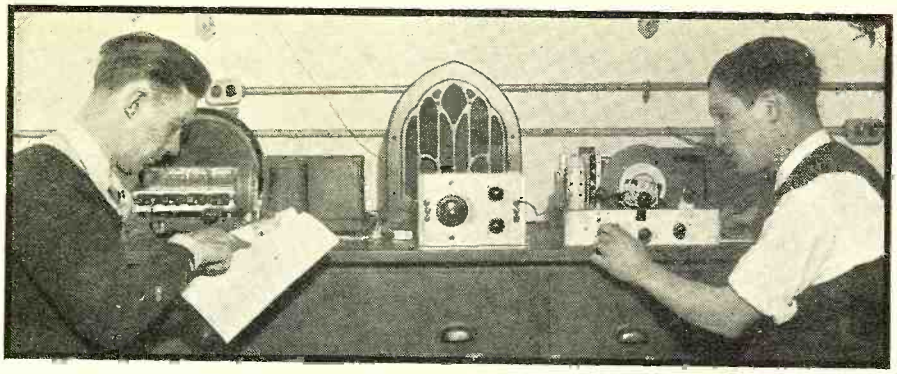


FIG. 8



THE DX CORNER

FOR BROADCAST WAVES

Suggestions to Contributors

THIS department of RADIO NEWS is now an established fact and opportunity is taken here to offer some suggestions to readers who submit DX information for publication. It is not by any means the intention of the editors to hem in contributors with a lot of hard and fast rules to follow. But if these suggestions are followed it will simplify the editorial job of studying the information presented in each letter and will insure more helpful and useful information being passed on to readers.

If listing stations heard please tabulate them *and give the frequency of each station.* This latter point is important, because it helps readers who do not have up-to-date station lists and it also helps to keep other readers informed on changes in frequency which may have been made without official announcement. It is also desirable that the location be given in listing foreign stations, as in some cases station calls and frequencies may be transferred from one station to another some distance away without the matter being brought to the attention of the general DX public (this is particularly true of distant foreign stations).

It also is helpful if the date and time are listed, for unusual catches as this will help to keep others informed as to when they can best try for these same stations.

If you are submitting information on both short-wave and broadcast band reception use separate sheets of paper, so that each type of material can go to its respective editor's desk without delay.

Last, but not least, in writing to this department, let us know what features you particularly like, what ones you do not find useful and what ones you would like to see added. Remember that this department is in a formative state. It is the editor's desire to mould it to meet your desires and requirements, but this is difficult to do unless you co-operate to the extent of making your wishes known.

DX Clubs

In response to the invitation to DX club executives to provide information concerning their clubs for the benefit of readers, several have responded.

The International DX'ers Alliance: Open for membership to experienced DX'ers who can submit verifications from foreign stations at least 2000 miles distant but not including Canada, Cuba or Mexico. This organization is international in scope, as its name implies. A printed publication, the "Globe Circler," is mailed to members monthly and contains up-to-date information concerning DX stations, schedules, etc. Dues are understood to be $1.25 for residents of the United States; foreign membership somewhat higher to cover the higher mailing cost. For further information address Charles Morrison, President, Bloomington, Ill.

Newark News Radio Club: The following pertinent information is quoted from a letter received from Alfred W. Oppel, Executive Secretary of this organization:

"We have 2000 members in all parts of the world. The club is a non-profit organization, six years old and is run by officers who serve without pay. To qualify for membership one need not have a large log of stations, nor even be an experienced DX'er, as only a love of radio is required. Membership dues are $2.00 the first year and $1.00 thereafter. Members receive the Wednesday copy of the *Newark Evening News* each week, in which are listed DX tips and information. Each member receives a membership card and button on enrollment. For local members meetings are held each month with entertainment supplied by the large local stations. A chain of 37 stations and 12 newspapers dispense DX tips for the club. For further information, address Newark News Radio Club, 215 Market Street, Newark, N. J."

Central DX Club: Organized in 1932 as a local club, it has now grown to be national in membership, although it serves the Middle West and Far West primarily. A monthly DX bulletin is sent to all members; also a weekly tip card. Dues are $1.00 the first year and 75 cents thereafter. Address inquiries to Allan M. Dewey, Jr., 421 Seventh Avenue (Room 302), La Grange, Ill.

DX CLUBS—ATTENTION! If you care to have your organizations brought to the attention of readers of this department, send along information to the DX Corner.

Weekly DX Tips

DX tips are broadcast weekly by WHAM, Rochester, N. Y., 1150 kc., 11-11:15 p.m., E.S.T., Thursday; CFRB, Toronto, Ontario, Canada, 690 kc., 10:45 p.m., E.S.T., Saturday; KFOX, Long Beach, Calif., 1250 kc., 3-3:10 a.m., E.S.T., Sunday; WBNX, New York City, 1350 kc., 10:15 p.m., E.S.T., Sunday (short-wave rebroadcasts, tips and features); KDKA, Pittsburgh, Pa., 980 kc., 12:30-1 a.m., E.S.T., Monday (also over W8XK, 48.83 meters, 6140 kc.).

Tuning Meter a DX Tool

The tuning meters on many modern receivers can be used to advantage as signal strength indicators. In fact, in DX work, this is one of the most useful functions of such meters.

Readers who have receivers with good automatic volume control but no tuning meters, or with tuning meters which register only on strong stations, will find an item in the "With the Experimenters" department in this issue which provides instructions for installing an ordinary milliammeter to function as a surprisingly good tuning meter. This is easily installed—and without danger of upsetting the alignment, calibration or operation of the receiver. If the owner of such a receiver does not know enough about the technical side of radio to make this change himself any serviceman can do the job in a half hour or so. Tuning meters can be applied only to receivers which include automatic volume control.

In most tuning meters the scale is marked off into divisions but not calibrated in numbers. When the receiver is turned on the needle flips to full scale if the receiver is not tuned to a station. Then when stations are tuned to resonance the needle drops back. On strong stations there will be a large drop; on very weak stations a slight drop. The amount of retardation from the "no signal" position therefore indicates the carrier strength of the station tuned in. This indication is not linear. That is, if one station causes the meter to retard twice as much as another it is not an indication that the field strength of the former is twice that of the latter. Actually the stronger of these stations may have many, many times the field strength of the other. This is not important, however, because whatever way the scale of the meter is marked may be set up as an arbitrary calibration to serve our purpose. Thus in recording a station in the log book the number of divisions it forces the needle back will represent its signal strength. For instance, if a given station causes the needle to retard 3 divisions from the "no signal" position, then that station will be entered on the log as "signal strength 3," and so on.

BUDAPEST INSULATED MAST

The new 120-kw. station at Budapest, Hungary (546 kc.), employs an antenna mast 997 feet high. Although the mast weighs 580 tons, it is entirely supported on the porcelain cones shown here, the walls of which are only 3 inches thick

It should be borne in mind that these indications are of carrier strength—not volume. Two stations which show the same reading on the meter when tuned to exact resonance will have the same volume at the loudspeaker only if they employ the same percentage of modulation at the transmitters. If one employs 60% modulation and the other 30% modulation the audio voltage at the loudspeaker will be twice as high on the former. The tuning meter should therefore not be considered as a volume indicator.

A typical application of this tuning meter

idea is found in observations made at the New York City listening post as shown in the following tabulation. At about midnight (E.S.T.), Friday, March 30, the channels between 640 kc. and 860 kc. were tuned in one after another and the signal strength as indicated by the tuning meter was recorded on each station. The next night, about 1 a.m., the same thing was repeated. The result is a record which shows definitely how the stations on each of these channels changed in carrier strength from night to night.

Kc.	*Call*	*March 30*	*March 31*
640	KFI	2.0	30.+
650	WSM	4.8	5.2+
660	WEAF	7.6	7.6
670	WMAQ	het.	3.1
680		1.1	het.
690		4.5	
700	WLW	6.5	7.1+
710	WOR	9.3	off
720	WGN	het.	4.8
730		3.7	3.3—
740	WSB	3.9	4.8+
750	WJR	5.6	4.8—
760	WJZ	8.2	8.2
770		4.8	4.4—
780		3.5	2.9—
790	WGY	5.4	5.4
800	WFAA	3.7	off
810	WCCO	4.5	3.1—
820	WHAS	4.3	4.3
830	KOA	2.5	3.1+
840	CKLW	4.3	5.1+
850		1.7	
860	WABC	10.5	10.5

Inasmuch as the tests on Saturday night were an hour later than those of Friday it would be expected that the far west stations would come in stronger, and such proved to be the case, as judged by KFI and KOA. In addition, stations on 650, 700, 740 and 840 kc. were found to be better the second night. On the other hand, five stations were not as good on Saturday as on Friday, WCCO being the one to suffer most. A record like this continued for a week or two would prove extremely interesting and it is certain that the recording of field strength values in this manner would add immeasurably to the value of the log book to any experimenter who is seriously interested in his DX work.

As a sidelight, it is of interest that when WLW signed off Saturday night the signal strength was indicated as 6.0 on the meter (it had faded from the 7.1 recorded earlier). The new Crosley 500 kw. transmitter (W8XO) started immediately, and showed signal strength of 7.1. Ten minutes later this had changed to 8.8, presumably due to increasing power at the transmitter. This carrier strength of 8.8 is higher than that of any local New York station except WABC and WOR and it therefore appears that the new transmitter is actually accomplishing what it was intended to do—extending the "local" reception area of this station out several hundred miles.

It would be interesting to have reports from readers who adopt this tuning meter method of signal strength indication, listing the measurements made on a number of stations, tabulated as above but covering perhaps several days instead of only one or two.

In the tabulation above no measurements are shown for channels having audible heterodynes because the presence of two signals causes error in the meter indication. Call letters are not given for all channels as no time was taken to wait for announcements. The call letters shown are assumed to be correct although in most cases the calls were not heard during these measurements.

Capetown, South Africa

From the Bureau of Foreign and Domestic Commerce in Washington comes the report that on January 15, 1934, the new Capetown transmitter was put into operation to replace the old 1 kw. transmitter. The new one is rated at 10 kw. and is expected to have considerably improved range. Information was not given as to the operating frequency or call letters, but it is assumed that the old call and frequency are still in use. The call was ZTC and the frequency 810 kc. Here is a real DX record for listeners to shoot at.

DX Ratings

The Plainfield DX Club has a rather novel method of rating the achievements of its members, according to a letter received from Harold J. Clark, one of the members. The ratings are of a military character. To qualify for the title of "General," for instance, the member must be able to show a log of 700 stations received and at least 400 of these verified. The other titles and requirements are as follows: Colonel—600 stations, 300 verifications; Major—500 stations, 250 verifications; Captain—400 stations, 200 verifications; Lieutenant—300 stations, 150 verifications; Sergeant—200 stations, 100 verifications; and Corporal—100 stations, 50 verifications.

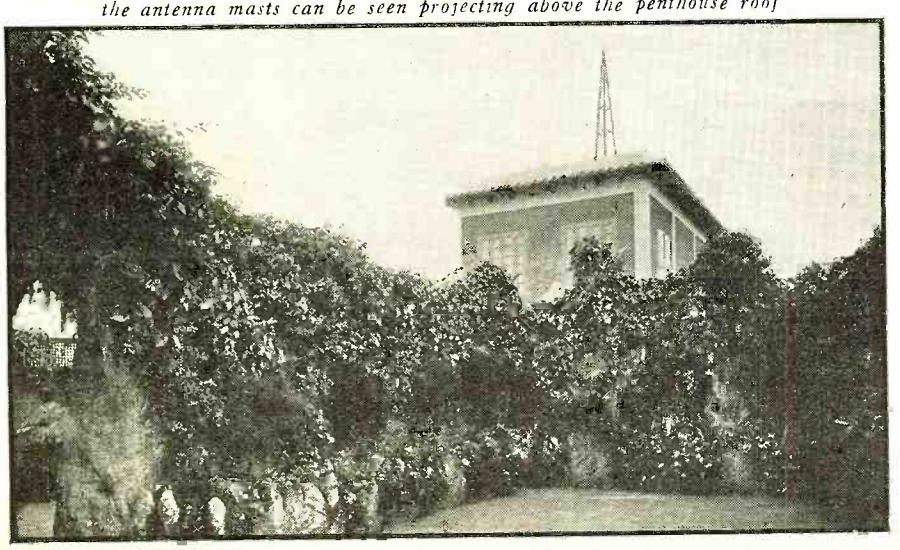
International Call Letters

In the April issue of RADIO NEWS appeared a list of international call letter assignments. Recently, however, a new distribution has been made as shown below. This list is now the official one and the assignments as shown here are now in use.

CAA-CEZ	Chile
CFA-CKZ	Canada
CLA-CMZ	Cuba
CNA-CNZ	Morocco
COA-COZ	Cuba
CPA-CPZ	Bolivia
CQA-CRZ	Portuguese Colonies
CSA-CUZ	Portugal
CVA-CXZ	Uruguay
CYA-CZZ	Canada
D	Germany
EAA-EHZ	Spain
EIA-EIZ	Irish Free State
ELA-ELZ	Republic of Liberia
EPA-EQZ	Persia
ESA-ESZ	Estonia
ETA-ETZ	Ethiopia
EZA-EZZ	Territory of the Saar
F	France and Colonies and Protectorates
G	Great Britain
HAA-HAZ	Hungary
HBA-HBZ	Swiss Confederation
HCA HCZ	Ecuador
HHA-HHZ	Republic of Hayti
HIA HIZ	Dominican Republic
HJA HKZ	Republic of Colombia
HPA HPZ	Republic of Panama
HRA-HRZ	Republic of Honduras
HSA-HSZ	Siam
HVA-HVZ	Vatican City (State of the)
HZA-HZZ	Saudi Arabia
I	Italy and Colonies
J	Japan
K	United States of America
LAA-LNZ	Norway
LOA-LWZ	Argentine Republic
LXA-LXZ	Luxemburg
LYA-LYZ	Lithuania
LZA-LZZ	Bulgaria
M	Great Britain
N	United States of America
OAA-OCZ	Peru
OEA-OEZ	Austria
OFA-OHZ	Finland
OIA-OJZ OKA-OKZ	Czechoslovakia
ONA-OTZ	Belgium and Colonies
OUA-OZZ	Denmark
PAA-PIZ	Netherlands
PJA-PJZ	Curacao
PKA-POZ	Dutch East Indies
PPA-PYZ	Brazil
PZA-PZZ	Surinam
R	U.S.S.R.
SAA-SMZ	Sweden
SOA-SRZ	Poland
SSA-SSZ	Egypt
STA-SUZ SVA-SZZ	Greece
TAA-TCZ	Turkey
TFA-TFZ	Iceland
TGA-TGZ	Guatemala
TIA-TIZ	Costa Rica
TKA-TZZ	France and Colonies and Protectorates
U	U.S.S.R.
VAA-VGZ	Canada
VHA-VMZ	Commonwealth of Australia
VOA-VOZ	Newfoundland
VPA-VSZ	British Colonies and Protectorates
VTA-VWZ	British India
VXA-VYZ	Canada
W	United States of America
XAA-XFZ	Mexico
XGA-XUZ	China
XYA-XZZ	British India
YAA-YAZ	Afghanistan
YBA-YHZ	Dutch East Indies
YIA-YIZ	Iraq
YJA-YJZ	New Hebrides
YLA-YLZ	Latvia
YMA-YMZ	Free City of Danzig
YNA-YNZ	Nicaragua
YOA-YRZ	Roumania
YSA-YSZ	Republic of El Salvador
YTA-YUZ	Yugoslavia
YVA-YWZ	Venezuela
ZAA-ZAZ	Albania
ZBA-ZJZ	British Colonies and Protectorates
ZKA-ZMZ	New Zealand
ZPA-ZPZ	Paraguay
ZSA-ZUZ	Union of South Africa
ZVA-ZZZ	Brazil

CMK, HOTEL PLAZA, HAVANA

When you listen in on CMK during the northern winter perhaps you can find comfort by recalling this view of the station to mind. The picture was taken from the famous roof garden atop the Hotel Plaza. In the background part of one of the antenna masts can be seen projecting above the penthouse roof



Still Higher Power

Notice has just been received that a 1000 kw. broadcast station is about to be constructed in Havana, Cuba, and is expected to be on the air beginning November 1, next. The call is COD and plans call for full-time operation on 690 kc.

Crystal Receivers

As a result of mention made a few months ago of the DX accomplishments of some readers who employ crystal receivers, there have been quite a number of letters received during the past month on this same subject. It appears that there

(*Continued on page* 758)

AMERICAN STATION LIST

NORTH AMERICA

(Exclusive of the United States)

CENTRAL and SOUTH AMERICA

NORTH AMERICA

CANADA

call	*location*	*kc.*	*kw.*
CJRM	Moose Jaw, Sask.	540	1.0
CKUA	Edmonton, Alberta	580	0.5
CHRC	Quebec, Que.	580	0.1
CKCL	Toronto, Ont.	580	0.1
CJOR	Vancouver, B. C.	600	0.5
CFCO	Chatham, Ont.	600	0.05
CFCF	Montreal, Que.	600	0.5
CJGX	Yorkton, Sask.	630	0.5
CFCY	Charlottetown, P. E. I.	630	0.5
VAS	Glace Bay, N. S.	685	2.0
CJCJ	Calgary, Alta.	690	0.1
CFRB	Toronto, Ont.	690	10.0
VOWR	St. John's, Newfoundland	700	50.0
CJCA	Edmonton, Alta.	730	1.0
CFPL	London, Ont.	730	0.1
CKAC	Montreal, Que.	730	5.0
CHWK	Chilliwack, B. C.	780	0.1
CJCS	Sudbury, Ont.	780	0.5
CJOC	Lethbridge, Alta.	840	0.1
CKLW	Windsor, Ont.	840	5.0
CRCO	Ottawa, Ont.	880	1.0
CJCB	Sydney, N. S.	880	0.05
CRCM	Montreal, Que.	910	5.0
CFAC	Calgary, Aa.	930	0.1
CFCH	North Bay, Ont.	930	0.1
CKPC	Brantford, Ont.	930	0.1
CFLC	Prescott, Ont.	930	0.1
CKPR	Fort William, Ont.	930	0.05
CRCT	Toronto, Ont.	960	5.0
CKCD	Vancouver, B. C.	1010	0.1
CKWX	Vancouver, B. C.	1010	0.1
CHWC	Regina, Sask.	1010	0.5
CKCK	Regina, Sask.	1010	0.5
CHML	Hamilton, Ont.	1010	0.05
CKCO	Ottawa, Ont.	1010	0.1
CKIC	Wolfville, N. S.	1010	0.05
CFCN	Calgary, Alta.	1030	10.0
CKNC	Toronto, Ont.	1030	0.1
CFNB	Fredericton, N. B.	1030	0.5
CHNS	Halifax, N. S.	1050	0.5
VOGY	St. John's, Newfoundland	1050	0.075
VOKW	St. John's, Newfoundland	1085	0.3
CRCV	Vancouver, B. C.	1100	1.0
CKOC	Hamilton, Ont.	1120	1.0
CFTP	Edmonton, Alberta	1120	0.1
CHLP	Montreal, Que.	1120	0.1
CHGS	Summerside, P. E. I.	1120	0.05
VONF	St. John's, Newfoundland	1195	0.4
CJAT	Trail, B. C.	1200	0.05
CHAB	Moose Jaw, Sask.	1200	0. 1
CKTB	St. Catherines, Ont.	1200	0.1
10AK	Stratford, Ont.	1200	0.015
10BP	Wingham, Ont.	1200	0.015
10BQ	Brantford, Ont.	1200	0.015
10BU	Canora, Sask.	1200	0.015
CKOV	Kelowna, B. C.	1210	0.05
CKBI	Prince Albert, Sask.	1210	0.1
CKMC	Cobalt, Ont.	1210	0.1
CKCH	Hull, Que.	1210	0.1
CHNC	New Carlisle, Que.	1210	0.1
CFBO	St. John, N. B.	1210	0.1
CFQC	Saskatoon, Sask.	1230	0.5
VOAC	St. John's, Newfoundland	1300	0.4
CFJC	Kamloops, B. C.	1310	0.1
CJKL	Kirkland Lake, Ont.	1310	0.1
CKCV	Quebec, Que.	1310	0.05
CJLS	Yarmouth, N. S.	1310	0.1
CHCK	Charlottetown, P. E. I.	1310	0.05
CHSJ	St. John, N. B.	1370	0.1
CJRC	Moose Jaw, Sask.	1390	0.1
CKFC	Vancouver, B. C.	1410	0.05
CKMO	Vancouver, B. C.	1410	0.1
CKGB	Timmins, Ont.	1420	0.1
CFCT	Victoria, B. C.	1450	0.05
CKX	Brandon, Man.	1450	0.5
CRCS	Chicoutimi, Que.	1500	0.1
CKCR	Waterloo, Ont.	1510	0.1
CFRC	Kingston, Ont.	1510	0.1
FQN	St. Pierre, Miquelon	572	0.25

MEXICO

XEY	Merida, Yuc.	547	0.01
XFA	Aguascalientes, Ags.	550	0.005
XEAO	Mexicali, B. C.	560	0.25
XEPN	Piedras Negras, Coah.	585	50.0
XFX	Mexico, D. F.	610	0.5
XEX	Monterrey, N. L.	630	0.05
XEMZ	Tijuana, B. C.	630	0.03
XEZ	Merida, Yuc. (under construction)	630	0.5
XFG	Mexico, D. F.	638	2.0
XEM	Matamoros, Tamps. (under construction)	660	500.0
XET	Monterrey, N. L.	690	0.5
XEN	Mexico, D. F.	710	1.0
XEOK	Tijuana, B. C.	757	2.5
XEYZ	Mexico, D. F.	780	10.0
XFC	Aguascalientes, Ags.	805	0.35
XEBC	Agua Caliente, B. C.	815	2.5
XETW	Mexico, D. F.	830	0.5
XETN	Matamoros, Tamps (under construction)	845	150.0
XEMO	Tijuana, B. C.	865	1.5
XEW	Mexico, D. F.	890	50.0
XETU	Mexico, D. F.	890	0.1
XEFO	Mexico, D. F.	940	5.0
XFO	Mexico, D. F.	940	5.0
XEAW	Reynosa, Tamps	965	10.0
XEP	Mexico, D. F.	970	0.5
XEFE	Monterrey, N. L.	985	0.1
XEAF	Nogales, Sonora	990	0.75
XEK	Mexico, D. F.	990	0.1
XEC	Toluca, Mexico	1000	0.05
XEL	Saltillo, Coahuila	1000	0.01
XEFI	Chihuahua, Chihuahua	1000	0.25
XEFJ	Monterrey, Nuevo Leon	1000	0.1
XEE	Durango, Dgo (under construction)	1010	0.05
XEU	Veracruz, Veracruz	1010	0.1
XEJ	Ciudad Juarez, Chih	1015	0.25
XES	Tampico, Tamaulipas	1020	0.25
XEB	Mexico, D. F.	1030	10.0
XEFC	Merida, Yucatan	1050	0.1
XEAI	Mexico, D. F.	1090	0.1
XEWW	Veracruz, Veracruz	1095	0.25
XEA	Guadalajara, Jalisco	1100	0.125
XEFG	Mexico, D. F.	1105	0.25
XENT	Nuevo Laredo, Tamaulipas	1115	150.0
XEH	Monterrey, Nuevo Leon	1132	0.25
XED	Guadalajara, Jalisco	1155	0.5
XETH	Puebla, Puebla	1200	0.1
XETZ	Mexico, D. F.	1210	0.5
XEFA	Tacuba, D. F.	1250	0.5
XEFI	Chihuahua, Chihuahua	1260	0.25
XFB	Jalapa, Vera Cruz	1290	1.0
XEAC	San Luis Potosi, S. L. P.	1295	0.1
XECW	Mexico, D. F.	1310	0.01
XEFW	Tampico, Tamaulipas	1310	0.07
XEI	Morelia, Michoacan	1310	0.125
XEFB	Monterrey, Nuevo Leon	1315	0.1
XEFZ	Mexico, D. F.	1370	0.1
XETB	Torreon, Coahuila	1380	0.125
XEFV	Ciudad Juarez, Chi.	1400	0.1
XEAB	Nuevo Laredo, Tamaulipas	1450	0.0075
XFA	Aguascalientes, Ags.	1500	.005
XEMC	Merida, Yucatan	—	0.25

WEST INDIES

CUBA

CMDD	Havana	588	0.15
CMW	Havana	595	1.4
CMQ	Havana	645	0.15
CMAF	Havana	680	1.0
CMK	Havana	730	5.0
CMBS	Havana	765	0.2
CMCQ	Havana	767	1.0
CMJK	Havana	790	0.5
CMGC	Matanzas	820	0.03
CMGA	Colon	834	0.1
CMC	Havana	835	0.5
CMCF	Havana	873	0.25
CMX	Havana	875	1.0
CMJF	Camaguey	910	0.2
CMCD	Havana	915	0.5
CMDE	Havana	915	0.15
CMHD	Caibarien	945	0.5
CMJL	Camaguey	960	0.05
CMBD	Havana	965	0.25
CMCW	Havana	965	0.15
CMGF	Matanzas	972	0.1
CMBZ	Havana	1005	0.15
CMHI	Santa Clara	1007	0.25
CMJO	Ciego de Avila	1010	0.05
CMKC	Santiago	1034	0.15
CMGH	Matanzas	1040	0.015
CMBG	Havana	1048	0.225
CMCB	Havana	1048	0.15
CMJG	Camaguey	1050	0.05
CMCU	Havana	1100	0.5
CMHA	Sagua la Grande	1103	—
CMHJ	Cienfuegos	1125	0.06
CMBW	Havana	1140	0.6
CMCG	Havana	1140	0.5
CMBJ	Havana	1147	0.5
CMJH	Ciego de Avila	1150	0.05
CMJE	Camaguey	1170	0.05
CMCJ	Havana	1180	0.5
CMBN	Havana	1185	0.15
CMBX	Havana	1185	—
CMHW	Cienfuegos	1200	0.1
CMGB	Matanzas	1205	0.03
CMHK	Las Cruces	1215	0.05
CMBY	Havana	1230	0.25
CMCA	Havana	1230	0.15
CMJN	Camaguey	1240	0.05
CMAB	Pinar del Rio	1249	0.02
CMBC	Havana	1270	0.15
CMCP	Havana	1270	0.15
CMHL	Cienfuegos	1290	0.02
CMKJ	Guantanamo	1300	0.02
CMCY	Havana	1316	0.5
CMJI	Ciego de Avila	1335	0.045
CMCN	Havana	1357	0.25
CMCR	Havana	1357	0.15
CMJP	Moron	1360	0.075
CMGE	Cardenas	1375	0.03
CMJC	Camaguey	1382	0.15
CMPN	Havana	1395	0.5
CMCM	Havana	1405	0.015
CMCH	Havana	1410	0.05
CMBL	Havana	1445	0.2
CMBK	Havana	1485	0.015

DOMINICAN REPUBLIC

HIX	San Domingo	580	1.0
HIT	San Domingo	1050	0.01
HIJK	San Domingo	1180	15.0
HIJ	San Domingo	1195	0.01
HI5E	San Domingo	1250	0.01
HIZ	San Domingo	1300	0.01
HICF	San Domingo	1300	0.0075
HI4D	San Domingo	1395	0.01
HIH	San Pedro de Macoris	1395	0.015

HAITI

HHK	Port au Prince	830	1.08

CENTRAL AMERICA

COSTA RICA

TISO	San Jose	550	.25
TIXA	San Jose	614	0.0075
TIFB	San Jose	714	0.03
TIGP	San Jose	800	0.075
TIEA	San Jose	833	0.0075
TIVL	San Jose	869	0.03
TICR	San Jose	912	0.075
TITV	San Jose	1000	0.0075
TIGA	Cartago	1014	0.03
TIRCA	San Jose	1100	0.5
TIFS	Cartago	1441	0.0075

GUATEMALA

TGW	Guatemala City	1350	0.5
TGX	Guatemala City	1380	0.075

EL SALVADOR

RDN	San Salvador	663	0.5

SOUTH AMERICA

ARGENTINA

LS10	"Rad. America," B. Aires	590	3.5
LS3	"Rad. Mayo," B. Aires	630	4.5
LS4	"Rad. Portena," B. Aires	670	6.0
LS1	"Rad. Municipal," B. Aires	710	5.0
LV1	San Juan	730	1.5
LR7	"Rad. La Prensa," B. A.	750	—
LT1	Rosario	780	5.0
LR10	"Rad. Cultura," B. Aires	790	8.0
LU2	Bahia Blanca	800	0.5
LV7	Tucuman	820	0.5
LR5	"Rad. Excelsior," B. Aires	830	16.0
LT8	Rosario	840	0.35
LV10	Mendoza	860	0.5
LR6	"Rad. La Nacion," B. A.	870	2.1
LV2	Cordoba	880	0.5
LV9	Salta	900	0.5
LR2	"Rad. Argentina," B. A.	910	6.0
LR3	Buenos Aires	950	12.0
LR4	"Rad. Splendid," B. A.	990	12.0
LR9	"Rad. Fenix," B. Aires	1030	5.0
LT9	Santa Fe	1060	0.2
LT3	Rosario	1080	3.5
LS5	"Rad. Rivadavia," B. A.	1110	4.5
LV5	San Juan	1120	0.7
LR8	"Rad. Paris," B. Aires	1150	5.0
LT5	Resistencia	1160	0.5
LS2	"Rad. Prieto," B. Aires	1190	5.0
LS8	"Rad. Stentor," B. Aires	1230	10.0
LS9	"Rad. La Voz del Aire," B. Aires	1270	5.0
LU7	Bahia Blanca	1280	0.2
LS7	"Rad. Patria," B. Aires	1310	3.5
LS6	"Rad. del Pueblo," B. A.	1350	3.5
LU6	Mar del Plata	1380	0.1
LT10	Santa Fe	1390	0.1

BOLIVIA

CP4	La Paz	600	—
CPX	La Paz	1240	—

BRAZIL

PRA8	Recife, Pernambuco	750	0.5
PRA2	Rio de Janeiro	750	1.5
PEB7	Rio de Janeiro	833	0.5
PRA4	Baia	857	0.05
PRB3	Juiz de Fora, M. Gerais	857	0.25
PRA6	Sao Paulo	857	1.0
PRA3	Rio de Janeiro	860	0.5
PRB2	Curityba, Parana	882	0.25
PRC3	Pelotas, R. G. do Sul	920	0.25
PRB6	Sao Paulo	934	0.25
PRC6	Rio de Janeiro	967	1.0
PRB4	Santos	1000	1.0
PRB8	Mogi das Cruzes, S. Paulo	1000	0.05
PRB9	Sao Paulo	1017	0.5
PRC7	Belo Horizonte, M. Gerais	1091	0.25
PRC2	Porto Alegre, R. G. do Sul	1091	0.5
PRB5	Franca, S. Paulo	1111	0.05
PRA7	Ribeirao Preto, S. Paulo	1154	0.05
PRA9	Rio de Janeiro	1154	1.0
PRC9	Campinas, S. Paulo	1175	0.25
PRD3	Taubate, S. Paulo	1200	0.25
PRA5	Sao Paulo	1295	0.1
PRC8	Rio de Janeiro	1300	0.25
PRC4	Amparo, S. Paulo	1304	0.05
PRD2	Rio de Janeiro	1350	1.0
PRD4	Araraquara, S. Paulo	1364	0.25
PRC5	Belem, Para	1364	0.1

CHILE

CE58	Santiago	585	1.0
CE62	Santiago	625	1.0
CE66	Santiago	665	1.0
CE70	Santiago	705	1.0
CE78	Santiago	785	1.0
CE82	Santiago	825	1.0
CE86	Santiago	865	1.0
CE88	Valparaiso	880	1.0
CE90	Santiago	905	1.0
CE92	Temuco	920	0.1
CE94	Santiago	945	1.0
CE98	Santiago	985	1.0
CE100	Santiago	1025	0.25
CE101	Vina del Mar	1010	0.1
CE102	Santiago	1025	0.1
CE103	Valdivia	1035	0.1
CE104	Magellanes	1040	0.1
CE105	Valparaiso	1050	0.1
CE106	Santiago	1065	0.5
CE107	Santiago	1065	0.1
CE108	Concepcion	1080	0.1
CE109	Valparaiso	1090	0.105
CE110	Santiago	1105	0.1
CE111	Osorno	1110	0.1
CE113	Chillan	1130	0.1
CE114	Santiago	1145	0.1
CE115	Talca	1150	0.1
CE117	Valparaiso	1170	0.25
CE119	Magallanes	1180	0.1
CE120	Curicu	1205	0.1
CE121	Vina del Mar	1210	0.1
CE122	Santiago	1225	0.1
CE125	Valparaiso	1250	0.1
CE128	Temuco	1280	0.5
CE130	Santiago	1305	0.1
CE131	Santiago	1305	0.1
CE133	Osorno	1335	0.1
CE134	Santiago	1345	0.15
CE138	Santiago	1385	0.1
CE139	Rancagua	1390	0.1
CE141	Concepcion	1410	0.1
CE142	Santiago	1425	0.1
CE143	Magallanes	1430	0.1
CE145	Rancagua	1450	0.1
CE146	Santiago	1465	0.5

COLOMBIA

HJN	Bogota	681	0.5
HJ3ABD	Bogota	882	0.05
HJ3ABH	Bogota	1000	0.01
HJ4ABC	Pereira	1000	0.05
HJ3ABF	Bogota	1304	0.05

PARAGUAY

ZP3	Asuncion	1000	0.3
ZP1	Asuncion	1135	1.0
ZP4	Asuncion	1275	0.15
ZP5	Asuncion	1465	0.15
ZP9	Asuncion	—	—

PERU

OAX	Lima	790	5.0

URUGUAY

CX4	Montevideo	610	1.0
CX6	Montevideo	650	5.0
CX8	Montevideo	690	1.0
CX10	Montevideo	730	1.0
CX12	Montevideo	770	1.0
CX14	Montevideo	810	1.0
CX16	Montevideo	850	0.2
CX18	Montevideo	890	0.75
CW19	Salto	920	0.1
CX20	Montevideo	930	2.0
CX22	Montevideo	970	0.25
CW23	Salto	1000	0.25
CX24	Montevideo	1010	10.0
CX26	Montevideo	1050	2.0
CW27	Montevideo	1080	0.25
CX28	Montevideo	1090	2.0
CW29	Mercedes	1120	0.05
CX30	Montevideo	1130	0.5
CW31	Salto	1160	0.5
CX32	Montevideo	1170	0.5
CW33	Florida	1200	0.075
CX34	Montevideo	1210	0.5
CW35	Paysandu	1240	0.03
CX36	Montevideo	1250	0.25
CW37	Montevideo	1280	0.02
CX38	Montevideo	1290	0.25
CW39	Paysandu	1320	0.03
CX40	Montevideo	1330	0.5
CW41	San Jose	1360	0.5
CX42	Montevideo	1370	1.0
CW43	Melo	1400	0.02
CX44	Montevideo	1410	1.0
CW45	Durazno	1440	0.03
CX46	Montevideo	1450	0.25
CW47	Canelones	1480	0.1
CX48	Montevideo	1490	1.5

VENEZUELA

YV2BC	Caracas	882	0.1
YV1BC	Caracas	960	5.0
YV3BC	Caracas	1200	0.05

Modern Switches

(*Continued from page 737*)

shorting or non-shorting position; that is, in one case the contactor connects two adjacent contact terminals during the transition from one index position of the switch to the next, while in the non-shorting case the contactor breaks the previous cricuit before the next circuit is made. This shorting type feature is of interest in such circuit design where the opening of the circuit or possible condenser discharges produce transients during switching. This type of contact insures definite wiping and positive electrical contact together with smooth operation.

In the design of the base or insulation between contacts and circuits many factors require consideration. Mechanically the material used must be strong, unaffected by heat such as encountered in confined spaces within chasses, and not subject to cold flow. Electrically the material should have low surface leakage, low dielectric hysteresis in the body of the insulating material, a high value of insulation and proper dielectric distribution.

High grade bakelite comes most nearly meeting the majority of these requirements. Mechanically it is strong; its ultimate tensile strength is approximately 20000 pounds per square inch and its compressive strength about 35000 pounds per square inch. The material can be punched readily into the intricate parts desired and the breakage during fabrication on account of riveting is very low. The thermal expansion of bakelite is on the same order as that of copper and other materials employed. The power loss factor which is the product of dielectric hysteresis and dielectric constant is reasonably low. It is approximately 0.18 for bakelite, 0.10 for glass and 0.0005 for fused quartz. This factor for bakelite increases with very high frequencies. It may be slightly higher at 1000 kilocycles than at 1000 cycles. But by suitable circuit design such losses can largely be compensated for.

The terminal contacts and ground terminals are made of phosphor bronze, silver plated. The contactors are coin silver. Special lubricants have been developed which do not materially increase the contact resistance and greatly improve the life of the switch. The direct current contact resistance is approximately 0.006 ohms between terminals and the capacity on the order of two to three micro-microfarads between terminal and ground plate on open circuit. Due to the design of using a very small moving contactor the capacity changes inappreciably during operation of the switch from one position to the next. Shields are used in many cases to completely isolate one section or group of sections from other sections and often associated equipment is combined with the switch, such as a.c. line switches and dial indicating devices. Figure 4 illustrates such typical combinations.

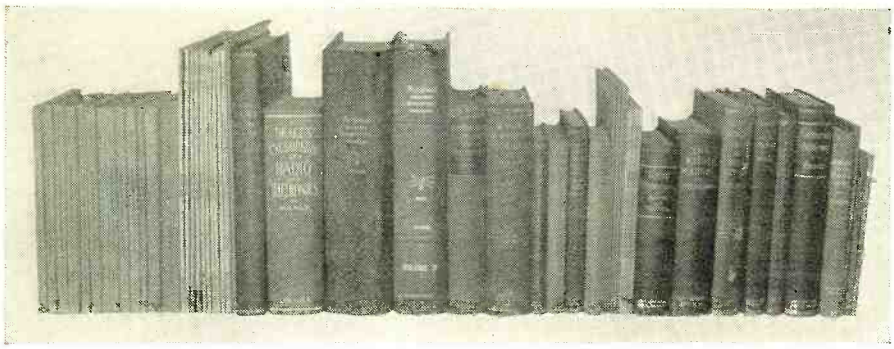
Numerous circuits have been devised to accomplish switching of inductances and associated apparatus with minimum contacts, often resulting in a complex switch mechanism. In order to show the related electrical and mechanical points mentioned above in connection with an elementary electrical circuit Figure 5 shows how by means of six contact terminals, one common terminal and three contactors the capacities of 2-4-6-8-10-12 microfarads can be obtained from three condensers with the six position switch. The contactors in this case are assembled in a non-shorting position. It is obvious from this that innumerable combinations of single, consecutively shorting, or all shorting with a single open contact and so forth can be obtained.

Perhaps one of the simple applications is that of the single contact type used on a short wave converter as shown in Figure 6. In this case the secondary L-2 is tapped, providing one switching circuit, and the shunt capacities across the oscillator secondary L-5, the second circuit. Any one of five frequency bands can be selected. Switch section S-3 is of interest since this circuit remains closed except in the last switch position.

In the multi-wave receiver however more circuits require selection. This is shown in Figure 7 where five circuits are simultaneously selected and illustrates the substitution of separate inductances in the preselector and oscillator circuits. In practice the switch is mechanically condensed into a three section type.

In some cases it may be desirable to short out certain inoperative inductances

(*Continued on page 769*)



THE TECHNICAL REVIEW

JOSEPH CALCATERRA

Handbook of Technical Instruction for Wireless Telegraphists, by H. M. Dowsett. Fifth edition. Published by Iliffe and Sons, Ltd. 1934. A new, revised and enlarged edition of the well-known handbook for those preparing for the P. M. G. Certificate in Great Britain. This book contains a complete theoretical course for radio operators on land or at sea, together with technical information and diagrams of radio equipment used on ships flying the British flag. The new edition has been brought up to the minute by the addition of considerable new material, especially on short-wave equipment. Other new chapters are included which cover piezo-electric frequency control, echo sounding apparatus and telephony. The discussion of the theory of radio is rather more comprehensive than is customary. The book goes into some detail regarding the principles governing electrical and radio apparatus. The reader is introduced to vector diagrams at an early stage in the book. However, once this is understood, he will find the understanding of the text easier. The chapter on vacuum tubes now includes several of the newer types, although it does not list all the multi-purpose tubes which are at present available. The description of the equipment is especially valuable for the operator, for it does not only tell him how it works, but tells him about the necessary adjustments and gives valuable advice in case something goes wrong. Obviously, it is only European equipment that is described here. Besides the usual run of transmitters, receivers and power supplies, one finds data on direction finders, special short-wave antennas, such as dipoles, etc. In short, it covers all points which are likely to come up in a radio operator's life.

Signals and Speech in Electrical Communication, by John Mills. Harcourt, Brace and Co., 1934. This book is intended for the general reader, not engaged in the radio or telephone industry who wishes to be informed of the progress in this art. It tells in ordinary language what a well-informed man ought to know—and no more. The opening chapter deals with the nature of speech, the characteristics of the ear and its limitations. It discusses at the same time the differences between two sounds of the same pitch but of different color. The second chapter is entitled "Electrical Brains." It describes some of the mechanisms employed in the communication industry from automatic traffic lights to the complicated electrical switches employed in the automatic telephone exchange. This uncanny instrument not only performs its manifold duties faithfully, but when it is defective it automatically disconnects itself, reports to the maintenance department and writes on an electrical typewriter on what operation it failed. The reader is introduced to the extension of the senses in Chapter III and to the frequencies of communication in the fourth chapter. The author refers to modulation as "a marriage of currents" but failed to call demodulation a "divorce." Other chapters deal with the remaining subjects in electrical communication. The development of the vacuum tube, for instance, is entertainingly told in a chapter entitled "The Modern Jinn." Picture transmission, television, etc., all come in for their share in order to give the reader a bird's-eye view of the present state of development in the art of electrical communication.

Catalog of Radio Parts, Part 2, issued by the General Radio Co. A supplement to the Catalog G published some months ago. This supplement contains information, data and prices on new equipment manufactured by the General Radio Co. The instruments listed include: rheostats, potentiometers, condensers, frequency measuring devices, radio-frequency bridges, standard signal generators, dials, etc.

Modern Sound Manual, issued by the Jensen Radio Mfg. Co. This is more than a catalog. Besides listing the various types of speakers and horns manufactured by this company, the manual includes valuable information for the serviceman concerning the design and installation of sound systems. The manual is available from the manufacturer to the serviceman and the trade generally at a price of twenty-five cents.

Review of Articles in the March, 1934, Issue of the Proceedings of the Institute of Radio Engineers

Some Notes on Adjacent Channel Interference, by I. J. Kaar. This paper deals with a form of adjacent channel broadcast interference brought about largely as a result of nonlinearity, misadjustment, misoperation, or improper design of the broadcast transmitter and associated equipment.

A New Type of Thyratron Relay, by George Babat. A new type of Thyratron relay and circuit, which are novel from the viewpoint that continuous current flows through the load for half-wave rectification, is described in this paper.

The Polarization of Sky Waves in the Southern Hemisphere, by A. L. Green. This paper describes the results of the first of a series of investigations in Australia of the influence of the ionized regions of the upper atmosphere on the reception of downcoming wireless waves.

The Calculation of Class C Amplifier and Harmonic Generator Performance of Screen-Grid and Similar Tubes, by Frederick Emmons Terman and John H. Ferns. In this paper it is shown how to predetermine the performance of harmonic generators and Class C amplifiers which employ screen-grid and similar tubes in which the plate current is substantially independent of plate voltage over the working part of the characteristic.

Elimination of Phase Shifts Between the Currents in Two Antennas, by Hans Roder. The data given in this paper shows how phase shifts in two antennas fed from a common radio-frequency supply can be eliminated by a certain method of tuning the antenna circuits. The results of an experimental investigation were found to be in good agreement with the theoretical analysis.

Inductance at High Frequencies and Its Relation to the Circuit Equations, by J. G. Brainerd. The problem attacked in this paper is that of determining in what manner the term representing the self-induced electromotive force must be modified when low-frequency circuit theory is applied to high-frequency wire circuits.

Review of Contemporary Literature

Cosmic Rays, by W. F. G. Swann. The Military Engineer, March-April, 1934. A discussion of the evidences which led to the discovery of cosmic radiation, the instruments employed to detect, measure them and determine their direction. The nature and origin of these rays is discussed.

The Effect of Screening Cans on the Effective Inductance and Resistance of Coils. The Wireless Engineer and Experimental Wireless, March, 1934. This editorial points out the effects of shielding cans on the inductance and resistance of inductance coils.

A Diode for Ultra H.F. Oscillations, by J. S. Petrie. The Wireless Engineer and Experimental Wireless, March, 1934. A description is given in this paper of a diode suitable for the production of electronic oscillations without the necessity of an external magnetic field as in the case of the magnetron.

The Problem of Duplex Telegraphy in the Mercantile Marine Wireless Service, by M. Reed. The Wireless Engineer and Experimental Wireless, March, 1934. This paper is concerned with the factors which influence the design of a ship's wireless duplex telegraph system to operate on wavelengths of the order of 2000 meters, so that simultaneous transmission and reception can take place on frequencies not too widely separated.

High-Frequency Measurements on an Electron Oscillator, by S. J. Borgars. The Wireless Engineer and Experimental Wireless, March, 1934. In this paper a method of making h.f. measurements is described which uses the oscillatory circuit of the generator itself as the measuring instrument and hence avoids errors due to subsidiary apparatus.

A Velocity-Modulation Television System, by L. H. Bedford and O. S. Puckle. The Wireless Engineer and Experimental Wireless, March, 1934. This is a rather comprehensive abstract of a paper read before the Wireless Section, I. E. E. The basic idea underlying the velocity-modulation television principle is that of obtaining light intensity variations in the received picture by varying not the instantaneous intensity of the scanning spot, but its instantaneous scanning velocity; i.e., its speed of traverse over the screen, the actual light intensity of the scanning spot remaining constant.

Radio Statistics and Markets. Electronics, March, 1934. An analysis of the fig-

ures for sales of radio sets and equipment during the past few years with summaries of the outlooks for markets in these lines for 1934. A marked improvement in conditions in the industry is shown by the figures made available.

A One-Tube Crystal-Controlled Transmitter, by George Grammer. QST, March, 1934. This article contains the circuit and constructional details of a really practical single-tube crystal-controlled oscillator which is simple to build and easy to operate.

How Good Is "Good Tone"? by W. W. MacDonald. Radio Retailing, March, 1934. This article describes a demonstration conducted to show the effect of increasing or decreasing the frequency response of a receiver on "good tone."

A Multi-Range Ohm- and Output Meter, by John H. Potts. Service, March, 1934. This article contains information on the circuits and construction of a simple multi-range ohm- and output meter for use in radio servicing,

How to Get Copies of Articles Abstracted in This Department

The abstracts of articles featured in this department are intended to serve as a guide to the most interesting and instructive material appearing in contemporary magazines and reports. These publications may be consulted at most of the larger public libraries or copies may be ordered direct from the publishers of the magazines mentioned.

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Review of Technical Booklets Available

2. *1934 R.F. Parts Catalog.* Specifications on the entire line of Hammarlund variable and adjustable condensers, r.f. transformers, sockets, shields and miscellaneous parts for broadcast and short-wave receivers, complete short-wave receivers and transmitting variable condensers.

4. *A 15- to 200-Meter Superheterodyne.*

(*Continued on page* 768)


LORETTA LEE


JOE PENNER


COE GLADE


MARTHA MEARS

BACKSTAGE *in* BROADCASTING

Samuel Kaufman

GEORGE HALL'S orchestra, one of CBS's most prominent dance units, is now heard over the new Newark, New Jersey, station, WNEW, in addition to its established schedule over the network. Hall's programs originate in the grill room of the Hotel Taft in New York. Loretta Lee recently returned to the Hall CBS programs as vocal soloist—much to the delight of her many followers. Loretta hails from New Orleans, a city that also produced the famous Boswell Sisters. Station WNEW represents a consolidation of WAAM, Newark, and WODA, Paterson. It is the newest full-time transmitter in the metropolitan New York zone.

SEVERAL months ago this writer called your attention to the sudden rise of Joe Penner to radio stardom. Since that time Joe has soared to still greater heights by being awarded a three-year contract and is the acknowledged leader of the past year's crop of new air comics. His silly "Wanna buy a duck?" line is heard everywhere and songs have been written around his comic utterances. Penner's achievements are impressive because his rise was due to program merit alone and not press-agent ballyhoo. He has developed a tremendous juvenile following. Kids everywhere are heard mimicking his style. Joe has the distinction of a stellar Sunday NBC program of his own, but on one recent week his sponsors, Standard Brands, Inc., wisely saw fit to place him on their two other network programs—Eddie Cantor's Chase & Sanborn Hour and Rudy Vallees' Fleischmann Hour as a guest artist.

CAB CALLOWAY'S orchestra, after many years of busy work presenting hot Harlem rhythms over American air lanes, has hied across the Atlantic to give B.B.C. listeners a taste of their darktown tunes. Calloway's orchestra had never previously been in England, but their phonograph recordings had tremendous sales all through the British Isles.

CAB CALLOWAY

FRANCES LANGFORD

AN all-star variety show known as the Colgate House Party has been added to NBC's Saturday night schedule. The cast includes Donald Novis, tenor; Frances Langford, contralto; Arthur Boran, impersonator, and Don Voorhees' orchestra. All of these names represent radio entertainers of stellar ranking and the program shows promise of developing into one of the most popular week-end radio features.

MARTHA MEARS, blonde young songster of the NBC, is one of the many prominent network personalities who started on the road to fame as a member of a Gus Edwards revue. As one of the newest vocal recruits on the NBC roster, Miss Mears won the distinction of being assigned to the stellar vocal soloist rôle of the Friday night Armour hour during Phil Baker's recent visit to New York.

MARIO CHAMLEE and Coe Glade, two of America's outstanding native operatic and concert stars, are the alternate soloists on the Swift's Garden Program heard Sunday afternoons over NBC. An orchestra conducted by Karl Schulte is also heard on each broadcast.

AN imposing array of talent has been gathered for the Palmer House programs heard over NBC from Chicago each Tuesday night. Ray Perkins, whimsical master-of-ceremonies, heads the cast, which includes Gale Page, blues singer, and Harold Stokes' orchestra. Prominent guest artists are also introduced on each program. Perkins, a native of Boston, has been a song writer, singer, actor, advertising agent and music critic before entering radio. Gale Page is one of radio's newest stars. She was born in Spokane twenty-three years ago. Since coming to Chicago last Fall her rise in Chicago radio circles was rapid.

RAY PERKINS

RAYMOND KNIGHT, one of radio's most versatile entertainers, heads the cast of the A. C. Spark Plug Derby series heard Wednesdays over NBC. The series is patterned after Knight's old "Station KUKU" comedy series. The cast has been collectively labeled "The Cuckoos" and includes Mary McCoy, Jack Arthur and Sally Belle Cox. Robert Armbruster's orchestra and the Sparklers Quartet supply the musical interludes.

PHIL BAKER, star of NBC's Friday Armour program, recently made a brief visit to New York to fulfill a theatrical engagement. New York studio audiences, for the first time, had the opportunity of seeing his Chicago studio company in microphone action. Like other air comics, Baker has views to express on the subject of studio audiences. He told the writer he would be willing to eliminate studio onlookers—if all the other air comedians did likewise. He holds that as long as visitors are permitted to one feature, all other similar programs are forced to follow suit. Baker pointed out that it is much easier to obtain laughs from studio visitors than from theatre audiences. The reason for this, he said, was that the free admission to the studios puts visitors in a mood to laugh at the least funny thing, while paying theatre audiences are far more critical because they are looking for "their money's worth." Baker was accompanied to New York by his two stooges, Beetle and Bottle. Beetle's identity was not disclosed to studio visitors. His ghost voice, which continually haunts Baker, entered the studio over a loudspeaker from some hidden nook in Radio City.

RAY KNIGHT

PHIL BAKER

VK2ME-VK3ME

(*Continued from page 729*)

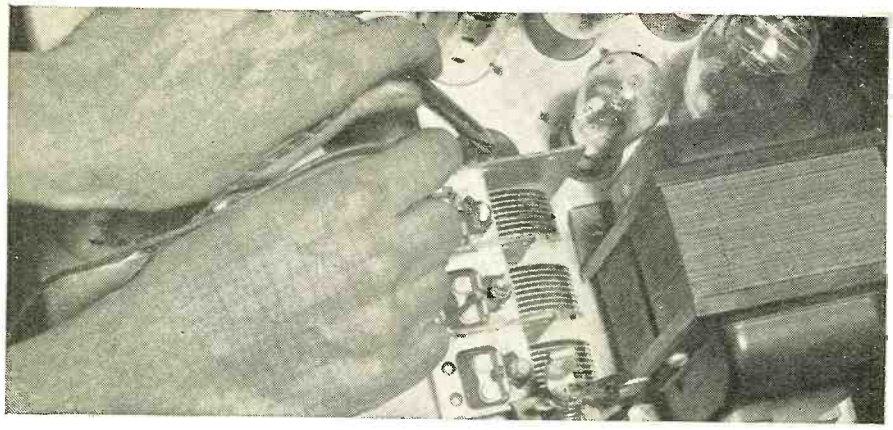
Sept. 5th, 1927, when the signals were picked up and relayed by the British Broadcasting Co. At this time thousands of the English public heard from their far-away Commonwealth through the medium of crystal sets via the famous 2LO. The first world-wide transmission to take place in Australia was arranged a month later when 2FC, the local Sydney station on 422 meters, was relayed for rebroadcasts in foreign lands. The Eucharistic Congress was transmitted to America and put on the air by our stations. And in 1930 part of a talking picture was sent to Byrd and his men, then at the South Pole.

Besides the 31.28-meter Sunday programs, VK2ME is used for a variety of commercial purposes, principally among them is serving as the Australian end of the Anglo-Australian Telephone Channel. For this purpose 28.5 meters is available.

Melbourne, VK3ME, owned by the same company as VK2ME, is now being used exclusively for program transmissions. Studios are located at 169 Queens Street. The towers and equipment, shown above, are installed at Braybrook, outside of Melbourne. The aerial, which is of the half-wave type, is situated at a distance from the transmitter and energized by means of a two-wire radio-frequency feeder line. Despite the fact that VK3ME has less than 2 kilowatts in its antenna, it is heard by most American DXers with the clarity and volume typical of its more powerful colleague, VK2ME. No zone type of schedule is used, the program being disseminated for the world in general to tune in on. However, fans in this part of the world seem to get the best of the deal, for broadcasts are at a time most favorable for reception in the States. The Wednesday schedule is between 5 a. m. and 6:30; on Saturdays between 5 and 7 a. m. E.S.T. Most of the items are recordings from London and New York. It isn't unusual to hear Paul Whiteman, an English band or the Philadelphia or Berlin symphonic orchestras. Prior to the commencement of a regular scheme of program transmissions, the station was used extensively for long distance experimental work, and in collaboration with the General Electric Company much valuable data was secured. What was considered far from a publicity gag, although it received much favorable comment from the press, was a two-way session between VK3ME and W2XAF, Schenectady, when the Rotary Clubs of these two respective cities conducted a joint meeting a little less than two years ago. Loudspeakers in the respective clubrooms rendered the distant proceedings so clearly that the two groups, separated by the breadth of the earth, were able to harmonize on a couple of choruses.

VK3ME uses just one frequency, 31.54 meters. Like their sister station at Sydney, they ask for and always appreciate reports from oversea listeners. Mr. H. Johnson, engineer of the broadcasting department, is exceedingly pleased to enlist the aid of short-wave fans in order to advance radio's high-frequency field. As a reward for reports, Mr. Johnson has, in the past three years, sent out thousands of personal letters verifying reception; about a thousand a year for the two years of VK3ME's operation alone.

So the next time that waves drift up from the Southern Seas to your antenna, you can realize that they are not from the wilds of Aussie Land, but from a modern organization that has pioneered in its captivating work in radio.



THE SERVICE BENCH

ZEH BOUCK

LONG LIVE THE KINK!

THE finest and most elaborate equipment will never lessen the convenience and utility of the simple shop idea called—for some obscure reason—a "kink." Simplicity is its element—effectiveness its virtue—as, for instance, this—

Emergency Tube Rack

—shown in Figure 1 and which can be almost instantly erected to take care of an overflow from the conventional knot-hole variety. This idea is contributed by

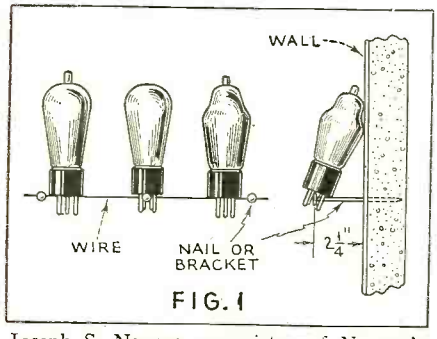


FIG. 1

Joseph S. Napora, proprietor of Napora's Radio Service, Uniontown, Pa., and consists of a convenient length of wire stretched horizontally between two or more brackets along the wall. The brackets may be anything—long nails, knobs, small stand-off insulators, etc.—that will hold the wire about 2¼ inches from the wall. The tube base is placed with prongs on each side of the wire, the bulb part leaning back against the wall—out-of-the-way and perfectly protected from everything short of target practice or an earthquake.

A Thermionic Condenser Tester

G. R. Gabbert of Mahoney City, Pa., prefers the circuit of Figure 2 to the dia-

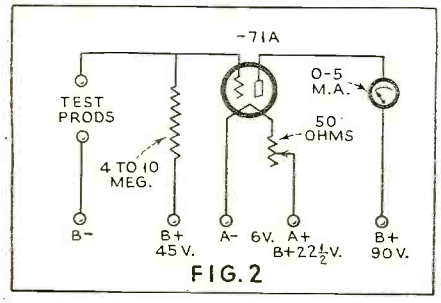


FIG. 2

gram published in the September 1933 issue of this department. It is primarily a vacuum tube voltmeter used for testing condensers, and indicates opens, shorts and leaky capacitors. The necessary parts and values are indicated on the diagram. The rheostat is adjusted for full scale deflection of the 71A. A good condenser will cause a momentary movement of the needle to the left, the original setting being resumed as the condenser takes its charge. The larger the capacity the greater the temporary deflection. An open condenser will show no kick at all, while a shorted capacitor will deflect permanently to zero. A leaky condenser will show a consistent deflection to the left—with possible erratic flickers—the degree of leakage, or short, corresponding to the extent of the left-handed deflection.

Wrenches and Screw-drivers

"Neutralizing wrenches are essential tools to the serviceman. In time they wear out or become stripped, and the commercial types are rather expensive. I make my own wrenches from red fiber tubing having an outside diameter of ⅜ inch with a $\frac{3}{32}$ inch wall. There are two ways of making the nut hole in the tubing. The first method is to heat a nut of the correct size and press it into the hole of the fiber tube. The second way, to be employed if the nut is definitely smaller than the tube opening, is to soften the end of the fiber in boiling water, and squeeze it,

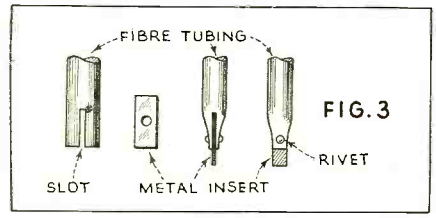


FIG. 3

with pliers, to fit about the nut. Where a screw-driver end is required, the tubing is slotted in accordance with Figure 3, softened in boiling water, and a metal insert riveted in place. It is a convenient idea to have a nut hole in one end of the tube and the screw-driver on the other." J. R. Smolcha, McKee Rocks, Pa.

Serviceman C. L. Smith of Jackson, Miss., goes in for a combination light and heavy-duty screw-driver that should last even unto television. The idea was stimulated by the trenchant observation that—"There are just two types of screws in a radio. Big ones and little ones. The big screw-driver won't handle the little screws and the big screws will ruin a small screw driver in short order. I determined to make a double-ended screw-driver that would handle both large and small screws—and at the same time make it of a good steel that would stand up. The junk man contributed an old Model T Ford magnet and the local blacksmith shaped it in accordance with Figure 4 and tempered it for thirty cents. It has proved to be the handiest tool in the shop. When you carry it on a job you can get the knobs off or take the whole business to pieces if desired! The best part of all is that the steel is sufficiently tough to hold its edge with the most stubborn screws that would soon chip the ordinary screw-driver."

Good enough! But we suggest a wooden handle slipping over the small screw-driver end. This will make possible additional pressure and purchase. Small screws, of course, can be handled without excessive force. Mr. Smith also contributes another kink to that vast diversity of soldering-iron holders. The only thing required is a coffee tin, in the upper edge of which four quadrantly spaced depressions are bent or cut. The idea is shown in Figure 5. The iron, of course, rests in the depressions, while the can itself is a convenient receptacle for solder and paste. (At last, a serviceman who admits he uses paste!) As

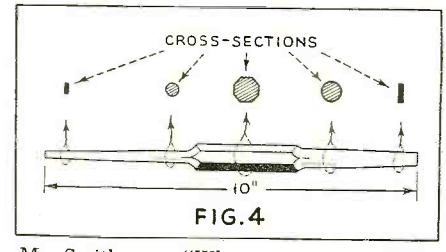


FIG. 4

Mr. Smith says, "When you find anything you find everything." The top of the coffee can is also excellent for tinning the iron.

Soldering iron holder kink number 758 is sent along by Frank J. Faulkner of

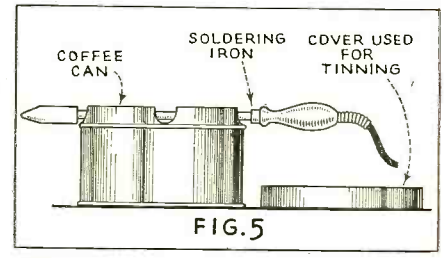


FIG. 5

Brigham City, Utah, and is sketched in Figure 6. It consists of simple wire or strip brackets plus the real idea of a small steel bristle brush mounted back down for the self-evident purpose of cleaning the iron most effectively and with no wear and tear on the serviceman's pants.

Trouble with Composite Sockets

"We recently made several changes in our test equipment in the course of modernization and found it convenient to use

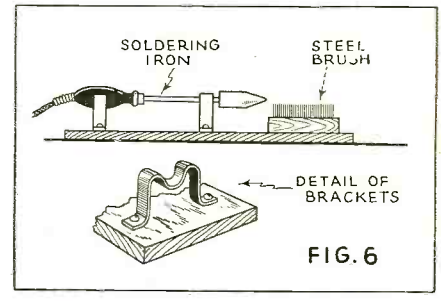


FIG. 6

a pair of composite or combination four, five and six prong sockets. We ran into the following trouble: When we inserted

a four or six prong tube, the larger diameter of the filament or heater prongs would spring the contacts so that a poor contact was made when a 5-prong tube was tested. After much experimenting, we finally overcame the difficulty by making the slight changes in the sockets indicated in the drawing, Figure 7. The filament holes, plate and grid holes of the 4-prong portion and plate, cathode, screen

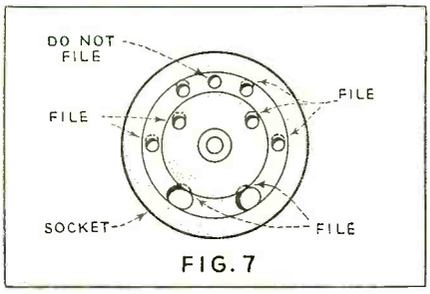


FIG. 7

and suppressor holes of the 6-prong section were filed with a small rat-tail file as shown in the dotted lines. This alteration permits the 4 and 6-prong bases to move slightly away from the filament springs, thus lessening the excessive pressure. With this modification these sockets have been perfectly dependable and satisfactory. G. V. Morris, Modern Radio Service, Eugene, Ore.

A Pointer on Pointers

When incorporating the conventional type of milliammeter in an ohmmeter circuit, and super-imposing a direct-reading scale, it will be found that one end of the scale is badly crowded, and accurate reading is made difficult by the width of the broad pointed needle. It is usually impossible to obtain knife-edge pointers for these small but rugged meters. Harry Schmidt, Richmond Hill, N. Y., was confronted with this problem, the meter in question being a Jewell type 88, zero to 1 milliampere. He solved the difficulty as follows: "After some study I hit upon a way of making a knife-edge pointer out of the original needle. Remove the meter case. Place the meter in a vise, and make sure it is firmly held by the terminal posts. Cut a piece of cardboard about the size

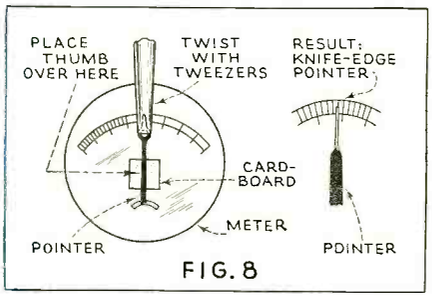


FIG. 8

of a postage stamp, and just thick enough to fit snuggly between the pointer and the scale. Slide this under the pointer about 0.5 inch from the end. Press your left thumb down on the pointer gently but firmly so that it cannot move. Slide a pair of small tweezers over the end of the pointer and twist until the plane of the arrow-like point is perpendicular to the scale. The result will be an excellent knife-edge pointer which will greatly facilitate the reading of crowded divisions. The illustration of Figure 8 will make the process a bit more clear.

A SUMMER SIDELINE FOR SUBURBAN SERVICEMEN

In the spring a serviceman's fancy lightly turns to thoughts of a truck garden—at

(*Continued on page 771*)

RADIO PHYSICS COURSE

ALFRED A. GHIRARDI*

Lesson 30

Inductance and Inductors

INDUCTORS connected in series as shown in (A) of Figure 1 simply add their self-inductances together since each one helps to oppose any change of the current through the entire system (provided the coils are so far apart or are placed at such angles with each other that there is no magnetic coupling between them). Thus, three coils having inductances of 100, 200 and 10 microhenries would have a combined inductance when connected in series, of 100 + 200 + 10 = 310 microhenries. Should there be magnetic coupling between the inductors, the effect of the mutual inductance considered in the proper direction will be added to the self-inductances only, depending on the relative directions of the magnetic fields of the coils, as will be explained later. Thus, for inductances L1, L2, L3, etc., in series, with no coupling between them, the total inductance L is:

$$L = L1 + L2 + L3 + L4, \text{ etc.}$$

It is common to connect separate inductors in series with a circuit to increase its total inductance. Such inductors are commonly called *loading coils*. Loading coils are sometimes connected in the aerial circuit or a tuning circuit of a radio transmitter or receiver for this purpose.

When inductors are connected in parallel with each other as in (B) of Figure 1, their combined inductance is found from the formula:

$$\frac{1}{L} = \frac{1}{L1} + \frac{1}{L2} + \frac{1}{L3} + \frac{1}{L4} + \text{—etc.}$$

Where L is the total or combined inductance of the coils whose separate self-inductances are L1, L2, L3, L4, etc. Here again no magnetic coupling must exist between the coils.

Example: What is the combined self-inductance of coils of 100, 200 and 10 microhenries when connected in parallel?

Solution:

$$\frac{1}{L} = \frac{1}{L1} + \frac{1}{L2} + \frac{1}{L3} \text{ or}$$

$$\frac{1}{L} = \frac{1}{100} + \frac{1}{200} + \frac{1}{10}$$

From which L = 8.7 microhenries. Ans.

The combined self-inductance of coils in parallel is always less than the self-inductance of any one of the coils considered alone. This is the same as for resistances.

When using these formulas, care should be taken to see that all the self-inductances are expressed in the same units. If the separate inductances are in henries, the total will likewise be in henries, if the inductances are in microhenries, the total will likewise be in microhenries.

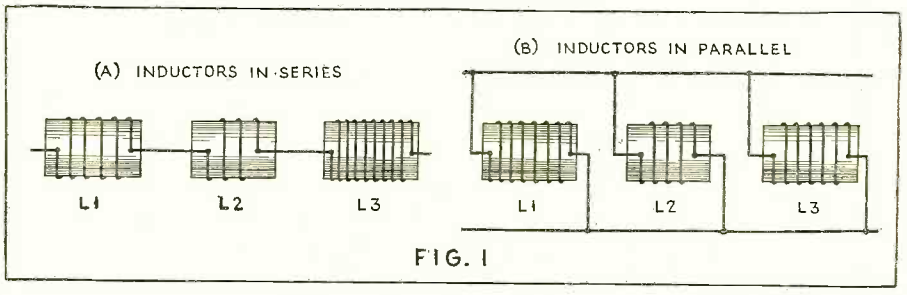


FIG. 1

Inductors in series and parallel

Review Questions on Induction

1. What is meant by self-induction? Mutual induction?
2. When does self-induction occur in a coil?
3. Is the self-induction of a wire increased or decreased by winding it up in the form of a solenoid? Why?
4. What is an inductor? What is inductance?
5. What is the induced e.m.f. in a choke coil having an inductance of 30 henries, if the current changes at the rate of 0.01 ampere per second? If the rate of current change is 2 amperes per second?
6. What is the inductance in microhenries of a solenoid wound with wire having 30 turns per inch, on a 2-inch diameter cardboard tube. The length of the winding is 3 inches and assume the form factor to be 0.08?
7. What would be the inductance of this coil if its magnetic circuit were completely of iron having a permeability of 25,000?
8. You are to make up a resistor of 10,000 ohms from a long piece of very fine "nichrome" resistance wire. This resistor is to be non-inductively wound. Describe three different ways of accomplishing this.

* Radio Technical Pub. Co. Publishers, Radio Physics Course.

Radio Amateurs Maintain Contact During Flood

SPOKANE — Peace-time heroes — modern radio amateurs—recently "stood by" for 120 consecutive hours, relaying communication from Wallace and Kellogg, Idaho, to the outside world. Amateur stations W7AMA and W7BEV remained in constant communication with W7BDX and W7AQK during the above-mentioned period. They handled more than 1000 messages and transmitted requests for food and clothing as well as messages to friends and relatives on the outside. Other members of the Spokane Radio Operators Association assisted in this work.

Scientist Thinks He Can Make Radio-Active Materials

SAN FRANCISCO—University of California scientists, working upon suggestions of Doctors Curie and Joliot, believe they have discovered a method for producing synthetic radio-active substances. They have been bombarding carbon and other substances with the newly discovered deutons.

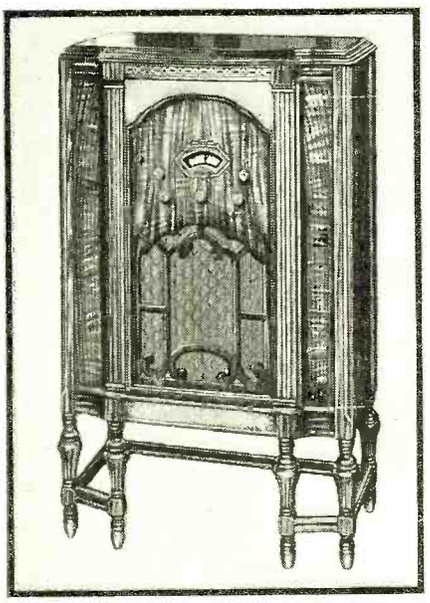
Marine Radio Equipment

(*Continued from page 720*)

83 db. at 1000 cycles. The input impedance is 500,000 ohms and output impedance windings of 4, 8, 15, 250 and 500 ohms. The manufacturer advises this P.A. system can drive 20 full-size dynamic type speakers. The amplifier employs a –57 type tube directly coupled to a type –59 which, in turn, drives a pair of –59's in Class B. The rectifier tube is the type –83. It operates from 110-volt, 60-cycle a.c. supply and the chassis dimensions are 11½ inches deep by 20 inches long by 10 inches high.

32-Volt All-Electric Receivers for Marine Installation

The Sears, Roebuck 32-volt all-electric receiver is excellently suited for installation in all types of boats that are equipped with 32-volt electric supply. The attractive six-legged console cabinet illustrated herewith houses the model 1715, a six-tube superheterodyne circuit which provides police



and amateur signals in addition to the regular broadcast programs. It draws less than 2 amperes current from the lighting plant and features a tubeless power unit, full-size electro-dynamic type speaker and a tone compensator. It uses the following type tubes: two –78's, one 6A7, one –75 and two –41 type power tubes. Their table type receiver meets the requirements of small boats using 32-volt power supply. The tube equipment of this set comprises one 6A7, one 6B7, one –78, one –38 and one 1V tube.

Radio Playhouse

(*Continued from page 723*)

approximately 100 and 5000 cycles, this new installation and all the units comprising its make-up have been selected in order to transmit faithfully the fundamental frequencies and all the harmonics and overtones between 30 and 10,000 cycles." Mr. Cohan stated that this means that the reproduced music practically equals the original rendition in fidelity and balance.

The control room apparatus includes four switchboard-type racks for the permanently mounted amplifiers and other auxiliary equipment. A specially designed control desk was built for the playhouse. This contains all controls which have to be used for the auditorium broadcasts. Three dials are arranged across the top of the desk. The first is the volume indicator, the second a special chronometer for timing programs and the third an electrically operated stopwatch for the split-second timing of individual numbers on each program.

No fees are charged for admission to the new studio. Free tickets are distributed by the network and the sponsor, but requests are so numerous that there are long waiting lists despite the large seating capacity.

Prior to the establishment of this auditorium studio, the CBS had occasionally leased Carnegie Hall, seating 3000, as well as the smaller Carnegie Chamber Hall for the purpose of accommodating visitors.

Portable P. A.

(*Continued from page 722*)

T1 to maintain the flat line-overall response curve of the amplifier. Each –79 Class B output tube is connected as an unbiased triode with its grids and plates connected respectively in parallel.

The value of all the resistors and condensers are shown in the circuit diagram. The remaining parts and accessories are herewith listed. The complete equipment is made available to RADIO NEWS readers by the Coast to Coast Radio Corporation.

List of Parts

ACP—Type D1194 five-prong connector plug with 2-foot cable
BP1 to BP12—Eby triple binding posts (in sections shown in diagram)
CH1—Type 6167 filter choke, 200 ohms, 125 ma., 30 henries
CH2—Type D1861 filter choke, 500 ohms, 60 ma., 30 henries
F1—Littlefuse 1-ampere fuse
F2—Mazda pilot lamp, 6 volts
LO1, LO2—Hubbell type 4054 flush outlet receptacles
PL—Mazda pilot lamp, 6 volts
PT1—Type E1044 vibrator power transformer, delivers 275 volts, 75 ma., primary 6 volts
PT2—Type E108-2 power transformer, delivers 280 volts, 180 ma.; 6.3 volts, 4 amperes; 5 volts, 3 amperes
T1—Type E693 Class B input transformer
T2—Type D2395-B Class B output transformer

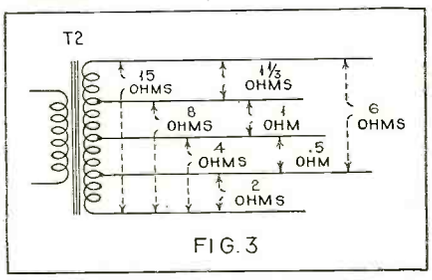


FIG. 3

VR—RCA-Victor RP-108 vibrator type converter-rectifier
VT1, VT4, VT5—Cinch 6-prong wafer socket
VT2, VT3—Cinch 7-prong wafer socket
VT6—Cinch 4-prong wafer socket
VT7, VT8—Cinch 5-prong wafer socket
1 type 5767 crystalline-finished, drilled metal chassis with four shield cans and base plate
1 tube shield for VT1
Astatic crystal phono pick-up, type S-8
Universal carbon microphone or Astatic crystal microphone type D104
Racon stormproof speaker
Portable phonograph turntable

WITH THE EXPERIMENTERS

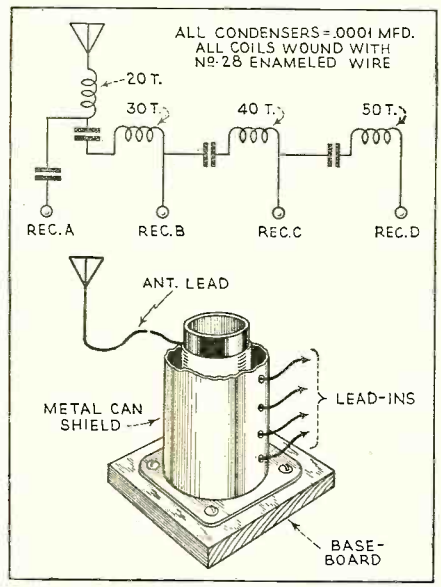
S. GORDON TAYLOR

Multiple Antenna System

Here is an inexpensive multiple antenna system, actually installed by the author in an apartment house, which provides efficient reception to four receivers from a single aerial.

The accompanying diagram shows the circuit and the value of parts necessary in making the various coils and condenser combinations to which the leads are tapped for the different sets. All coils are wound in the same direction on the one coil form. The diameter of the form is not critical and can be from two to three inches.

A hard rubber, bakelite or cardboard tube can be used for the coil form. For



protection and appearance the coil and condensers should be mounted in a metal can as shown. The completed unit can be mounted directly at the antenna lead-in or on the window sill adjacent to the first receiver.

JAMES R. BROWN,
St. Louis, Mo.

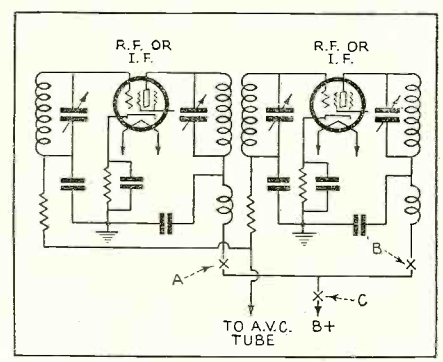
Adding a Tuning Meter

Many receivers, although they include automatic volume control, do not include a tuning meter. In such cases a tuning meter is easy to install and anyone possessing a low range milliammeter need not be without this decidedly desirable feature. Likewise in some receivers which do include a tuning meter either its scale is too small or the movement of the needle when tuning in a station is so slight that it is practically useless. In using a regular milliammeter for this purpose all of the objections are overcome.

The first step is to study the circuit diagram of the receiver to determine where the meter should be connected. The best place is in the B-plus lead to the filter through which the plate voltage is fed to one of the automatically controlled r.f. or i.f. tubes, as at "A" or "B" in the diagram. The meter must be connected on the B-plus side of the filter, otherwise the r.f. present in the meter and leads will likely cause the amplifier to be unstable or the tuned circuits to be thrown out of alignment. If different automatic control voltages are applied to different tubes connect the meter in the plate circuit of the one receiving the largest automatic bias as this tube will have the widest variation in plate current.

If more convenient the meter may be installed in the B-plus lead (see "C") which supplies all of the controlled tubes. The current change ratio will be the same there as in the lead to a single plate but the current will be higher, of course. Do not connect the meter in a common lead which supplies the current for tubes which are not automatically controlled or one which is common to tubes having different automatic bias voltages.

The meter used should be such that its range is *lower* than that drawn by the circuit in which it is connected when no signal is tuned in. This is done in order that when the meter is adjusted as explained below it will show full scale deflection when no signal is present and will therefore show maximum variation as stations are tuned in. In a circuit where the current drain is 10 ma. the range of the meter selected for use should be not greater than 0-5 ma. and an 0-1 or 0-2 ma. meter will serve equally well. Before putting the



meter into the circuit, shunt it with a resistor of such a value that the range of the meter is increased to a point where full scale deflection is obtained with no signal tuned in. The value of the shunt may be calculated or a rheostat of several hundred ohms can be connected across the meter (with the sliding arm set for mini-

mum resistance.) Then, with no signal, advance the rheostat until full scale deflection is obtained. This rheostat may be left in the circuit permanently or to save space a fixed resistor may be substituted for it as soon as the correct value has been determined.

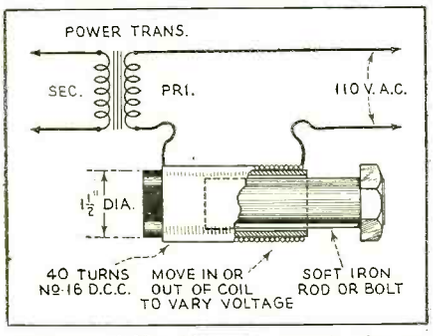
Using an 0-2 ma. d.c. meter in the plate circuit of the first i.f. tube of one commercial receiver a 100-ohm shunt (it just happened to fall at this even value) was required. This meter, the scale of which is marked off into 20 divisions, retards more than half scale on strong local signals and even extremely weak signals provide a noticeable variation. Weak signals which resulted in a barely visible indication on the shadow type tuning meter originally included in this receiver now provide a movement of over ¼ inch on the new meter; still weaker signals which caused no variation of the old meter, cause variations of up to 2 divisions on the milliammeter. Any signal strong enough to be heard above the noise level results in some movement of the meter.

Another advantage of this system is that the meter does not flick sharply on static impulses, or when tuning rapidly across a station. With many tuning meters this flickering on static make it impossible to detect weak stations by means of the meter. With the higher damping of the milliammeter this trouble is no longer present. It is therefore found possible to tune even for DX stations on both the broadcast and short-wave bands with the speaker volume control cut down to zero, to be tuned up only after the station has been exactly tuned in.

Line Voltage Regulator

In localities where the electric line supply voltage varies during the day, this simple and easily made line voltage regulator will be found helpful.

To make this device simply wind 20 to



40 turns of No. 16 d.c.c. magnet wire on a 1½ inch cardboard or bakelite tube and connect the winding in series with one side of the a.c. line in-put to the power transformer. Now, insert an iron rod or bolt about 6 inches in length inside the tubing. The diameter of the rod should be such as to fit snugly within the tubing.

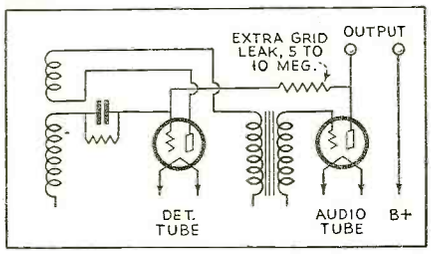
The output voltage of the power transformed can be regulated over a surprisingly wide range by simply moving the iron in or out of the coil. When the line voltage is normal the iron rod can be removed from the coil. The small inductance of the winding then has negligible effect on the voltage and it is not necessary to disconnect this coil from the primary circuit.

This device is an effective voltage regulator for the output of home-made filament and supply transformers.

H. D. HOOTON,
Beech Hill, W. Va.

Pepping Up Volume

Experimenters will be interested in a simple stunt for increasing volume, which can be easily adapted to many receivers. This is done by connecting a high resistance between the grid of the detector and the plate of the first audio amplifier tube, as shown in the diagram. The grid connection should, of course, be as short as possible. The value of this resistor should be 5 megohms or more, as too low a resistance will produce a continuous squeal due to a.f. oscillation. The resulting increase in volume is sometimes surprising.

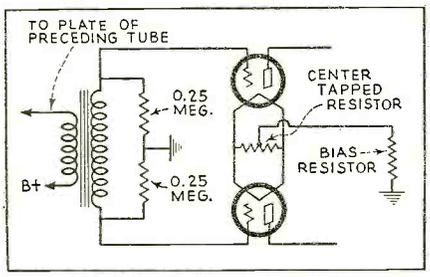


When this change is made the usual grid leak may be omitted altogether or retained, according to whichever gives the best results. In battery sets, a saving of B battery current can be effected by reducing the B voltage on the amplifying tube to the same as that applied on the detector. Using this hook-up the lower voltage will often give as great a volume as obtainable with higher voltage, without the resistor.

DAVID J. GIBSON,
Holden, Alberta, Canada.

Untapped Transformer for Push-Pull Input

It often happens that the experimenter or the serviceman is without the necessary



tapped transformer for a push-pull audio amplifier stage and this article will show how a standard single untapped coupling unit can be converted to this purpose. Some experimenters may also reason that a saving is accomplished by this method as the standard tapped input coupling transformer is more expensive than the untapped single unit.

As shown in the diagram the secondary winding of the transformer connects to the grids of the tubes and the junction of the resistors provides the necessary connection to ground. The resistors are not critical and can be 150,000 to 500,000 ohms but both should, of course, have the same value.

ROBERT I. CROWELL,
Dennis, Mass.

Power Supply Hum

The following information compiled by RCA-Radiotron Co., Inc., for eliminating hum that may originate in the power supply of radio receivers, particularly those of the universal a.c.-d.c. type, should prove helpful

In the small-size receivers the power supply system, in general, is the most common source of hum. The necessity of using low-capacity condensers and small filter chokes may result in ripple voltage high enough to cause audible hum.

There are a number of steps that can be tried in the elimination of this trouble. In many cases, balancing both sides of the line to the chassis through condensers will materially reduce hum. The capacity of

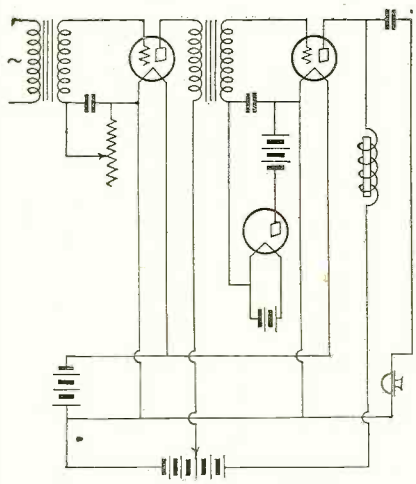
(*Continued on page* 759)

LATEST RADIO PATENTS

BEN J. CHROMY*

1,907,741. ELECTRIC AMPLIFIER. RAYMOND T. CLOUD, Chicago, Ill., assignor of one-half to Emanuel M. Zeiony, New York, N. Y. Filed June 9, 1930. Serial No. 459,858. 18 Claims.

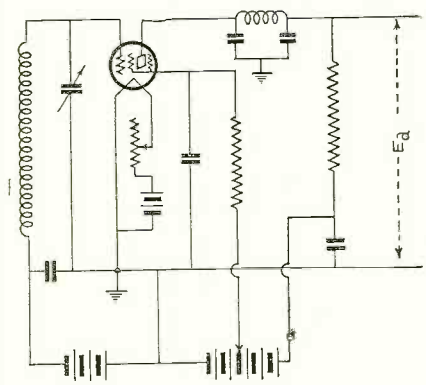
1. In an audio-frequency amplifying system of the character described, an input circuit including the electron-emitting ele-



ment and the control element of a thermionic triode, an input transfer secondary of materially low ohmic resistance included in said circuit, and means in series with one of said triode elements and said secondary for limiting the extremities of positive excursions of the control element potential.

1,907,768. AUDION DETECTOR CIRCUIT. PAUL O. FARNHAM and RAYMOND ASBERSON, Boonton, N. J., assignors, by mesne assignments, to Radio Corporation of America, New York, N. Y., a Corporation of Delaware. Filed July 20, 1929. Serial No. 379,762. 11 Claims.

1. In the operation of a screen-grid detector, the method of deferring over-



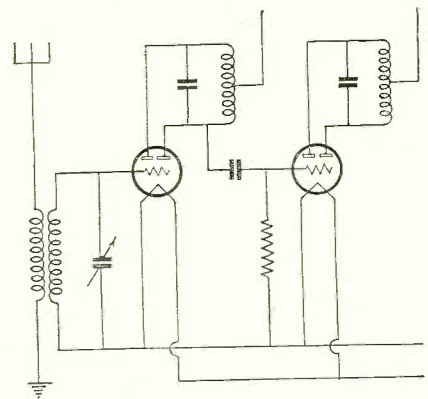
loading in the plate circuit which comprises automatically decreasing the screen-grid potential as the signal strength increases.

1,907,471. INDICATING SYSTEM FOR AIRCRAFT. ERNST F. W. ALEXANDERSON, Schenectady, N. Y., assignor to General Electric Company, a Corporation of New York. Filed Nov. 16, 1931. Serial No. 575,205. 16 Claims.

11. In a system for protecting aircraft against collision, a high frequency oscillating detector on each aircraft, each of said oscillating detectors being arranged to radiate oscillations to other craft and to receive oscillations therefrom, means on each craft for modulating the frequency of the respective oscillating detector in accordance with the speed of the respective craft, and means on each craft responsive to the difference in frequency between oscillations produced by the respective oscillating detector and oscillations received thereby from other aircraft.

1,908,920. THERMIONIC VALVE. JAMES ROBINSON, London, England. Filed July 6, 1927. Serial No. 203,783, and in Great Britain Nov. 30, 1926. 4 Claims.

1. A thermionic valve having a single filament, a control electrode and plate electrode and a plurality of additional juxtaposed elements of similar physical character to the said electrodes and disposed substantially outside the cathode



field, the filament being asymmetrically disposed with respect to the valve electrodes and the additional juxtaposed elements.

1,912,470. AMPLIFIER SYSTEM. ROGER M. WISE, New York, N. Y., assignor of one-half to E. T. Cunningham, New York, N. Y. Filed May 19, 1927. Serial No. 192,552. 2 Claims.

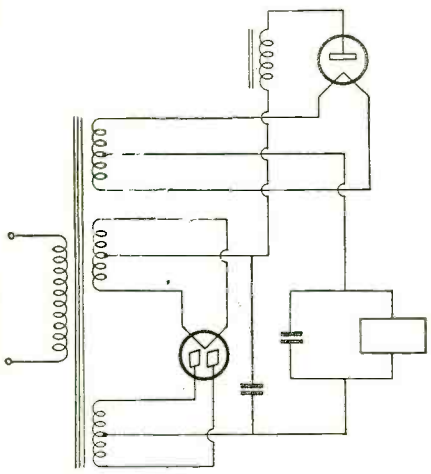
1. In an electron relay system, a plurality of electron relays each having grid and plate circuits, means for resistively coupling together said circuits in cascade, a blocking condenser inserted in each grid circuit which is resistively coupled to a preceding relay, a source of plate potential in common to said relays, said source having an appreciable resistance tending to form a coupling between said relays for repeated currents of audio frequency, a reactance for by-passing a major portion of audio-frequency components about the resistance of said source, and means for preventing positive feed-back of energy to at least one of the relays caused by components of frequencies so low as to cause the blocking condenser to introduce a phase displacement and the resistance to cause intercoupling between the relays, said means comprising a resistor in common to the plate circuit of one relay to which positive feed-back of energy has a tendency to occur, and to the plate circuit of the next preceding relay, and a by-pass condenser shunted across said source of potential, one terminal of said condenser being connected to the point of connection of said common resistor to said last-named plate circuits, said common resistor serving to impose a neutralized component upon the grid of

* Patent Attorney, Washington, D. C.

said one relay for said low-frequency components for which the by-pass condenser is ineffective.

1,912,991. ELECTRICAL SUPPLY SYSTEM. BENJAMIN F. MIESSNER, Short Hills, N. J., assignor, by mesne assignments, to Radio Corporation of America, New York, N. Y., a Corporation of Delaware. Filed May 3, 1929. Serial No. 360,044. 10 Claims.

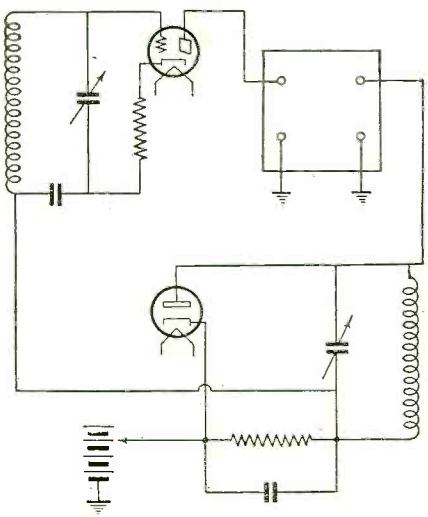
1. In an electrical current supply system the combination of a source of pulsating



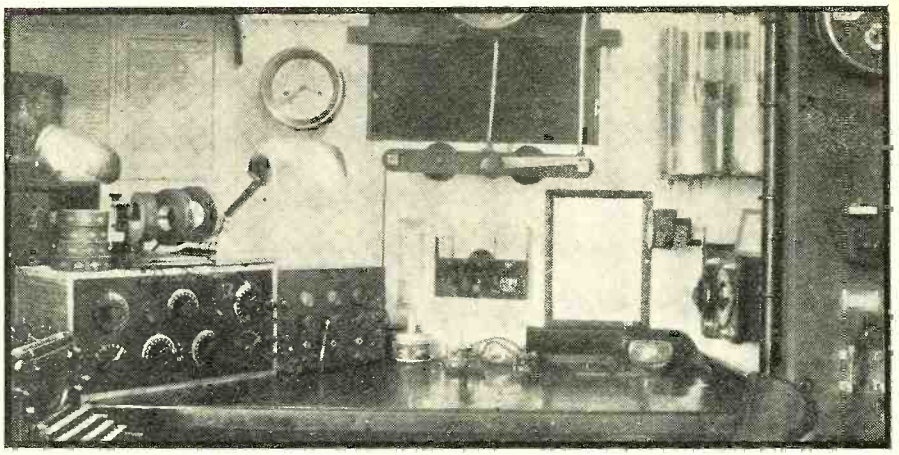
unidirectional current, a work circuit and an electronically conductive device in series between said source and system, said device having a cathode energized from a fluctuating source of current, said cathode being constructed so as to have low emission temperature, low heating voltage and high thermal inertia characteristics, said device being so energized that the average potential across the electronically conductive path exceeds the saturation potential of said path by at least the amplitude of the potential variations thereacross.

1,903,542. AUDION AMPLIFIER. ALFRED W. BARBER, Boonton, N. J. Filed Feb. 12, 1931. Serial No. 515,347. 12 Claims.

1. In the operation of an electrical wave amplifier working into a rectifier and subject to signals of varying magnitude, the method of automatically controlling the gain of said amplifier, which comprises impressing upon the amplifier input circuit



two discrete direct-current potentials which vary automatically and according to different functions of the magnitude of the incoming electrical wave, one of said potentials being predominately effective for weak signals and the other predominately effective for strong signals.



QRD? QRD? QRD?

CONDUCTED BY GY

YEA, the ARTA strike still continues, with no happy medium being reached by either side. There seems to be no bargaining and from the attitude displayed by both the ARTA and the I.M.&M. Lines, it is just a case of how long one or the other can hold out. Pressure from the NRA officials has changed the minds of officials of the lines, and the ARTA is doing its darndest to keep scabs from working on their vessels. Well, with warmer weather here this column feels that it will be much easier on the boys picketing the offices of the Line.

Short waves are known to have that peculiar faculty to hop, skip and jump without any seeming degree of fading, even after it has traveled a considerable distance. To the average layman, this statement means little, but to cruising Police cars who do not hear their headquarters call letters, it has meant severe reprimands. The story is told about two such cops who, upon returning to their car, heard their number being called to proceed to a number on Main Street. They shot over to the spot, hoping they hadn't been away from their car too long, and found the Main Street address as deserted as a graveyard. They cruised around there for a time and seeing nothing extraordinary, they phoned their precinct. They were informed by the operator on duty that the call had come from another city and "to keep their earmuffs off and to remain in the car."

Mr. C. J. Pannill, vice-president of the RMCA, has been instrumental in bettering conditions for operators who await assignment in the Buzzer Rooms in the various offices of the company. Assignments, in the future, will be posted in a conspicuous spot for all ops to see. Also, each operator upon arriving at the Static Room, will be given a number. This will give him an idea as to where he stands in line for an assignment so that, knowing the trend of shipping conditions, he will be in a better position to guide himself as to his turn. If he is on the N.G. list of the company, he will be so notified so that he will not have to wait around for an expected assignment and then, after months of waiting, still not receive any post. All these orders are for the betterment of operators' morale and contributes to undermining the power of some assigners who have their pets. By the number system one man cannot be pushed ahead of another, unless the lower numbered man refuses an assignment given to him. If this system remains in force, there will be fewer complaints of discrimination and an end to the abnormal waste of time of those who have waited for months on end without ever receiving a ship. Hurrah for Mr. Pannill and a big thanks.

Some ops insist on the old excuse of "no time to study" when they are approached with a course on furthering their knowledge of radio. A letter from Mr. Salvador Tayabas, who is a star student with CREI, should knock that excuse into a cocked hat. . . . "In the past two years I have worked hard always in the radio line. I have attended two international Radio conferences, the one at Madrid and the other at Mexico City, as delegate for my country, Mexico. I have built three radio stations, the last one of 10,000 watts of power, and I am right now holding the position of responsible engineer in this station (XER, Villa Acuna, Coah., Mexico) one of the most powerful in the world, I think, for we have about 150 KW in the Antenna. . . ." Sooooo, me hearties, it can be done and time can be found to squeeze in a bit of knowledge. He has the same 24 hours per day which we use to measure a full day in this part of the world.

Although Engineer John Dyer of the Byrd Expedition has completed the erection of station KFZ at the camp in Little America, short-wave fans are searching the ether for the first traces of its signal. KFZ has been heard mostly when relayed via LSX, Buenos Aires. The FRC licensed KFZ to use an assortment of freqs from 100 meters to 14 meters and tests are now being conducted to determine the wave which will reach this country with the greatest reliability. Many people are getting into the habit of listening each Saturday night to the Byrd broadcast which comes through WABC of the Columbia network at 10 p.m., E.S.T., and checking reception with the short-wave signal. As an added attraction, a 50-watt pack transmitter installed on one of the dog sleds will be heard, via KFZ, via LSX and via WABC.

A terrific wallop was handed to the operators in the Airways companies when the Administration decided that the Army should carry the mail. Although many of the ops are still being carried on the payrolls of the Airways companies because of the passenger traffic still handled by them,

the ops will be released when the finances of the companies necessitate shutdown of operation of their lines. This indirectly affects the ARTA, who has many of these airways ops on its roster.

How times have changed! The photograph pictured at the head of this column shows one of the old-time radio shacks, back in 1921, on the *S.S. Carillo* (KDE). It can be noticed that the old coil system was installed for the purpose of sharpening the signal. This apparatus was completely designed and installed by that real old-timer, Earl Hill, who is now parking his heels at Preston, Cuba. Earl can be remembered as that very, very quiet fellow who used to come into the shack and remain for hours without saying a single word. In the right-hand corner, that old 2 kw. spark was still perking. The receiver, incidentally, was an all-wave job, ranging from 300 to 5000 meters.

Well, shipping still continues to go out and very few men are waiting in the buzzer rooms for assignments. This month the blue-eyed mail carrier brings to our desk mail and greetings from all parts. Space permits mention only of one from Joe Whitely, who is now pounding the pavements as a policeman in N. Y. C., and Jack Schauffler, the snappy Airways operator out in Cudahy, Wis., who is intending to make a trip, via plane, to Boston, where he is required as a witness in an accident case. Jack says it will be good to see the old gang again and sends his 73. Well, cheerio, bon voyage, ge. . . . GY.

1-Tube R.F. Amplifier

(*Continued from page 732*)

The tubular condenser, C6, is soldered to the positive filament terminal. It is important here to connect the outside foil of the condenser to the filament, thus serving as a shield. This side is marked on the condenser.

The grid leak R5 is soldered to the free end of this condenser C6 and the terminal which received the antenna. The battery wire—blue—should be connected to the joint of the condenser and the grid leak.

The plate terminal of the socket connects to the antenna coupling condenser lug (the one where there is already a wire). Condensers C7 and C8 are both soldered to the grounded terminal of the terminal strip. The other wire of the condenser C7 should be soldered to the screen-grid terminal of the socket. Resistor R6 is connected between the screen-grid terminal and the free terminal of condenser C8. This latter junction should be made the positive B supply by connecting it to the screen-grid terminal of the audio amplifier tube.

Change the filament resistor which is mounted on the filament switch. Your set is now ready for operation.

The operation is still the same as it was before except that the antenna-coupling condenser is no longer in the circuit and no adjustments of this little condenser are necessary.

List of Parts

1 r.r. "Cha-Set" "Add-A-Unit" section
C6, C7, C8—By-pass condensers, .1 mfd., 200 volts
R1—Wire-wound filament resistor, 2.6 ohms
R5—Carbon resistor, 100,000 ohms
R6—Carbon resistor, 40,000 ohms
1 four-prong wafer type socket
1 terminal strip
1 grid clip
1 type –34 tube

The DX Corner (Broadcast Band)

(*Continued from page 741*)

are many owners of large vacuum-tube receivers who occasionally revert to the use of the old crystal set and actually take greater pride in the DX reception obtained with these little receivers than in the much greater distances covered with their big receivers.

H. H. Parker, Los Gatos, Calif., lists a group of eight stations, ranging in distance between 300 and 1100 miles away, that he was able to bring in on his crystal set. This log was made several years ago, but now that KPO, only 30 miles from his location, is using a power of 50 kw., he finds his little crystal set incapable of bringing in stations from great distances as before. However, it does bring in the six or seven San Francisco and Oakland stations (53 miles away) any time during the day. This log, incidentally, was compiled when many of the stations he heard were using considerably lower power than they now employ—which makes his record of 1300 miles even more impressive.

Another crystal fan, Robert Jones, Jr., Newellton, La., sends in his record of crystal reception, listing 10 stations over 400 miles distant that he has heard. The most distant is WABC, which is approximately 1300 miles airline from his home. This is an especially good record for his location, down in Louisiana where static conditions are much worse during the greater part of the year than they would be further north.

S. T. Brewer, West Lafayette, Ind., has "recently gone primitive and built a crystal receiver," as he puts it. To date he has received four stations more than 500 miles distant from his location. At the time of writing his letter he had just purchased a new and much more sensitive crystal, but hadn't had an opportunity to go out after DX with it. However, he had high expectations for considerably improving his present record, which is approximately 1100 miles.

The best crystal record for the month goes to George Holloway, Warren, Ohio. The log of his crystal receiver up to January 15 showed 21 stations 300 miles or more distant, the best catch being XER, 1400 miles, approximately.

Asking for Verifications

J. H. Woodhead, Monarch, Wyoming, modestly limits his list of stations received during the past winter to those over 2500 miles distant. Included are 2 South Americans, 11 Australians, 14 Japs, 1 Chinese, 1 Porto Rican, 1 Philippine, 1 Hawaiian and 1 in Newfoundland. Altogether his broadcast band log shows 823 stations received.

He offers a worth-while suggestion to those seeking verifications from the Japanese stations, or any other foreign stations for that matter. In seeking verifications he describes as nearly as possible what he hears, always giving the time (in Greenwich Mean Time) of announcements and their length. He also gives the time and duration of any pauses or breaks in the program. Where one is unable to understand the foreign language spoken, this mention of pauses, time and length of announcements and speech, length of musical waiian and 1 in Newfoundland. Altotion with sufficient proof or reception to permit even the most cautious to verify.

Several of the Japanese stations include booklets describing the stations when sending out verifications, according to Mr. Woodhead. He uses a Victor R-32 receiver which is now five years old—"not very selective, but sensitive to the Nth degree"; also an antenna tuner similar to the R. N. Tenatuner described in the February RADIO NEWS, page 483.

Chinese Station List

"In the Broadcast Corner of RADIO NEWS for April there is a list of Chinese stations. I notice that some of these stations have no location named, so I am sending in a list that I received March 7th.

"This list was sent to me by Mr. T. Y. Woo, director of radio station XGOA at Nanking. He wrote the letter February 12th so the list should be quite up to the minute:

Call	*Location*	*Frequency*	*Watts*
XXOC	Nanchang	1132	500
XGOA	Nanking	660	75000
XGOD	Hangchow	977.5	1000
XGOK	Kwangchow	677.2	1000
XGOY	Yunnan	698	500
XHHE	Shanghai	940	100
XHHF	Shanghai	960	100
XHHG	Shanghai	1020	100
XHHH	Shanghai	1040	100
XHHI	Shanghai	1060	100
XHHK	Shanghai	1420	100
XHHM	Shanghai	1180	100
XHHN	Shanghai	1200	100
XHHS	Shanghai	1100	100
XHHU	Shanghai	1160	100
XHHV	Shanghai	880	100
XHHX	Shanghai	920	100
XHHY	Shanghai	1240	100
XMHC	Shanghai	700	500
XOPP	Peiping	952.3	100
XOST	Tsinan	857	500
XOW	Foochow	675	1000
XQHD	Shanghai	1360	200
XTOY	Taiyuan	625	500

"I surely enjoy the DX Corner for Broadcast Waves and hope this list will help some other fans to increase the size of their logs."

T. Wm. Kelly,
San Jose, Calif.

Good Ground Systems

Here is a thought from Ray E. Everly, Newton, Ill., which is worthy of careful consideration:

"We find much published information on good antenna systems, but entirely too little attention is given to the advantages of a good ground. After several years of experimentation with antenna and ground systems I have reached the conclusion that a really good ground, well watered, is essential if best reception results are to be obtained. It will be less noisy and will provide greater signal strength than will the use of either an indoor cold-water pipe or radiator.

"I have three grounds, spaced about 6 feet apart and all connected together to provide a single ground lead to the set. The first is an 8-foot length of 1-inch galvanized iron pipe with holes drilled through it every 6 inches to a distance of 2 feet up from the bottom end. The pipe is sunk into the ground to a distance of about 6 feet and is filled with rock salt. The top of the pipe is left open and once a week is filled with water. The rock salt helps to attract and hold moisture and the weekly watering insures adequate moisture at all times.

"The second ground consists of a number of old B batteries in which the cells have been freely punctured with a nail. These batteries are buried in a trench 1 foot deep and well watered down. The holes in the cells allow the chemicals to seep into the surrounding ground and serve to keep it moist.

"For the third ground I use 25 feet of old brass pipe, ½ inch in diameter. It is bent in the form of a large loop and buried in a trench 1 foot deep with 5 pounds of rock salt sprinkled in the trench before the earth was replaced. In both this case and the second one I have small pipes driven into the ground down to the level of the trench floor. By means of these pipes I

wet these grounds down once every week.

"Another simple but highly effective ground can be made by punching an old Ford radiator full of holes, then burying it deep enough so that just the filler cap extends above the earth. Sprinkle rock salt in the hole before replacing the earth and drop some down the filler pipe of the radiator. Thereafter pour water into the filler hole every few days."

It is really surprising what grounds such as these will accomplish in some locations. In other locations, however, the cold-water pipe may be found superior to any "local" ground. So much depends on the formation of surrounding soil that the only sure method of obtaining the best ground for any given location is to try several types of grounds and then permanently adopt the one, or the combination, which provides the best results.

WLW-W8XO

"Regarding the paragraph, 'WLW Testing with 500 KW.,' on page 545 of RADIO NEWS for March, 1934, I am glad to advise you that my experience in receiving the experimental broadcasts of WLW's new super-power transmitter, W8XO, has been quite different from results obtained at your listening post.

"While I am able to receive WLW's regular 50 kw. broadcasts as long as KMPC, Beverly Hills, 710 kc., 500 w., about 15 miles from my location, are off the air (which is several hours every evening), the 50 kw. signals are weak and fade badly; the reception could certainly not be classified as good. The moment KMPC is back on the air, it will drown out the WLW 50 kw. transmitter completely, my set not being very selective. Now, with their 500 kw. transmitter, WLW's signals come in here just like a local, loud and clear and quite free from fading. The programs are thoroughly enjoyable from a musical standpoint, and the interference from KMPC, if present at all, is no more than occasional, feeble cross-talk."

J. A. WHITMORE, Los Angeles, Calif.

With the Experimenters

(*Continued from page 753*)

these condensers should be about .1 mfd.

The use of each half of the 25Z5 tube to supply a separate load circuit will usually achieve a reduction in hum. The speaker field can be supplied from one plate and its cathode, and the plate voltage for the tubes can be supplied from the other plate and its cathode. In a few cases it may be found that this arrangement, due to other circuit conditions, causes hum. In such cases, the plates and cathodes of the 25Z5 tube should be operated in parallel.

In circuits which employ separate loads for the two halves of the 25Z5, an increase in the capacity of the condenser by-passing the speaker field may reduce hum. Of course, in sets using both plates and cathodes of the 25Z5 rectifier in parallel, the filter condenser and the condenser by-passing the speaker field are the same.

Perhaps the most effective, but also the most expensive, method of reducing hum due to the power supply is to increase the capacity of the filter condenser. The maximum permissible size and cost of the condenser must be taken into consideration when this is done. However, increasing the capacity of the filter condenser has the further advantage of an improvement in power supply regulation.

It is sometimes possible to eliminate hum by introducing into some circuit an a.c. voltage of equal value and opposite phase to the ripple voltage.

The DX Corner

(Short Waves)

(*Continued from page 728*)

homa, reports the following Best Bets in his location: GSF, DJB, EAQ, FYA, VK2ME, VE9GW, GSE, GSC, GSK, HBP, YV3BC, YV1BC, HC2RL, HJ5ABD, HJ1ABB, CP5, COC, PRADO, HJ4ABE, HJ3ABD, VE9DN, LSX, KFZ, XETE, YV5BMO, JYK, KWE, JOA. He uses a Philco 16B all-wave set.

A Report from Texas

Frank B. Johnston of Crosbyton, Texas, reports the following Best Bets on a home-built two-tube set: W3XAL, W8XK, W2XE, YVQ, EAQ, W1XAZ, W2XAF, W3XL, YV1BC, VE9GW, W9XAA, W8XAL, W3XAU, VE9CS, W4XB, W1XAL, CSN, VK2ME, VK3ME, YV3BC.

A Report from British Columbia

Mr. Jack Bews of Revelstoke reports the following Best Bets in his location: PSK, HJ1ABB, W3XAL, W8XK, W9XF, W2XAD, W2XE, W2XAF, KEQ, W3XL, W3XAU, KWU.

DX Owl of the West—Yes, Sir!

Mr. A. E. Berger, an Official RADIO NEWS Observer, sends in a very fine report this month which is too long to print, and we have included the information in our DX Best Bets.

A Report from New Brunswick

Alfred Knobel of New Brunswick, N. J., using a National short-wave 45 a.c. set, lists the following Best Bets: FYA, DJB, DJC, GSA., GSB, HIZ, HJ1ABB, VE9GW, YV3BC, W3XAL, W8XK, W3XL, W2XAF, W1XAZ, VK2ME, EAQ, I2RO, PRA3 (PSK).

A Report from Seattle, Wash.

Mr. Arthur D. Golden of Seattle sends in a very fine report of which we will only publish what he calls his most dependable stations (the complete list is too long and has been incorporated in Best Bets): FYA, PSK, RV15, HJ1ABB, XETE, VE9CS, RV50, VK3ME, VK2ME, all the German and British transmissions, YV3BC, HCJB, MC2RL, PRADO, LSX, LSN, COC, as well as the American stations.

An Official Report from Tennessee

Observer C. D. Moss of Dyersburg, Tennessee, reports that conditions have been mostly favorable with very little static in his location. He reports that the 31-meter band is picking up. Best Bets for the past month have been DJC, YV1BC, YV3BC, HC2RL, HJ1ABB, VK2ME, VK3ME, YV5BMO, as well as the usual American stations.

A Report from Montreal

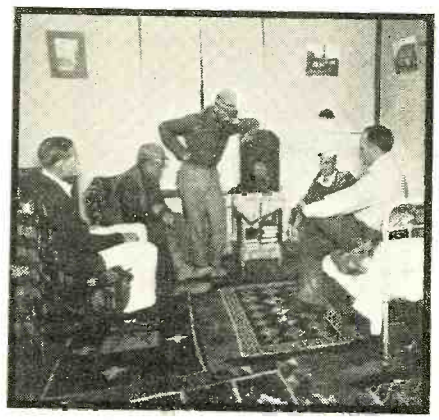
Mr. C. E. Roy reports the following Best Bets for Montreal: FYA, GSE, GSC, GSB, GSA, I2RO, DJD, DJC, EAQ, GCW, XETE, W3XAU, W8XK, VE9HX, VE9GW, W8XAL, RV59.

Report of Results on a One-Tube RADIO NEWS Hook-up

Mr. Freeman C. Balph of Indianapolis, Indiana, reports building the "Scoutmaster" circuit in the April issue of RADIO NEWS, except that he used a 210A tube. Here are some of the stations he heard with this set: EAQ, EAM, XDD, KEJ, KFS, KEZ, KKW, WIW, W2XE, W8XK, VE9GW, W1XAL, W3XAL, OXY, GSA, KWI, LSX, EAV, FXC, W2XAF W3XAU, W8XAL, YV3BC, and several other South American stations on 49 meters. The antenna was a small length of wire strung out of the window and tied to a tree. Mr. Balph is a RADIO NEWS Short-Wave Listening Post Observer and built the set as an experiment to see whether what we said about simple one-tube sets was the exact truth or not. He writes that he was doubtful about receiving DX on a one-tube set until he built the circuit, which removed all doubts from his mind.

All-Wave Radio in a Mining Camp

CHILE—Chilean and American engineers are entertained by news from all over the world, brought to them with the new



General Electric all-wave radio, installed in their living quarters. The problem of entertainment was thus solved once and for all.

Report from Cuba

Mr. Clarence M. Heal of Paso Estancia, Cuba, writes in a report that the mysterious Mexican station as reported by Mr. Wright of Brooklyn in a past issue is station XAM of Merida, Yucatan. He says "Bueno, bueno, Mexico," which means "All right, all right, Mexico." His Best Bets follow: W8XK, W3XAL, W4XB, W3XL, W2XAD, W2XAF, G6RX, GSA, GSB, FYA, EAQ, YV1BC, YV3BC, HI1A, DJC, COC, XAM. His set is a Philips four-tube all-wave battery receiver.

A Report from Ohio

Official Observer Donald W. Shields of Roseville, Ohio, reports the following Best Bets for this month: DJA, DJC, DJB, VE9GW, HJ1ABB, YV3BC, EAQ, HBP, KEE, PSK, LSX, LSN, KKP, HI1A. He uses a Philco 16B eleven-tube all-wave receiver.

What-Ho the Fair Sex!

An interesting report from Mrs. L. R. Ledbetter of Vicksburg, Mississippi, contains some very interesting information as well as the following Best Bets: DJB, GSF, HVJ, FYA, GSE, DJD, GSD, PHI, LSX, EAQ, IRM, XETE, CT1AA, VK2ME, GSC, HBP, DJA, VK3ME, PLV, CNR, J1AA, PSK, HJ1ABB, GSA, DJC, COC, G6RX as well as all the Americans.

Readers Who Helped Log Stations for This Month's Report

We are indebted to the following readers of RADIO NEWS who sent in reports of re-

ception this month: Wm. E. Hanson, West Haven, Conn.; A. A. Boussy, Springfield, Mass.; A. J. Mannix, Portsmouth, N. H.; C. H. Skatzes, Delaware, O.; H. Kemp, Waterbury, Conn.; A. Hamilton, Somerville, Mass.; J. Stokes, Pittsburgh, Pa.; Dr. M. Hausdorff, Lugano, Switzerland; J. E. Brooks, Montgomery, Ala.; W. Hardell, Rhinelander, Wis.; S. E. Ramsey, Pittsburgh, Pa.; D. E. Bame, Copaigue, L. I.; E. C. Lips, Pittsburgh, Pa.; P. Simmons, Chicago, Ill.; G. L. Rich, Richmond, Va.; F. H. Kydd, Ceballos, Cuba; E. W. Springer, Rochester, Pa.; J. S. Banks, New York City; T. Schneider, Lancaster, O.; R. W. Evans, Lima, O.; E. G. DeHaven, Los Angeles, Calif.; C. Will, Glencoe, Ill.; H. Johnson, Big Spring, Tex.; R. Leader, San Francisco, Calif.; A. Wilesko, Brooklyn, N. Y.; Dr. G. W. Twomey, Fort Snelling, Minn.; W. Dixon, Plainfield, N. J.; Dr. J. P. Watson, Hazlehurst, Miss.; D. Smith, Woburn, Mass.; G. E. Dubbe, Walla Walla, Wash.; K. Boord, Smithfield, W. Va.; J. A. Mas, New York City; J. H. Schulken, Charleston, S. C.; F. G. Hehr, Sayville, L. I.; G. R. Heil, Corona, N. Y.; E. S. Christiani, Jr., British Guiana; J. Harold Lindblom, Lansing, Ia.; A. Edwards, Urbana, Ohio; J. J. Maling, Norfolk, England; E. R. Bergeman, Elgin, Ill.; C. C. Bonsell, Marietta, O.; H. R. Drake, Dover, N. J.; W. A. Doty, New York City; H. Adams, Jr., Baltimore, Md.; O. L. Ramsey, Struthers, O.; A. DelGuercio, Newark, N. J.; F. C. Balph, Indianapolis, Ind.; E. W. Prichard, Poughkeepsie, N. Y.; E. A. Datomi, Omaha, Neb.; J. W. Smith, Baltimore, Md.; Mrs. L. R. Ledbetter, Vicksburg, Miss.; D. W. Shields, Roseville, O.; C. E. Heal, Paso Estancio, Cuba; C. E. Roy, Montreal, Can.; C. D. Moss, Dyersburg, Tenn.; A. D. Golden, Seattle, Wash.; A. Knobel, New Brunswick, N. J.; A. E. Berger, San Gabriel, Calif.; J. Bews, Revelstoke, Can.; F. B. Johnston, Crosbyton, Tex.; R. Woods, Sand Springs, Okla.; E. M. O'Sullivan, Jackson, Mich.; Dr. G. Campbell MacDiarmid, New Zealand; E. H. Davenport, Pittsford, Vt.; L. J. Plunket-Checkemian, Sussex, Eng.; D. H. Townsend, Fallon, Nev.; L. H. Colburn, Surrey, Eng.; C. L. Wright, Leicester, England; R. LeJeune, Greenwich, Conn.; H. L. Harris, Jr., Pacific Grove, Calif.; A. Barber, Blackpool, Lancs., Eng.; N. C. Smith, Kent, Eng.; N. Nattall, Lancashire, Eng.; C. W. Bourne, Council Grove, Kans.; E. P. Mallard, Charlotte, N. C.; V. A Sears, Summerville, S. C.; R. W. Mitchell, Winchester, Mass.; V. Scott, Rockland, O.; A. J. Leonhardt, Brooklyn, N. Y.; J. M. Kelley, North Bennington, Vt.; G. W. Cunningham, Barre, Vt.; J. C. Platts, Kittanning, Pa.; F. Erich Bruhn, Cascade, Colo.; C. Nick, Philadelphia, Pa.; E. Diel, Rocky Ford, Colo.; R. Edkins, Transcona, Man., Can.; D. M. Gants, Gardner, Kans.; W. D. Mullane, Dorchester, Mass.; Deans Crumpler, Latta, S. C.; J. F. Henderson, Pampa, Tex.; J. L. Davis, Savannah, Ga.; L. Swenson, Eden, Idaho; G. Krebs, Louisville, Ky.

World-Wide Radio Log of Short-Wave Stations

Through the courtesy of the RCA-Victor Company, readers of RADIO NEWS may receive a log-book of short-wave stations and important short-wave data that will help them in obtaining better results on the short waves. Simply address a letter or postal card to RADIO NEWS, Department RC, 222 W. 39th St., New York City, including your name and address. The log will promptly be sent to you. Your letter must be received at RADIO NEWS on or before June 10th, however.

Send in Your Reports

The Editors acknowledge with thanks the assistance of public-spirited readers who have thus co-operated to make these columns so successful and helpful. Let us urge our readers, one and all, to continue, in even a larger way, to send in these reports. We would be grateful if every reader who hears even a single station would send it in to us with just the data as to its wavelength, the time which it was heard, etc. Of course, we would prefer to get more information, including the Best Bets in each listener's locality, as well as definite logs of stations, their wavelengths and times of transmission. Readers will also help by stating what type of receiver they use in logging these stations.

A Correction

In the April issue the International Morse Code chart was shown with some symbols lacking in dots. A corrected chart appears below.

INTERNATIONAL MORSE CODE

1. A dash is equal to three dots.
2. The space between parts of the same letter is equal to one dot.
3. The space between two letters is equal to three dots
4. The space between two words is equal to five dots.

A • —	N — •	1 • — — — —
B — • • •	O — — —	2 • • — — —
C — • — •	P • — — •	3 • • • — —
D — • •	Q — — • —	4 • • • • —
E •	R • — •	5 • • • • •
F • • — •	S • • •	6 — • • • •
G — — •	T —	7 — — • • •
H • • • •	U • • —	8 — — — • •
I • •	V • • • —	9 — — — — •
J • — — —	W • — —	0 — — — — —
K — • —	X — • • —	
L • — • •	Y — • — —	
M — —	Z — — • •	

Period	• — • — • —
Semicolon	— • — • — •
Comma	— — • • — —
Colon	— — — • • •
Interrogation	• • — — • •
Exclamation point	— • — • — —
Apostrophe	• — — — — •
Hyphen	— • • • • —
Bar indicating fraction	— • • — •
Parenthesis	— • — — • —
Inverted commas	• — • • — •
Underline	• • — — • —
Double dash	— • • • —
Distress Call	• • • — — — • • •
Attention call	— • — • —
General inquiry call	— • — • • — — • —
From (de)	— • • •
Invitation to transmit (go ahead)	— • —
Warning—high power	— — • • — —
Question (please repeat after .....)—interrupting long messages	• • — — • •
Wait	• — • • •
Break (Bk.) (double dash)	— • • • —
Understand	• • • — •
Error	• • • • • • • •
Received (O. K.)	• — •
Position report (to precede position messages)	— • — •
End of each message (cross)	• — • — •
Transmission finished (end of work) (conclusion of correspondence)	• • • — • —

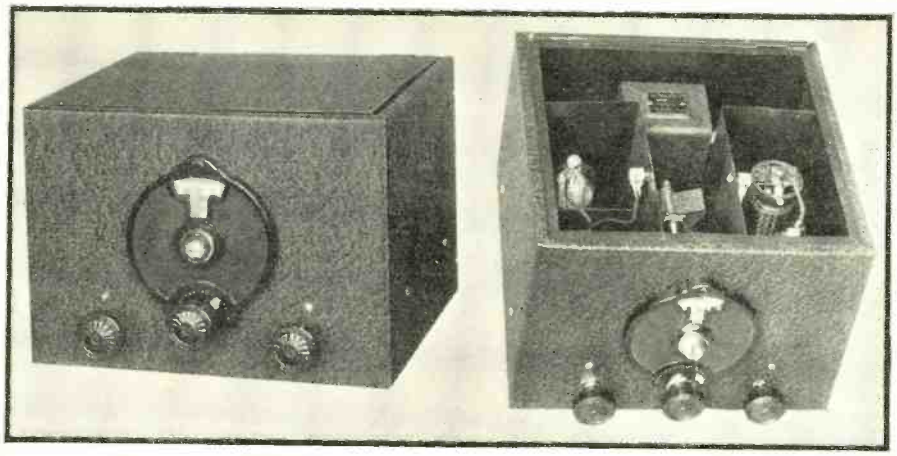
WHAT'S NEW IN RADIO

WILLIAM C. DORF

Short-Wave Receiver

Description—The National SW-3, three-tube Thrill Box receivers are now available for 110-volt a.c. or d.c. supply and for 2-volt battery operation. The new Thrill Box uses the grooved R-39 coil forms; also Isolantite insulated condensers and tube sockets. The circuit employs one r.f. stage coupled to a regenerative detector and one stage of impedance-coupled audio amplification. The volume control is calibrated from one to nine in steps corresponding to the R volume scale. Band-spread coils are available for the 20, 40, 80- and 160-meter bands.

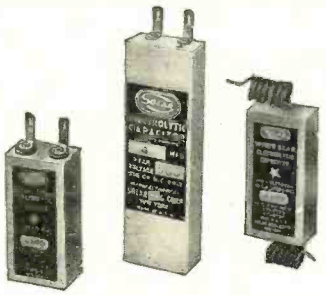
Maker—National Company, Inc., Malden, Mass.



Midget Type Electrolytic Condensers

Description—Solar introduces a new line of smallsize dry electrolytic condensers in cardboard containers. They are available in three voltage ratings: 220, 500 and 525 volts. Due to their compact size, these new condensers should have unusual interest for the radio serviceman. In the photograph the two outside units are the new midget condensers and in the middle is the standard size electrolytic which is shown for comparative size.

Maker—Solar Manufacturing Corp., 599 Broadway, New York City.



Motor-Car Antenna

Description—The Fishwick Effarsee tubular automobile aerial can be mounted lengthwise or crosswise under the car or it can be attached to the front or rear bumpers. The manufacturer points out that the outstanding feature of this antenna is its 27 square feet of wire fabric. The outside casing of the aerial is waterproofed and it comes complete with webbing straps for attachment. It is available in two sizes, the junior measuring 1½ inches in diameter and the senior measuring 2½ inches in diameter. Both are 36 inches long.

Maker—Fishwick Radio Co., 226 E. 8th St., Cincinnati, Ohio.

Portable Phonograph

Description—Vacationers will be interested in this new RCA-Victor portable model 219 phonograph. It is compact, light in weight and equipped with a clock type spring capable of playing two standard size records in succession without rewinding. The phonograph features an improved sound box, using a moulded horn of fibrous material to eliminate the usual metallic harshness associated with the old type portable phonograph. The fabrikoid-covered case available in either black or blue, measures 7¼ inches high by 12¾ inches wide by 16 inches deep. There is a leather-covered holder in the top cover which is capable of carrying 12 records.

Maker—RCA-Victor Company, Camden, N. J.

Aluminum Solder

Description—This company recently introduced a flux-filled aluminum solder. The new solder contains a special alloy with an

efficient flux sealed within the core. It is available in handy small tins for household and small repair work and in one-

pound spools for commercial and industrial use.

Maker—Kester Solder Co., 4201 Wrightwood Ave., Chicago, Ill.

Capacity Indicator

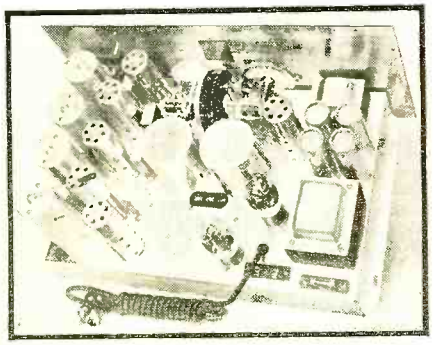
Description—The new Amplex capacity measuring instrument should prove a valuable service aid to servicemen, laboratory engineers and experimenters. By the substitution method it indicates open or leaky by-pass or filter condensers and will indicate immediately the required capacity for best results in any part of a circuit. The condensers incorporated in the instrument are rated at 600 volts and the by-pass units have a range from .0001 to 1 mfd.

and the range of the filter condensers from 2 to 12 mfds. It is a direct-reading instrument and employs positive-acting, self-wiping switches. The bakelite case measures 7½ inches by 4½ inches by 1¾ inches.

Maker—Amplex Instrument Labs., 240 W. 23rd St., New York City.

New Quartz Crystal Single-Signal Receiver

Description—Announcement is made of the complete line of four Hammarlund Comet "Pro" receivers which include the standard model using eight tubes, the standard model plus automatic volume control,

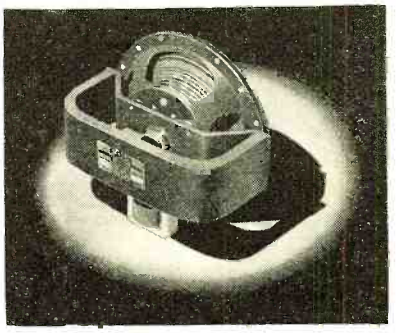


the crystal receiver and the crystal model plus automatic volume control. The illustration below is a top view of the new Comet "Pro" crystal model, eight-tube superheterodyne receiver. This set employs the following type tubes: –57's for the first and second detectors; –58's for the two intermediate-frequency stages, for the oscillator and beat-frequency oscillator; a 2A5 power tube in the output stage and an –80 type for rectification. This model, using the quartz crystal filter, is capable of providing a degree of selectivity not obtainable with any practical combination of coils and condensers. The tuning range is from 8 to 550 meters. These receivers are available for battery, d.c. or a.c. operation.

Maker—Hammarlund Mfg. Co., Inc., 424 W. 33rd St New York City.

New Speaker

Description—The features of the new Rola PM-8 permanent-magnet dynamic type loudspeaker include a new corrugated diaphragm type centering member, a



domed center shield, a dust-proof acoustic filter assembly and a magnet core construction which provides greater efficiency. The domed center shield, placed in the apex of the cone, shields the magnetic air-gap against the entrance of metallic particles and dust. The new particle-proof acoustic filter and corrugated diaphragm type centering member protect the voice coil. Sensitivity, tone fidelity and power-handling ability of these new PM-8 loudspeakers are said to be comparable to those of the high-grade electro-dynamic reproducers.

Maker—The Rola Company, 2530 Superior Ave., Cleveland, Ohio.

New Amperite for 2-Volt Tubes

Description—A new series of Amperite automatic filament controls for 2-volt type

tubes was recently announced. With the new line of Amperites a receiver with 2-volt type tubes can be operated from an air cell, storage battery, 2-volt tap of a Delco plant or from dry cells. A single Amperite unit can be used to control all the tubes in the set.

Maker—Amperite Corp., 561 Broadway, New York City.

5-Meter Power Supply

(*Continued from page 733*)

a "single-plate-to-single-grid" type of not too high a ratio. The one illustrated has a ratio of three to one.

Automatic bias is provided for the first tube, but, because of the writer's preference for a definitely fixed bias on the output tube, a biasing battery was used on that stage. With a fixed battery bias, it is possible to increase the undistorted audio output of this tube, which factor makes the use of a separate biasing battery highly desirable. Center-tapped resistors are provided for the a.c. filament leads of both tubes. The values are not particularly critical—those used in the unit illustrated are 75 ohms each, and although it is possible to use the filament center-taps provided on commonly obtainable power and filament transformers, these resistances are highly desirable, as they readily provide a grid return right near the tube. The bias resistor for the type –56 tube is 2700 ohms and can be of the 1-watt size. This value of resistor is for a terminal plate voltage of about 200 volts. At these values the tube should draw a plate current of about 2 ma. This bias resistor is by-passed to ground by means of a 2-microfarad condenser of about 400 volts d.c. breakdown rating.

The microphone transformer may be of any conventional type. The one used in the illustration was for the accommodation of a single-button microphone. The binding posts and the switch are provided for the connections of the single-button microphone with a single dry cell in series with one leg. The switch cuts off the battery when it is not wanted.

Across the secondary of this transformer there is connected a 500,000-ohm potentiometer to be used as gain control for the modulator unit. In the final tryout it will be found that this amplifier-modulator unit will provide more than sufficient audio push to the 5-meter transmitter,* hence the volume control. Across the secondary of the interstage transformer there is connected a resistor of fairly high value—this may be anywhere from 100,000 to 500,000 ohms. It was found best to use a 100,000-ohm unit in the model.

The bias battery which provides grid bias for the final stage tube is by-passed by a 1-microfarad condenser of 500-volt breakdown—this condenser is not essential, but highly desirable.

Finally, the output choke is what is most familiarly known as a "Heising" choke. It is through this choke that the total current to be drawn by the modulator as well as the current to be drawn by the tubes of the external unit to be modulated must pass. The choke must therefore be capable of carrying at least 200 ma. It may be of any convenient manufacture, but must be of fairly good construction, with an inductance of about 30 henries and a fairly low d.c. resistance winding. It is a desirable procedure to ascertain the current draw of the –50 tube before the unit is put into definite operation. Taking it for granted that the B voltage through this choke may be too high for the modulator tube, it is desirable to start with a fairly high C bias for his tube—90 volts would be a safe value. For all ordinary purposes, however, with a plate voltage of about 450 volts and a C bias of about 85 volts, the plate current for this tube should be limited to about 55 mils.

The unit as a whole makes a splendid amplifier for all purposes within its power limitations. Its quality may somewhat be improved by the use of a double-button microphone with a suitable microphone transformer. It is hard to say whether it is worth the bother and expense of these additions. The average ham who has been pounding brass on the regularly allocated amateur bands, and is desirous of going on 'phone, will find this unit all that can be wished for for 'phone communications. Obviously, on the regular amateur 'phone bands, a crystal-controlled transmitter with not more than a 10-watt output tube is a most desirable type of accessory radio-frequency apparatus for a regular set-up with this unit. However, that is not necessarily the limit of its usefulness, there being no limit to linear r.f. amplification which can be tacked onto the end of a 10-watt stage that is modulated by this unit.

The List of Parts

B1—One No. 6 dry cell or small flashlight cell
C1, C2, C3—Polymet filter condensers, 2 mfd., 1000 volts
C4—Aerovox filter condenser, 1 mfd., 400 volts (omitted in model illustrated)
C5—Aerovox filter condenser, 1 mfd., 500 volts
C6—Aerovox filter condenser, 1 mfd., 300 volts,
Ch1, Ch2, Ch3—RCA double filter chokes with winding connected in parallel or Todd chokes, 18-30 henry, 160-200 mils.
M1—Single-button microphone
R1—Electrad voltage divider, 25,000 ohms, 75 watts
R2, R3—Pilot 75-ohm, tapped filament resistors
R4—Frost or Yaxley 500,000-ohm potentiometer
R5—100,000- to 500,000-ohm, 1-watt resistor
R6—Bias resistor, 2700 ohms, 1 watt

SW—Toggle switch, s.p.s.t.
T1—Thordarson power transformer, type 3202C
T2—Audio transformer, 3-1 ratio
T3—Microphone transformer, preferably a type such as Kenyon BLG, or similar
3 four-prong sockets
1 five-prong socket
1 baseboard measuring 9 by 24 inches
Tubes required—two type –81, one type –50 and one type –56

* As described in RADIO NEWS of December, 1933.

"53" Tube

(*Continued from page 739*)

the output obtainable with these two tubes is higher than that of any other pair of tubes, operated Class B and limited to 300 volts. Suitable drivers for this case are a –59 operated as a triode, a 2A5 operated as a triode or a –56.

Figure 10 shows the operation characteristics of two –53 type tubes employed in a single Class B stage, driven by a –59. Full output can be obtained from the –53 stage with an input signal of approximately 19.5 volts. When the same tubes are driven by a 2A5 type the power output is slightly less, but a smaller input signal is required. The –56, employed as a driver, increases the power sensitivity of the systems, but the maximum power output is less than of the other combinations. Operating characteristics for the last two cases are shown in Figure 11.

Plate characteristics of a single triode section are shown in Figure 12. These characteristics should not be confused with those of Figure 8, which refer to the triode

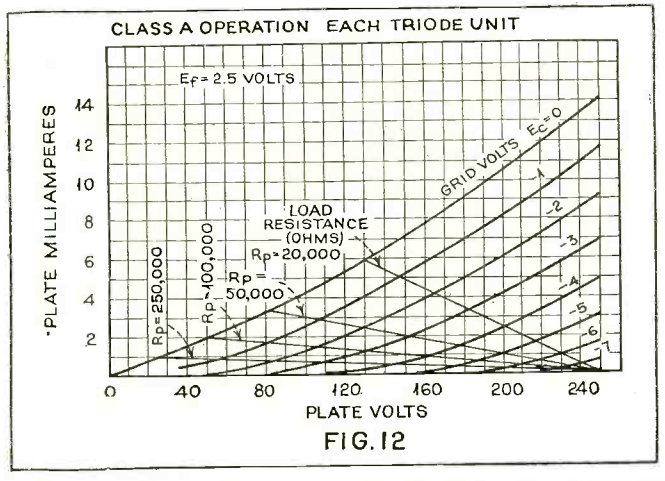


FIG. 12

units connected in parallel. The triode units are suitable for utilization either as a biased detector or as an audio-frequency amplifier. Therefore, both functions can be performed by a single tube. A suitable circuit for this purpose is shown in Figure 3. The values of resistors and condensers are shown in the diagram. The requirement that both units have a different grid bias may cause some difficulty, since there is a common cathode. Therefore it would be best to obtain the bias from the voltage-divider system, which is indicated in the Figure. Maximum sensitivity of the detector is obtained with a grid bias of approximately —7.5 volts. This value is not critical. The plate current of the detector will then be approximately .1 milliampere. The amplifier plate current is 1.2 milliamperes with a grid bias of —3 volts. This combination is sufficient to drive an output tube of a type 2A5 which requires a signal of approximately 16 volts for full output. In order to obtain this full output the input signal to the detector at radio frequency (modulated 30 percent) should be approximately .3 volt.

The two triode units can be employed, in cascade, in a resistance-coupled amplifier as shown in Figure 4. This system again presents the same difficulty of the common cathode and therefore the bias is again obtained from the voltage divider. The maximum input to the first amplifier unit should not be more than .08 volt, because the second amplifier unit will draw current if this value is exceeded. With that input voltage an output of 57.5 volts can be obtained from the second amplifier unit. Over-all gain of two stages is 720. A very low percentage of distortion is claimed for this amplifier. Just one word about the frequency response. When the first stage is fed from a low-resistance source this amplifier delivers (at 10,000 cycles) approximately 70 percent of the maximum voltage amplification.

It has always been difficult to obtain two signal voltages, of equal amplitude and 180 degrees out of phase, from a single-tube amplifier without employing a transformer. The diode detector makes it possible to obtain such a voltage, direct from the diode, but systems to couple a push-pull amplifier to a single-tube amplifier without resorting to transformers have always been hard to make. Type –53 presents a possibility of obtaining the required out-of-phase voltage in the following manner. It is well known that any signal when fed into an amplifier tube undergoes a reversal of phase when it is taken off in the plate circuit in the normal manner. Therefore it becomes possible to obtain the other half of the signal voltage by taking a small portion of the output of the first a.f. unit and sending it through the second unit. This portion will then be reversed in phase and should be of such magnitude that the output of the second unit equals the output of the first. In this manner it is possible to couple a single amplifier to a push-pull amplifier. A suitable circuit is shown in Figure 5. The potentiometer, P, should be adjusted until the output of the two units are equal. Assuming that all components of the amplifier keep the same value, this adjustment will not have to be touched again. The diagram shows a –53 feeding a push-pull stage, employing 2A5 tubes.

There are, no doubt, many more possibilities for employing two amplifier units in the –53. For instance, it would be possible to employ one part as an oscillator and the other as an amplifier. It is also possible to make a two-stage, d.c. amplifier. The tube can also be employed as a push-pull driver. The resourceful engineer and experimenter will perhaps be able to add many more useful circuits. The technical data for this article were supplied by R.C.A. engineers.

2-Tube Short-Wave Converter

(*Continued from page* 731)

Choke X and condensers C8 and C9 comprise the filter system which smooths out the high-voltage current—reduces the hum. Resistors R3 and R4 are so connected as to provide the proper voltages to the tube. Condensers C10 and C11 are by-pass capacitors.

While the short-wave converter described above is necessarily more involved than the beginner's short-wave receiver and adapter considered in previous articles, it should not be beyond the scope of the serious fan who has carried on with us. If you are genuinely interested, but somewhat in awe of the mechanical and electrical details, it may be worth while to have your local serviceman build it up for you. If you possess a high-grade broadcast receiver, a converter of this type represents an economical method of obtaining excellent short-wave reception—even when the cost of construction is considered. The tools on hand should be those mentioned in the adapter and receiver articles.

Construction of the converter follows the general principles outlined in the two articles immediately preceding. The parts will be readily identified by the coding which is the same in the parts list at the end of this article, in Figure 1 and in the picture wiring diagram, Figure 2. The numbers on the sockets, etc., correspond with the connections shown in Figure 1.

First mount the power transformer (Trans.), choke (X), binding posts and condensers C4, C8 and C9 in accordance with the layout of Figures 2 and 4. The panel, drilled as shown in Figure 3, is next in line. The switch, S, may now be mounted.

Connect leads to the four sockets as follows: ANTENNA SOCKET—an 8″ and a 3″ lead to prong 3—a 3″ lead to prong 4. 2A7 TUBE SOCKET—twisted 12″ leads to heaters, 4 and 5—2″ lead to prong 6—an 8″ lead to prong 3—6″ leads to prongs 2 and 8 and a 4″ lead to prong 7. TYPE -80 SOCKET—10″ twisted leads to filaments, prongs 1 and 2—10″ leads to plates, 3 and 4. OSCILLATOR SOCKET—4″ leads to prongs 1, 2 and 4 and a 6″ lead to prong 3.

Connecting these leads before the sockets are mounted will facilitate making the connections. Mount the sockets. The connections to L5 and L6, the output unit, are now in order and should also be made before mounting. An 8″ lead should be soldered to connection 2, and 4″ leads to connections 3, 4 and 5. Connection 5 is common with the shield can, indicated by dotted lines in Figure 1 and should be grounded as shown. Now connect the lead from prong 3 on the 2A7 socket, and mount the I-F unit (L5-L6). Cut the leads from this unit to the proper length and solder to their destined connections.

Mount C1 and C2 and complete wiring—the remaining condensers, resistors, etc., being held in place by their own pigtails or the rigidity of the short wiring itself. The case of the electrolytic double-unit condenser, C8 and C9, runs to ground and connection 8 on the power transformer. The power lead to the switch S should be twisted.

The dials are the last item and are fastened to the panel by small screws from the back, after first removing the hub caps and loosening the setscrews so that the dials will slip on the condenser shafts. The condensers should be opened to their lowest capacity—the rotor plates swung all the way out. Set the dials at "0," tighten the setscrews and replace the hubcaps. Constructional details are further made clear in the photographic views in Figures 4 and 5.

Some adjustment may be required before the best results will be secured with the converter. Insert tubes and coils in their respective sockets—the oscillator coil in the right-hand socket, the r.f. coil in the left-hand socket (the 4000 to 7500 kc. coils will be best for the initial attempt), the 2A7 tube in the center socket nearest the panel and the -80 in the remaining socket—*looking at the converter from the rear.* Connect antenna and ground to the indicated posts. Connect post G to the

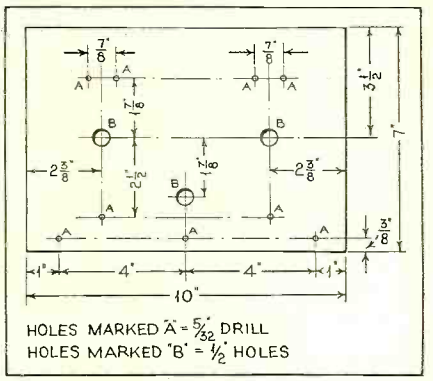


FIGURE 3

ground post on your broadcast receiver and A1 to the antenna post. Plug in the power supply and turn on both converter and receiver.

Tune the receiver to some frequency between 500 and 600 kc.—a frequency upon which, in normal operation, no station can be heard. Turn the volume control full on. Now adjust the output unit by means of C7, using a non-metallic neutralizing wrench. Adjust for the loudest hiss in the loudspeaker. After the loudest hiss point is reached—or if no definite hiss adjustment is noted—tune C1 a degree at a time, and while on each degree, tune C2 over its entire range. A station will shortly be heard. Tune in as loudly as possible on C1. Now adjust C7 carefully, retuning C2 for each change in the output unit. Note the loudness of the signal, and shift the wire connected to A1 on the converter to A2. Readjust C7 and C2 without touching C1. Connect the lead from the broadcast receiver antenna post permanentiy to either A1 or A2—whichever connection gave the best signal. If it was A1, you will of course have to readjust C7 and C2.

With the signal tuned in to maximum as indicated above, check the readings on the two dials. If they are not the same, adjust C4 by means of the non-metallic screwdriver until they read identically. (If the difference in readings is considerable, see if there is not another point C2, closer to the reading on C1, where the station can be received. Do not touch C1. If such a point exists, start from here when adjusting C4.) The readings may vary slightly over different portions of the dials. An exceedingly delicate (and therefore rather impractical adjustment for the beginner) would be necessary on C7 to provide exact tracking.

If a whistle is heard on all stations, it is due to the fact that the *broadcast receiver* is tuned to a frequency on which a nearby or powerful broadcast station is transmitting. Readjusting the broadcast receiver, C7 and C4, will eliminate this annoyance.

The operator may notice that some stations can be received on rather widely

separated adjustments of C2—a possibility that was implied in the above directions for adjusting C4. This is due to the fact that the signal will be heard when the oscillator circuit is tuned to the signal frequency *plus or minus* the intermediate frequency. The proper oscillator frequency, however, is the signal frequency minus the intermediate frequency. Only this adjustment will provide good tracking and complete wave coverage.

A switch may be conveniently provided to throw the antenna from converter to broadcast receiver—for short- or long-wave reception respectively. The most simple arrangement is shown in Figure 7. This can be used in almost all instances. However, if a slight loss of volume on broadcast reception is noted, the switching system of Figure 8 can be employed, which removes L6 from across the broadcast receiver primary. The power switch on the converter should of course be turned off when the broadcast receiver is being used alone.

Parts List

1 aluminum or bakelite panel, size 7" x 10"
1 baseboard, size 8" x 10"
1 4-prong socket (for the –80 tube)
2 6-prong sockets (for the coils)
1 7-prong socket (for the 2A7 tube)
2 National SE-90, 90 mmfd. variable tuning condensers (C1 and C2)
1 National air padding condenser, 35 mmfd., type W35 (C4)
1 mica condenser, .001 mfd. (C3)
2 mica condensers, .0001 mfd. (C5 and C12)
3 paper condensers, .1 mfd. (C6, C10 and C11)
1 two-section Hi-Farad electrolytic condenser, 8 mfd. per section (C8 and C8)
1 mica condenser, .01 mfd. (C13)
3 Lynch pigtail 1-watt, 50,000-ohm resistors (R1, R3 and R4)
1 Lynch pigtail 1-watt, 250-ohm resistor (R2)
1 National I. F. output transformer, type C (L5, L6 and C14) (Condenser included in unit)
1 National 2.5 mh. r.f. choke, type 100 (RFC)
1 20-henry choke coil (X)
1 power transformer for a type –80 rectifying tube and a 2.5-volt heater secondary (Trans.)
5 binding posts
1 switch (S)
1 National grid-grip (for connection to top of 2A7 tube)
2 National type VB-C dials
1 coil flexible hook-up wire
Miscellaneous hardware, etc.—screws, nuts and bolts, bakelite strips for binding posts, washers or short lengths of tubing for the mounting of raised parts
1 type 2A7 tube
1 type –80 rectifying tube
Coil sets covering the desired frequency bands

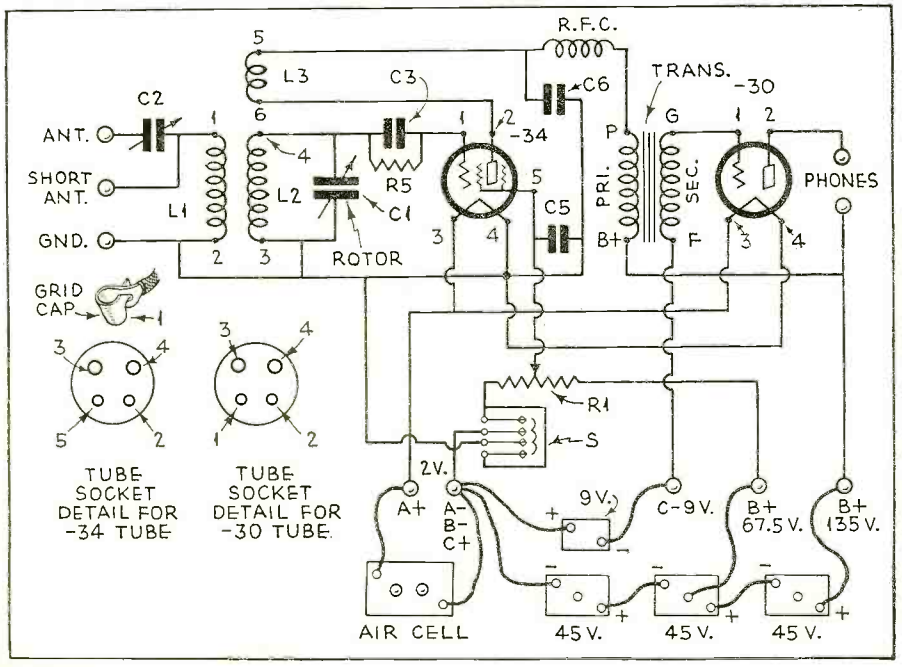
Five sets of standard coils are available. They are the National type CAO, CBO, etc., for the oscillator coils, and CAD, CBD, etc., up to CED for the detector coils. The middle letter indicates the frequency range: A indicates 11,500-20,000 kc.; B, 7000-12,000 kc.; C, 4000-7500 kc.; D, 2400-4300 kc.; E, 1500-2600 kc. The oscillator coils differ from the r.f. coils and may be observed by inspecting the diagram, Figure 1, and are therefore not interchangeable. **James Millen,** The National Co. Inc.

Believes He Has Caught Ether

NEW YORK—Dr. E. E. Free in his "Weekly Science" notes that Professor Vaclav Posejpal of the University of Prague, in Czecho-Slovakia, believes he has caught a fleeting shadow of the ether, that hypothetical medium supposed to carry radio and light waves. Other experimenters have made thousands of attempts to trap it or to disclose its existence, but have failed. Professor Posejpal imagined the ether to consist of vast clouds of atomic particles like the nuclei of hydrogen, but without electrical charge. He placed a thin wire of the rare metal palladium in the most perfect vacuum he could make and measured the resistance of the wire before and after heating it. His experiments showed "loose" hydrogen nuclei appear inside the tube and collect on the palladium wire. The professor thinks they come from the store of such particles in the ether. Professor Aime Cotton of the University of Paris suggests that they may come from loose water molecules inside the vacuum.

REVISED CIRCUIT FOR THE TWO-TUBE SET

The diagram below shows corrected and revised circuit for the battery-operated two-tube receiver described in the April and May installments of Mr. Millen's series for the beginner



The Technical Review

(*Continued from page* 745)

Outstanding features of the Hammarlund-Roberts high-frequency superheterodyne designed especially for commercial operators for laboratory, newspaper, police, airport and steamship use.

5. *A 1934 Volume-Control and Resistor Catalog.* Data on standard and replacement volume controls, Truvolt adjustable resistors, vitreous wire-wound fixed resistors, voltage dividers, precision wire-wound non-inductive resistors, high-quality attenuators, center-tapped filament resistors, power (50-watt) rheostats and other Electrad resistor specialties.

6. *Line Voltage Control.* Characteristics and uses of a voltage regulator and chart showing the correct Amperite recommended by set manufacturers for their receivers. Also tells how to improve your customers' sets and make a profit besides.

7. *Rich Rewards in Radio.* Information on the growth of radio and the opportunities existing in the field of radio manufacturing, radio servicing, broadcasting, talking pictures, television, public-address systems and commercial station operation on land and sea, for men who are trained to fill the many jobs created by the radio and allied industries. The book also contains detailed information on the home-study courses in radio and allied subjects offered by the National Radio Institute. This book is available only to RADIO NEWS readers who are over 16 years of age and who are residents of the United States or Canada.

9. *Catalog of Resistors.* Specifications of the International Resistance Co. 1934 line of metallized, wire-wound and precision wire-wound resistors, motor-radio suppressors, handy servicemen's kits, valuable technical data and list of free bulletins available on the building of servicemen's test equipment.

16. *R.M.A. Standard Resistor Color-Code Chart and Meter Conversion Data.* A handy postcard-size color-code chart designed by the Lynch Mfg. Co. to simplify the job of identifying the resistance values of resistors used in most of the standard receivers. A catalog of Lynch products is included, together with information on how to convert simple meters into useful servicing and testing instruments by the use of series and shunt resistors.

25. *Noise-Reducing Antenna Systems.* This folder describes in detail the two types of noise-reducing systems perfected by the Lynch Mfg. Co. for both broadcast and short-wave reception.

26. *Auto-Radio Antennas, Filters and Noise Suppressors.* A complete line of antennas, filters and ignition noise suppressors especially designed for motor-radio installations. The antenna system is of the under-the-car type for easy installation and has all the Lynch antenna system features, including matching transformers and shielded lead-in.

34. *Serviceman's 1934 Replacement Volume Control Guide.* A revised, enlarged list, in alphabetical order, of all old and new receivers showing model number, value of control in ohms and a recommended Electrad control for replacement purposes. It contains specifications and volume control circuits for over 2000 receiver models and is more comprehensive than the 1933 edition which was so popular last season.

41. *How to Build the "Economy Eight."* Constructional information, diagrams, list of parts, etc., of an efficient 8-tube receiver which can be built from a kit which sells for $13.75. Servicemen and set builders can put in their spare time to advantage building and selling these sets.

52. *The Servicer.* Helpful information designed to help the serviceman do better work and make more money doing it.

56. *Servicing and Testing Instruments.* Description of a new line of low-priced analyzers, set testers, tube testers, ohmmeters, capacity testers, oscillators and universal meters. Information is also given on the new Supreme Model 55 tube tester and the new Supreme Master diagnometer which employs the "free reference point system of analysis."

57. *How to Build a High-Quality Condenser or Ribbon Microphone.* This circular describes the Amperite microphone kit with which it is possible to build, easily and quickly, a high-quality condenser or ribbon microphone.

59. *The I.R.C. Volt-Ohmmeter.* The characteristics and uses of the International Resistance Co. volt-ohmmeter, a combination voltmeter and ohmmeter specially designed for the point-to-point method of trouble-shooting.

60. *Audio and Power Transformers and Choke Coils for Use in Public-Address Amplifiers and Radio Receivers.* Information on the characteristics of a wide variety of AmerTran DeLuxe and Silcor (popular-priced line) audio and power transformers and chokes.

62. *How to Make Money on Public Address.* A number of valuable articles on how to make money with public-address equipment, together with descriptions and prices of a wide variety of Lafayette amplifiers and public-address equipment.

PLEASE NOTE: *To avoid disappointment, please make your selection of booklets from the latest issue of* RADIO NEWS.

JUNE, 1934
RADIO NEWS Free Technical Booklet Service
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Gentlemen: Please send me, without charge, the booklets or folders I have filled in below:

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- Serviceman Employed By:
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  - ☐ Jobber
  - ☐ Dealer
  - ☐ Servicing Organization
- ☐ Dealer
- ☐ Jobber
- ☐ Radio Engineer
- ☐ Experimenter
- ☐ Laboratory Technician
- ☐ Professional or Amateur Set Builder
- ☐ Licensed Amateur
- ☐ Station Operator
- ☐ Public Address Work
- ☐ .....

I am a ☐ subscriber ☐ newsstand reader.

I buy approximately $..... of radio material a month. (Please answer this question without exaggeration or not at all.)

Name.....

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City.....State.....

PLEASE USE PENCIL AND PRINT IN FILLING IN COUPON

Selector Switches

(*Continued from page 743*)

in which case an auxiliary switching circuit performs this function as shown in Figure 8.

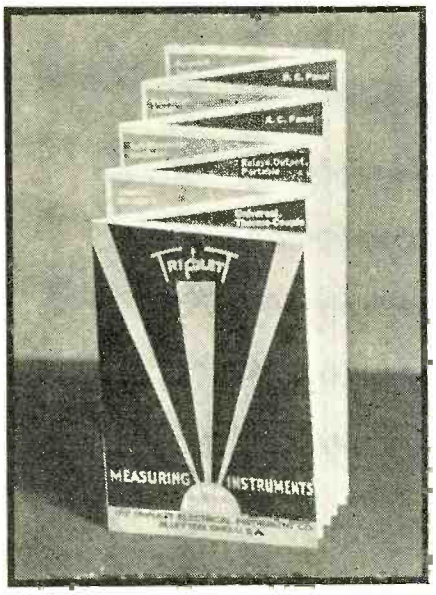
The common or ground terminal contact on the switch described can be divided into sections and in this manner the switch transfers apparatus from one circuit to another. This allows greater freedom in circuit design and frequently reduces required parts. Figure 9 illustrates a circuit in which the contactors during operation move from one circuit to another. It also shows the shorting feature by the use of adjacent contactors in section three.

The combination of circuit selector switch with the feature of station pre-selection is shown in Figure 10. The switch is operated in the conventional manner over two positions. On position two the shaft is pushed in and engages switch section three, which, when the switch is rotated to position three causes a station pre-selector to become operative. A separate section operates various dial lights conforming to the frequency band being used.

It is obviously impossible to cover in detail the numerous circuits which have been devised, but the cases given above are in general representative of present practice in receiver design.

The circuit requirements of test and service equipment often necessitate the use of complex circuit selector switches and the switches primarily designed for receiver application find increasing use in this type of service.

The writer wishes to express his gratitude to Radio Corporation of America for the use of Figure 6; Crosley Radio Corporation for Figure 7; United American Bosch Corporation for Figure 8; Philco Radio and Television Corporation for Figure 9 and General Household Utilities Corporation for Figure 10. P. G. ANDRES, Yaxley Mfg. Co., Inc.



Electrical Measuring Instruments Explained

The folder pictured above describes the complete line of Triplett electrical measuring instruments. It is printed in a new way so that an excellent thumb index of each page is provided. The folder can be obtained by writing to RADIO NEWS, Department TR, 222 West 39th Street, New York City, enclosing your name and address.

Put Radio on Your Boat

(*Continued from page 717*)

motor car, solves this problem readily. It is wise, however, to have the installation made by an expert who understands this work and before making any kind of installation, consult your local radio serviceman or dealer. He will be glad to advise you what type of apparatus to buy, under the conditions to be encountered in your particular boat. Also you can get some information by writing to the various manufacturers of automobile receiving sets that are now being used for this marine purpose. These manufacturers have competent engineers in their employ who are glad to offer advice on the types of their receivers giving the best results under marine conditions. Many manufacturers have prepared bulletins on the installation of automotive radio sets, giving complete information on the servicing and installation of ignition-quiet radio receivers. If you will mention RADIO NEWS when you write to these sources or when you talk to your serviceman, they will know exactly what your problems are.

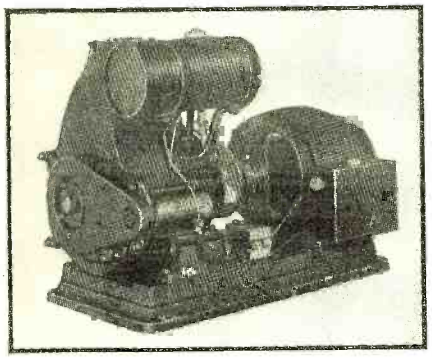
In Class No. 1, for small open boats, rowboats, canoes and outboard-powered craft, the problems are more complex, due to the lack of space. Installation of radio aboard the outboard type is still somewhat in the development stage. The exhaust noise from this type of engine has been greatly reduced through the development of the underwater exhaust. But the close proximity of the ignition system to the antenna and the fact that most of the engines are single or double-cycle, *operating from magnetos,* is also a hazard. By installing the antenna far forward, in the bow, as shown in the drawing accompanying this article, and the use of ignition suppressors and filter condensers, the spark noise is materially reduced, but in the smallest boats it is not entirely eliminated. On local stations, however, reception even in these boats is not greatly bothered by this type

INDEX TO ADVERTISERS

of interference. Installations for rowboats and canoes come down almost entirely to the midget type of receivers of 2,3 or 4 tubes, operating on dry cells and midget "B" batteries, packed in a small battery case. The best antenna to use is an insulated wire tacked along the gunwales and a copper strip on bow or stern for a ground. These small sets do, however, give a lot of enjoyment and are superior in many ways to the ordinary portable phonograph that so many canoe fans have carried in previous years. The bother of changing records, etc., and of carrying this equipment is eliminated. The set itself may be installed on a little shelf placed in the bow or underneath the stern seat. A drawing of an antenna of this type is shown in this article.

New Type Portables

Then again there are radio installations of the portable type that can be carried around aboard ship, or anywhere, to give really fine results for marine vacation periods. One of the latest types of these being furnished to radio enthusiasts this year is shown in an illustration on these pages. It is a Portable, working from a 6-volt storage battery and containing a complete 5-tube superheterodyne. You may bring it home and plug it in directly to a 110-volt a.c. lighting line. It works equally well on the battery or on 110 volts. It can be used in your automobile, on your boat, in your camp or at home.



32-v. power supply

In selecting radio sets to be used aboard any type of vessel, particularly those that are to come in contact with salt water, it is desirable that they be completely enclosed, as salt water causes corrosion of some metals and dampness interferes with the efficiency of insulating materials.

Consult an Expert

When planning your radio installation, our best advice is *"not to go off half-cocked if you do not know the answer."* Consult your serviceman or dealer Many radio servicemen and dealers this year are contacting your Boat Clubs or Boat Yard so that you can have expert advice for the asking. Boat manufacturers, this year, are also giving a great deal of attention to the installation of radio equipment. They are slowly learning that the advantage of radio on a boat is even greater than in the case of the automobile, because the boat enthusiast is usually more isolated on a trip than the motorist. Marine manufacturers, themselves, have been working in conjunction with radio manufacturers for the past few months and are now able to install a suitable radio receiving set in any given type of boat. If you do not have necessary contact with the radio field, RADIO NEWS will be glad to help furnish this material and see that you get the information you require. Simply address RADIO NEWS, Yachting Department, and state the class of boat you own and we will have the information forwarded to you.

Marine Radio

(*Continued from page* 713)

this new field where you can be of such helpfulness and where you can earn an honest extra dollar. You will find you are dealing with a fine type of prospect and one who will be willing to pay you well for a job well done!

Servicemen, dealers: If you desire more information on this new field, write to me on your business letterhead and I will see that the information is sent to you.

Owners of marine craft. Whether you own large or small boats: If there is any doubt in your mind on the subject of marine radio installation, write to me and I will see that you are furnished with the information you desire.

Yacht club and beach club officials, boat-yard managers, etc.: Write me if you want more information on Public-Address equipment for your organization. I will see that it is sent to you so that you can be ready for the coming season.

R. F. Amplifiers

(*Continued from page* 735)

the author took a set of readings on his own transmitter, using the 7000 kc. 210 stage, feeding the power amplifier. Capacity coupling was used in this test, the results of which are shown in Figure 4. Note the resemblance to Figure 3.

The Service Bench

(*Continued from page* 749)

least, according to Roger H. Hertel of Hertel's Radio Store, Clay Center, Nebraska. As Mr. Hertel has been in the radio service business for eight years (and what's more important *is still in it!*), it may be well to give ear to what he has to say. We've been asking for service sidelines—and we're getting 'em. "It is not a too-easy task," observes Mr. Hertel, "to make a living servicing radios in a small town—even with my electrical sidelines—refrigerators and electrical supplies—helping out.

"For the past five years I have made a portion of my living by raising a garden. This sideline is worked in a business-like manner. Early each morning I contact the local vegetable dealers, and arrange with them to buy my products as long as I can supply them. I also consult them in anticipation of their needs, and plant accordingly. I make it a point to have the earliest garden in town, and replant so as to have a continuous supply of vegetables clean up to frost. I canvass my dealers every evening, taking orders for early delivery next day, and by eight o'clock in the morning the vegetables are delivered. The remainder of the morning is spent taking care of the garden, and the afternoon is devoted to my radio work.

The radio business has slackened up in the past summers—just when gardening requires attention—so it all fits in very nicely. The expense of this sideline is next to nothing—outside of the labor which I find in the nature of a pleasant hobby. Available ground can be bought or rented dirt cheap—and I'm not punning. You may think I'm nertz, but this is a sideline for the serviceman which should not be overlooked—and I'll be glad to supply additional facts to anyone who wants them."

We don't think anything of the kind,

Mr. Hertel. Thanks for the tip, and we close with the observation that, as this issue reaches our readers in the middle of May, there's time to get out the hoe and rake!

THE DAY'S WORK

Hum has been an illusive menace to satisfactory reception ever since the advent of the line-power receiver. One of our old reliable contributors, Harry D. Hooton, Radio Service, Beech Hill, West Va., contributes the following to the ever growing symposium on the subject: "For several years I have enjoyed the reputation of a man who never got 'stuck' on a service job. However, that reputation came near the cracking point while servicing a fine custom-built all wave receiver. The set would perform normally for ten or fifteen minutes. Then a terrific a.c. hum would develop, increasing in volume until the incoming signal was completely drowned out. If the set was turned off for a few minutes, it could be operated for another short time before the hum began. I made the usual continuity tests and checked the tubes, various voltages, etc. No results. The set tested okay in every way. I finally decided that the hum must originate somewhere in the power unit, so I went to work on that. One of the first things that caught my eye was the wiring of this unit, which was effected entirely with heavy *solid* bus wire! I knew then where my trouble was located. The constructor had placed the two rectifiers rather close to the filter block and the heat had caused the bus wire to expand, tearing the foil of the filter condenser. After the tubes had cooled the wiring contracted to its original length reconnecting the condenser. The other filter condensers were so badly damaged by the expansion and contraction of the wiring that I found it necessary to replace the entire block. Needless to say the new condensers were wired with *stranded* wire with plenty of slack to allow for expansion."

M. P. Academy Award

CAMDEN, N. J.—A certificate of merit for scientific and technical achievement has just been presented to the Photophone division of the RCA-Victor Company here in recognition of its development of high-fidelity sound motion-picture reproduction and recording systems.

JUNE, 1934

Technical Information Coupon
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Kindly supply me with complete information on the attached question:

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☐ I am not yet a subscriber to RADIO NEWS.

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NATIONAL RADIO PRODUCTS

Shown below are a few representative examples of National Radio Products. The list prices given are subject to 40% discount when purchased through an authorized NATIONAL CO. distributor. National Velvet Vernier Dials, Transmitting and Variable Condensers, R. F. Chokes, Amateur Receivers (SW-3, SW-58 and 34, FB-7A, FBX-A, AGS and AGSX), Short Wave Power Units, and Short Wave Accessories are built to strictly maintained standards of precision and workmanship, and are universally used in Short Wave and Amateur Radio. The full line is described and priced in our new and complete Bulletin No. 220. Write for your copy today, enclosing 6c to cover mailing costs.

STD Midget Condenser
Double condenser, 180° SLW plates, 50 mmf. per section. Air gap, .026. Isolantite insulation. Constant-impedance rotor connection, insulated front-bearing. List price **$3.50.**

Type "N" Dial
Solid German silver 4" precision dial with original and matchless Velvet Vernier mechanism. Machine divided scale and vernier read to 1/10th division. Ratio 5-1. List price **$6.75.**

Air-Dielectric Condenser-Tuned IF Transformer
Standard in National FB-7A and FBX-A Amateur Receivers. 450 to 550 kc. tuning range. Also made in 175 kc. model. List price ea. **$5.**

STN Midget Condensers
For neutralizing 245, 247, 210 and similar tubes in amplifier, buffer or doubler stages. Isolantite insulation. Max. cap. 18 mmf. 3000 v. breakdown. List price **$2.00.**

SEH Midget Condenser
Like half of 2SE Condenser but with more plates and air gap of .0175. Caps. 200, 250, 300 and 335 mmf. List prices (respectively) **$3.75, $4., $4., $4.25.**

2-SE Midget Condenser
Isolated rotors, electrically independent, prevent interstage coupling through common rotor and frame circuits. Isolantite insulation. 270° SFL plates. 100 mmf. per sect. Air gap .026. List price **$5.00.**

NATIONAL Sockets
National Isolantite Sockets reduce socket losses to a minimum. Made in either 4, 5, 6 or 7-prong styles and also special 6-prong for National coils. Ea. **$.60.**

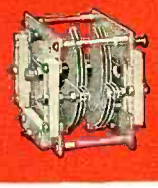
Type B Dial Velvet-Vernier
The smooth, National Velvet-Vernier Drive is positive and free from back-lash. Variable ratio 6-1 to 20-1. Horizontal diameter 4". List price (without illuminator) **$2.75.**

Air-Dielectric Padding Condenser
Shielded air-dielectric padding-condenser on Isolantite base. In 75 and 100 mmf. max. capacities. Extremely compact. List price (respectively), **$2** and **$2.25.**

FB-7A Coil Form
Made of R-39, special low-loss dielectric. Complete with grounded metal end handle, air-dielectric padding-condenser, and protective sleeve. List price each **$3.65.**

SEU Midget Condenser
Heavy, double-spaced, polished, round edge, 270° SFL plates. Air gap .055. Isolantite insulation. 15, 20 and 25 mmf. capacities. List prices (respectively) **$2.50, $2.75, $2.75.**

Stand-off Insulator
Isolantite insulator with 3-point mount and 6/32 screw on top. For carrying high tension leads, mounting transmitter inductances, etc. List price, ea. **$.25.**



EMP Condenser
Split-stator condenser for receivers and low power push-pull transmitters. 1200 v. breakdown. Air-gap, .023. Standard size 100 mmf. per section. List price **$5.00.**

Standard R-39 Coil Forms
Made of R-39 ultra low loss form material, for National SW-5, SW-45, SW-34, SW-3, and SW-58 Receivers. In 4, 5 or 6-prong bases, list price each **$.75.**

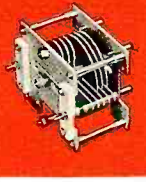
Low Frequency Oscillator Coils
Contains two separate inductances closely coupled within a shield, as used in the National Type SRR 56 MC Superregenerative Receiver. List price OSR **$1.50.**

Type 90 RF Choke
For by-passing work on screen grid or plate circuits of screen grid tubes or between detector and first audio. DC res. 350 ohms. Ind. 90 m.h. List price without mount, **$1.25.**

NATIONAL Coil Cabinet
For storage and protection of coils. Heavy gauge brown moiré finished steel in two sections, closing to form a cabinet 9" x 8" x 5". List price **$3.75.**

Midget R-39 Coil Forms
For ultra HF use. Have best form factor and lowest RF resistance. 1" diam. 1½" long, 1/16" wall. Unwound and ungrooved. List price ea. **$.50.**

EM Equimeter Condensers
For low powered transmitters and oscillators 1000 v. and under. 180° SLW plates. Isolantite insulation. Air gap, .023. Caps. 50 to 1000 mmf. List prices (without dials) **$2.50** to **$5.50.**



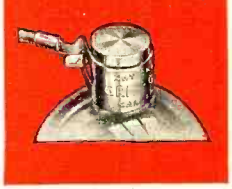
Frequency Meter Condenser
For Amateur Frequency Meters and Monitors. Special circular rotor plates permit use of High C Circuit. Min. cap. 40 mmf. Max. cap. 75 mmf. List price, **$5.50.**

ET Equitune Condenser
The original National "girder frame" condenser. Modified 180° plates. Caps. 150 to 500 mmf. Air gap, .023. List prices **$4.25** to **$5.**

Type 100 RF Choke
Isolantite mounting, continuous universal winding in 4 sections. Ind. 2½ m.h. Distrib. cap. 1 mmf. DC res. 50 ohms. 125 ma. List price each **$.75.**

Type R-152. RF Choke
Continuous universal winding in 5 sections on 10,000 v. Isolantite insulation. Ind. 4 m.h. Distrib. cap. 1 mmf. DC Res. 10 ohms; continuous rating 0.6, intermittent 0.8 amps. List price **$2.25.**

NATIONAL Grid Grip
For attaching a wire to the screen grid terminal of AC or DC tubes. Never works loose, permanent contact. For broadcast set tubes, list price, ea. **$.05**; for large tubes like 872, list price ea. **$.10.**



NATIONAL COMPANY, INC., MALDEN, MASSACHUSETTS

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START A SPARE TIME OR FULL TIME

RADIO SERVICE BUSINESS

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HERE ARE A FEW EXAMPLES OF THE KIND OF MONEY I TRAIN MY MEN TO MAKE

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"Before taking your Radio Course I was making $18 a week. I came here three years ago and in the past months I made about $4500 in Radio. I cannot say too much for the wonderful help I have received from N. R. I."

Noel W. Ray,
American National Bank Building,
Gadsden, Alabama.

Spare Time Work Pays $18 a Week

"I only do spare time Radio work and average $18 a week. People who in good times would buy a new Radio, now have the old one fixed."

Stephen J. Drapchaty,
407 Wunderlich Avenue,
Barberton, Ohio.

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"If I had not taken your Course I would be digging ditches instead of running my own business. One week I made $75 on repairing alone, and this doesn't count sales. If a fellow wants to get into Radio, N. R. I. is the starting point."

R. S. Lewis,
Modern Radio Service,
Pittsfield, Ill.

Free Book Tells How Mail Coupon!

The world-wide use of Radio sets for home entertainment has made many opportunities for you to have a spare time or full time Radio business of your own. I give you instructions early in your Course for doing 28 Radio jobs common in almost every neighborhood. Many N. R. I. men make $5, $10, $15 a week extra in spare time almost at once. I show you how to install and service all types of receiving sets. I give you Radio equipment and instructions for conducting experiments, for building circuits and testing equipment, and for making tests that will give you broad, practical Radio experience. Clip the coupon below and get my free 64-page book, "Rich Rewards in Radio"—it gives you a full story of the success of N. R. I. students and graduates, and tells how to start a spare time or full time Radio business on money made in spare time while learning.

Many N. R. I. Men Make $5, $10, $15 a Week Extra in Spare Time Almost at Once

Many of the seventeen million sets now in use are only 25 per cent to 40 per cent efficient. I will show you how to cash in on this condition. I will show you the plans and ideas that have enabled many others to make $5, $10, $15 a week in spare time while learning. Ford R. Leary, 1633 Davison Road, Flint, Mich., wrote: "My part-time earnings while taking the N. R. I. Course were $651."

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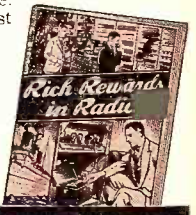
J. E. SMITH, Pres.
Dept. 4FR,
National Radio Institute,
Washington, D. C.



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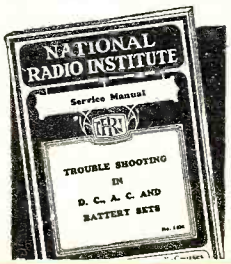

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