FOREMOST SET-CONSTRUCTION DESIGNS

RADIO NEWS AND SHORT WAVE RADIO

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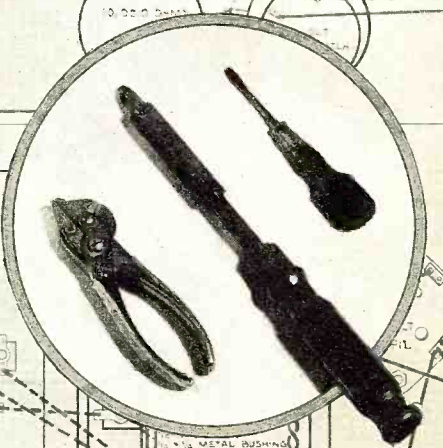

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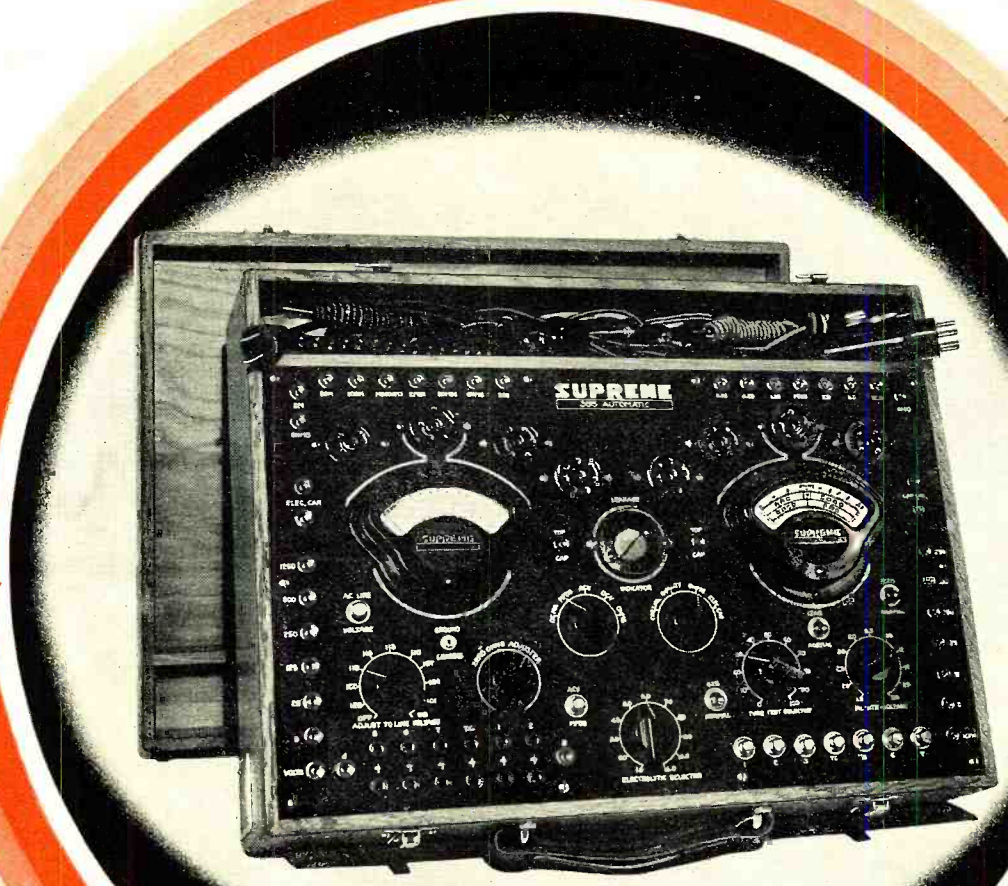
IMPROVED AUTO-RADIOS

A Publication Devoted to Progress in Radio

Set Building	Service Work	Television
Short Waves	Engineering	Electronics
DX Reception	Experiments	Broadcasting
Amateur Activity	Measurements	Applications

Supreme Presents



the 385 AUTOMATIC!

Presenting the Supreme "385 Automatic" - - marking another Supreme trail-blazing achievement - - "UNI-CONSTRUCTION." Go to your jobber to see the "385 Automatic" and prepare yourself to expect not only a new standard of value made possible by uni-construction, but an instrument sure to revolutionize radio service procedure. Built on an entirely new principle the "385 Automatic" is the most complete, easiest handled, and the fastest instrument ever built - - - AUTOMATIC in its diagnosis.

In addition to retaining the many popular features of the famous 333 DeLuxe Analyzers and 85 Tube Testers, the "385 Automatic" has PLUS features such as two separate ohmmeters. One with a low range of 0/200 ohms the lowest division of which is 1/4 ohm. The other with intermediate ranges of 0/2,000/20,000/200,000 ohms and high ranges of 0/2,000,000/20,000,000 ohms. All with self-contained power supply.

One of the most interesting of the new Supreme developments in the "385 Automatic" is the improved condenser tester with six direct reading capacity ranges, neon condenser leakage test for non-electrolytics indicating leakages, shorts and opens PLUS THE FIRST ENGLISH READING ELECTROLYTIC CONDENSER TESTER. Just set the "condenser selector" to the value of the condenser to be tested and the meter will read directly in terms of "GOOD" or "BAD." Condensers will read in the "BAD" area when leakage is more than 1 milliampere per mfd.

Here is something actually NEW. See your jobber and write today for the complete descriptive booklet "385 Automatic." See for yourself how Supreme inventive Engineering and Supreme uni-construction make possible the finest radio service instrument in the world at a price so pleasantly interesting.

SUPREME INSTRUMENTS CORPORATION

520 Supreme Bldg. Greenwood, Mississippi

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Vol. XVI
No. 11

RADIO NEWS

May, 1935

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Broadcast Editor

EVERETT M. WALKER
Associate Editor

JOSEPH F. ODENBACH
Art Editor

Reading Guide to this Issue—

As a matter of convenience for those having specialized interests in the radio field, the following lists the articles and features in this issue, classified under 14 heads. The numbers correspond with the article numbers in the Table of Contents on this page:

Amateurs—6, 7, 8, 10, 11, 13, 16, 17, 20, 21, 27, 32, 33

Broadcast Fans—3, 4, 9, 15, 16, 17, 21, 24, 25, 26, 28, 32

Dealers—1, 3, 4, 7, 8, 9, 12, 15, 16, 19, 20, 21, 23, 26, 29, 32, 33

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Engineers—5, 7, 9, 10, 11, 12, 13, 32, 33, 34

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Students—11, 13, 17, 27, 29, 30, 33

Technicians—5, 7, 8, 9, 11, 12, 16, 21, 25, 27, 29, 30, 32, 33

Next Month—

For Amateurs—Constructional article on a home-built "All-Hamwave" receiver with a home-made switch and coil; a home-made pre-amplifier for operation from the a.c. line; ¾ meter "acorn" tube receiver.

For Servicemen and Technicians—Applications of the oscillator in service work; a home-built tube checker; more on cathode-ray oscilloscope applications in servicing.

For Short-Wave Fans—New "distance" map; World Short-Wave Time Table; DX Corner for Short Waves; Operating test reports on s.w. receivers.

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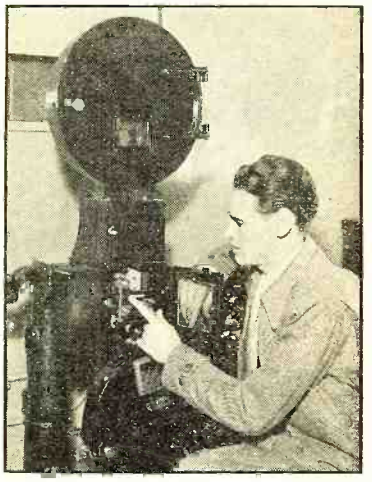
NEW RADIO DEVELOPMENTS

RADIO IN RESEARCH

T. S. Greenwood, scientist of the expedition yacht, Atlantis, will act as radio operator of the transmitter, pictured above, on the Woods Hole Institute trip into the Sargasso Sea to study marine life.



FILM BROADCASTS

Sound-on-Film-on-Air might be the title of the picture above, which shows the equipment for broadcasting speech recorded on film, directly from radio station KFWB. Center: William H. Peck, inventor, and Dr. C. C. Clark, Chairman of Science Department, School of Commerce, New York University, demonstrating television in a class as a visual and aural aid in higher educational work.

DOTS • • • • •

and

— — — **DASHES**

Short but Interesting Items from the Month's Radio News the World Over

Television First-Line Progress Being Made in America

CAMDEN, N. J.—Television in the United States is keeping pace if not leading developments in Europe, according to Major-General James G. Harbord and David Sarnoff, chairman of the board and president, respectively, of R.C.A. In a recent scientific report they stated that technical and geographical difficulties made television impractical in the United States at present, and that it would supplement rather than supersede sound broadcasting when further technical improvement and simplification are made. They announced that the R.C.A. laboratories were working in these directions and the next step would be field demonstrations to determine the practical service range of television as it exists now. Interviews with other experts indicated that television seems practically certain to come on the ultra-short-wave channels.

Perfect Silence Impossible

SCHENECTADY, NEW YORK—The impossibility of producing perfect silence has been demonstrated, recently, by efforts of the engineers of General Electric Company to construct a room into which no sound at all could penetrate. They built a small box-like room inside one of the laboratory rooms, like one box fitted into another. The floors, ceiling and walls of the inner room were suspended on springs. This room was then padded inside and out with —sound-absorbing materials. When the room was completed a sensitive noise meter placed inside it detected sounds averaging about 14 decibels.

American Farmers' Income Increased Last Fall

OMAHA, NEBR.—The cash income of American farmers, from all sources, reported recently by the Bureau of Agricultural Economics is said to be far in advance of previous Harvests. As an example, the October revenue totaled $736,000,000 as compared with about $600,000,000, in October of 1933. What does this mean to the radioman? It means that the farmer has more money to spend this year, and enough to enable him to purchase a good radio receiver. Nuf Sed!

A New Station for West England

LONDON, ENGLAND—It is reported that the B. B. C. is contemplating the erection of a new station in the neighborhood of Plymouth. This new transmitter is intended to serve listeners along the coast of South Devonshire and Cornwall.

TALKING LIGHT BEAM

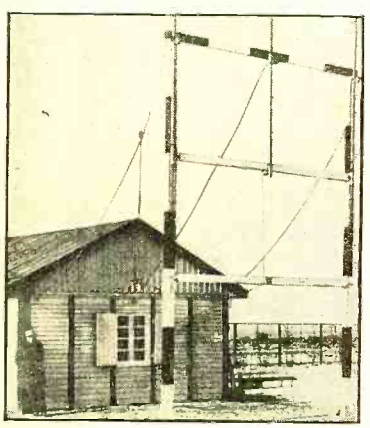
C. G. McLoughlin, of the G. E. Company, demonstrating a new miniature model of the talking beam of light, where sound is carried over light waves rather than radio waves or a telephone line.

SOUND EFFECTS

Sounds from a sewing machine and a vacuum cleaner, amplified by vacuum tubes, were used to produce an imitation of a 1912 motor car in a recent London stage performance.

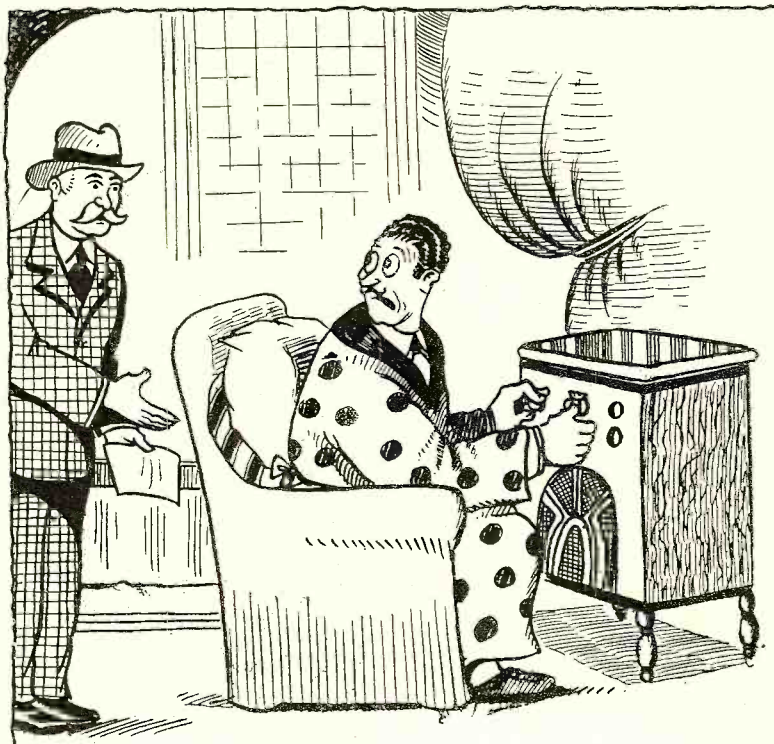
AVIATION BUOY

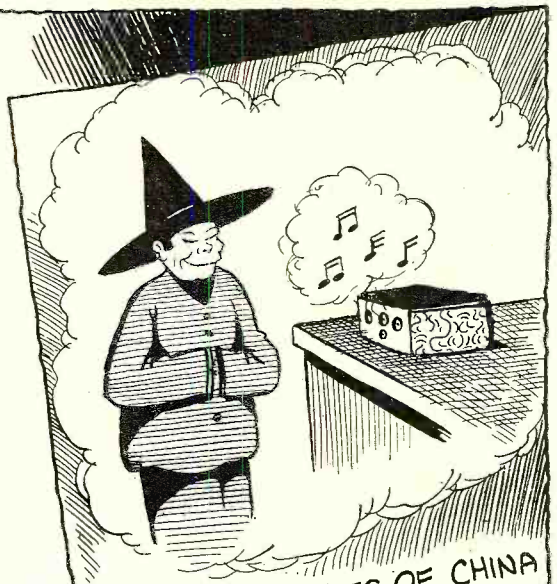
A new German radio device for blind-landing of planes.



RADIO FACTS and ODDITIES ....

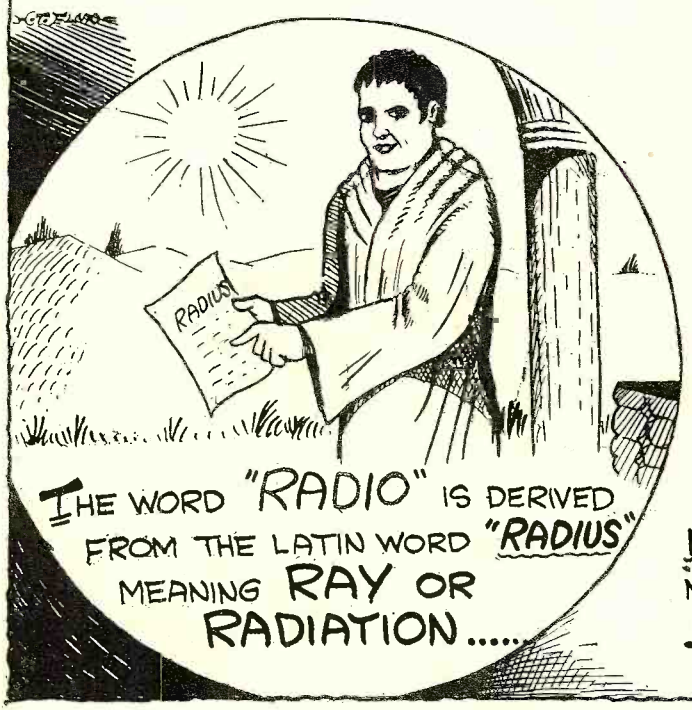
(Send in your Radio Oddities to "Elmo" and see them illustrated)



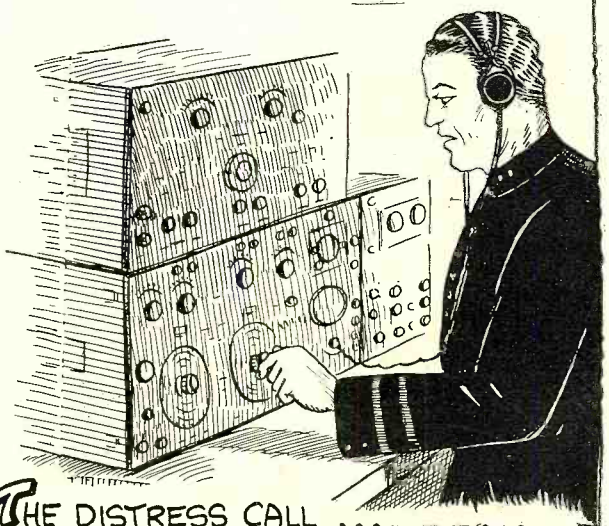


WEALTHY NATIVES OF CHINA BURY A RADIO RECEIVER WITH DECEASED RELATIVES, SO THEY WILL BE ENTERTAINED WITH MUSIC IN THEIR CELESTIAL PARADISE !!!

IN MOST EUROPEAN COUNTRIES TAXES ARE COLLECTED FROM LISTENERS OF BROADCASTING PROGRAMS !!!



THE WORD "RADIO" IS DERIVED FROM THE LATIN WORD "RADIUS" MEANING RAY OR RADIATION.....



THE DISTRESS CALL ..---... IS SENT AS ONE LETTER !!! IT HAS NO MEANING, IT IS NOT REALLY S.O.S, NOR DOES IT MEAN "SAVE OUR SOULS"!!

S _O_ S. (FALLACY)

..---... (THE DISTRESS CALL)

Radio News

May, 1935

The New AUTO RADIO

(The Editor—To You)

Do you want a modern radio receiver for that new car of yours? Or do you think a modern receiver would bring you more enjoyment in your present car? In either case you will find what you want here

SPRING is here! Your automobile, new or old, calls you out onto the highways amongst budding leaves and flowers. What could be more suitable than one of the new and improved auto-radio installations to make these trips more enjoyable? There are a number of features in the new models that might be worth mentioning. The majority of these sets can be mounted so that the control is either on the steering column or on the dash. The loudspeaker arrangements are such that "ear level" reproduction is now accomplished. The sensitivity of these sets is also considerably increased. In fact, the new auto-radio receivers now available are the most sensitive sets that have ever been produced for public use. Their sensitivity runs twenty to thirty times better than the average modern home receiver. Tone quality has also been improved so that it is now comparable with standard broadcast sets.

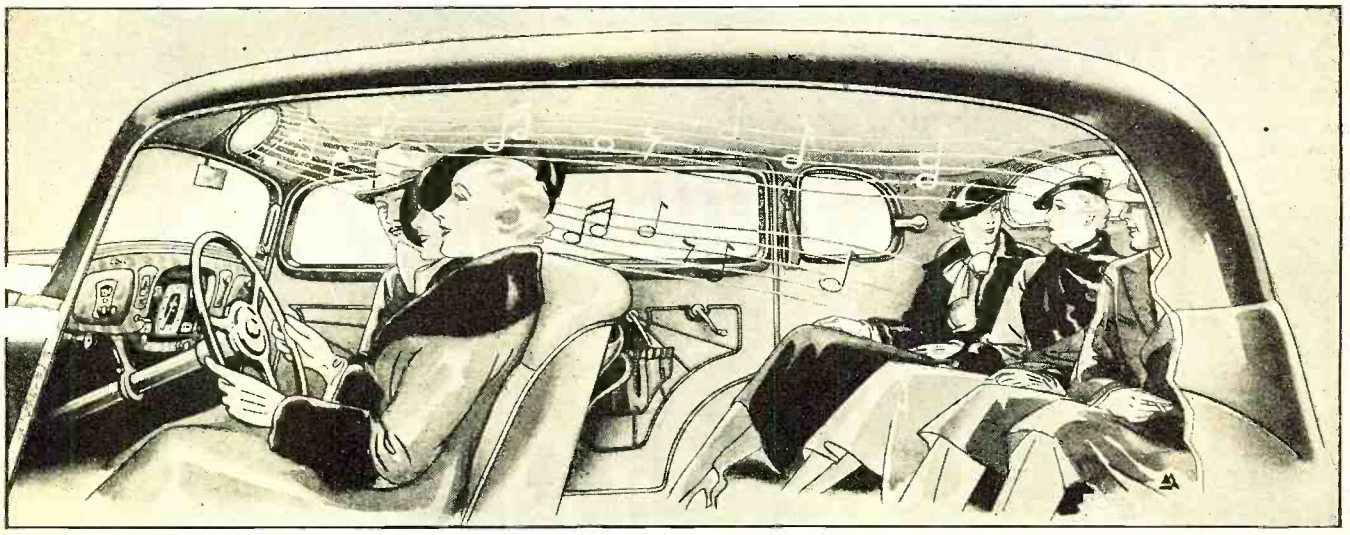
Due to the fact that most of this year's automobiles have a single-piece metal top, sometimes known as the "turret" top, the older style antenna systems have to be discarded and arrangements within the receiver made to accommodate either the new running-board antennas, or those antennas supported between the axles. Then again some cars are equipped with special generators and other accessory equipment, as standard. A careful perusal, therefore, of not only the new sets, but of accessories and other parts, should be made to enable the prospective buyer or serviceman to choose the type of apparatus he proposes for his new car or, in the case of the serviceman, the type of apparatus he should recommend to his clients who come to him for advice.

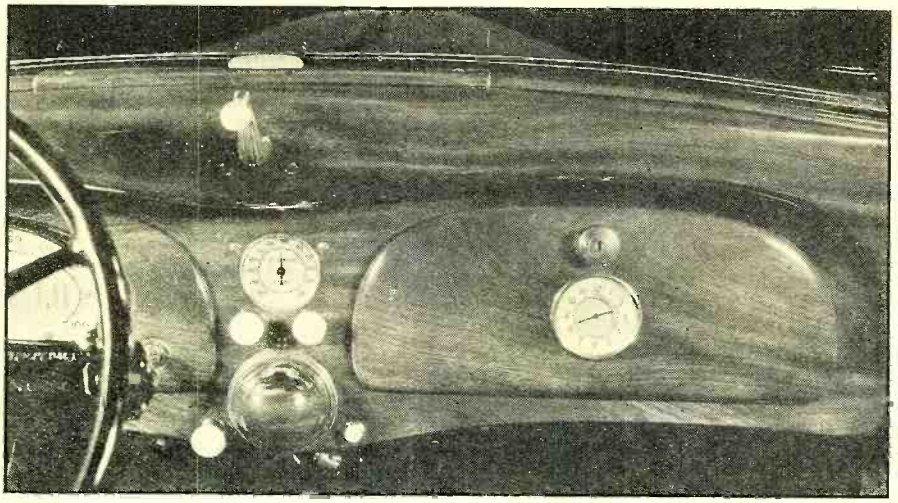
In the following pages there are printed descriptions of the various new types of receivers, accessories, noise-reducing systems, etc.; published as the result of a careful survey of all types of equipment made by American manufacturers. The items that follow on these pages have been kept as short as possible, to give an idea of the numerous types and to make the descriptions as representative as possible. Illustrations of the equipment described are also included.

If our readers find, here, the type of the equipment that they want, all they have to do, to get complete information, would be to clip out the item and send it with their request direct to the manufacturer. The editors feel that this year, as never before, auto radio has reached a new high ground of performance, at a cost which is now only a fraction of that for a mediocre automobile radio set of a few years ago.

THERE'S MUSIC IN THE AIR!

Those balmy spring days on the open road will seem even more refreshing if you have a modern auto-radio along with you.





Improved AUTO-RADIOS

By R. Hertzberg *and* W. C. Dorf

THE noticeable trend in Auto Radio for 1935 is toward the design of individual receivers for particular cars. Automobile manufacturers now appreciate the desirability of co-operating directly with radio manufacturers, and not only are they permitting the latter to build sets to fit properly in their vehicles, but they are also providing larger storage batteries and heavier charging generators to accommodate the extra current drain. From the standpoint of the car owner, this means a more harmonious appearance than before, greater operating convenience, and freedom from starting and ignition troubles. From the standpoint of the service man, it means easier installation and servicing, fewer "nuisance" calls, and continued customer satisfaction.

AN evident technical development is the use of separate loudspeakers mounted above the windshield to give "ear-level" reception. The rounded, semi-streamline bodies of many 1935 cars lend themselves very conveniently for this purpose. The speakers appear to be molded into the tops, with only the usual grille showing.

The advent of automobiles with all-steel bodies has created one serious problem as far as the radio installation is concerned, and that is difficulty of arranging a suitable antenna. Previously, a sheet of wire netting tacked inside the wood-and-fabric top of a car was a highly effective antenna, but since an all-steel body is pretty nearly a perfect electrical shield, some other type of aerial now becomes necessary. Fortunately, the sensitivity of the receivers themselves has been improved sufficiently to allow the use of between-axle aerials and capacitor plates under the running-boards. Of course, the all-steel body is not used by all car manufacturers, and roof antennas are still practicable in many cars.

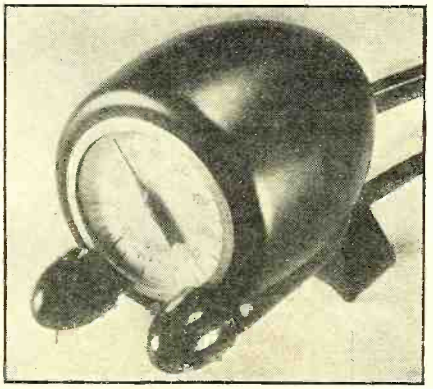
A New Motor-Car Line

United Motors Service has four new 1935 model Delco auto receivers. A universal control unit supplied with all models is adaptable, by means of special mounting plates, to all makes of cars. Vibrator type plate supply units are employed. The Model 628 shown in the illustration uses six tubes. Receiver and loudspeaker are separate, the latter being an eight-inch dynamic in a round case. All models have automatic volume control and an antenna trimmer adjustment. For roadsters, touring cars, convertibles and steel-top cars, Delco also has its "Flex-O-Strip" under-car

antenna, which consists of metal ribbons stretched under both running-boards.

New Streamlined Model

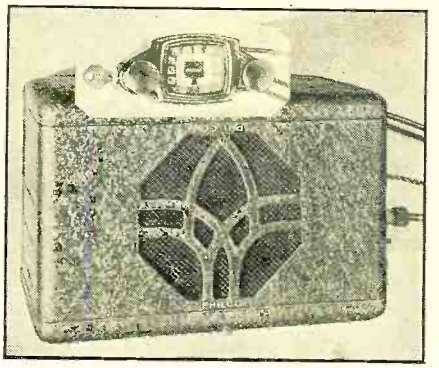
The well-known "Magic Brain" unit of the RCA receivers has been adapted to a series of three auto radio sets, all using the streamlined control unit illustrated. This is designed for steering column mounting.



The Model M-104 is a single-unit receiver. The M-108 and M-109 are two-unit sets, with the loudspeakers separate from the tuner.

Four New Auto Sets

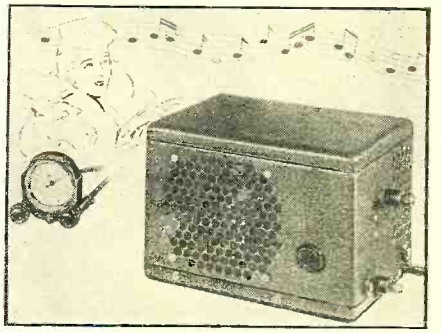
Four Philco Transitones have been announced for 1935. Model 805 is a 5-tube, single unit superheterodyne designed to operate with either roof or under-car aerials. It has automatic volume control and a dynamic speaker. The control unit is transversely illuminated and is equipped with a safety lock. It fits on either the steering column or the instrument panel of the car. The Model 806 is like the 805, but has six tubes and a full-range tone control operated by a knob on the set. The Model 807 is an advanced model, with seven tubes, and with the tone control knob right on the main tuning control unit. The sensitivity, power output and tone range are of a higher order than the two other receivers. The Model 808 is the DeLuxe



Philco, with all the features of the 807, and with the dynamic speaker separate from the tuner.

6-Tube "Superhet"

The Zenith Model 666 is a 6-tube superheterodyne, with speaker and chassis in a metal container measuring 9¾ inches high, 6¾ inches wide and 6¾ inches deep. This is connected by a flexible cable to a control unit for dash or steering column mounting. Tubes used are 6D6 r.f. amplifier, 6C6 first detector oscillator, 6D6 i.f. amplifier, 75 second detector and a.v.c, 42 power amplifier and 84 rectifier. The speaker is a 6-inch dynamic. The tuning range is 535 to 1600 kc., the overall sensitivity one microvolt. Power output 3.25 watts. Drain on car's battery six amperes. The chassis floats completely on rubber, and the whole receiver mounts with a



single bolt. The Zenith company claims that no spark plug suppressors are needed with this receiver.

Two New Receivers

Studebaker offers as optional equipment on its 1935 cars a radio receiver specially made for them by Philco. This uses a roof-top speaker installed in a header bar compartment directly over the windshield. The set itself is a 6-tube superheterodyne with automatic volume control.

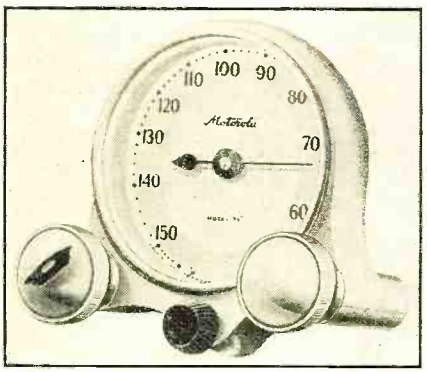
All Studebaker closed cars are equipped with roof antennas and are otherwise completely wired for radio installations. A special charging generator is provided as stock equipment on the Commander and President models whether or not a radio is installed at the time of purchase; the car owner can then have a receiver put in

at a later date without having to worry about the battery system.

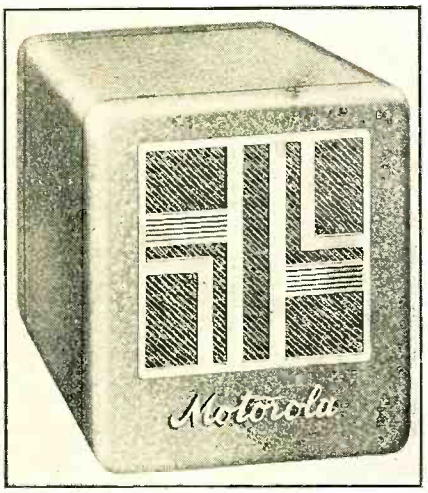
Studebaker also offers a single-unit receiver, containing its own loudspeaker, for use in 1935 open cars or in prior model vehicles.

Three New Models

The feature of the three new 1935 Motorolas of the Galvin Company is the "Magic Eliminode," a set filter that makes the use of spark-plug suppressors unnecessary. The Model 100 is an eight-tube set using a separate eight-inch dynamic speaker and the following tubes: two 78's, one 77, one 85, one 76, two 6A4's and one 84. It is 6½ inches high, 8⅞ inches wide and 9⅜ inches deep. The Model 75 uses six tubes and a self-contained six-inch dy-



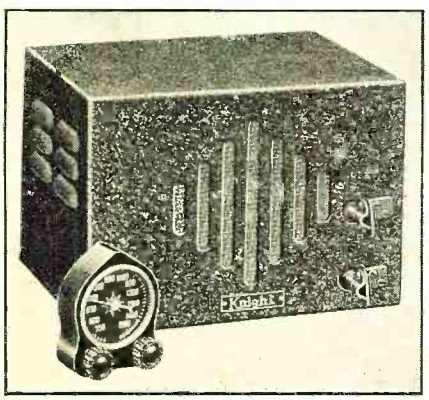
namic speaker in a case measuring 8¾ inches by 7 9/16 inches by 8 5/16 inches. Tubes are two 78's, one 77, one 75, one 41 and one 84. The smallest set of the line is the



Model 57, a five-tube superheterodyne with self-contained 5-inch dynamic speaker. For all-steel and turret-top cars, Motorola supplies running-board aerials.

Has Airplane Dial

Allied Radio features in its new Spring and Summer catalog an advanced line of

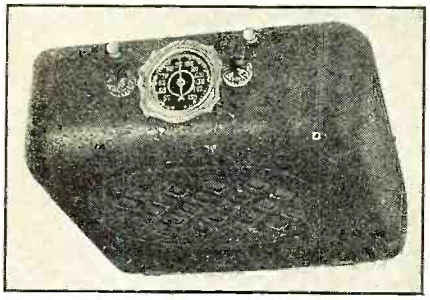


single-unit auto radio receivers. The model illustrated employs six tubes in a superheterodyne circuit, and has automatic volume control, built-in B supply, three-gang rubber floated condenser, illuminated airplane dial, and six-inch dynamic speaker. The compact, all-steel cabinet mounts in a single hole and fits practically all cars.

A five-tube receiver in the same cabinet is also available.

A Single-Unit Receiver

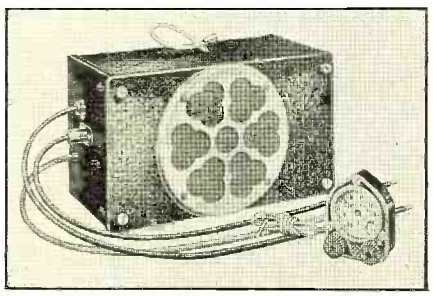
The Lafayette Model B-62 is a 5-tube superheterodyne of the single unit type. The set is built in the form of a shallow dish 12 by 8 by 4 inches overall, and can



be mounted with equal ease under the dashboard, to the back of the front seat, or even to the roof of the car. A five-inch dynamic speaker, double-vibrator plate supply and automatic volume control are employed.

An Improved Model

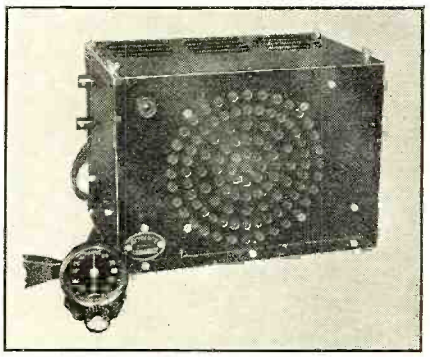
The Atwater Kent contribution to 1935 auto radio is the Model 776 receiver, a 6-tube superheterodyne. Tuner and loudspeaker are in a single black steel case intended for mounting under the dashboard. Only one fastening bolt is needed. Two type 6D6, one 85, one 6A7, one 41 and one



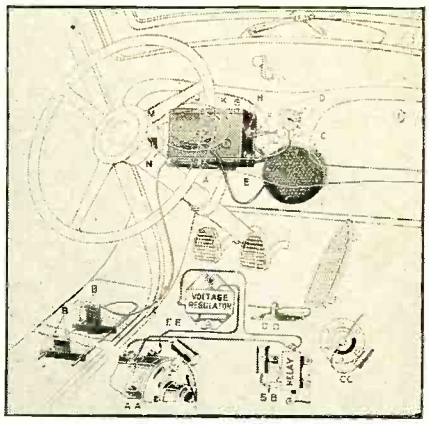
84 are used, with a shielded vibrator type power unit. On most new cars no spark plug suppressors are required with this receiver. The control dial can be mounted on either the steering column or the dashboard. The ash receiver opening is recommended as the best place.

A Single-Unit Set

The new Acratone Model 40, 6-tube auto radio is a single-unit superheterodyne with



steering column control, dynamic speaker, tone control, automatic volume control, 2.5 watt audio output and copper-plated



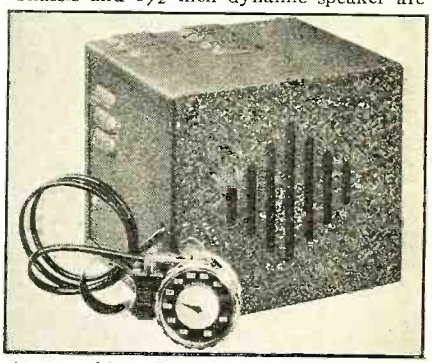
A TYPICAL INSTALLATION

housing. The case fits easily under the dashboard of any car.

Another interesting Federated product is the Acratone Model 47 automobile amplifier, which fits under the dash like a regular radio receiver and has a small control unit for steering column mounting.

Single Mounting Receiver

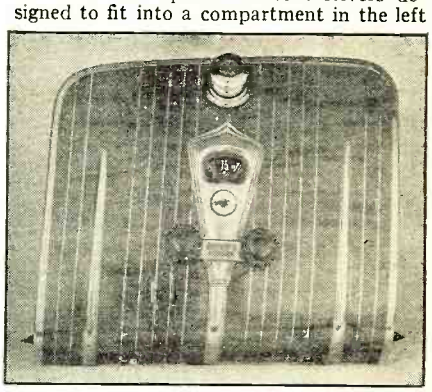
The Autocrat Model 5 is a compact, rugged five-tube superheterodyne using one each of the 6A7, 6D6, 6B7, 41 and 84 tubes. Chassis and 5½ inch dynamic speaker are



in a crackle finished steel case that mounts with a single bolt. The control unit, which clamps to the steering wheel, has a key switch. Tuning is accomplished by turning a large notched wheel that forms part of the control-unit case. Of identical appearance is the Autocrat Model 60, which has similar mechanical features but uses two 6D6's, one 6A7, one 75, one 41 and one 84.

A New Idea!

Nash and Lafayette cars for 1935 can be fitted with special Philco receivers designed to fit into a compartment in the left

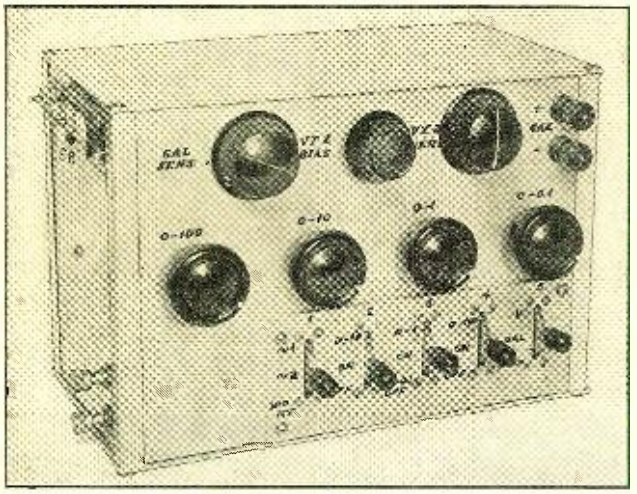


side of the instrument panel. All cars of these makes have roof-top antennas built in and heavy air-cooled generators are stock equipment.

Speaker Mounted Above Windshield

A special receiver for the 1935 Ford is sold exclusively by Ford dealers. The re-

(*Continued on page* 706)



FRONT VIEW

To utilize switches which he had on hand, the author employed a more complicated switching arrangement. The circuit of Figure 2 shows a more simple hook-up, which employs standard switches yet is the electrical equivalent of the original

A HIGH-RANGE, THERMIONIC

This instrument, designed for tirely new circuit which eliminates vious designs. It requires no

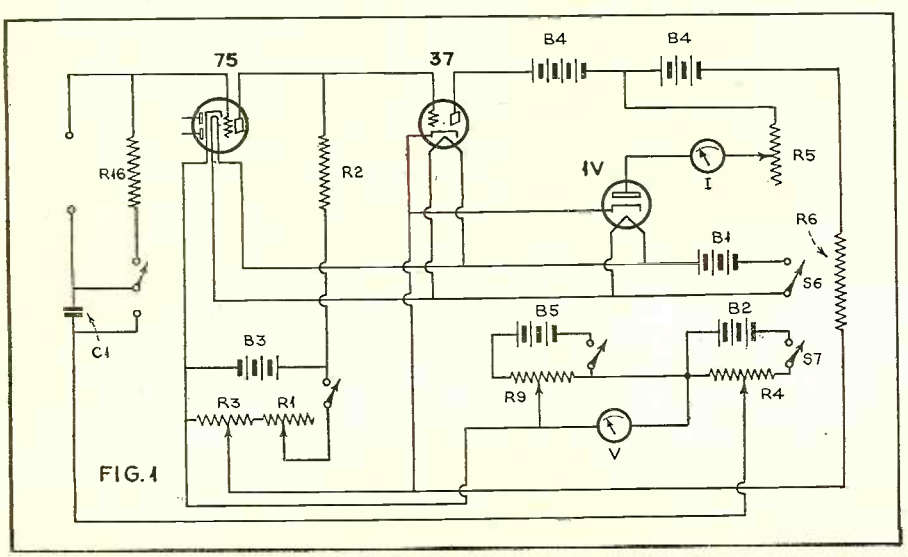
William

A GOOD vacuum-tube voltmeter is an almost indispensable piece of apparatus in the laboratory of the serious experimenter and research worker because of the inherent possibilities of a well-designed instrument. It provides a means of reading accurately the value of both alternating and direct potentials, with practically no power consumed from the circuit being measured. The resistance of the meter here described is 20 megohms, for alternating current and higher for direct. Careful tests as to the accuracy of this instrument show an overall accuracy of 2% for a.c. and d.c. voltages down to 0.1 volt while d.c. voltages down to 0.001 volt and a.c. down to 0.005 volt were read with accuracy of better than 10%.

In the past, considerable material has been published on the subject of vacuum-tube meters based on one of two fundamental principles. Both, however, were notably inaccurate and insensitive at low ranges. To show the reason for this inaccuracy a short discussion of the conventional circuits will be necessary. In the simplest circuit a vacuum tube was connected up with a sensitive meter in the plate circuit, and the grid biased negatively to nearly cut-off. Various voltages were then applied to the grid and from the known value of these, and the value of the plate current, a calibration curve was plotted. The disadvantages of this type were: first, that means had to be provided for increasing the bias for high ranges so that the grid would not go positive and draw current; second, the calibration curve was dependent for its accuracy upon the constancy of both filament and plate voltage. The second conventional circuit was similar to the first, except that means was provided for furnishing a fixed bias to the tube, so that the plate current was very small. It is interesting to note that in this circuit absolute cut-off of the tube could not be used as the plate current of commercial tubes cannot be said to cut off sharply for any one value of grid voltage, but decreases more and more slowly as zero is approached. To employ this circuit for measurement the tube was biased nearly to cut-off and the value of plate current noted. The voltage to be measured was then applied to the grid through a suitable coupling device, additional d.c. bias was added until the plate current returned to its original value, and the voltage of the added bias read by a suitable meter. The voltage of this bias is, with certain reservations, equal to the peak voltage of the incoming signal. This was satisfactory for d.c. and for high values of a.c. On low values of a.c., however, the lack of absolute cut-off of the tube inserted a considerable error in the reading so that the bias added would be less than the value of the signal. This error begins to be apparent at about one volt and at 0.1 volt reaches very considerable proportions. In an experimental set-up, using a single 30 tube, this error amounted to 20% at 0.1 volt. The use of sufficient bias to eliminate this error rendered the instrument so insensitive that small variations of grid voltage would not be detected by the plate meter.

FUNDAMENTAL CIRCUIT

Figure 1. This circuit illustrates the basic principle of the new v.t. voltmeter

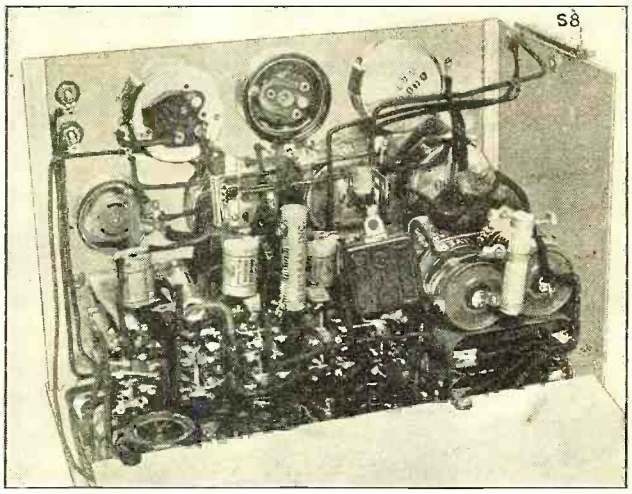


With the idea of eliminating the shortcomings of these circuits, the circuit shown in Figure 1 was developed. To avoid calibration the variable bias principle was used, the first two tubes, a 75 and a 37 were operated on the straight part of their respective curves by the use of amplifier bias, while the 1V diode was employed as the rectifier and eliminated the errors at low range. The characteristics of a diode are for this purpose far superior to a triode particularly as to cut-off. The portion of the circuit involving the 37, the 1V and the milliammeter (I) is essentially a bridge so arranged that the meter will indicate only when unbalance exists in one direction. To make the operation perfectly clear let us follow its functions through from the beginning. A fixed bias supplied by B2 and R4 was placed on the grid of the 75 with the input terminals shorted. The bias of the 37 was then adjusted by means of R3 so that its d.c. plate resistance was equal to R6, and the bridge circuit was balanced. Then a small alternating voltage was brought in through the input. On the half cycle where the grid of the 75 was made more negative its plate current was less, therefore the drop through R2 was less and the grid of the 37 was less negative. The result of this was a decrease in the plate resistance of the 37. This meant an unbalance in the bridge circuit so that the cathode of the 1V was positive with respect to its plate, but being a rectifier no current flowed through the meter I. Now considering the other half cycle in which the alternating voltage subtracted from the bias on the 75, its plate current was greater, and there followed a train of events which was opposite to that previously encountered,

HIGH PRECISION VOLTMETER

experimenters, incorporates an en- several of the drawbacks of pre- calibration and is very accurate

R. Harry



INSIDE VIEW

making the plate resistance of the 37 greater. The resulting unbalance of the bridge threw the plate of the 1V positive with respect to its cathode and current flowed through the meter I. Reasoning from what has gone before it should be clear that when additional bias was supplied (by means of B5 and R9) to the grid of the 75 so that its bias, even on the positive half cycle of the impressed voltage never went positive with respect to the original value supplied by R6 there was no deflection of the plate meter I. If, however, at any time the grid of the 75 had gone above its original value a deflection of the meter would have been observed. The bias could then have been increased until a zero reading of I was again obtained. In this way a bias exactly equal to the maximum value of the positive half cycle of the voltage to be measured was applied. It was then only necessary to supply a suitable means for measuring this additional bias to obtain the desired reading. This is clearly shown in the circuit of Figure 1. Figure 2 is fundamentally the same but with switches added to provide various ranges.

At this time it may be well to point out how this circuit provides the high sensitivity and accuracy which are claimed for it. In the first place any voltage which is brought in at the input is impressed on the grid of the 75 with but slight error for all ordinary frequencies. That is, the loss due to C1 is less than 1% at 50 cycles and even less for higher frequencies. The effect of the grid capacitance of the 75 is simply to reduce the impedance of the grid circuit at very high frequencies and does not become important below 100 kc. After a voltage has once reached the first grid the effect of losses is simply to reduce the sensitivity; thus accuracy is affected only in the very low ranges for high frequencies. The circuit was designed for extreme sensitivity. In fact, d.c. voltages in the neighborhood of 0.0001 at the input were detected with the author's instrument, which means that if the potentiometer supplying variable bias were sufficiently accurate the added bias could be adjusted to equal the unknown voltage within 0.0001 volt for d.c. This allows considerable leeway for losses at the higher frequencies without materially affecting the accuracy. This sensitivity may seem excessive, but no instability was encountered, so it seemed justified. If trouble is to be avoided, however, batteries should be used to supply all voltages, and wire-wound resistances used in every case except R2 and R6. C1 should be a high-grade, mica condenser to eliminate leakage which would introduce errors in the low ranges where an undesired d.c. component exists in a circuit in which the a.c. component only is to be measured.

The layout of parts used by the author is only suggestive of one logical arrangement, and as every experimenter has his own thoughts as to layout, no detail will be given on this subject. One interesting feature of the instrument is that the milliammeter used was not tied up, but was made a separate unit and connected through a cord. A switching arrangement was used so that the same 0-1 milliammeter was used both for the trimming meter and with suitable resistances as the voltmeter. The v.t. voltmeter was first trimmed with the milliammeter in the position I with the position V shorted to place normal load on the potentiometer which was being used (R8, 9, 10, or 11). Mr. Harry uses a special milliammeter with an internal resistance of 5 ohms. Those who use a milliammeter with higher resistance should employ resistor R17 (Figure 2) to eliminate an error on the lowest range.—*Editor's Note.* The meter was then transferred to the V position and the voltage read. A number of multipolar switches were used in the author's instrument, but four Yaxley 3-pole switches would have been even more suitable for range switches, while a 3-pole double throw would serve for meter transfer.

With the completed meter, the method of trimming is of interest. The input is short-circuited with one of the range switches closed to complete the short-circuit, and the filaments turned on and allowed to reach stable operating temperature. The tap on R4 is set about 1/3 of the way from the positive end to give normal amplifier bias of 0.5 volt, and the switch above R1 closed. The tap on R3 is advanced until the meter I falls to a low value, and then brought just to zero by means of R1 which is simply a vernier for R3. It is important that this be done and that the meter be brought just to zero if errors in the low ranges are to be eliminated. The voltage to be measured is then brought in at the input, the range switch covering the estimated value of the voltage to be measured is put on, and the corresponding potentiometer advanced until the meter again reads just zero. The meter is then transferred to the V position and the (*Continued on page* 708)

COMPLETE CIRCUIT

Figure 2. This diagram is the same as Figure 1, but with the switches for different ranges added and using only one meter for V and I

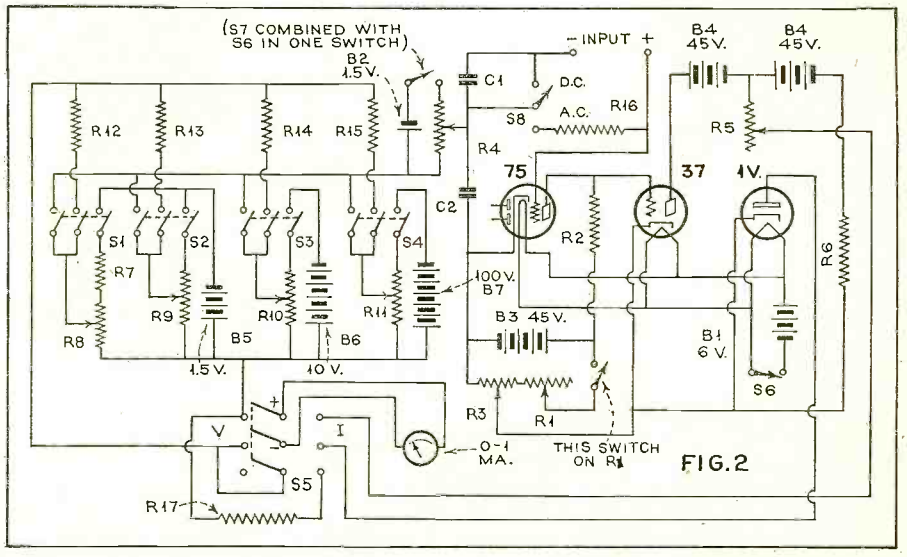
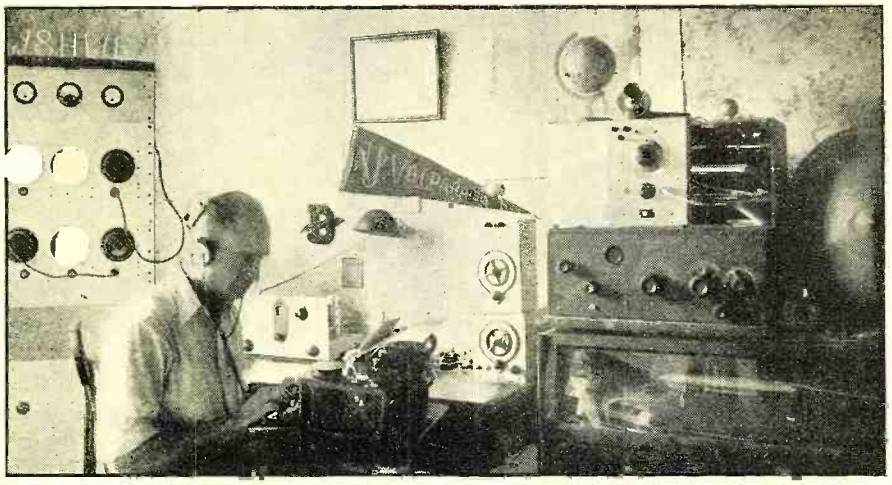


FIG. 2



A WELL-KNOWN "HAM"

This is the amateur relay station of L. W. Briggs of Utica, New York, call letters W8HWR. Mr. Briggs' station is a U.S.N.R. station and operates on 3530 and 3582 kc

THE "HAM" SHACK

CQ CQ CQ

OF late there has been much cogitation among 'phone men for the allocation of additional frequencies for aural transmission. The most recent movement has been to seek a slice of the now exclusively c.w. band of 7 megacycles. There has been much discussion on the airways on this idea, which so far as known has gone no further than unofficial discussion.

WHILE there may be grounds for need of additional 'phone channels, the 7-megacycle band is perhaps better suited to C.W. than it is to 'phone. In the first place it is only 300 kilocycles wide, and the assigning of any portion of it to telephonic communication would certainly increase the problem of interference on an already overcrowded C.W. band. The 40-meter men would undoubtedly rise into action if the proposal got to the point of official consideration.

On the other hand, it might be argued that it is the only amateur band whereon aural transmission is prohibited. Further, it might be pointed out that a number of foreign governments allow their amateurs to operate 'phone on this band—why not the United States, which already is an amateur's paradise, compared with the more stringent regulations prevailing in most other foreign countries.

The proposal to seek additional bands for 'phone, however, has some merit. Discarding (for the moment) the ultra-high frequencies from 28 megacycles up, let's consider the number of channels available for 'phone and C.W. In the four major amateur bands, the 'phone men have a total of 500 kilocycles, whereof 200 (on 20 and 75-meter bands) are available only to the holders of class A licenses. That leaves 300 for the restricted stations. On the other hand, on some of these same bands and including the 7-megacycle band, the C.W. men have 1,100 kilocycles (exclusively for telegraph) and in addition may operate on the 1.7 and 14-megacycle 'phone bands in competition with aural stations. Adding these together, the total number of kilocycles available for C.W. is 1,400.

The question evolves into one solely of equitable distribution of frequencies in proportion to the number of stations. It cannot be denied that while telegraphy is the backbone of amateur radio, interest in 'phone transmission is *gaining by leaps and bounds!* All one has to do is to listen in on one of the various 'phone bands and hear the jamming. Accurate figures on the number of stations devoted to telegraphy and 'phone are not available, but conservative estimates are that not more than 25 percent of the 47,000 licensed stations in the United States at the present time are using voice transmission. There is, on the other hand, a band devoted to C.W. that is practically unused. That is the C.W. portion of the 1.7-megacycle band from 1,715 to 1,800 kilocycles. 'Phone men who are interested in obtaining more frequencies should make some effort to have this band assigned to their use. That, it seems, is the logical place to seek more 'phone frequencies.

Constructing an Antenna Mast

The design and construction of a light and reasonably high antenna mast is a problem which frequently confronts the "ham." Unfortunately trees seldom grow in the right places; it would take 50 years to grow a natural support of adequate size (and by that time there might not be an antenna problem), so the construction details of a not-too-high mast, but one that meets the requirements of most stations, are described here.

The mast shown in the illustration is 47 feet high. The base section consists of a 30-foot four-by-four, and the top section is constructed of 18-foot one-by-fours. The ground section is a crotch arrangement which in addition to providing a substantial means of mounting the mast rigidly in the ground, greatly facilitates raising it. The construction is quite simple. The base section, or crotch, is made up of a six-foot length of four-by-four, which is the same cross-section as the base of the mast. Two 10-foot two-by-fours are fastened securely on each side with a combination of nails and bolts. Twenty-penny nails are used. It might have been better to use three-by-fours for this purpose. That portion which is to be buried is given two heavy coats of asphalt paint.

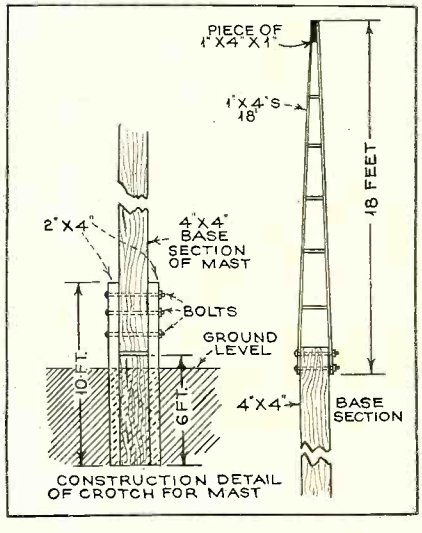
In building the mast itself, it is a good plan to use a sidewalk as a "straight-edge" to facilitate accurate alignment. The four-by-four is laid out straight and the two one-by-fours are placed so they overlap about two feet. Two holes are bored four inches from the top of the four-by-four and the bottom of the one-by-fours, and securely fastened with bolts. A few nails may be added for providing additional structural strength. Then a piece of one-by-four (about one foot long) is placed between the top ends of the one-by-fours; a hole is drilled through the three sections, and a bolt is used to draw the whole thing together. Nails again may be added to provide greater rigidity. Then to increase the strength of the top section, pieces of one-by-four are placed in between the tapering side sections and securely nailed from the outside. If six or more of these pieces are placed between the sides, the strength of the top section almost will equal a solid piece of wood, will have less tendency to bend, and will provide a top section of extremely light weight.

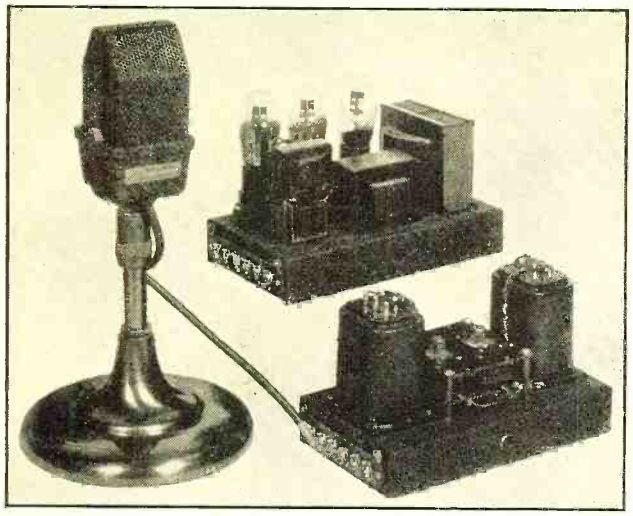
The guys then are fastened. The top ones are placed within a foot of the hoisting pulley at the extreme top and the lower ones just below the middle joint. Ordinary heavy-guage galvanized wire may be used, but one of the best and most inexpensive materials for the purpose is the so-called steel clothesline. This is a heavily galvanized cable, consisting of 7 strands of No. 18 wire and is readily available at most hardware stores. The "egg" insulators are the best type to use. They are arranged so that if the porcelain should break, the loops of the wire passing through the insulator will overlap, thereby providing utmost safety. The anchors may be almost anything driven into the ground, but a type which has been found most satisfactory, particularly where the guy wires must necessarily be placed close to the base of the pole, consist of pieces of pipe buried in the ground horizontally, and pieces of heavy cable fastened to them. The "dead men" used on the mast shown are two-foot pieces of pipe buried four feet deep. Rocks and earth are piled in on top of them so as to further distribute the upward force over a greater area. Concrete thrown in on top of the pipes would provide greater rigidity. As a precaution against rust, the pipe and the wire attached to it should be given a coat of asphalt paint.

To raise the mast, the base should be placed between the sling and the lowest bolt inserted to serve as a fulcrum. With the aid of two ladders and about four pairs of hands, no difficulty should be experienced in swinging the pole into position. As for cost, the whole thing may be put together, painted and swung into position for less than $5. It is an excellent aerial mast for a small yard.

Some strange things do happen in amateur radio. Recently an eastern manager got a strange complaint from an irate broadcast listener. The B. C. L. wanted to know what was his (the ham's) idea of

(*Continued on page* 686)





A New 25-14,000 CYCLE PRE-AMPLIFIER

Using the new "acorn" tubes in this high-gain pre-amplifier equal efficiency is obtained using either the a.c. line or batteries as the power supply

S. Ruttenberg

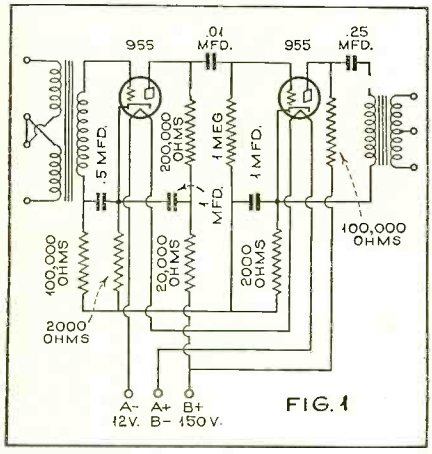


FIG. 1

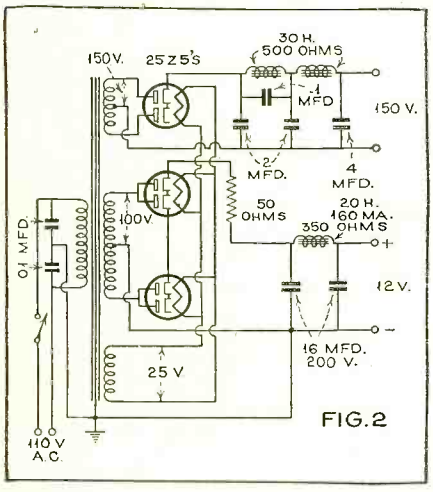


FIG. 2

BUILDERS of pre-amplifiers will welcome the new 955 or "Acorn" tubes with open arms. An absolutely humless pre-amplifier with flat response, for condenser or the newer velocity microphones, is a reality.

Although intended to be used on ultra short-wave work, the electrical and physical characteristics of the 955 tube are ideally suited for the amplification of the weak currents generated by dynamic or velocity microphones. Most important of these characteristics is the low electrode capacity of the tube that permits the use of an unusually high secondary impedance input transformer without losing the higher frequencies of the audio spectrum. The amplification factor is 25 which is much higher than the mu of any triode used heretofore for pre-amplification work. Its very small size and rugged construction makes it practically free from microphonic noises. Disturbances due to thermal agitation are down to a minimum value—not greater than that of the directly heated type of tubes. Besides these advantages, there is another characteristic of the tube which makes possible the use of rectified a.c. on the heater element; that is the low heater current which is only 160 ma.

Figure 1 shows the circuit of the pre-amplifier. We cannot overstress the importance of using parts of the highest quality in its construction. since they will determine the overall efficiency of the amplifier.

Figure 2 shows the power supply using three 25Z5 tubes. One is used for the plate supply and the remaining two as a full-wave rectifier for the heater supply. The latter consume rather low voltage for this type of rectifying tube. The purpose of this has been to reduce the power consumption and the amount of heat to be dissipated through series resistors. Paper dielectric condensers are used throughout, except for the filter section of the heater rectifier where two 16 mfd. dry electrolytic condensers are used. The paper condensers help considerably in the elimination of noise due to the power supply itself besides prolonging the life of the entire apparatus.

A very desirable feature of this pre-amplifier is its flexibility. It can be operated with equal efficiency on 115 volts a.c. or on dry batteries.

Figure 3 shows the dry cell arrangement that takes the place of the a.c. power supply. The photograph shows the two units that compose the pre-amplifier (with the shields removed). It is advisable to keep these two units separated as far as possible to prevent induction hum between the power transformer and the input transformer of the pre-amplifier. Both units are magnetically shielded by steel covers that are easily removed, for the replacement of tubes. The overall amplification of the amplifier is 75 db.

The overall frequency response of the Amperite velocity microphone and pre-amplifier are shown in Figure 4. It is interesting to note the difference

(*Continued on page* 710)

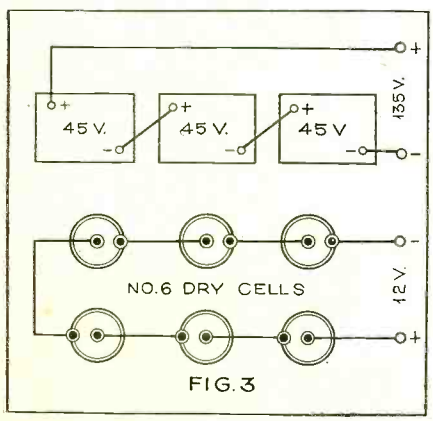


FIG. 3

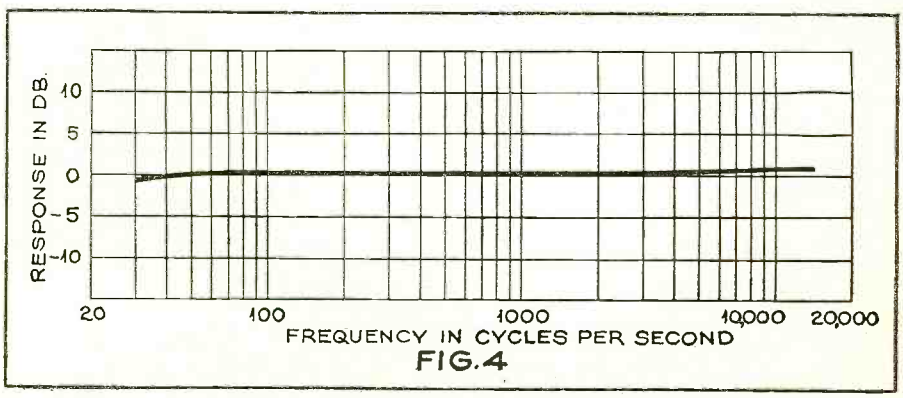
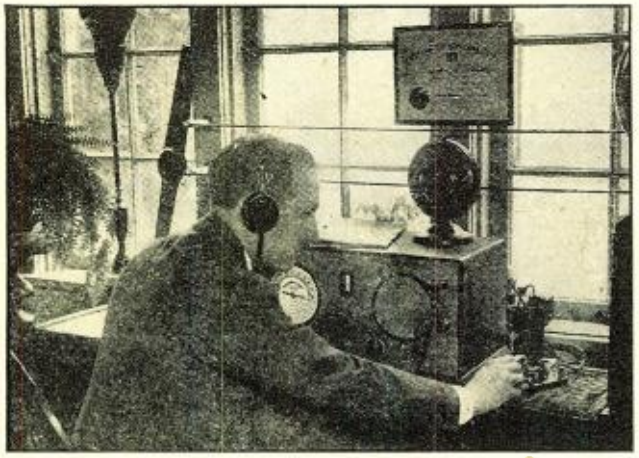


FIG. 4



Informal Tests on an "AMATEUR" RECEIVER

(The Super-Skyrider)

By the Staff

WHEN this receiver was unpacked at the Westchester Listening Post, its installation for tests was just a simple matter. All that had to be done was to attach the "green" antenna wire to an aerial and the "black" lead to a suitable ground. The plug was then connected to a 60-cycle, 110-volt power source—just as simple as that. This simplicity is due to the fact that the loudspeaker is incorporated as a part of the cabinet, even though the whole set takes up but a small space. Last month we described the general arrangement of the receiver and so, in this short article, we will briefly state some of the results we had with it. First of all, there are three positions for the crystal switch. One position cuts it out, another position cuts it in the circuit, in series, and the third position places it in multiple. Extreme selectivity is accomplished with the switch in the second position. In the second position there will be noted a considerable decrease in signal strength when listening to telephone signals, but only a small decrease when listening for C.W. When the set was received the crystal circuit was not properly aligned with the intermediate amplifier but, on realigning, full advantage of its selectivity could be obtained.

In testing (*Continued on page* 708)

New S. W. UNIT

John Strong

RAPIDLY increasing interest in short-wave reception, as indicated by the wide popular acceptance of all-wave receivers, has created a real need for a converter low in cost and universal in application. These requirements are met by the Rim "Explorer" Converter described here, one which is new in principle and design.

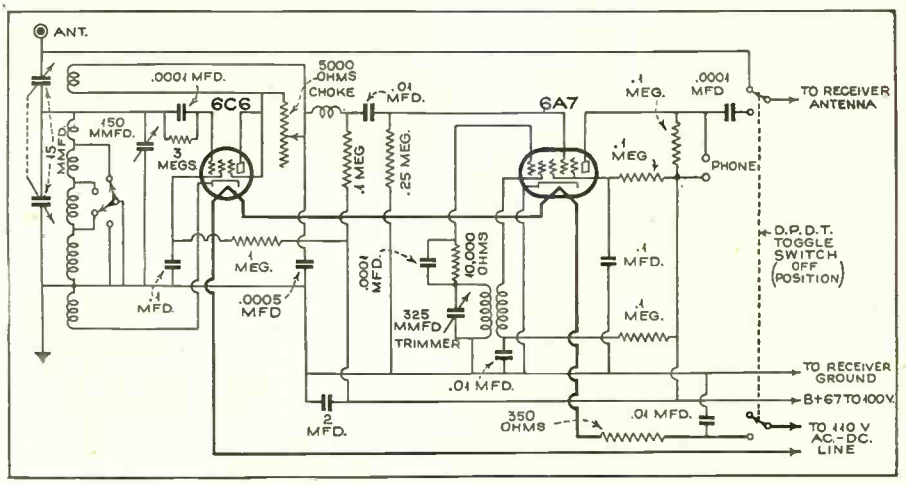
The converter works on a novel, heretofore unused, principle (see Figure 1). The first tube, a 6C6, acts as a regenerative detector; in its plate circuit appears the audio-frequency component of the received signal. This audio-frequency signal is then modulated onto a locally generated carrier (in the 6A7) which is adjustable within the broadcast band. This new signal is now fed to the receiver, where it is amplified and detected as usual. It is apparent that this enables one to have a regenerative detector with lots of amplification.

The pentode section of the 6A7 provides some amplification for the audio component, resulting in a reasonable percentage of modulation.

The advantage of this circuit is its simplicity and absence of images.

The regenerative detector provides the advantages of regeneration—added selectivity and sensitivity—"single-spot" tuning, no repeat points, C.W. code reception, "zero beat" resonance indication, and the simplicity of regenerative performance. The characteristics of 6C6 tube and provision for feedback in both the plate and cathode yield balanced regeneration over the entire short-wave range. Only the plate feedback is varied to obtain regeneration control. No plug-in coils are used. A special band switch removes and shorts unwanted coils from the tuning circuit. It covers the wavelength range of 15 to 200 meters in four bands, as follows: 15 to 29, 28.5 to 56, 54 to 104, and 103 to 202 meters. The four wave bands are calibrated directly in meters on the dial.

The aerial trimmer condenser is balanced by another variable condenser in the tuning (*Continued on page* 701)



THE CIRCUIT DIAGRAM

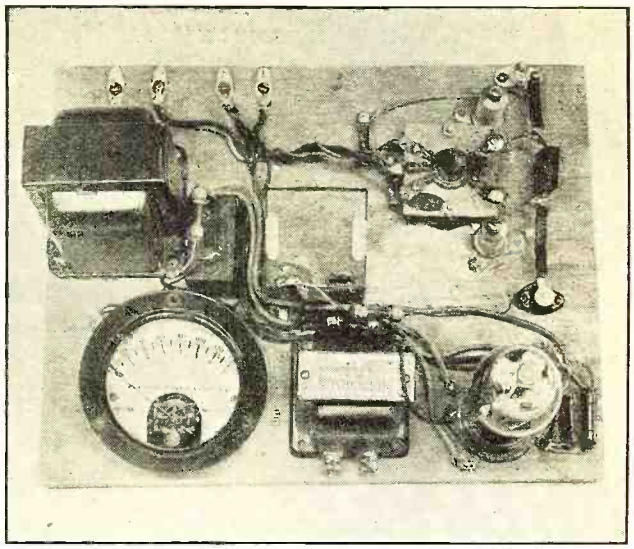
Shown above is a schematic wiring diagram of the short-wave converter illustrated at the right. Instead of functioning on the superheterodyne principle, this converter is in effect a miniature transmitter. The oscillator is permanently tuned to one frequency and the audio output of the detector is used to modulate this locally generated "carrier."

The "Acorn" Tube
ON 3/4 METER
(The Transmitter)

A practical transmitter for 75 centimeters. Articles to follow will describe the receiver, a transceiver and antennas

Ed. Glaser*

Part One



THERE is always fun in playing with something new or in pioneering. Many a bored "ham" or experimenter seeks new fields to conquer, new outlets for his interest and creative thought. Generation and application of the ultra-high frequencies offer such opportunities.

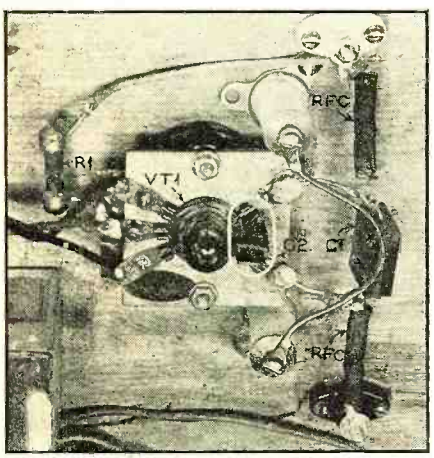
There is bound to be a great deal of activity on the ultra-high frequency channels in the very near future in facsimile transmission, in television, in program relaying and, perhaps, in new phases of radio yet to be invented. More room (more frequency channels) is available in the ultra-high frequencies (upwards of 30 megacycles) than in all the other radio-frequency bands put together and, since there is a serious shortage of available channels throughout the spectrum, the unused u.h.f. (ultra-high frequency) bands must become populated.

It is not to be understood that activity in this region is comparatively recent. Heinrich Hertz himself did some of his earliest work at these frequencies. A handful of amateurs (notably Kruse and Phelps) were communicating on 5 meters and playing with oscillators around one meter and less back in 1927. Anyone at all in touch with radio progress knows of all the amateur activity at present in the 5 meter band. But only a few are working on shorter waves (above 60 mc.). Until the advent of the new RCA 955 "acorn" tube there was no tube that would do a decent job below 2 meters. The 37, 76 and 56 were quite satisfactory for reception down to that point while the 800 and similar tubes were OK (but not without their faults) down to one meter for transmission.

The acorn tube makes available the region down to around 50 cm. (600 mc.). No suitable large tube is available so we have to use the 955 for transmission as well as reception. While this seems to be a drawback it has its advantages. First, all amateurs transmitting in this region are forced to use the same low power. They compete on an equal footing. There is no such thing as brute force as on the lower frequencies. Secondly, the necessity of using "flea-power" oscillators stimulates the development of circuits and antennæ that will give the utmost in efficiency, and thus radiate a respectable amount of power in a given direction. The decision of the RADIO NEWS staff and the writer to use a frequency of 400 mc. (75 cm.) was largely motivated by this interesting situation. We might have taken a stab at 50 cm., or at the very highest frequency at which oscillation would occur, but we wanted a stable communication circuit and one which would be easily reproducible.

A breadboard oscillator was set up at W2BRB to study the behavior of the 955. Several circuits were tried but the old reliable Gutton-Touly (shown in Figure 1) seemed to be the most satisfactory and did not require any special parts. The Hartley and others required minute fixed condensers for grid and by-pass functions. A pentode modulator was added making the unit a thoroughly respectable transmitter. (Although modulated oscillators are getting to be a nuisance on 5 meters in crowded areas certainly no one can object to their use at 75 cm.). The transmitter circuit as shown in Figure 1 is simplicity itself. The antenna (A) shown is satisfactory for getting started. C_1 can be any capacity above (*Continued on page* 716)

**Amateur station W2BRB.*

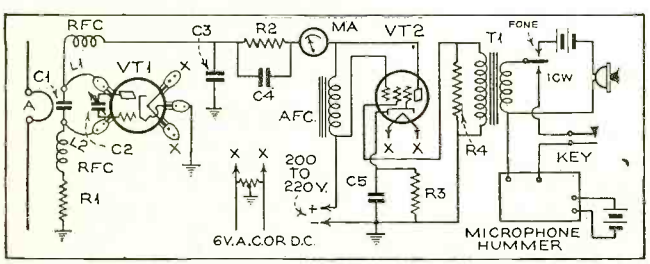


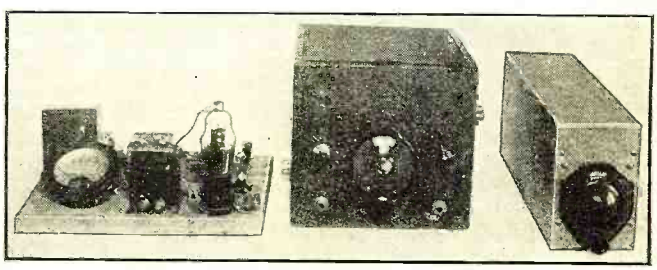
CLOSE-UP OF OSCILLATOR

Figure 2 (left). The two stand-off insulators support the half loop in the antenna and serve as terminals for the transmission line. C2 consists of copper strips connected directly to grid and plate terminal clips (not to the ends of the soldering lugs) to form the plates of this condenser. Figure 1 (below) shows the transmitter circuit and to the right is the group of ¾ meter apparatus, consisting of the transmitter, transceiver and receiver to be described in this series.

THE TRANSMITTER

The transmitter is built on a paraffin-impregnated base board, 8 inches by 11 inches. A close-up of the "Acorn" tube oscillator circuit is shown in Figure 2 and the schematic circuit in Figure 1.





Using the

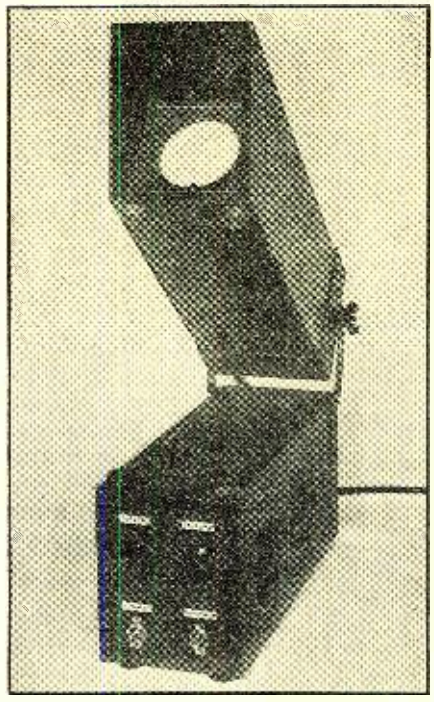
CATHODE-RAY OSCILLOGRAPH

(Fundamental Applications)

The cathode-ray oscillograph is due to become an indispensable part of the equipment of the modern service shop and laboratory. This series of articles describing its various applications is therefore especially timely

Kendall Clough

Part One



A CATHODE-RAY OSCILLOSCOPE

In this self-contained a.c. operated oscilloscope the tube is mounted in the adjustable top section and the power supply and 60-cycle sweep supply in the lower section. This is one of the cathode-ray units designed and built by the author.

THE advent of reasonably priced cathode-ray tubes, together with economical associated equipment, has placed a keen analytical tool within the reach of many who lack information on the circuit set-ups for securing wave patterns and for the interpretation of the patterns when formed.

In this brief treatment of an inexhaustible subject it is hoped to make it possible for those who are using cathode-ray equipment for the first time to gain a fair understanding of the results which are obtained.

In simplest terms, the cathode-ray tube is an electron gun which projects a stream of electrons along the length of the tube. At the end of the tube, a screen is provided. This is coated with salts which glow when bombarded by the electron stream. Properly focused by controls provided in the energizing circuits, the electron stream is seen on the screen as a small green spot.

The electron stream on its way to the screen passes between two sets of plates, one of which is mounted in a horizontal plane, and the other in a vertical plane. Considering any one pair of plates, it is apparent that polarizing one plate negatively and the other positively will cause the electron stream to be attracted or bent towards the positive plate. This bending motion will be proportional to the voltage applied.

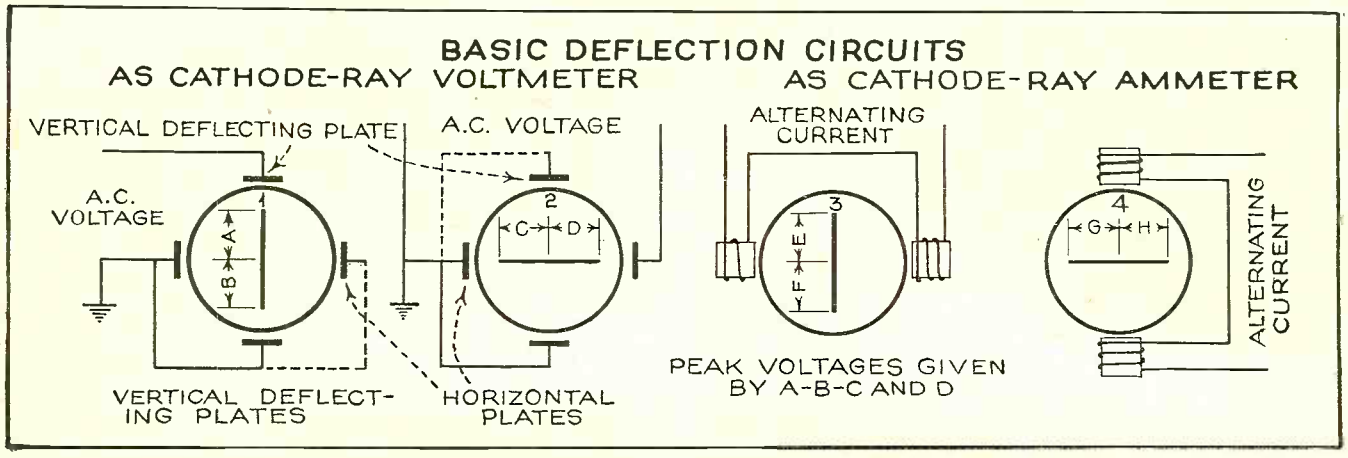
Thus it is seen that the beam acts as the pointer on a voltmeter, although it actually has two properties that make it superior for many measurements to this simple analogy, namely: the electron stream has no inertia and so is able to follow the most instantaneous voltage variation applied to the plates; and it cannot break off or be damaged by too-high potentials.

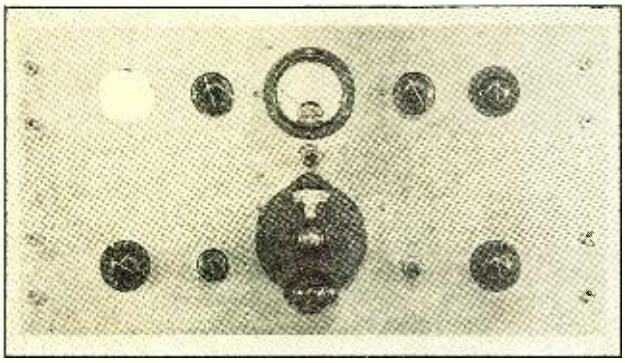
It is customary to call the pair of plates which lie in the horizontal plane, the "vertical" deflecting plates, since they are effective in deflecting the beam in the vertical direction. Likewise the other set of plates are called the "horizontal" plates. This terminology will be used throughout the discussion.

In most commercial tubes, such as the type 906, one vertical and one horizontal plate are connected together and grounded within the instrument case. In order that the polarity of the deflections shall correspond to that ordinarily used in electrical terminology, the tube is held in its mount as shown in Patterns 1 and 2 with the "free" plates at the right and upper side when viewed from the front of the tube.

In this way positive voltages applied to the free horizontal plate will deflect the beam to the right and positive voltages applied to the free vertical plate will deflect the beam upwards. It is important to keep this fact in mind when dealing with measurements in which polarity is an important consideration.

If an a.c. potential is applied to the "vertical" plates as shown in Pattern 1, the spot is deflected up and down, giving a straight line trace as indicates in the figure. Likewise a horizontal straight line trace will result if the voltage is applied to the horizontal plates as shown in Pattern 2. By scaling the distances "a" and "b," or "c" and "d," the peak voltages of the wave causing the deflection will be obtained. In the event that a quantitative measure of the peak voltage is needed, a scale may be provided on the face of the tube and calibrated by the application of known voltages from batteries or by a sinusoidal a.c. wave making (*Continued on page* 708)





THE TRIPLE UNIT METER

Three distinct units interlocked by an efficient switching device make this new service meter invaluable to the wide-awake serviceman.

How to Make a New Type

COMBINATION SERVICE METER

L. R. Goetz

THE general public acceptance of short-wave receivers and the increasing demand for antenna systems that have a better signal-to-noise ratio have created a necessity for the serviceman to have equipment that will cover a wide range of frequencies and yet be flexible enough that a large investment in equipment is not required.

THE test equipment described here is made up of three distinct units and interlocked by switching arrangements which combine it in one unit with a great saving of parts required. These switching arrangements are made possible by the new type 1200 and 1300 Yaxley switches which are made especially to handle radio-frequency circuits. The equipment consists of:

1. Beat-frequency oscillator, 150 kc. —20 mc. (See Figure 3.) (Audio modulation may be added.)
2. Peak voltmeter—a.c., d.c. and r.f. voltages of any value above one volt. (See Figure 2.)
3. A method of measuring r.f. output of the beat-oscillator in supers.
4. A grid-dip type meter for measuring the r.f. coil resonance points (or resonant point) of any circuit (antennas).

Since this equipment was built for shop use, it was made in one unit. The units may be divided to suit the individual's requirement if necessary. The r.f. oscillator is a 24 tube in an electron-coupled circuit which has very good frequency stability and will hold close calibration over a long period of time.

For the oscillator circuit (Figure 3) at point S5, a milliammeter may be connected, and at point A1-A2 an antenna or feeder circuit may be connected for measuring antennas or receivers, or, if grid-dip meter is required for sufficient sensitivity, the 0-1 milliammeter may be cut into the grid circuit by means of switch S7.

The peak voltmeter section has three types of input circuits available:

1. Pure resistance input for d.c. and low-frequency a.c. measurements.
2. Condenser input r.f. measurements.
3. Resonant input for r.f. measurements.

By using external dividers (Figures 4a-4b) there is almost no limit to the voltages that may be measured directly, either no load or under load, also r..f voltages of transmitters may be measured.

By using 1 mfd. condensers in place of condensers C3 (in Figure 2), audio voltages in audio systems may be measured. Since the unit must be shielded, the front panel is made from $\frac{3}{32}$-inch aluminum and the rest of the housing is made of .010 sheet copper, thus allowing the unit to be mounted in a rack or slipped in a wood case for portable use.

All controls that are used while making measurements are placed on the left side to make it possible to make measurements and write the results at the same time; also all the input circuits are placed on the left side.

The calibration of the oscillator is accomplished by using a standard all-wave receiver and using broadcast stations for the calibration points. The procedure is to tune in a broadcast station and adjust the r.f. oscillator to "zero beat" and the *frequency of measured signal* plotted against *dial reading*, on graph (*Continued on page* 713)

TABLE 1

FREQUENCY	TURNS	TAP	WIRE	LENGTH OF WINDING.
28 mc - 9 mc.	7	2	20	1 1/2"
9.5 mc - 4 mc.	18	6	20	1 7/16"
5.8 mc - 2.5 mc.	28	9	20	1 3/16"
2.8 mc - 1.4 mc.	60	20	28	1 5/16"
1.4 mc - .5 mc	120	35	30	2"
ALL COILS 1 1/4" DIAMETER				

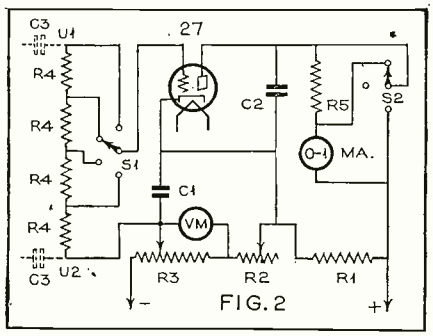


FIG. 2

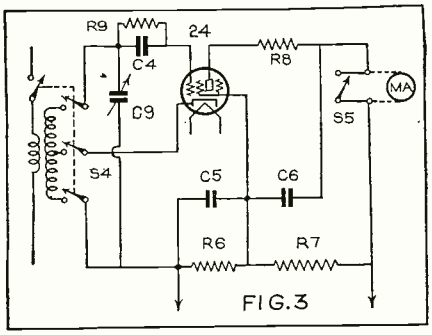


FIG. 3

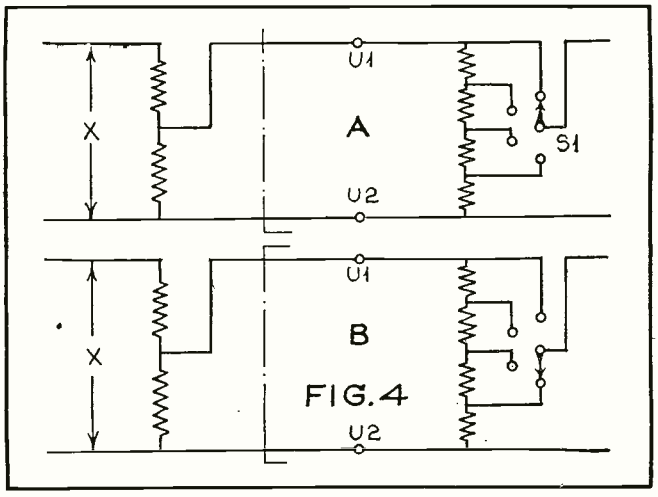


FIG. 4

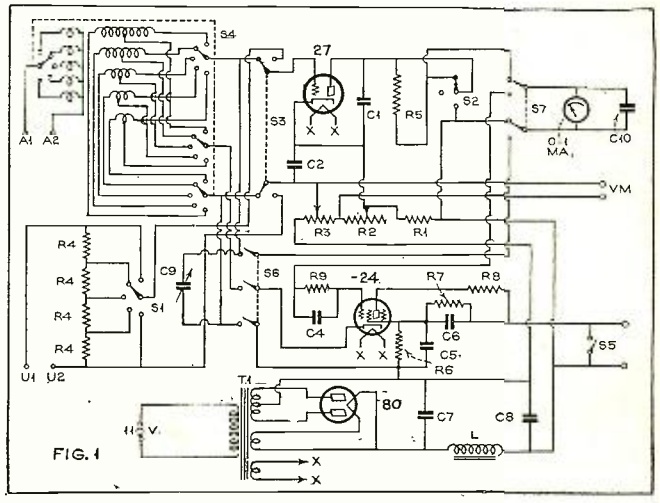


FIG. 1

Calculating POWER OUTPUT

(For Vacuum Tubes)

Experimenters who wish to use their tubes under conditions not given in the tube manuals will find this article of great value. What is the maximum power output of a given triode in Class A amplification?

C. A. Johnson

EVERY serious experimenter has been asked this question at one time or another. There is a definite answer for each case. By following the method outlined below, you can calculate the undistorted power output for any set of operating conditions.

In order to use this information to the best advantage, we must first briefly examine the equivalent plate circuit of a triode as shown in Figure 1.

Any circuit for the transfer of power may be divided into two parts, namely, (1) the source and (2) the load. This division is indicated in the diagram by the dotted lines. For the purpose of this analysis, we will assume that R_L is a pure resistance.

The total a.c. power expended in this circuit is given by the formula:

$$P_T = (\Delta I_p)^2 (R_p + R_L)$$

When ΔI_p = r.m.s. alternating current. The "power output" of the circuit (i.e., the useful power delivered to the load), is

$$P_L = (\Delta I_p)^2 R_L$$

It can be shown mathematically that, for any given generator voltage, the maximum power is delivered to the load when $R_L = R_p$. If the reader doubts this fact he can prove it for himself graphically.

If the plate circuit of a triode were a device that obeyed Ohm's law for any applied voltage, our problem would be solved. The maximum useful power output would be delivered to the load when $R_L = R_p$, and, under this condition the load would receive 50% of the total power developed in the circuit.

Everyone knows, however, that the plate voltage-plate current curve for a triode is not a straight line. Figure 2 is a typical "family" of such curves for a familiar triode. More voltage is required, per unit of current, near the base of the characterististic, hence it shows a curvature. The slope of the curve is also determined by the amount of grid bias, so that we have a slightly different characteristic for every grid voltage.

For distortionless amplification only the straight portion of any one of the E_p-I_p curves can be used. This decides two important facts about the power output of the tube:

1. Much less than 50% of the power expended in the plate circuit can be delivered to the load.
2. The actual amount of power available from a given triode depends upon the allowable distortion.

In general, the optimum condition is obtained when R_L has a value somewhere between R_p and $2R_p$. Both power output and distortion decrease with an increase of R_L above a value equal to R_p.

Figure 3 is a set of characteristics for a 31 type tube. The following outline shows how the power output and the amount of distortion can be calculated for a given load and given operating point. We will illustrate with a typical case, assuming the following conditions:

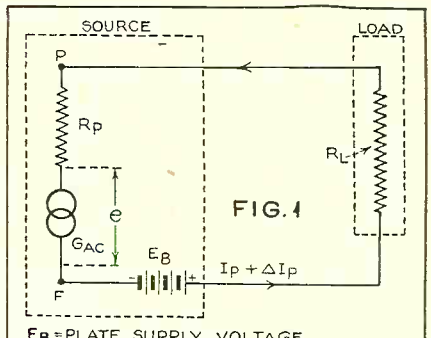


FIG. 1

E_B = PLATE SUPPLY VOLTAGE
I_p = PLATE CURRENT
ΔI_p = CHANGE PLATE CURRENT DUE TO SIGNAL. P = POINT IN CIRCUIT CORRESPONDING TO PLATE. F = POINT IN CIRCUIT CORRESPONDING TO FILAMENT. R_p = PLATE RESISTANCE. R_L = LOAD RESISTANCE. G_{AC} = RESISTANCELESS A.C. GENERATOR. e = VOLTAGE OUTPUT, OF $G_{AC} = \Delta E_g \mu$ WHEN: μ = VOLTAGE AMPLIFICATION FACTOR OF TRIODE. ΔE_g = CHANGE IN GRID VOLTAGE DUE TO SIGNAL.

Load resistance = R_L = 7000 ohms
Plate current = I_p = 8 milliamperes
Plate voltage = E_p = 135 volts (approx.)
Grid bias = E_c = —22.5 volts

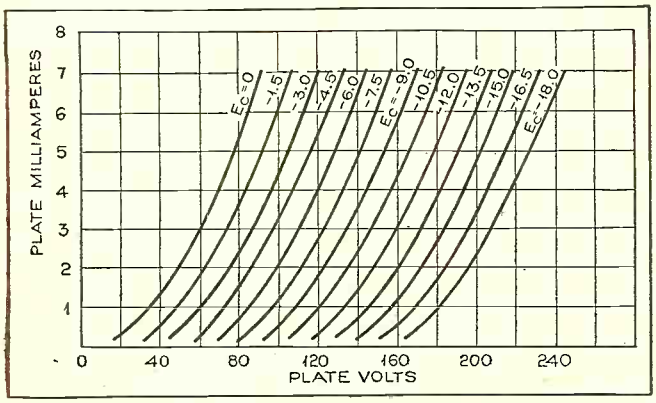
With such a set of data given the maximum power output can be determined as follows:

1. Using Figure 3, find the point corresponding to 135 volts and 8 milliamperes on the curve for E_c = —22.5. Call this point "*q*." This is the position of the operating point when there is no signal on the grid.
2. To obtain the path of this operating point we must draw through "*q*" a line—the "load line"—with a slope corresponding to 7000 ohms. This line generally can be found by dividing the B-supply voltage by the load resistance. However, we do not yet know the voltage of the B supply. With no signal coming in, the plate current was 8 ma., so the drop in the load resistance equals 7000 × .008 = 56 volts and the B supply should be 135 + 56 = 191 volts.

   The load line is now drawn by connecting 191 volts on the voltage axis with the operating point "*q*" and producing the line until it meets the curve $E_c = 0$.
3. Label this line *p-h*. It represents the path of the operating point of the tube as (*Continued on page* 719)

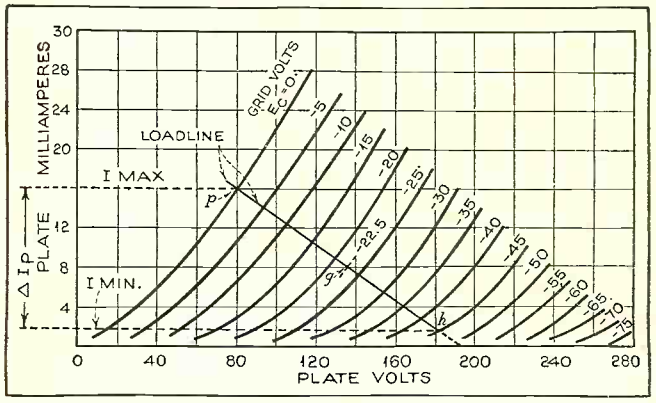
PLATE CHARACTERISTICS

Figure 2. Shows a typical "family" of E_p—I_p curves for a type -01A tube.



THE LOAD LINE

Figure 3. The construction for calculating the maximum undistorted output of a type -31 tube.

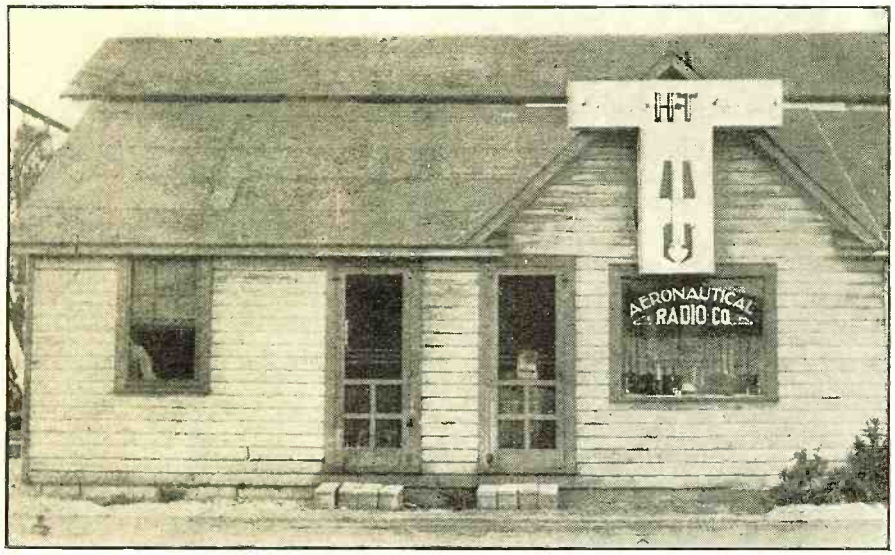


RADIO *in* AIRCRAFT

(Field Experience)

Henry W. Roberts

Part Five



THEORETICAL knowledge alone will not enable us to become expert in the important business of servicing aircraft radio. Theory must be bolstered by actual field experience before the serviceman can conscientiously claim proficiency. Although there are relatively few types of aircraft radio apparatus, there are several hundred types of airplanes, and, especially in private flying, each installation possesses its individual peculiarities.

LET us go out to an airport, look at the ships, and see how a radioman goes about his work. We will select for our trip Roosevelt Field, in New York, not only because it is the world's foremost airport for private flying, but also because it is the headquarters of Aeronautical Radio Company, a pioneer concern specializing exclusively in aircraft radio.

The trim, white building shown on this page, with its showroom, workshop and spacious office, was born in the midst of depression, in 1932, and flourished ever since. Many aviation notables passed through its modest door, hundreds of airplanes had their radios installed and serviced here, and many a pilot flew hundreds of miles to have his radio installed by Aeronautical Radio mechanics and be sure of a good job. Their customers are scattered from coast to coast and through every continent.

AERONAUTICAL SERVICING

Here is a modern aeronautical service shop catering exclusively to air-minded customers.

There is a lesson and an inspiration in the success of this world's first aircraft radio service station. When its owner, Mr. George W. McCaulay, first hung out his shingle at Roosevelt Field, he led the way for hundreds of aircraft radio servicemen. His courage and foresight were amply rewarded and one brief year later his name was synonymous with aircraft radio at every airport. Ask him if he is afraid of competition and hear his cheerful assurance that there is not enough of it. There is plenty of room in this new uncrowded field and a dire need of experienced men.

"Calling WQEB! Calling WQEB!" blares the loudspeaker. Mr. McCaulay pauses to press the microphone button and answers: "WQEB, McCauley. Go ahead!" A customer wants to know if he can have his radio checked overnight. "Come on in; we will keep open until you land." The shop and the transmitter (call letters WQEB, 287 kc.) are "on call" day and night, and a hundred miles away a ship points its nose to Roosevelt Field.

Outside, mechanics are busy on a trim, fast ship. Here is a good instance of practical experience furnishing a simple solution to a difficult problem. The pilot had complained of intermittent radio operation, and inspection revealed that while there was nothing wrong with the radio, oil was dripping from the engine onto the generator, leaking along the shaft and shorting the commutators. To relocate the generator would have been a lengthy and expensive job; mounting on the generator shaft a small flanged metal disc (see Figure 1) remedied the trouble, the oil being thrown off the shaft by centrifugal force. This simple "kink" was worth fifteen dollars to the owner of the airplane.

ANTENNAS ON A PLANE

An advantageous combination of longitudinal-L and directional loop antennas on a cabin monoplane.

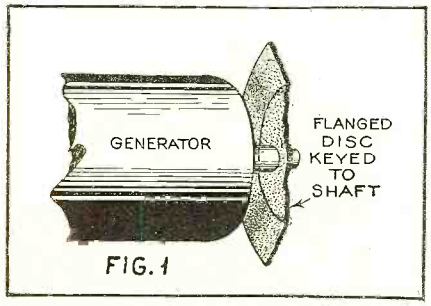


FIG. 1

A white cabin biplane, belonging to a great metropolitan newspaper, taxies up alongside, and the pilot waves to our host. A photographer alights with his camera, and in a few seconds his pictures are on their way to the editor's desk. Theirs is a risky job, flying for news in all kinds of weather. You may recall the dramatic rescue of the crew of a sinking freighter off Fire Island a few weeks ago, when a newspaper airplane located the wreck miles out at sea and directed ships to the rescue—in time! This is the ship and these are the men, and it is all in their day's work. Above the white fuselage is the slender strand of antenna wire which made the rescue possible.

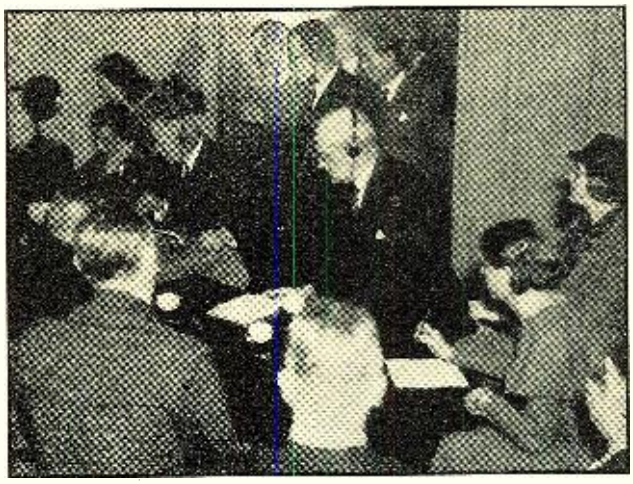
When this airplane was purchased, it came equipped at the factory with a so-called "wing" antenna, consisting of a metal sheet placed under the fabric along the leading edge of the upper wing. The inherent disadvantages of this type of antenna (see December issue) were not known to the mechanic who had made the original radio installation, and the airplane was once lost in a storm, unable to ride the beacon. The new longitudinal-L antenna, extending along the top of the fuselage, from a short support above the cabin to the tail until, with the lead-in at the support, gives clearly defined reception of beacon signals, and the pilot now feels safe to tackle any weather to score a "scoop" for his paper.

Selecting the proper antenna is always very important. A very interesting installation, employing two separate antenna systems, can be found on the 200-mile-an-hour Seversky which we see streaking over the field, headed for its home airport at Farmingdale. This is an all-metal (*Continued on page* 717)

The Future of SHORT-WAVE RECEPTION

Charles A. Morrision

Part Two



AT A TENSE MOMENT

Germany's Ambassador to Japan, Dr. H. von Dirksen (center, wearing headphones) at a short-wave circuit in Japan receiving the official announcement of the plebiscite in the industrial valley of the Saar.

WORLD-WIDE reception on the short waves is now an accomplished fact. Last month Mr. Morrison, who is President of the International DX'ers Alliance told us of some of the coming uses of short waves and outlined reception results that could be obtained from some of the leading European stations. In this article he talks of reception from South America, Australia, Japan, etc.

IN South America we have a slightly different situation, as short-wave broadcasting there is not organized on a national basis. Radio Station HC2RL, in Guayaquil, Ecuador, was built with the sole thought of diffusing to the world that typical Latin type of music that is distinctly found only in Ecuador. HC2RL's bi-weekly transmissions are eagerly awaited by thousands of radio listeners both in the United States and in other parts of the world. They are expertly organized and frequent announcements are made in English. HC2RL transmits an extremely high-class program, with apparently no end of fine talent.

Another of the popular voices of South America is PRADO, in El Riobamba, Ecuador. This station puts on a fine weekly broadcast somewhat similar to that of HC2RL, but usually of a little lighter type of entertainment.

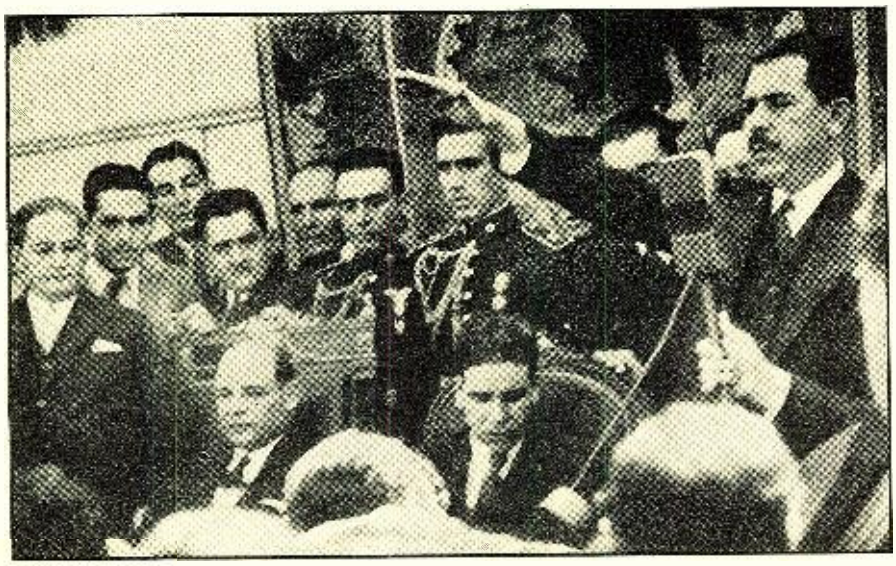
Colombia in South America has a great abundance of small short-wave stations, which can be picked up with varying tone quality and power each night. One example is the HJ1ABB transmitter at Barranquilla which, although only using 300 watts of power, is seldom absent from the dials. HJ1ABB specializes on popular Colombian melodies played in their distinctive style, and dance rhythms. A new station, HJ1ABG, at Barranquilla, also is being heard at present with excellent quality and a fine selection of program material.

Paraguay and the Guianas have no short-wave broadcasting stations, and Argentina is only heard through its commercial transmitter, LSX. No doubt within a very few months the national voices of these countries will be added to our international bill of fare.

One of the most consistent and strongest transmissions radiated from South America is that of the Radio Compania of Brazil's station, PRF5, located at Rio de Janeiro, who holds forth for 45 minutes each day (in the late afternoon) with a rapid-fire dialogue of Portuguese and occasionally a little music. It is a shame more music is not heard from this station, as with the strength of their signal it would be enjoyable. They announce in both English and French two or three times during their program.

WORLD EVENTS ON SHORT WAVES

General L. Cardenas broadcasting, during official ceremonies at the National Stadium in Mexico City and pledging himself to policies of government over the short wave.



The trio voices of Australia, VK2ME, VK3LR and VK3ME, are too well known to more than mention in passing, as these stations for several years have provided an early morning fare of some of the most varied and interesting programs put on the air. The laugh of the kookaburra, that peculiar little animal found only in Australia, is a regular feature of the broadcasts and, once heard, is never forgotten. Another of the regular features of these stations are their talks on different phases of Australian life and glimpses of the little-known interior of the Commonwealth, its Bushmen, animals, flowers and geographical features. These are very eagerly received by short-wave fans. These two stations come in from fair to good the year around, under average conditions, with their scheduled transmissions on certain days of the week.

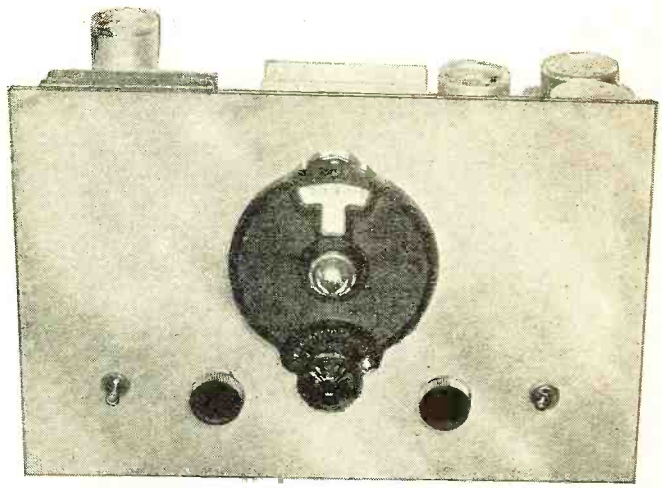
Bringing to a close this brief summary of the national voices of a few of the countries regularly heard, it would be well to mention Japan. It used to be quite a feat to get a broadcast from Japan, and accomplished with no regularity. Now Japan has installed one of the most comprehensive and complete national short-wave services in the world. Part of the large array of short-wave transmitters are used for program purposes, relaying the programs of the Japan Broadcasting Company. Others of the group have been erected especially for commercial transoceanic telephone communications. Every morning it is possible for the early riser to tune in one or more of these Japanese stations with their delightfully different programs of typical Oriental music and voice. To have not heard a relay of one of the Japanese baseball games is to have missed one of the most amusing and comical broadcasts on the air.

It is a pity that our own United States short-wave stations are not officially recognized as a national voice, although inasmuch as they relay the "chain" offerings of the NBC and the CBS, they do (*Continued on page* 701)

Build this Radio News

SHORT-WAVE CONVERTER

Any broadcast-band receiver will provide world-wide short-wave reception through the addition of this unit



S. Gordon Taylor

Part Two

THE article last month described this new development of the RADIO NEWS laboratory in some detail. In it were included the circuit diagram and parts list. The present article provides data on construction, wiring, adjustment and alignment.

THE photographs and drawings in this and the previous article provide substantially complete information for the constructor, especially if the foundation kit including the completely drilled chassis and panel is used. For those who may prefer to make their own chassis and panel, complete working drawings are provided in the blueprints available from Radio News. A full-size picture diagram, showing how to run each wire, is also included in the blueprints.

In assembling the job, all the parts that belong on top of the chassis, as shown in Figure 5, can be mounted at once. In fact, all parts except the tubular by-pass condensers, resistors, antenna switch and midget condensers can be mounted before starting the wiring.

As will be noted from Figure 4, the sockets for the 6D6 and 6A7 tubes are placed with their socket mounting screws at a slight angle to a line drawn parallel with the end of the chassis. The socket for the 80 rectifier is mounted with its large pins toward the near end of the chassis, and the 76 tube with its odd single pin toward the front. Figure 3 shows the terminal connections for the 4 coils, as viewed from underneath the chassis. C4 should be mounted with the large end of the adjustment screw below and the small end accessible from above the chassis through a hole provided for this purpose.

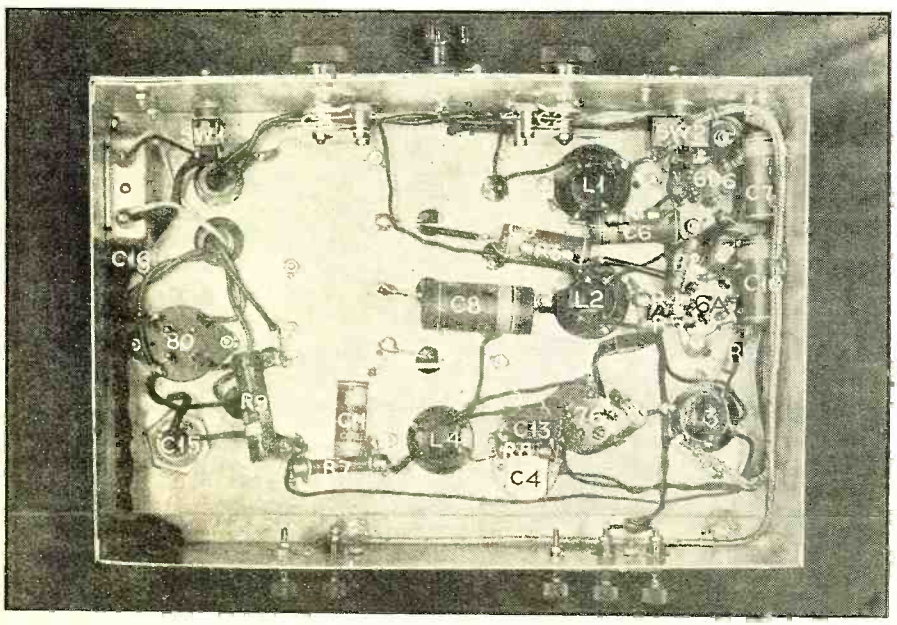
The wiring of the power supply and tube filaments can best be completed first, then the tube sockets and coils may be wired as far as possible. With this done, the switches and midget condensers may be mounted on the front side of the chassis and wired into the circuit. Leads going from the output coil (this lead is temporarily connected to either one of the 2 output terminals of transformer L3) to the antenna switch and from the antenna switch to the output terminals of the converter should be shielded wire. These should be run together along the end wall of the chassis and the shielding should be securely grounded by soldering or clamping the shield to the chassis every few inches. The leads from the antenna terminals A1 and A2 should not be shielded but should be twisted together to avoid pickup from adjacent circuits. Use 2 wires of different colors here, otherwise there may be confusion in connecting them. Be sure that the wire from antenna post A1 connects to the antenna switch.

In the tuned circuit keep the leads between the coils and the tuning condensers as short and direct as possible, to avoid adding unnecessarily to the inductance and capacity of the tuning circuits. With all parts mounted and the wiring completed to this point, the last step in the construction is to wire in the various resistors and the bypass condensers. One point for special attention is in the grounding of the rotor plates of the 3-gang condenser. The rotor terminals lugs extend down through holes in the chassis and should be individually connected to the chassis by means of half-inch long soldered leads. Experience has shown that simply grounding the condenser frame by means of its mounting screws is likely to be inadequate.

With assembly and wiring completed the spring plates of the compression-type trimmer condensers on the two front sections of the gang condenser should be broken off as they are not used and tend to add unnecessary capacity to the tuned r.f. circuits. The one (C12) on the rear section of the gang condenser is left intact, as this is used as the trimmer capacity in lining up the oscillator.

BLUEPRINTS

A SET of RADIO NEWS converter prints, including a full-scale picture wiring diagram, full-scale working drawings of chassis and panel, schematic circuit diagram, etc., may be obtained by sending 50c to RADIO NEWS, Blueprint Dept., 461 Eighth Ave., New York City. These prints are sufficiently accurate for direct use as drilling templates if desired.



Installation

In installing the converter connect the antenna lead to antenna terminal A1. If an L-type antenna is used, put a

jumper from Terminal A2 to the ground terminal. If a doublet is used omit the jumper and connect the two antenna leads to A1 and A2. The output of the converter should be connected to the antenna and ground terminals of the broadcast receiver by means of a shielded wire, as shown in Figure 5. It is desirable that the converter be placed close enough to the broadcast receiver so that this lead need not be more than 3 or 4 feet in length. The shield on this wire is used as the ground lead.

Plug the converter into the line, tune the broadcast receiver to about 540 kc., and the converter is ready for final adjustment.

Adjustment

If a calibrated signal generator is available, follow the usual procedure employed in lining-up r.f. tuning circuits. For those who do not possess such a generator, the suggestions below will indicate the method of alignment, using shortwave broadcast signals. But first certain other adjustments must be made.

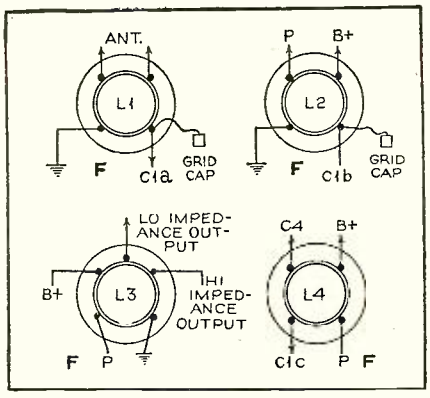
The first step is to tune the broadcast receiver to about 540 kc., and turn the gain high. Then tune the converter to its highest frequency and adjust the midget condensers, C2 and C3, to resonance, as indicated by maximum noise. If resonance cannot be obtained screw the padding condenser (C4) in or out until a definite resonance point is found with C2 and C3. The output transformer (L3) is next tuned to the same frequency as the broadcast receiver, by adjusting the screw of C5, mounted in the top of the can of this transformer, for maximum noise. Be careful that the screwdriver employed has an insulated handle and that the blade does not touch the can because this condenser screw is in the B plus circuit.

The last adjustment is to match the output impedance of the converter to that of the receiver. This is accomplished by touching the output lead of the converter to each of the 2 output terminals of the output coil. One of these output coils is of the high-impedance type and the other of the low-impedance type. One or the other will give the best response depending on whether the broadcast receiver has a low- or high-impedance input.

When shifting this lead from one output coil to the other, it will be necessary to readjust the output tuning condenser C5.

Alignment

With the main dial set at 97 (plates almost all meshed) adjust the oscillator padding condenser (C4) for more or less capacity until a 49-meter broadcast station is heard. The two condensers C2 and C3 should be kept adjusted to resonance during this process. Now, again vary the padding condenser until the repeat point for this station is heard. The correct one of these 2 points is the one at which the least capacity of C5 is used. This condenser is adjustable from either above or below the chassis, the screw being slotted at both ends. *When adjusted from above the chassis, the capacity decreases as the screw is turned clockwise.* This is just the opposite of normal action and this fact must be borne in mind to avoid confusion in determining which of the repeat points is the one obtained at the low capacity setting.



THE COIL CONNECTIONS

Figure 3. Here are shown the coil terminal arrangements, as viewed from the under side of chassis. "F" indicates the side of coils toward front panel. Grid cap leads of L1 and L2 are brought out through the holes near tops of coil shields.

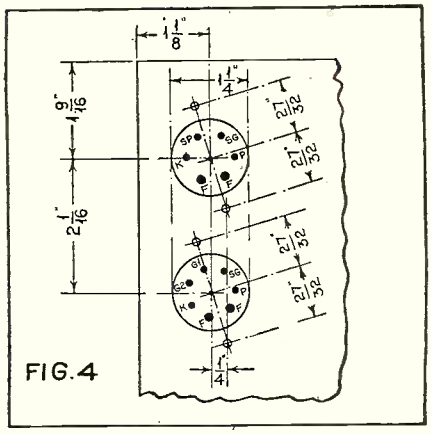


FIG. 4

Now go to the high-frequency end of the main dial and adjust the three panel controls for miximum background noise. In doing this the small trimmer condenser on top of the oscillator section of the gang condenser should be very nearly all out. If the point of resonance is reached on condenser C2 and C3 it is an indication that alignment is fairly close.

The next step is to make sure that you are covering the required tuning range. You can determine this by tuning in a 19-meter broadcast station or a 20-meter amateur phone station. If the former is tuned in at about 13 on the dial or the latter at about 21, the converter is covering its normal range. Should you find it impossible to go down as far as the 19-meter band it will be necessary to reduce the capacity in the trimmer (C12) of the oscillator tuning condenser, and again readjust the padding condenser.

When this point is reached in the adjustment it is advisable to experiment a little with the padding condenser C4 and the trimmer condenser C12 to find that adjustment in which the r.f. and detector stages require the least adjustment of C2 and C3 to maintain resonance as the main tuning control is tuned through the entire range. When this has been accomplished the converter is "set to go."

In one of the recent tests of this converter it was connected to a t.r.f receiver, built 6 years ago. This receiver employed 2 r.f. stages equipped with the first screen-grid tubes (type 222). In spite of the low sensitivity of the receiver, as compared with modern superheterodyne, the converter made it possible to tune in the 25-meter German. English and French station with enough volume to more than fill the 6-room apartment in New York City where the test was made.

A converter which can accomplish such a feat as this should be distinctly worth-while to the owner of an old receiver who cannot afford a new all-wave set, but has a hankering for short-wave reception. Or to the man who sticks to a t.r.f receiver for its tone quality on local broadcasts but wants to add the short-wave feature. Every serviceman has such customers on his books and the RADIO NEWS Converter offers a means for satisfying these customers at a profit.

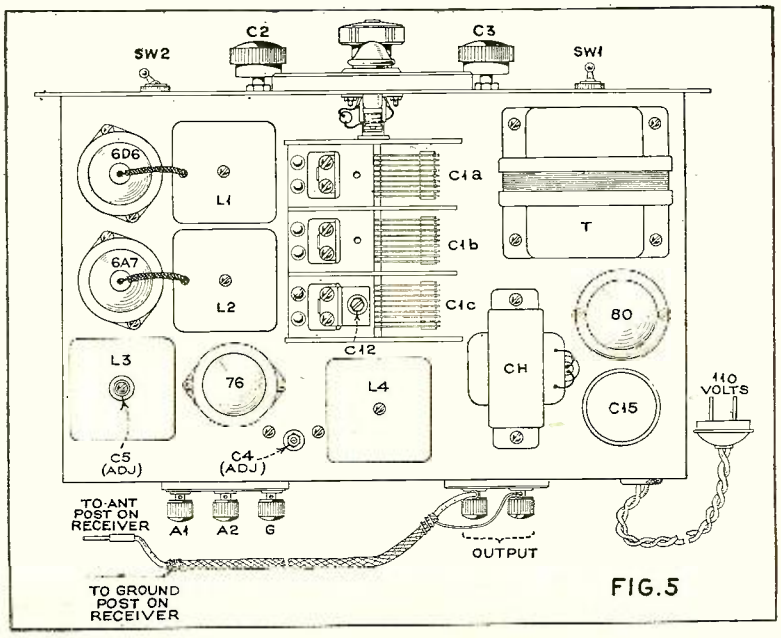


FIG. 5

UNITED STATES AND WORLD-WIDE MILEAGE CHART

43	83	76	90	11	78	71	46	50	41	57	59	55	72	16	15	10	70	10	34	21	46	59	39	66	22	13	103	10	51	25	22	15	63	62	52	46	60	38	MOSCOW, U.S.S.R.
29	113	58	57	49	99	108	57	42	14	83	69	10	85	51	52	47	40	48	31	53	9	41	67	66	63	50	66	44	25	60	57	52	91	82	58	60	51		KHABAROVSK, U.S.S.R.
23	61	93	74	62	48	63	22	11	65	35	23	56	35	55	57	58	25	62	81	63	54	89	97	16	59	56	66	54	73	56	58	59	99	36	16	25			LOS ANGELES, U.S.A.
33	53	118	99	42	40	48	4	25	73	25	13	38	29	34	36	40	50	43	79	42	67	101	74	22	36	36	89	37	85	33	36	39	77	22	9				NEW YORK, U.S.A.
29	55	108	90	49	41	52	7	17	72	26	13	45	28	42	44	47	41	51	82	51	63	99	83	14	45	44	80	43	82	42	44	47	86	25					ST. LOUIS, U.S.A.
54	31	108	95	54	19	28	25	42	95	6	14	52	11	46	47	52	60	55	96	52	88	121	71	23	41	49	81	52	106	40	43	49	63						CARACAS, VENEZUELA
104	42	54	68	56	53	38	81	101	79	65	77	61	66	59	57	59	115	56	59	52	91	59	25	85	49	60	70	65	74	53	53	51							CAPETOWN, SOUTH AFRÍCA
49	68	87	105	5	63	56	39	51	57	55	50	7	60	4	3	5	77	6	47	4	61	72	38	60	11	4	118	9	66	9	6								GENEVA, SWITZERLAND
51	62	91	110	11	57	50	37	52	62	49	46	13	54	8	6	11	78	12	53	8	67	77	39	56	5	9	124	15	73	3									MADRID, SPAIN
51	59	94	113	14	54	47	35	51	66	46	43	15	51	9	9	14	78	15	56	12	70	81	40	54	4	12	120	17	75										LISBON, PORTUGAL
53	110	32	39	61	117	111	81	65	12	107	94	60	107	67	67	62	53	61	22	61	18	17	58	88	76	64	52	60											MANILA, P.I.
40	76	87	99	8	68	64	36	45	50	57	49	3	62	7	8	5	78	9	45	12	53	69	44	57	20	5	110												OSLO, NORWAY
73	61	32	14	113	67	72	87	72	62	75	78	112	69	118	118	113	47	112	71	115	58	46	84	68	118	116													WELLINGTON, NEW ZEALAND
44	71	88	103	5	65	59	37	48	54	55	49	3	60	3	3	4	72	7	47	8	58	72	41	58	14														HUIZEN, NETHERLANDS
55	58	92	112	15	52	46	38	54	67	47	45	17	52	12	11	16	81	16	56	12	72	79	38	56															RABAT, MOROCCO
38	46	100	80	63	33	58	21	25	70	20	11	59	19	56	57	61	38	64	96	62	70	103	92																MEXICO CITY
82	64	55	75	37	71	55	75	89	58	76	81	42	79	42	40	39	50	36	38	38	70	49																	NAIROBI, KENYA
36	93	18	32	67	107	95	98	82	36	121	110	69	118	74	73	68	66	66	25	69	36																		BANDOENG, JAVA
35	114	50	48	57	103	117	64	47	12	88	74	55	89	60	60	56	38	56	32	61																			TOKIO, JAPAN
52	69	83	101	5	65	57	44	55	56	58	54	9	63	9	7	7	80	5	45																				ROME, ITALY
58	102	42	57	43	108	92	77	70	20	102	92	43	106	49	49	44	70	41																					CALCUTTA, INDIA
49	73	81	99	2	69	61	44	52	51	61	55	6	66	9	7	4	76																						BUDAPEST, HUNGARY
28	75	68	51	76	66	82	46	27	50	57	48	71	55	72	74	72																							HONOLULU, HAWAII
45	73	85	101	3	68	61	40	49	51	58	52	2	63	6	5																								BERLIN, GERMANY
47	68	89	105	6	62	56	37	49	56	54	48	6	58	2																									PARIS, FRANCE
45	69	91	106	9	61	58	35	47	55	53	46	6	57																										LONDON, ENGLAND
56	22	99	83	63	14	29	31	43	99	5	16	63																											QUITO, ECUADOR
43	74	85	99	5	68	62	39	47	50	58	51																												COPENHAGEN, DENMARK
40	43	110	90	54	29	42	15	28	83	14																													HAVANA, CUBA
55	29	98	88	59	15	28	28	42	98																														BOGOTA, COLOMBIA
43	122	44	50	51	112	112	70	56																															NANKING, CHINA
13	70	92	78	52	70	69	21																																VANCOUVER, CANADA
29	56	113	96	43	52	52																																	TORONTO, CANADA
81	12	83	72	61	16																																		RIO DE JANEIRO, BRAZIL
69	13	90	80	68																																			LA PAZ, BOLIVIA
48	73	83	99																																				VIENNA, AUSTRIA
73	72	20																																					SYDNEY, AUSTRALIA
83	76																																						PERTH, AUSTRALIA
83																																							BUENOS AIRES, ARGENTINA
																																							ANCHORAGE, ALASKA

WINNIPEG, MAN.																													
WASHINGTON, D.C.																													126
VANCOUVER, B.C.																												238	118
TULSA, OKLA.																											165	106	96
ST. LOUIS, MO.																										36	179	174	86
SAN FRANCISCO, CAL.																									174	146	81	244	152
SALT LAKE CITY, UTAH																								60	116	92	81	185	96
RALEIGH, N.C.																							183	240	64	97	243	23	136
PORTLAND, ORE.																						239	64	54	173	154	26	236	123
PITTSBURGH, PA.																					218	33	167	227	56	92	220	19	107
PIEDRAS NEGRAS, MEX.																				144	170	138	107	142	91	59	188	154	150
PHOENIX, ARIZ.																			86	183	102	190	51	66	126	93	124	198	138
NEW YORK, N.Y.																		215	173	32	246	44	197	258	188	223	246	21	126
NEW ORLEANS, LA.																	119	132	65	93	207	77	144	193	60	55	220	98	144
MONTREAL, QUE.																141	38	220	189	48	236	73	195	255	98	134	232	39	115
MINNEAPOLIS, MINN.															96	106	102	130	121	74	144	100	99	159	46	63	145	93	39
MIAMI, FLA.														152	143	68	112	200	128	103	272	70	210	261	108	119	283	94	192
MEMPHIS, TENN.													88	70	113	36	197	126	76	67	186	64	125	180	25	34	195	77	110
LOS ANGELES, CAL.												161	237	153	247	169	247	37	113	214	83	224	57	34	159	127	108	230	154
HELENA, MONT.											93	140	227	91	184	166	194	92	140	166	52	188	41	81	124	110	55	185	73
FORT WORTH, TEX.										124	122	45	115	88	155	47	141	86	35	111	162	109	99	146	57	26	177	122	121
DETROIT, MICH.									103	145	198	46	118	54	53	96	49	169	137	21	197	52	149	209	46	81	198	40	86
DES MOINES, IA.								54	66	98	144	49	135	24	104	84	103	115	99	72	148	91	95	155	79	48	153	90	61
DENVER, COL.							61	116	66	124	83	88	174	70	163	109	163	59	82	132	99	147	37	95	79	55	112	149	81
CLEVELAND, O.						123	51	10	106	159	206	64	111	64	49	94	40	176	140	11	208	43	157	218	50	86	208	30	86
CINCINNATI, O.					23	109	51	24	84	151	190	42	87	60	71	72	58	158	118	26	199	40	145	204	32	66	203	40	98
CHICAGO, ILL.				25	32	92	31	24	83	128	175	49	120	35	75	84	72	140	117	41	177	64	126	185	21	60	179	60	73
BOSTON, MASS.			84	74	54	177	115	61	158	205	260	164	128	153	144	137	18	229	191	49	255	61	210	270	104	140	226	55	130
ATLANTA, GA.		94	59	38	56	121	75	60	75	173	195	33	61	92	100	43	76	160	103	53	218	35	159	214	47	67	226	55	131
ALBUQUERQUE, N.M.	127	196	112	124	142	33	83	136	56	86	67	161	170	98	187	103	181	33	57	149	112	157	50	90	93	59	130	165	114

To determine mileage between any two of the listed cities in the world, first find these two cities on the world chart (top triangle). Follow the horizontal column across the chart from the upper city, and the vertical column up from the lower city. The box at which these two columns intersect shows the required mileage in hundreds of miles. The same method applies to the U. S. chart (lower triangle) except that mileages are shown in tens. All mileages show the shortest (great circle) paths between points

S.W. 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.

Alaska, Thomas A. Pugh.
Argentina, J. F. Edbrooke.
Australia, C. N. H. Richardson, H. Arthur Matthews, A. H. Garth, A. E. Faull.
Bermuda, Thursten Clarke.
Brazil, W. W. Enete, Louis Rogers Gray.
British Guiana, E. S. Christiani, Jr.
British West Indies, E. G. Derrick, N. Hood-Daniel, Edela Rosa.
Canada, J. T. Atkinson, C. Holmes. Jack Bews, Robert Edkins. W. H. Fraser, Charles E. Roy, Douglas Wood, A. B. Baadsgaard, Frederick C. Hickson.
Canal Zone, Bertram Baker.
Canary Islands, Manuel Davin.
Central America, R. Wilder Tatum.
Chile, Jorge Izquerdo.
China, Baron Von Huene.
Colombia, J. D. Lowe, Italo Amore.
Cuba, Frank H. Kydd, Dr. Evelio Villar.
Denmark, Hans W. Priwin.
Dutch East Indies, E. M. O. Godee, A. den Breems, J. H. A. Hardeman.
Dutch West Indies, R. J. Van Ommeren.
England, N. C. Smith. H. O. Graham, Alan Barber, Donald Burns, Leslie H. Colburn, Frederick W. Cable, C. L. Davies, Frederick W. Gunn, R. S. Houghton, W. P. Kempster, R. Lawton, John J. Maling, Norman Nattall, L. H. Plunkett-Checkemain, Harold J. Self, R. Stevens, L. C. Styles, C. L. Wright, John Gordon Hampshire.
France, J. C. Meillon, Jr., Alfred Quaglino.
Germany, Herbert Lennartz.
Hawaii, O. F. Sternemann.
India, D. R. D. Wadia.
Irish Free State, Ron. C. Bradley.
Iraq, Hagop Kouyoumdjian.
Italy, A. Passini, Dr. Guglielmo Tixy.
Japan, Masall Satow.
Malta, Edgar J. Vassallo.
Mexico, Felipe L. Saldana.
New Zealand, Dr. G. Campbell Macdiarmid, Kenneth H. Moffatt.
Norway, Per Torp.
Philippine Islands, Victorino Leonen.
Portugal, Jose Fernandes Patrae, Jr.
Scotland, Duncan T. Donaldson.
South Africa, Mike Kruger, A. C. Lyell, H. Mallet-Veale.
Spain, Jose Ma. Maranges.
Switzerland, Dr. Max Hausdorff, Ed J. DeLopez.
Turkey, Hermann Freiss, M. Seyfeddin.
Venezuela, Francisco Fossa Anderson.

Applications for Official Observers in the remaining countries should be sent in immediately to the DX Corner.

A NEW L.P.O. FOR TEXAS

Meet Carl Scherz of San Angelo, seated in his DX Corner. He is a member of the A.R.R.L. and is certainly batting a high average for stations received and reported to the DX Editor

S. W. TIME SCHEDULE

LAURENCE M. COCKADAY

THE twenty-sixth installment of the DX Corner for Short Waves contains the World Short-Wave Time-Table for 24-hour use all over the world. The list starts at 01 G.M.T. and runs 24 hours through 00 G.M.T., right around the clock! This new Time-Table contains a List of Short-Wave Stations, logged during the last month in the RADIO NEWS Westchester Listening Post (in our Editor's home), as well as at our official RADIO NEWS Short-Wave Listening Posts throughout the world. It provides an hour-to-hour guide to short-wave fans, whether experienced or inexperienced. The new type of Time-Table shows the Call Letters, Station Locations, Wavelength and Frequency in the middle column. The column at the left gives the times of Transmission, in G.M.T. a.m., and the column at the right gives the Times of Transmission, in G.M.T. p.m. The corresponding time in E.S.T. is also given and space has been left for filling in your own Local Time. The time, E.S.T., in the U. S. would be 8 p.m., E.S.T., for 01 G.M.T., as there is a five-hour difference. The time E.S.T. for 13 G.M.T. would, therefore, be 8 a.m., E.S.T. These two features can be seen at the beginning of each outside column in the new Time-Table. The times, C.S.T., for these two corresponding hours would be 7 p.m., C.S.T. and 7 a.m., C.S.T. The times, M.S.T., for the corresponding hours would be 6 p.m., M.S.T., and 6 a.m., M.S.T. The times, P.S.T., for corresponding hours would be 5 p.m. and 5 a.m., P.S.T. In this way American listeners can easily fill in their own Local Times at the top of the columns. Foreign listeners would probably prefer to use G.M.T., anyway, or, if not, can compute the time difference from G.M.T. and fill in their Local Time in each column head. We earnestly request our readers to give us their opinions of the new Time-Table, as we think it is simpler and saves turning over four pages to find out the schedule of a particular station at a particular time of day. At the end of the Time-Table is a List of Symbols, covering the various irregularities of transmission, schedules, etc. Do you want the Time-Table running vertically on the page or horizontally across the page as formerly?

Affiliated DX Clubs

We are hereby placing a standing invitation to reliable DX Clubs to become affiliated with the DX Corner as Associate Members, acting as advisers on short-wave activities, in promoting short-wave popularity and reception efficiency. A list of associate organizations follows: International DX'ers Alliance, President, Charles A. Morrison; Newark News Radio Club, Irving R. Potts, President, A. W. Oppel, Executive Secretary; Society of Wireless Pioneers, M. Mickelson, Vice-President; U. S. Radio DX Club, Geo. E. Deering, Jr., President; the Radio Club Venezolano of Caracas, Venezuela, President, Alberto Lopez; The World-wide Dial Club of Chicago, Illinois, President, Howard A. Olson.

Any DX fan wishing to join any one of these Clubs or Associations may write for information to the Short-Wave DX Editor, and his letter will be sent to the organization in question. Other Clubs who wish to become affiliated should make their application to the Short-Wave DX Editor. Clubs associated with the DX Corner have the privilege of sending in Club Notes for publication in RADIO NEWS.

Your DX Logs Welcome

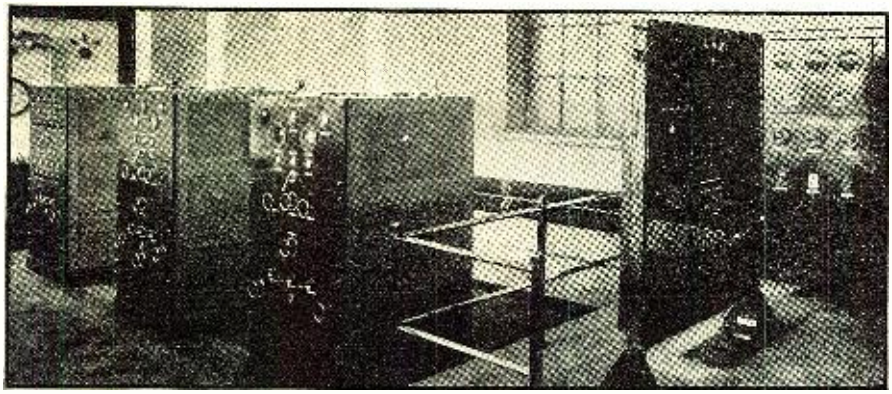
Please keep on sending in information on any stations and Best Bets that you hear during the coming month, getting them in to the short-wave DX Editor by the 20th of the month. In this way you share your "Best Catches" with other readers and they, in turn, share with you making for improved general knowledge on short-wave reception. Our Editors are doing the same thing, working with you day and night, to bring you the best and most reliable short-wave information. Your logs are welcome and are sincerely invited.

Let's See Your DX Corner!

Readers are invited to send in photographs or snapshots of themselves in their Listening Posts, for publication in the DX Corner. Let other readers see what you and your equipment look like! RADIO NEWS will pay $1.00 for each photo used, to help defray expenses. If a copy of RADIO NEWS appears in the photo, this payment will be doubled.

Listening Post Observers and Other Fans Please Notice

Listed on next page is this month's partial information regarding short-wave stations, heard and reported by our World-Wide Listening Posts. Each item in the listening is credited with the Observer's surname. This will allow our readers to note who obtained the information given. If any of our readers can supply actual Time Schedules, actual Wavelengths, correct Frequencies, or any other Important Information regarding these items, the DX Corner Editor and its readers will be glad to get the information. There are some hard stations to pull in in these listings, but we urge our Listening Posts and other readers to



TRANSMITTING EQUIPMENT OF HAS3-HAT, AT BUDAPEST

Here are the three transmitter panels for the Hungarian Short-Wave Stations now being heard on new schedules as reported in the Time-Table, on next page

try their skill in logging the stations and getting correct information about them. When you are satisfied that you have this information correct, send it in to the editor; or if you have received a "veri" from any of the hard-to-get stations, send in a copy of the "veri" so that the whole short-wave fraternity may benefit. The list follows:

CO9GC, Santiago de Cuba, Cuba, 48.79 meters, 6150 kc., 11:30 a.m., to 1:30 p.m., and 3-4:30 p.m., and 9-10 p.m. (Skatzes, Fletcher)

HI3C, La Romana, D. R., 43 meters, 6900 kc., 12:30-2 p.m., E.S.T. Also 6:30-8 p.m., E.S.T., on Tues. and Wed. (Armstrong)

VE9AS, University of New Brunswick, Canada, 46.7 meters, 6425 kc., reported 4:15-5 p.m., and also at 9:20 p.m., E.S.T. (Lee, Jr., Shields, Miller, A. E. Smith). Also reported as VE9AF. (Amlie, Armstrong)

PKYDA2 is reported as the correct call for Bandoeng, Java. 49.02 meters, 6120 kc., using 1.5 kw.; they are on the air 3:30-6:30, 9:30-15, and 23-00 G.M.T. PKYDA, Batavia, Java, a 10 kw. transmitter, is on 49.69 meters from 3:30-6:30 G.M.T. They transmit on 98.68 meters from 23-00 G.M.T., and from 9:30-15 G.M.T. PKYDB, Soerabaya, Java, on 67.11 meters with a power of 1.5 kw., is on the air at the same time as PKYDA2. (Hardeman)

YVQ, Maracaibo, Venezuela, 22.48 meters, 13340 kc., carrying the same programs as **YV1RC** and **YV2RC.** Is heard from 11 a.m., to 1 p.m., E.S.T., irregularly. (Baldwin and Westchester L. P.)

VP6YB is the correct call for the station given last month as VP6TB, Barbados, B. W. I., 4-5 p.m., E.S.T., on 42 meters, according to John Wojtkeiwic.

What has happened to the schedule of W3XAL on 17780? Has it gone irregular? (Howald)

CJRX and **CJRO** reported now on the air from 11 a.m., onward (Howald, Swenson)

CT1AA, Lisbon, Portugal, reported heard on 50.17 meters up to 6 p.m., E.S.T., testing. (Freiss, Malast, G. D. Wood, N. C. Smith, Baldwin, Twomey, McLeod, Bower, Waite, Wright, Garcias.) They have also been reported testing on 25.2 meters 9-10 a.m., E.S.T. (Wagner)

PKYDB2 reported as Bandoeng, Java, on 4.3 mc. (Pasquale)

YV5RMO, Maracaibo, Venezuela, reported heard on 25.7 meters 5:30-5:45 p.m. (A. Emerson)

ZFD, Bermuda, reported testing with organ and other music, 10335 kc. (J. T. Atkinson)

I2RO, Rome, Italy, heard irregularly from 8 a.m., to 3:30 p.m., on 25.4 meters, their old wavelength. (Skatzes, Westchester L. P.)

Our readers are indebted to the following for complete address and schedule of station HP5B: C. D. Moss, Morre, Arendale, Harris.

HJA3, Barranquilla, Colombia, reported heard 6425 kc., on Wed. and Thurs., 9-11:30 p.m., E.S.T. (Schumacher)

KEJ, or is it KEG, reported on 8800 kc. (Amlie, Peters, Koehnlein). Also reported on 9050 kc. (Chambers, Gallagher). Also on 9010 kc. (Catchim, Suratt, Jr.). Also station **KEE** reported 7710 kc., with either Columbia or NBC programs for Honolulu. Who knows the truth of this mixup?

JB, Johannesburg, S. Africa, 6122 kc., reported heard. (Pasquale)

Short-wave Stations that relay JOAK at various times of day are: JVF, JVN, JVM, JVP, JVT. The correct verification address is, Kokusaidenwa Kaisha, Ltd., Osaka Bldg., Kojimachiku, Tokyo, Japan. (Bews)

CMCI, Havana, Cuba, reported heard on 49.5 meters 8-11 p.m., except Saturday. (Amlie)

COK, Havana Cuba, 44 meters, reported 8-11:15 p.m., E.S.T.

PRA8, Pernambuco, Brazil, 49.5 meters, 6040 kc., closes down at 1:30 a.m., G.M.T. (Donaldson, N. C. Smith.) Who knows complete program?

SP1SI, reported as a new Polish station testing on various wavelengths. Who can give schedule and frequency? (N. C. Smith)

VE9CA, reported as a new station at Calgary, Alberta, Canada, 49.75 meters, 6030 kc., 25 kw. (Baadsgaard)

TIXGP3, San Jose de Costa Rica, reported on 5777 kc. The long-wave call is TIGPH. (Miller)

Who is JV on about 47 meters? He relays JOAK at about 2 a.m., E.S.T. (Haley)

HJ4ABN, Manizales, Colombia. (Moore of Arkansas confirms the last letter of this call as N). (Kemp, Tolpin, Moore and Young)

New Jap station on about 6350 kc., carrying the same program as JVT reported by Howald.

New Daventry transmitters reported as follows: GSL, 49.1 meters, 6110 kc., 15 kw.; GSI, 19.66 meters, 15260 kc., 10 kw.; GSJ, 13.93 meters, 21530 kc., 10 kw. (Bower)

(*Continued on page 682*)

S.W. PIONEERS
Official RADIO NEWS Listening Post Observers

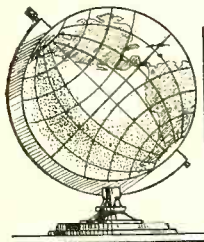
LISTED below by States are the Official RADIO NEWS Short-Wave Listening Post Observers who are serving conscientiously in logging stations for the DX Corner.

United States of America

Alabama, J. E. Brooks; **Arizona,** Geo. Pasquale; **Arkansas,** Don Pryor, James G. Moore; **California,** E. G. DeHaven, C. H. Canning, O. I. Noda, E. S. Allen, A. E. Berger, Geo. C. Sholin, Wesley W. London, G. C. Gallagher, Robert J. McMahon, Werner Howald; **Colorado,** Wm. J. Vette; **Connecticut,** Phillip Swanson, Geo. A. Smith, H. Kemp; **District of Columbia,** Douglas S. Catchim; **Florida,** George H. Fletcher, E. M. Law, James F. Dechert; **Georgia,** James L. Davis, C. H. Armstrong, Guy R. Bigbee, John McCarley, R. W. Winfree; **Idaho,** Bernard D. Starr, Lawrence Swenson. **Illinois,** Phillip Simmons, E. Bergeman, Robert L. Weber, Floyd Waters, Charles A. Morrison, Larry Eisler, Samuel Tolpin, Ray A. Walters, Robert Irving; **Indiana,** Freeman C. Balph, J. R. Flannigan, Henry Spearing; **Iowa,** J. Harold Lindblom; **Kansas,** C. W. Bourne, William Schumacher; **Kentucky,** James T. Spalding, Charles Miller, William A. McAlister, George Krebs; **Louisiana,** Roy W. Peyton; **Maryland,** Howard Adams, Jr., James W. Smith, J. F. Fritsch; **Massachusetts,** Armand A. Boussey, J. Walter Bunnell, Harold K. Miller, Donald Smith, Elmer F. Orne, Arthur Hamilton, Roy Sanders, Robert L. Young, Walter L. Chambers; **Michigan,** Stewart R. Ruple; **Minnesota,** E. M. Norris, Dr. G. W. Twomey, M. Mickelson; **Mississippi,** Dr. J. P. Watson, Mrs. L. R. Ledbetter; **Missouri,** C. H. Long; **Montana,** Henry Dobrovalny; **Nebraska,** P. H. Clute, G. W. Renish, Jr., Harold Hansen, Hans Andersen; **Nevada,** Don H. Townsend, Jr.; **New Hampshire,** P. C. Atwood, A. J. Mannix; **New Jersey,** William Dixon, R. H. Schiller, Wm. F. Buhl, Paul B. Silver; **New Mexico,** G. K. Harrison; **New York,** Robert F. Kaiser, William Koehnlein, T. J. Knapp, Joseph M. Malast, Capt. Horace L. Hall, S. G. Taylor, John M. Borst, William C. Dorf, R. Wright, I. H. Kattall, H. S. Bradley, Donald E. Bame, Albert J. Leonhardt, Edmore Melanson, John C. Kalmbach, Jr., J. H. Miller; **North Carolina,** H. O. Murdoch, Jr., W. C. Couch, E. Payson Mallard; **Ohio,** William A. Oker, R. W. Evans, C. H. Skatzes, Donald W. Shields, Albert E. Emerson, Samuel J. Emerson, Clarence D. Hall, Charles Dooley, Stan Elcheshen; **Oklahoma,** H. L. Pribble, Robert Woods; **Oregon,** Virgil C. Tramp, James Haley, George R. Johnson, Ned Smith, Harold H. Flick; **Pennsylvania,** Edward C. Lips, K. A. Staats, C. T. Sheaks, George Lilley, John A. Leininger, F. L. Stitzinger, Hen F. Polm, Charles Nick, Oliver Amlie, R. O. Lamb, Harold W. Bower; **Rhode Island,** Joseph V. Trzuskowski; **South Carolina,** Ben F. Goodlett, Edward F. Bahan; **South Dakota,** Paul J. Mraz; **Tennessee,** Charles D. Moss; **Texas,** Heinie Johnson, Bryan Scott, John Stewart, Carl Scherz; **Utah,** Harold D. Nordeen, Earl Larson; **Vermont,** Joseph M. Kelley, Eddie H. Davenport, Dr. Allen E. Smith; **Virginia,** Gordon L. Rich, G. Hampton Allison, D. W. Parsons, L. P. Morgan; **Washington,** A. D. Golden, Charles G. Payne, Glenn E. Dubbe; **West Virginia,** Kenneth Boord, R. E. Sumner; **Wisconsin,** Willard M. Hardell, Walter A. Jasiorkowski; **Wyoming,** Dr. F. C. Naegeli, L. M. Jensen.

MEET OLIVER AMLIE

New O.R.N.S.W.L.P.O. for Pennsylvania; winner of many short-wave contests



WORLD SHORT WAVE TIME-TABLE

Compiled by Laurence M. Cockaday

Hours of transmission for the World's Short Wave Broadcast Stations

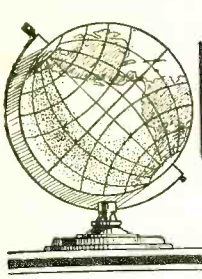
FILL IN LOCAL TIME											
8	9	10	11	M	1	2	3	4	5	6	7
EASTERN STANDARD TIME											
01	02	03	04	05	06	07	08	09	10	11	12
GREENWICH MEAN TIME											

HOURS OF TRANSMISSION

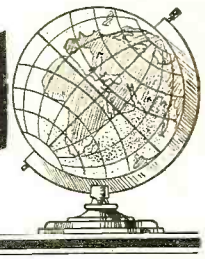
Meters length Wave-	Call Letters	Frequency Kc.	City Country
13.9+	W8XK	21540	Pittsburgh, Pa.
16.8+	W3XAL	17780	Bound Brook, N. J.
16.8+	PHI	17775	Huizen, Holland
16.8+	DJE	17760	Zeesen, Germany
19.4	PRADO	15440	Riobamba, Ecuador
19.5	HAS3	15370	Budapest, Hungary
19.5	W2XAD	15330	Schenectady, N. Y.
19.6+	CP7	15300	La Paz, Bolivia
19.6+	DJQ	15283	Zeesen, Germany
19.6+	W2XE	15270	New York, N. Y.
19.6+	FYA	15243	Pontoise, France
19.6+	PCJ	15220	Huizen, Holland
19.7	W8XK	15210	Pittsburgh, Pa.
19.7	DJB	15200	Zeesen, Germany
19.8	GSF	15140	Daventry, England
19.8	HVJ	15123	Vatican City
19.9+	RKI	15040	Moscow, U.S.S.R.
22.0	JYK	13610	Kemikawa-Cho., Jap.
22.3+	TIEP	13420	San Jose, Costa Rica
22.4+	YVQ	13340	Maracaibo, Ven.
22.7+	QRP	13200	Ruysselede, Belg.
22.7+	VPD	13200	Suva, Fiji Islands
23.3	CNR	12830	Rabat, Morocco
24.2	CT1GO	12396	Paredo, Portugal
24.8+	CT1CT	12082	Lisbon, Portugal
24.9+	RW59	12000	Moscow, U.S.S.R.
25.2	FYA	11900	Pontoise, France
25.2	W8XK	11870	Pittsburgh, Pa.
25.2+	GSE	11860	Daventry, England
25.3+	W2XE	11830	New York, N. Y.
25.4	I2RO	11810	Rome, Italy
25.5	DJD	11760	Zeesen, Germany
25.5	GSD	11750	Daventry, England
25.5+	PHI	11730	Huizen, Holland
25.6	FYA	11720	Pontoise, France
25.6	CJRX	11720	Winnipeg, Canada
25.6	YV5RMO	11720	Maracaibo, Venez.
26.0	XGR	11530	Shanghai, China
27.9+	JVM	10740	Nazaki, Jap.
28.1	CEC	10670	Santiago, Chile
28.1+	JVN	10660	Nazaki, Japan
28.3+	FYB	10578	Paris, France
28.9+	LSX	10350	Buenos Aires, Argen.
29.0+	ZFD	10335	Hamilton, Bermuda
29.0+	ORK	10330	Ruysselede, Belgium
30.4	EAQ	9860	Madrid, Spain
30.5+	IRM	9820	Rome, Italy
30.6+	GCW	9790	Rugby, England
30.7+	I2RO	9780	Rome, Italy
31.2+	CT1AA	9600	Lisbon, Portugal
31.2+	W3XAU	9590	Philadelphia, Pa.
31.2+	VK2ME	9590	Sydney, Australia
31.3	HBL	9580	Geneva, Switzerland
31.3	VK3LR	9580	Lyndhurst, Victoria, Australia
31.3	GSC	9575	Daventry, England
31.3+	W1XAZ	9570	Springfield, Mass.
31.3+	VUB	9565	Bombay, India
31.3+	DJA	9560	Zeesen, Germany
31.4+	LKJ1	9540	Jeloy, Norway
31.4+	DJN	9539	Zeesen, Germany
31.4+	W2XAF	9530	Schenectady, N. Y.
31.5	VK3ME	9510	Melbourne, Australia
31.5	GSB	9510	Daventry, England
31.5+	PRF5	9501	Rio de Janeiro, Braz.
31.7+	COH	9428	Havana, Cuba
31.8	PLV	9415	Bandoeng, Java
32.8	CP6	9120	La Paz, Bolivia
33.1+	TFK	9050	Reykjavik, Iceland
37.3	CNR	8035	Rabat, Morocco
37.3+	IRS	8020	Rome, Italy
37.4+	HC2JSB	8000	Guayaquil, Ecuador
38.4+	HBP	7790	Geneva, Switzerland
38.5	YNLF	7788	Managua, Nicaragua
40.5+	HJ3ABD	7402	Bogota, Colombia
40.5+	EA8AB	7403	Tenerie, C. I.
41.8	CR6AA	7177	Lobito, Angola. Port. West Africa
42.0	HJ4ABB	7138	Manizales, Col.
42.0	OA4R	—	Lima, Peru
42.1+	HB9B	7120	Basle, Switzerland
43.4+	HI3C	6900	La Romana, D.R.
44.0	HIH	6818	San Pedro, D. R.
44.5+	JVT	6750	Nazaki, Japan
44.6+	TIEP	6710	San Jose, Costa Rica
45.0+	HC2RL	6668	Guayaquil, Ecuador
45.3	PRADO	6616	Riobamba, Ecuador
45.3+	RW72	6611	Moscow, U. S. S. R.
46.2	HJ5ABD	6490	Cali, Colombia
46.2+	HI4D	6482	San Domingo, D. R.
46.5+	HJ1ABB	6447	Barranquilla, Col.
46.6+	VE9AS	6425	Fredericton, N. Bru.
46.6	HJA3	6425	Barranquilla, Col.
47.0	YV4RC	6375	Caracas, Venez.

HOURS OF TRANSMISSION

8	9	10	11	N	1	2	3	4	5	6	7
13	14	15	16	17	18	19	20	21	22	23	00



WORLD SHORT WAVE TIME-TABLE

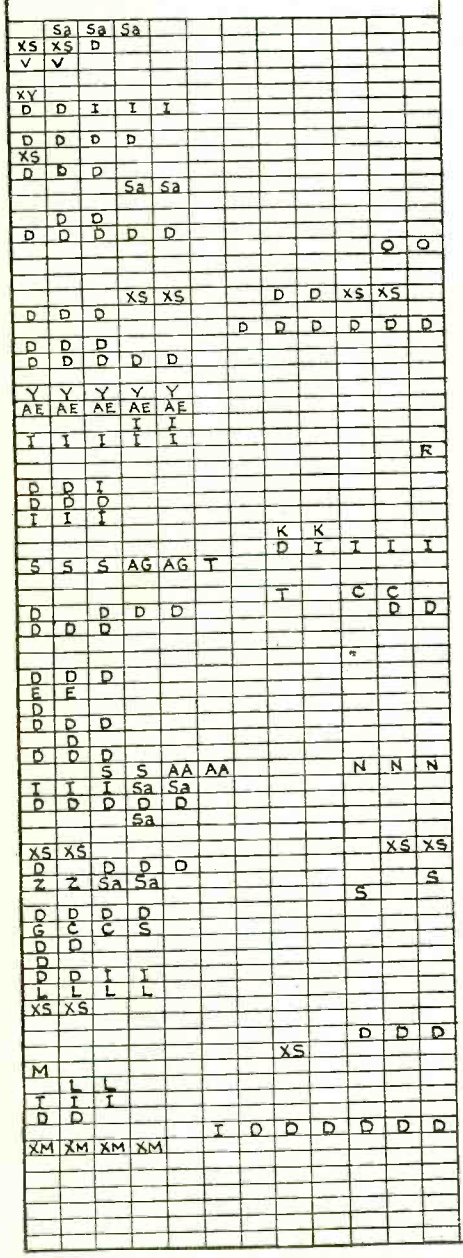


(Continued from the Previous Page)

Hours of transmission for the World's Short Wave Broadcast Stations

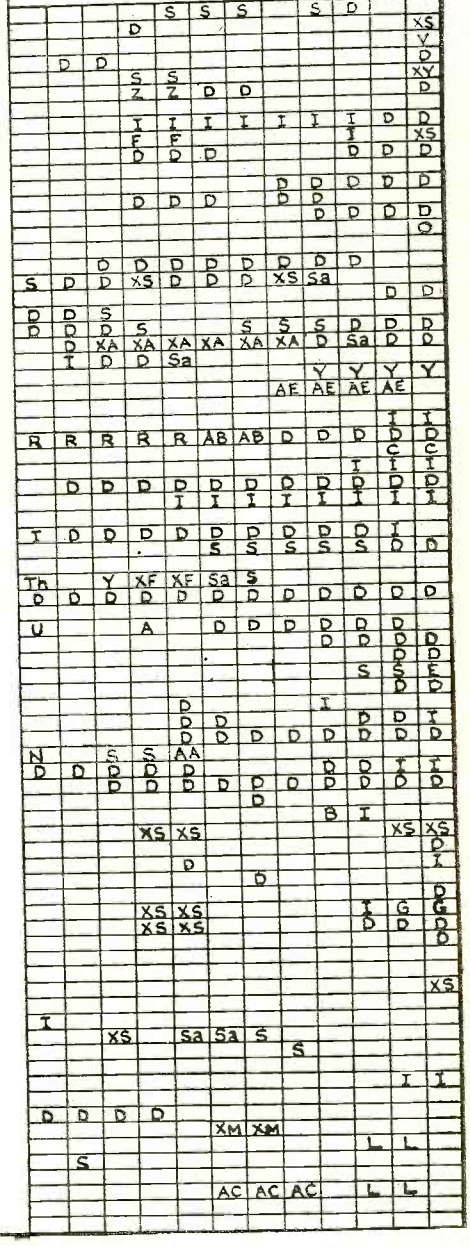
												FILL IN LOCAL TIME												
8	9	10	11	M	1	2	3	4	5	6	7	EASTERN STANDARD TIME	8	9	10	11	N	1	2	3	4	5	6	7
01	02	03	04	05	06	07	08	09	10	11	12	GREENWICH MEAN TIME	13	14	15	16	17	18	19	20	21	22	23	00

HOURS OF TRANSMISSION



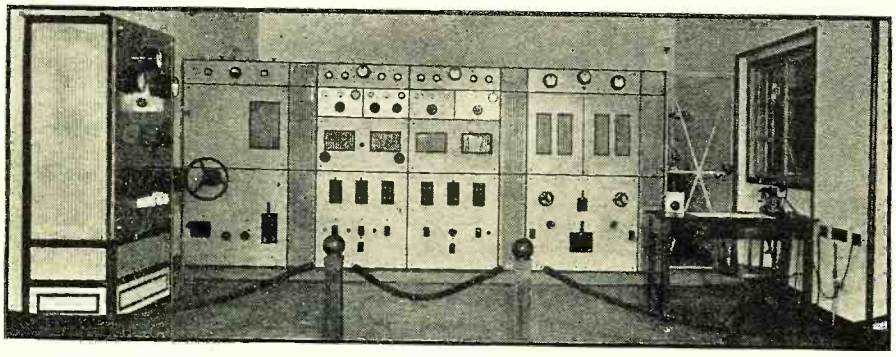
Meters Wave-length	Call Letters	Frequency Kc.	City Country
47.5	HIZ	6315	San Domingo, D. R.
47.8	HJ3ABF	6275	Bogota, Colombia
48.1	OAX4B	6230	Lima, Peru
48.1	HJ4ABC	6230	Pereira, Col.
48.4	CT1GO	6198	Parede, Portugal
48.4	HI1A	6188	Santiago de Los Caballeros, D. R.
48.7+	CJRO	6160	Winnipeg, Manitoba
48.7+	HJ2ABA	6150	Tunja, Colombia
48.7+	VV3RC	6150	Caracas, Venezuela
48.7+	VE9CL	6150	Winnipeg, Man.
48.7+	CSL	6150	Lisbon, Portugal
48.7+	CO9GC	6150	Santiago, Cuba
48.8+	W8XK	6140	Pittsburgh, Pa.
48.9+	ZGE	6130	Kuala Lumpur, F. M. S.
48.9+	LKJ1	6128	Jeloy, Norway
48.9+	ZTJ	6122	Johannesburg, Africa
49.0+	W2XE	6120	New York, N. Y.
49.0+	PKYDA2	6120	Bandoeng, Java
49.0+	VV2RC	6112	Caracas, Ven.
49.0+	VE9HX	6110	Halifax, N. S.
49.0+	VUC	6109	Calcutta, India
49.1+	W3XAL	6100	Bound Brook, N. J.
49.1+	W9XF	6100	Chicago, Ill.
49.1+	HJ4ABL	6100	Manizales, Col.
49.1+	HJ4ABN	6100	Manizales, Col.
49.1+	VE9GW	6090	Bowmanville, Can.
49.2+	I2RO	6085	Rome, Italy
49.3+	CP5	6080	La Paz, Bolivia
49.3+	W9XAA	6080	Chicago, Ill.
49.3+	DJM	—	Zeesen, Germany
49.3+	CQN	6073	Macao, Asia
49.3+	OER2	6072	Vienna, Austria
49.3+	VE9CS	6070	Vancouver, B. C
49.3+	HJ1ABF	6070	Barranquilla, Col.
49.4+	VQ7LO	6060	Nairobi, Kenya, Afr.
49.4+	W8XAL	6060	Cincinnati, Ohio
49.4+	W3XAU	6060	Philadelphia, Pa.
49.4+	OXY	6060	Skamlebaek, Den.
49.5+	GSA	6050	Daventry, England
49.6+	HJ1ABG	6042	Barranquilla, Col.
49.6+	W1XAL	6040	Boston, Mass.
49.6+	PRA8	6040	Pernambuco, Brazil
49.7+	HP5B	6030	Panama City, Pan.
49.7+	YV6RV	6030	Valencia, Venezuela
49.8	DJC	6020	Zeesen, Germany
49.8+	ZHI	6012	Singapore, Malaya
49.8+	COC	6010	Havana, Cuba
49.8+	XEBT	6010	Mexico City, Mex.
49.9+	VE9DN	6005	Montreal, Quebec
49.9+	RW59	6000	Moscow, U. S. S. R.
50.1	TGX	5984	Guatemala City
50.1+	XECW	5980	Xantocam, Mexico
50.1+	HIX	5980	San Domingo, D. R.
50.2+	HVJ	5969	Vatican City
50.5+	HJ1ABJ	5940	Santa Marta, Col.
50.6+	HJ4ABE	5860	Medellin, Colombia
51.2+	YV5RMO	5850	Maracaibo, Venez.
51.4+	HJ2ABC	5824	Cucuta, Colombia
51.7+	TIX	5795	San Jose, Costa Rica
51.8+	OAX4D	5780	Lima, Peru
52 0	TIXGP3	5777	Almatica, San Jose, Costa Rica
52.7+	XQAJ	5660	Shanghai, China
52.7	FIQA	5692	Tananarive, Mad.
55.5+	HAT	5400	Budapest, Hungary
64.5+	HC2EP	4650	Guayaquil, Ecuador
69.4	G6RX	4320	Rugby, England
69.5	YNLF	4316	Managua, Nicaragua
70.2	RW15	4273	Khabarovsk, Siberia
73.0	HCJB	4107	Quito, Ecuador
74.9+	CT2AJ	4002	San Miguel, Azores
79.9+	CT1CT	3750	Lisbon, Portugal
81.0+	Radio LL	3700	Paris, France
84.6+	CR7AA	3543	Lourenzo Marques, Mozambique

HOURS OF TRANSMISSION



KEY TO TIME TABLE SYMBOLS

A—Sunday, Winter only
B—Sunday, Monday, Wednesday, Friday
C—Monday, Wednesday, Friday
D—Daily at hours indicated
E—Tuesday, Thursday
F—Friday
G—Tuesday, Thursday, Saturday
H—Wednesday, Friday, Sunday
I—Irregularly
J—Thursday, Saturday
K—Monday, Friday
L—Wednesday, Saturday
M—Monday
N—Monday, Wednesday, Thursday
O—Tuesday, Friday, Sunday
P—Except Tuesday, Wednesday, Summer only
Q—Except Tuesday, Wednesday
R—Thursday, Friday, Saturday
S—Sunday
T—Tuesday
TH—Thursday
U—Sunday, Summer only
V—Wednesday, Sunday
W—Wednesday
Y—Monday, Wednesday, Saturday
Z—Tuesday, Friday
AA—Saturday, Sunday
AB—Except Monday, Tuesday, Wed.
AC—Monday, Tuesday, Saturday
AD—Time at 20 G.M.T.
AE—Except Monday, Wednesday, Friday
AF—Saturday irregularly
AG—Tuesday, Sunday
AH—Time at 7:30 G.M.T.
AI—Tuesday, Friday, Saturday
AJ—Wednesday, Thursday
SA—Saturday
XA—Except Saturday, Sunday
XF—Except Friday
XG—Except Tuesday, Thursday, Saturday
XM—Except Monday
XS—Except Sunday
XSa—Except Saturday
XT—Except Tuesday
XTh—Except Thursday
XW—Except Wednesday
XX—Tuesday, Thursday, Friday
XY—Except Tuesday, Sunday



CT1GO's TRANSMITTER

This is the new 5 kw. short-wave transmitter for the Portuguese Radio Club, at Lisbon. The long-wave set is an exact duplicate

The DX Corner (Short Waves)

(*Continued from page* 679)

VPD, Suva, Fiji Islands, reported heard Tues. and Fri., 11:30 a.m., to 12:30 p.m., E.S.T. (Spearing)

A new Australian, VK3AW, reported on 31.3 meters. (Pasquale)

HKE, Observatorio Nacional de San Bartolome, Bogota, Colombia, reported on the air 8-9 p.m., E.S.T., on Tues. and Sat. on a wavelength of 42.3 meters. (Armstrong.) Frequency reported as 7.09 mc., heard 3:30-7:30 p.m., E.S.T. (Flick.)

HB9B, Basle, Switzerland, 42.14 meeters, 7.12 mc., heard Thursday from 4-4:30 p.m., E.S.T. (N. C. Smith, Moore, Harris, Arendale. (Armstrong, Waters, Chambers.)

XECW, Xantocam, Mexico, 50.17 meters, 5980 kc., reported heard after 10:15 p.m. to midnight, E.S.T. (Bourne, Miller.)

JVP, 7510 kc., heard 9:44 a.m., E.S.T. (Bourne.)

TFK, Reykjavik, Iceland, 9050 kc., heard 7:20 p.m., E.S.T. (Jensen.)

HKB, Bogota, Colombia, 9903 kc., testing with Lima, Peru, Monday, Wednesday, Friday, 4:30-5 p.m., E.S. (Wailonas.)

ZHJ, Penang, Straits Settlements 49.44 meters, 6072 kc., heard Mon., Weds. and Sat. What is frequency and schedule? (P. B. Silver, N. C. Smith.)

HRP1, San Pedros, Rep. de Honduras, is reported soon to go on the 49-meter band at about 6015 kc. (Bower, Skatzes.) Another report says they will be on the air on 42.69 meters, 7028 kc. (Sholin.)

Who is CX30, on 48 meters? (Villar.)

HJ2ABH, Tunja, Colombia, 48.7 meters, reported heard. Or can it be HJ2ABA? (N. C. Smith.)

CT2AJ has changed frequency from 4000 kc. to 4002 kc. (Bigbee.)

Who is VK15 on 6430 kc., reported heard 11 p.m.? (Jensen.)

HJ1ABH, Cienaga, Magdalena, Colombia, reported heard 8-10 p.m., E.S.T. (Armstrong.)

HJ1ABE, Cartagena, Colombia, 49.05 meters, transmits from 7 p.m. onward. They use 24 meters in the daytime. (Malast.)

HJ4ABL, Manizales, Colombia, 49.1+ meters, 6100 kc., 6-7 p.m., E.S.T., announcing themselves as Ecos de Occidente. (Miller, A. E. Smith.)

Who has heard HH1FS on about 6550 kc., at 10-10:15 p.m., E.S.T.? They say they are at Mala-Raza. They talk at this time to HH-FM, also at Mala-Raza. They say they use "Flea" power of 4 watts with "loop" modulation. (Hi!) (Saldana.)

VK2ME, Sydney, Australia, reported heard by L.P.O. Seyfeddin. This is the first report we have had of this station being heard in Turkey. (F.B.O.M.—Editor.)

ZP10, Asuncion, Paraguay, reported heard. (Armstrong.)

PK1WK now reported changed in wavelength to 85.96 meters, 3490 kc., at 6 a.m., E.S.T. (Gallagher.) Also reported by Sholin, who states he received card that they broadcast from 10:30 G.M.T., onward. Call may have been changed to PKYDH3. Still another L.P.O. reports PK1WK off the air. Who knows about this?

XEIO reported as Mexico City, 50.16 meters, 59.8 mc., 5-8 p.m., E.S.T. (Gallagher.)

XOD, Shanghai, China, on about 49 meters, reported heard 5:30-6 p.m., E.S.T. (Thatcher.)

GCW, Rugby, England, reported heard on 30.6 meters, irregularly, relaying English programs. (Young, Skatzes, Saldana.)

Readers Who Helped Log Stations for This Month's Report

L. P. Morgan, J. H. A. Hardeman, Hagop Kouyoumdjian, Frederick W. Cable, Robert Irving, Alfred Quaglino, Ray A. Walters, M. Seyfeddin, Robert J. McMahon, Carl Scherz, Ron C. Bradley, G. C. Gallagher, Walter L. Chambers, Earl Larson, Samuel Tolpin, Harold W. Bower, Joseph H. Miller, Dr. Allen E. Smith, Charles Dooley, Fred C. Hickson, L. M. Jensen, R. O. Lamb, Robert L. Young, Harold H. Flick, Paul B. Silver, Stan Elcheshen, Alvin Beal, L. T. Lee, Jr., William H. Cooper, Jr., John Cullen, Matthew Ogrin, Anthony Slapkowski, Jr., Jerry M. Hynek, C. McCormick, Alfred J. Mannix, Hans Andersen, Charles Krier, J. H. Hayes, Bob H. Cleaver, G. W. Osbahr, Leon Tallman, E. G. Hendrickson, Forrest W. Dodge, Arthur Bogart, Donald E. Dickson, Jr., Sidney

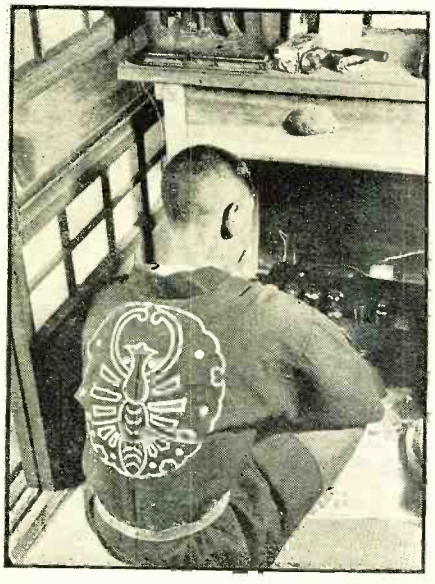
(*Continued on next page*)

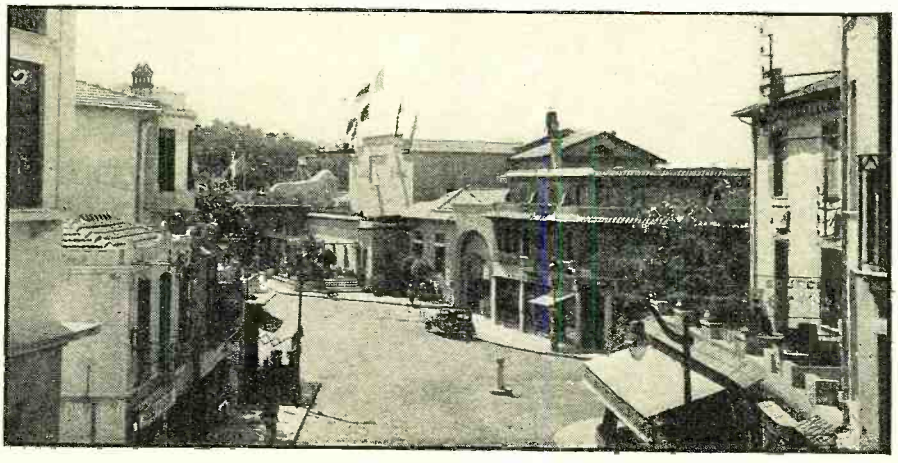
VIEW OF AN EXHIBITION STAND AT INDIA'S FIRST RADIO SHOW

This was sent in by O.R.N.S.W.L.P.O. Wadia, who is a prime mover in expanding radio in his country. Notice the Philco and the Scott short-wave apparatus displayed

THE HOME OF ALFRED QUAGLINO

Monsieur Quaglino lives in this beautiful town, Juan-les-Pins, France. He is a newly appointed L.P.O. for that country. At left, the Japanese peasants go in strong for short-wave reception. Their receivers are placed on the floor, however, with their loudspeakers overhead





WORLD ALPHABETS

Compiled by C. C. Clark, Ph.D.*

THESE "alphabets" are arranged for the purpose of assisting the radio DX listener in recognizing quickly the spoken Call Letters of Foreign Broadcasting Stations. They must, therefore, be simple, and easy of recognition. All diacritical marks have been omitted. This means that a few of the letters are somewhat unscientifically represented, their true sounds being only approximately given. These are the letters with no true representation in English spelling. The alphabets are *not* for the purpose of learning to pronounce the letters, but to help recognize them when they are heard.

The seven columns below give the alphabet and first ten numbers in English, German, French, Italian, Portuguese, Spanish and Dutch, respectively. All pronunciations are given as they sound when spelled in English. The numerals are given in the original language with pronunciation (in parenthesis) as they would sound in English pronunciation.

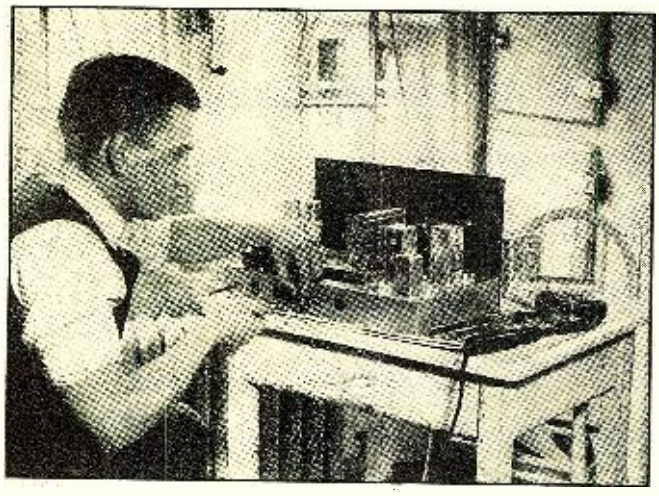
* School of Commerce, New York University.

ENGLISH ALPHABET	GERMAN PRONUNCIATION	FRENCH PRONUNCIATION	ITALIAN PRONUNCIATION	PORTUGUESE PRONUNCIATION	SPANISH PRONUNCIATION	DUTCH PRONUNCIATION
a	ah	ah	ah	ah	ah	ah
b	bay	bay	bay	beh	beh	bay
c	tsay	say	chay	seh	seh	say
d	day	day	dee	deh	deh	day
e	ay	ay	ay	eh	eh (as in mate)	ay
f	eff	ef	effa	effeh	effeh	eff
g	gay	zay (z like s in pleasure)	ge (as in genus)	zhay	heh	ghay
h	hah	ash	ahk-kah	a-gah (er-gah)	acha	hah
i	ee	ee	ee (as i in machine)	ee	ee	ee (as y in pretty)
j	yot (yah)	zee (z like s in pleasure)		zhota	hota	ja (yay)
k	kah	kah	kappa	kah	kah	kah
l	ell	el	ella	elleh	elleh	el
m	em	em	emma	emmeh	emmeh	em
n	en	en	enna	enneh	enneh	en
o	oh	oh!	o (as in toll)	o (as in for)	o (shorter than o in oh)	oah (as in woah)
p	pay	pay	pay	peh	peh	pay
q	koo	keeu	koo	keh	koo	keeu
r	err	air (aer)	erra	err (airr)	erreh	err
s	ess	ess	essa	esseh	esseh	es
t	tay	tay	tay	teh	teh	tay
u	oo	eeu	oo	oo	oo	eeu
v	fow (as in found)	vay	vay	veh	veh	vay
w	vay	dooble-vay	doppio-vay	veh-dobrado	dobleh-veh	way
x	iks	eeks	iks	sheeze	ekis	iks
y	ipsilon	ee-grec	e-greco	ipsilon or e-gray-goo	ee-gre-eh-ga	aai
z	tset	zett	dzay-ta	zeh	theta	zett
1	ein (as in wine)	un (uhn)	uno	un	uno	een (ayn)
2	zwei (zwy)	deux (like di in dirt)	due (e as a in ate)	dous	dos	twee (tway)
3	drei (dry)	troix (trwa)	tre (e as a in ate)	trez	tres (trace)	drie (dree)
4	vier (feer)	quatre (katr)	quatro	quatro	cuatro (quatro)	vier (veer)
5	fünf (feeunf)	cinq (sank)	cinque (chinq-que)	cinco (sinko)	cinco (sinko)	vijf (vaif)
6	sechs (zex)	six (seess)	sei (seh as e in men)	seis (e as in ell)	seis	zes
7	sieben (zeeben)	sept (set)	sette (setteh)	sete (e as in set)	siete (sieteh)	zeven (zaven)
8	acht (ahcht)	huit (weet)	otto (first o as in ought)	oito (o as in on)	ocho	acht (ahcht)
9	neun (noin)	neuf (nerf)	nove (noveh)	nove (noveh)	nueve (nueveh)	negen (nayghen
10	zehn (tsayn)	dix (dees)	dieci (diechi)	dez (e as in set)	diez (deeis)	tien (teen with short e)

(*Continued for previous page*)

G. Millen, Sidney Elkin, W. H. Coburn, Phil E. Lockwood, Edward G. Schmeichel, Kennard F. Myers, W. R. Manne, Richard Suratt, Jr., F. Harlan Simmons, Jr., Harold G. Burdick, Freeman C. Balph, Ralph B. Baldwin, Glenn Roof, Manuel Gomez, Charles Nead, Carl Schradieck, R. H. Loubert, W. W. Gaunt, Jr., Carl Stahler, Frank Siegel, L. L. Umberger, Ray P. Laton, Morgan Foshay, Peter Musnicki, Charles S. Potts, Harry Myers, Raymond B. Edge, Hugo Mangeri, W. R. Hamilton, Sherman Moulton, F. R. Curtis, L. C. Dank, Edward Hughes, Earl Wickham, Lewis F. Miller, Roland Robinson, Guy E. Hews, Vern A. Scharf, Russell Leader, Otts Rehak, C. W. Anderson, Wheeler T. Thompson, Jas. W. Clarkson, L. J. Niederle, Charles W. Havlena, Frank E. Baier, Wm. T. Arms, S. P. Herren, Jr., Walter F. Daboll, Taylor W. Gannett, James L. Davis, I. V. Tobler, Bryan Scott, Frank H. Kydd, H. S. Bradley, R. Wright, Jack Bews, Charles D. Moss, Felipe L. Saldana, Paul V. Starr, Jack Dwyer, Robert C. Byers, George Harris, William Ray, R. F. Mackie, Lauren E. Cheda, Arthur B. Coover, L. C. Styles, Robert Marshall, Werner Howald, R. B. Holmgren, G. Douglas Wood, Robert Rogers, G. W. Twomey, M.D., J. T. Atkinson, Kenneth R. Boord, H. McKnight, A. B. Baadsgaard, Oliver Harris, Duncan T. Donald-

(*Continued on page* 713)



The "HOW TO BROWNING

(*By* Glenn H. Browning)

In this third installment the author the operating and adjustment data highest efficiency. He also includes

Part

THE FINISHING TOUCH

This new set when completed gives a very workmanlike and "commercial" appearance and in operation lives up to that appearance.

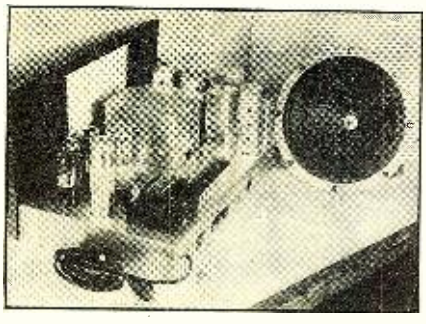
IN the previous articles the writer has described an all-wave superheterodyne incorporating several new features. The constructional details have already been taken up and it remains to give instructions as to the proper alignment of the various circuits involved, as well as a few suggestions for obtaining the best possible results from the receiver itself.

AFTER the wiring has been done, a careful check should be made to see that all the parts are properly located and connected. When this is done the receiver is ready to try out. Be sure to plug in the loudspeaker before turning on the set, for if this is *not* done a considerable higher voltage than normal is placed on one of the filter condensers. As has already been stated in previous articles, the complete tuner (as well as the two intermediate frequency band-pass transformers) have been carefully aligned at the factory, the i.f. transformers having been set accurately on the intermediate frequency of 456 kilocycles, while the tuner was aligned in a complete receiver. The alignment has been made by means of an all-wave signal generator having an attenuated output, so that not only have the proper adjustments been made on all the trimming and padding condensers but the overall sensitivity has also been obtained on at least three points on each of the four bands. Therefore, if the receiver has been carefully wired it should bring in signals *without any adjustments being necessary at all!* However, a slight lining up of the i.f. transformers may increase the overall sensitivity if the adjustment has been disturbed. It should be stated however, that in *all cases* the receiver should receive signals before changes in any of the adjustments are made. The i.f. transformers may be readjusted in the following manner, without the aid of either signal generator or an output meter: First, remove the antenna lead; turn both volume controls to the point of maximum response (rotate clockwise as far as possible); turn tone control as far counter-clockwise as possible without turning off the set; turn on the automatic volume control (rotate A.V.C. switch counter-clockwise): Set selector switch on either the second or third band. When this is done a hissing noise should be heard from the loudspeaker: The adjustment of the variable air condensers should be set at such a point that no signals from outside station are being received.

The i.f. transformer which feeds the detector should be aligned first. Its location is given on the drawings as T2. It has already been mounted so that the adjustment screws face out from the chassis. Three of these adjustment screws will be found. The center adjustment screw is the link-tuned circuit and is not connected to either the 58 or the 2A6 tube. Do *not* change the adjustment of this link circuit for tube or lead capacity has no effect on its frequency. The top and the bottom adjustment screws may be rotated very slightly until the maximum hissing sound is heard. A similar procedure should be followed on T1 (remember *not* to change the tuning of the link circuit in this transformer which is adjusted by the middle screw). To align T1 the 56 beat-frequency-oscillator tube should be removed from its socket. When these transformers are brought into alignment a hiss will be heard even with the 58 tube (used as an r.f. amplifier) disconnected from the circuit.

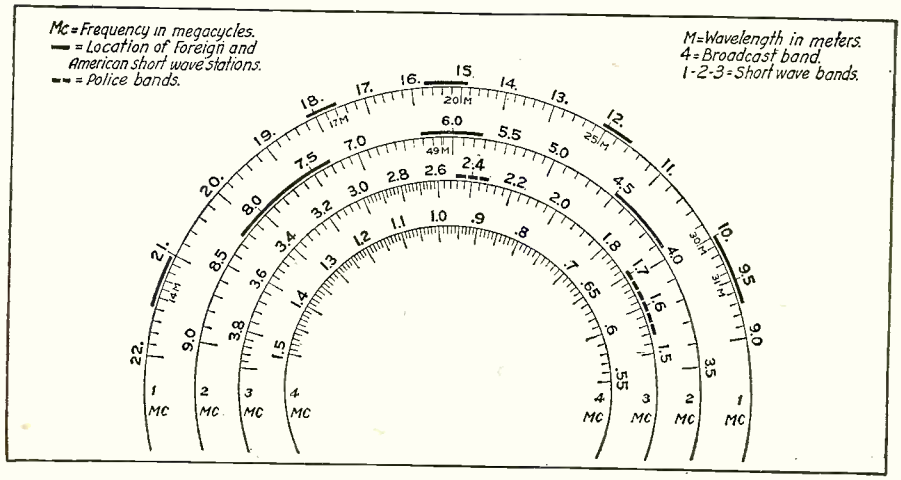
If the wiring of the receiver has been carefully done, the i.f. band-pass transformers will not oscillate during these adjustments with the 10,000 ohm i.f. volume control fully advanced. If oscillations occur, retard the 10,000-ohm volume control very slightly and readjust the i.f. transformers. After the i.f. transformers have been properly lined up, the 10,000-ohm volume control may be advanced to its maximum setting, for tuning for correct alignment and the adjustment of the condenser which gives greatest tendency for local oscillations are not at the same point.

The receiver then should be tried out for sensitivity on all bands. On the first band a distinct reduction in noise,



THE DIAL CALIBRATION

Here is a small-size reproduction of the tuning dial calibration card which slips in place in back of the panel. Photo shows completed set at left.



ADJUST" 35!

follows up his previous articles with necessary to get the set working at complete instructions on "aligning"

Three

even with the antenna connected, will be obtained at frequencies higher than about 12 megacycles (at night). This does not mean that the set is less sensitive on those frequencies for actually there is less noise in most locations. If, after thoroughly trying out the receiver, it is thought that the sensitivity could be improved, the following adjustments may be made: With the antenna disconnected, set the tuning condensers at maximum and the switch on the broadcast band. In the rear compartment of the tuner will be found two variable padding or tracking condensers, the lower one controlling the tracking of the oscillator on band No. 4 (broadcast band) and the upper one controlling the tracking on band No. 3. By turning the tracking condenser on the broadcast band (be sure the switch is set on this band) a distinct peak of noise will be heard. This is the right position for this tracking condenser. Be sure no signal is being received. If it is, set the tuning condenser to a slightly different position before making the adjustments. Set the coil switch on band No. 3 and repeat this process. The padding condensers on the other two bands are comparatively large and fixed mica condensers have been employed. These condensers have been accurately measured for capacity on a bridge before being installed and are of a proper size for correct tracking.

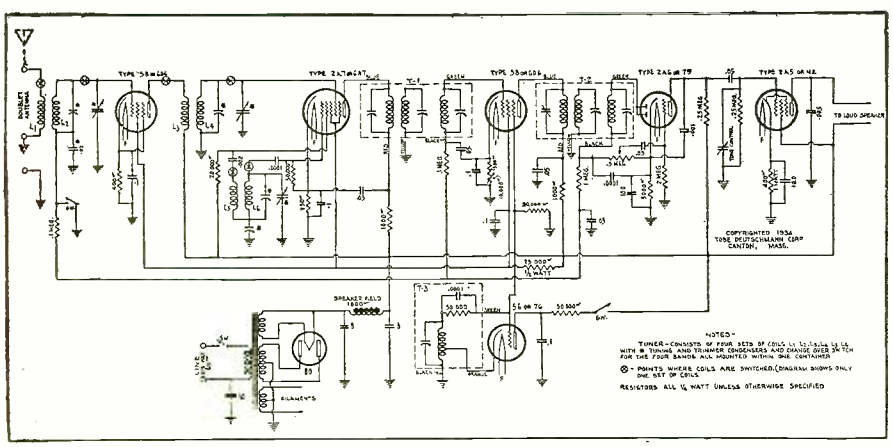
In order to line up the trimming condensers on each coil, the variable-air condenser should be set near minimum. In the front compartment (compartment towards the front panel) are the antenna tuning coils for all four bands. In the second compartment are the tuned r.f. transformers for all four bands, while in the rear compartment are the oscillator coils for the four bands. Leave the trimming condensers on the oscillator alone for this will vary the frequency to which the receiver is tuned. The other two sets of coils may be lined up for maximum noise as follows:

With the antenna disconnected as before and the volume controls at maximum, set the switch on the broadcast band. Looking at the chassis from underneath the broadcast coils are the ones on the left, or row No. 4. The antenna tuning coil and the r.f stage then may be lined up for maximum noise by rotating the adjustment screws of the trimming condensers slightly. With the switch on No. 3 position, again adjust the antenna and r.f. trimmers on row No. 3 for maximum noise. Repeat the process with the switch set on No. 2 position and adjust the trimmers on the antenna and r.f. coils on row No. 2. In adjusting row No. 1, the noise level, in most cases, is very materially reduced and consequently it is considerably harder to line them up.

There is a possibility on both rows

THE REVISED CIRCUIT

The schematic diagram, below, shows the circuit for the Browning 35 as completed with all improvements. At the right is a portrait of the designer.



ALIGNING THE CIRCUITS

This task is really a simple one if the complete instructions given in the text are followed explicitly.

No. 1 and No. 2 of adjusting the trimmers to the "image" frequency instead of the frequency for which they were designed. Sometimes it will be found that two maximums of noise are obtained, one with the trimmers at a lower capacity and one with them at a higher capacity (lower capacity with the moving plate farther away from the fixed plate). In this case, the true alignment will be the one with the maximum capacity. The stage of r.f. and the tuned antenna circuit give an excellent image ratio, as will be noted in actual operation.

It will be noted that in the instructions just given, the padding or tracking condensers have been adjusted before the trimming condensers. This procedure is reversed when lining up on a signal generator but it has been found that in making alignments on noise that this order in general gives better results.

The beat-frequency oscillator has been adjusted at the factory for a frequency which will give about a 1000-cycle note. The capacitance of wiring, however, will differ somewhat and it may be necessary for the set-builder to readjust the tuned circuit. The adjustment screw for the beat-frequency oscillator will (*Continued on page* 711)

SHORT-WAVE PAGE

NOW that the winter has passed and summer is "just around the corner" we look forward to remarkable reception from overseas with pleasure; the time that we will receive the foreign locals all day and almost all night.

THE signals radiated by the French station FYA (operating on 25.2 meters and 25.63 meters) should, if radio history repeats itself, be a constant visitor from the time of their first transmission until they sign off at 1 a.m. During the cold weather, signals from Pontoise rather died out with the coming of dark and it was only occasionally that we heard the "Frenchman" until 9 p.m.

Germany, we hope, will be coming in on 19.74 meters (DJB) and many a listener will drink his morning coffee to the stirring strains of a German band.

Short-wave listeners last winter in South Africa sadly bemoaned the fact that GSG (16.86 meters), Daventry, was among the missing. It will soon be back again for them.

Holland has broadcast on the "old-timer" PCJ (19.71 meters) and did come through. PHI (25.57 meters) was also heard. When PCJ and PHI were operating, à la lancleur, one had ample opportunity to experiment with reception of their twin signals. Personally, I always found PCJ far superior in every way.

Budapest (operating on 19.51 meters) managed to find a quiet spot on a band that is extremely popular. Their signals are strong and crystal-clear reception is generally received. HAS chose to come on the air on Sunday only and this is indeed an excellent day, because many fans do the major portion of their DX'ing either on Saturday or Sunday.

During either of these days (or nights) practically the entire world may be logged; many countries (quiet during the week days) become active on either of these days. This is true of VK2ME (31.28 meters), Sydney, Australia. It is difficult to say at what hour this station is heard best throughout the world, but in New York and its surrounding territory, if this "Aussie" is heard at all on their first transmission (1 to 3 a.m.) then we always have excellent signal strength when they return to the air at 5 a.m. Spring and summer bring us three Australians with even better volume than we have experienced during the last few months.

What has me puzzled is how will we receive the Asiatics and Africans now? During the warm days of last summer the "J" stations were all over the dials. Logging a Japanese on any of their wavelengths was easy. Anyone who needed an Asiatic "veri" to complete their verification collection had only to rise early and tune on any of the Japs' assigned frequencies and, sure enough, there they were! Of course, getting a verification was another matter, but after waiting weary months, even these started to arrive. No real DX'er can offer any excuse for not having an Asiatic "veri." Old-timers in the short-wave field, possessors of verifications from the late F3ICD, Indo-China, will recall when that station left the air (never to return) what a "howl" other listeners, not owners of this exclusive Saigon veri, set up! Fifty percent of these complainers are *still* without an Asiatic veri. Why? Simply because they do not know when and how to tune. They are under the impression that "fishing" for an Asiatic is as easy as tuning for a European. This is not so. Mainly because no matter how loud a "J" station will build up to, you must first detect the signal. As many times as I have heard Japan, Java and the Far Eastern stations, I have never heard them "roll in" until I had held on to the weak signal for at least ten minutes. At present I have ten stations in Asia verified and expect several more to be among my verifications before long.

The African stations are far less active than any of the broadcast stations throughout the world. OPM, the commercial phone circuit in Leopoldville, Belgian Congo, is about the most active. One or two reception reports of Rabat, Morocco, did reach us, but Sunday after Sunday slipped by and CNR was not heard by the writer on either of their wavelengths. This was unusual, as previously, weeks at a time, Rabat made its appearance on 37.33 meters around 4 p.m. and stayed with us until they signed off at 5 p.m.

A station that is a real catch, here or in any part of the United States, is JB (49.2 meters), Johannesburg, Union of South Africa. Only during "freak" radio conditions are we able to log this fairly low-powered African. But remember we *did* have some freak radio weather!

The past few weeks brought several stations to life, and all of them seem to hover very close to the 49-meter band. One 10-watter, XECW, Mexico City, played leap-frog between 50.2 meters and 48.89 meters. The fans who logged and reported this station were amply rewarded with a beautiful verification card. Their hours of transmission are 10 p.m. to 11:30 p.m., E.S.T. The address is: XECW, Del Caballero Santokan, Bajio No. 120, Mexico, D. F.

Fans on the North American continent are not extremely interested in stations in North America, but for the "boys" overseas a good catch is the 100-watt station in Fredericton, New Brunswick, Canada. Using the call VE9AS and operating on 6425 kilocycles, this station is heard between 5 and 6 p.m., E.S.T. The address is: University of New Brunswick, Fredericton, N. B., Canada.

Capt. Horace L. Hall

The "Ham" Shack

(*Continued from page* 666)

ringing his telephone at 2 a.m., blaming his signal for causing the bell to ring. When he picked up the receiver, he heard the ham talking a lot of "nonsense." The ham was mystified. Questioning the B. C. L., he learned that the telephone rang and upon answering the call, heard him talking about "tubes, condensers and what-nots." The telephone operator pushed the wrong key, no doubt, and the ham's signal was "detected" through the carbon microphone.

Data on "Ham" Antennas

The amateur is constantly on the search for information on antennas, transmission lines, etc. Arthur H. Lynch has prepared an interesting pamphlet describing several types of "Ham" antennas in considerable detail. Attention is given to "Zepp's," doublets, twisted-pair cable and transposed transmission lines, antenna tuning systems, ultra-high frequency antennas, beam arrays, etc. Anyone desiring a copy of this pamphlet may obtain same, without charge, by addressing a request to Department L, RADIO NEWS.

Calls Heard

Duncan G. Donaldson, Main Street, Kelty, Fife, Scotland. On 20 meter on 'phone: W2BCR, W1CGY. On 40 meter C.W.: EA4BM, EA3AR, EA5BC, OH7RW, CO1CB and ON4PA.

H. S. B. Hamilton, N. Y. (No American and Canadians listed.) On 20 meters: HC1JW, LU1PB, HJ5ABG, VP5PA, HI6F, 7G, 8X, CO2JM, CO6OM, TI4AC, YN1OR, YN1OP, K1AG, K1AI, K1GK. On 40 meters: EA8AF, CT1ED, TI1AF, TI2EP, TI2RC, TI3AV, TI4AC, X1AF, LU1DA, LU1EX, LU1FJ, LU1DJ, LU1HF, LU2AA, LU2CA, LU2HH, LU2PB, LU2AQ, LU2CH, LU2KB, LU3BH, LU3DH, LU3FF, LU3CB, LU3KB, LU4BH, LU4CN, LU4PB, LU5AG, LU5CZ, LU5EX, LU5FC, LU5MA, LU8AB, LU8PA, LU8JF and LU8EI.

N. C. Smith, Forge House, High Street, Foots Cray, Sidcup, Kent, England: On 40 meter C.W.: PK1BO, U5HS, ZT1R, EA8AH, SU1FS, K5AA, CN8MP, UK2CC, VK7JB, ZS5A, W2CEE, SU1RO, ZB1B, VU2DB, SU1TM, KA1SX, ESX5C, LY1AG, W6AP, VK6KO, YR5FD, W8GDH, W3HGW, W3CHE, W4NP, W8BCT, VK2AZ, ZD1D. On 80 meter 'phone: W1ADM portable, W9MM, W3DQ, VE1EI, W2LL, W2GHB, W3IF, W2LI, W3EGY, W2AIP, W1CRW, W2KI. On 80 meter C.W.: W1HXA, VE1GK, W1GOC, W1GDZ, W3FAP, W8MXC, W8AQO, W8AKX, W8CNP, W1GU, W2HH and W8MOI.

Code Practice Transmissions

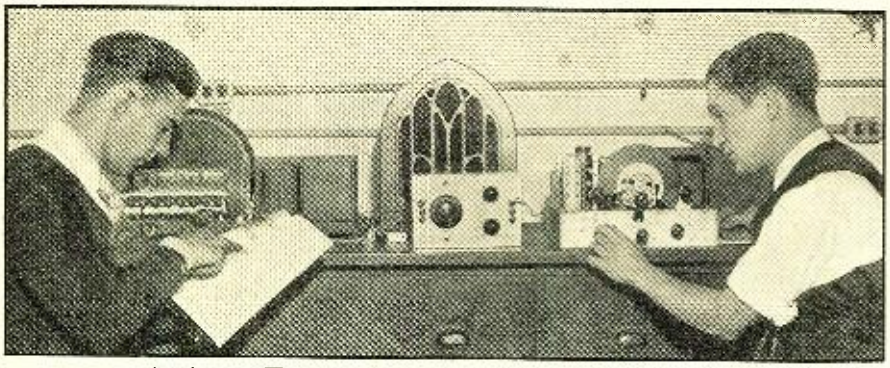
First National Television, Inc., owners of station W9XBY, 1530 kc., have inaugurated a new series of code practice transmissions, known as the *Dot and Dash Club*. These transmissions take place Mondays, Wednesdays and Fridays, from 5:30 to 5:45 p.m. Central Standard Time. They consist of slow, medium and fast groups of

(*Continued on page* 710)

S. W. STATION IDENTIFICATION CHART

(Continued from last month)

Call Letters	Address	Name	Announcement	Identifying Signals
OXY	Statsradiofonien, Heibergsgade 7, Copenhagen, Denmark			Chimes from the Town Hall clock at 6 p. m. EST
PCJ	Philips Radio, Emmasingel 29, Eindhoven, Holland			
PHI	PHOHI Studios, Hilversum, Holland		Announces in Dutch, Malay, German, French, English, Spanish and Portuguese. "Hallo, Hallo PHI, Holland," also "This is Huizen"	Signs off with Dutch National Hymn
PLV, PMY, etc. BandoengStations	Mr. H. van der Veen, Engineer in Charge, Java Wireless Stations, Bandoeng, Java, D. E. I.			PLV plays 3 records, starts calling on 4th record; PLF, PMC begin transmissions with 3 auto horn notes: F, D, C.
PRADO	Estacion Radiodifusora del Prado, Apartado de Correos 98, Riobamba, Ecuador	El Prado	"Estacion del PRADO, Riobamba, Ecuador." In Spanish and English	
PRF5	International Radio Co. of Brazil, Rio de Janeiro, Brazil	La Presse Nacional	"Short-wave Station PRF5, F for Friday, Rrrio-de-Janeiro, Brazil"	3 chimes—announces in Portuguese, French, English, and Spanish
RW15	Far East Radio Station, Khabarovsk, Siberia			
RW59	Radio Centre, Solianka 12, Moscow, USSR	Workers of the World	"Moscow Calling." Announces in German, French, Spanish, Hungarian, Swedish and English on different days of the week	Plays the "International" at beginning and end of transmissions
TGX	M. A. Mejicano Novales, El Liberal Progresista, Guatemala City, Guatemala			Two tone high frequency signals
TIEP, TI2EP	E. Pinto Hernandez, Apartado de Correos 257, San Jose, Costa Rica	La Voz del Tropico	"La Voz del Tropico"	
TI4NRH	Amando Cespedes Marin, Heredia, Costa Rica	Sol Lucet Omnibus	English and Spanish spoken	Bugle calls and bird calls, finishes with March of Costa Rican Republic
VE9CA	Calgary, Alberta	Voice of the Prairie	"Voice of the Prairie"	
VE9CS	Radio Service Engineers, Ltd., 734 Davie Street, Vancouver, B. C., Canada			Sounds two bells between selections
VE9DR	Canadian Marconi Co., P. O. Box 1690, Montreal, Quebec, Canada			
VE9GW	R.R. No. 4, Bowmanville, Ont., Canada		"Canadian Radio Commission Station VE9GW at Bowmanville, Ontario, Canada"	Has that "empty hall" effect during announcements
VE9HX	The Maritime Broadcasting Co., Ltd., Box 998, Halifax, Nova Scotia, Canada	The Key Station of the Maritimes		4 strokes on gong at beginning of transmission
VK2ME	Amalgamated Wireless (Australasia) Ltd., Box 2516 BB G.P.O., Sydney, Australia	The Voice of Australia	"Vee-Ki-2ME, Sydney Amalgamated Wireless of Australia"	Call of laughing notes of kookaburra bird Finishes with "God Save the King"
VK3ME	Melbourne, Australia		"Vee-Ki-3-ME, Melbourne Amalgamated Wireless of Australia"	Begins with clock chimes
VK3LR	Postmaster-General's Dept., Treasury Gardens, Melbourne C2, Victoria Australia			
VPD	Amalgamated Wireless (Australasia) Ltd., Suva, Fiji	Radio Suva		
VQ7LO	Cable and Wireless Ltd.. P.O. Box 777, Nairobi, Kenya Colony, British East Africa			
VUB	Indian State Broadcasting Service, Irwin House, Sprott Road, Ballard Estate, Bombay, India			
W1XAL	World Wide Broadcasting Corp., 70 Brookline Ave., Boston, Massachusetts		"This is international S.W. Station W1XAL at Boston"	
W1XAZ	Radio Station W1XAZ, Bradford Hotel, Boston, Massachusetts		"Westinghouse Stations WBZ, WBZA and Short-Wave station W1XAZ"	
W2XAF-W2XAD	General Electric Co., Schenectady N. Y. ,	The voice of electricity	"This is WGY and W2XAF," or "This is WGY and W2XAD"	Begins each program with a discharge of 10 million volts
W2XE	Columbia Broadcasting System, 485 Madison Avenue, New York City		"This is the Columbia Broadcasting System SW Experimental station W2XE"—in various languages	
W3XAU	WCAU Broadcasting Co., 1622 Chestnut Street, Philadelphia, Pa.		"This is the Columbia Broadcasting System S.W. Station W3XAU at Philadelphia"	
W3XAL, W3XL	National Broadcasting Co., Rockefeller Plaza, New York City		"W3XAL, Bound Brook, New Jersey"	
W8XAL	Crosley Radio Corp., Cincinnati, Ohio	The Nation's Station	"The Nation's Station WLW and S.W. Station W8XAL"	
W8XK	Westinghouse Elec. Mfg. Co., Hotel William Penn, Pittsburgh, Pa.		"This is Westinghouse Station KDKA and its S.W. complement, W8XK"	NBC chimes
W9XAA	The Voice of Labor, 666 Lake Shore Drive, Chicago, Illinois	The Voice of Labor	"WCFL and W9XAA, The Voice of Labor"	
W9XF	National Broadcasting Co., Inc., Merchandise Mart, Chicago, Illinois		"W9XF, Chicago, 6100kc"	NBC chimes
XEBT	B. Sancristobal, Apartado 79-44, Mexico D.F., Mexico	El Buen Tono	Announce in Spanish and English	Blowing of automobile horn—like very fast "cuckoo" calls, repeated twice; sometimes a siren. Sign off with Ave Maria
XQAJ	80 Love Lane, Shanghai, China			
YNLF	Sr. M. Le Frane, 206 Calle 15 de Septiembre, Managua, Nicaragua	La Voz de Nicaragua	"La Voz de Nicaragua"	
YV2RC	Broadcasting Caracas, Apartado de Correos 290, Caracas, Venezuela	Broadcasting Caracas	"Ee-vay-dos-erray-seh broadcasting Caracas"	Chimes each quarter hour. Sign off with Venezuela Anthem
YV3RC	Caracas, Venezuela	Radiodifusora, Venezuela	Ee-vay-trays-erray-say	Plays bells on the hour. Two chimes, repeated, before announcement
YV5RMO	Sr. S. M. Vegas, Apartado de Correos 214 Maracaibo, Venezuela	Ecos del Caribe	"Ecos del Caribe"	Strikes gong before announcing
YV6RV	Valencia, Venezuela	La Voz de Carabobo	"La Voz de Carabobo, Ee-vay sez-erray-vay"	Strikes gong before announcement
ZGE	Secretary for Postal Affairs for S.S. and F.M.S., Kuala Lumpur, Federated Malay States			
ZHI	Radio Service Co. of Malaya, 2 Orchard Road, Singapore, Malaya			
ZTE	Malayan Amateur Society, Singapore, Malaya			
ZTJ	African Broadcasting Co., Ltd., Box 4559, Johonnnesburg, Union of South Africa			



THE DX CORNER

(For Broadcast Waves)

S. GORDON TAYLOR

IT is with pleasure that the names of nine newly appointed DX'ers are included in the list of Official RADIO NEWS Broadcast Band Listening Post Observers this month. With the coming of summer it naturally follows that DX on the broadcast band will suffer a slump. However, applications for appointments as Official Observers will be welcomed throughout the summer months. It is hoped that by the time the DX season opens up again in the autumn there will be at least 100 Official Observers. Applications are invited, especially from states not already represented in the list on this page, the Provinces of Canada and South American countries.

DON'T forget to send in information on antennas, antenna tuning, noise reduction or other kinks which you have worked out to improve your DX reception. This makes fine material for this department during the summer months, as it enables DX'ers to try out these schemes and, if successful, adopt them before the 1935-36 DX season rolls around.

The TP's are now at peak levels. Reference to the Consolidated Foreign "Best Bets" list shows the 1YA, 650 kc., has been reported from every section of the U. S. A close second is 2BL, 855 kc., followed by 4BC, 1145 kc.; 2YA, 570 kc.; 4QG, 760 kc.; and 3LO, 800 kc. Those who are looking for TP's will do well to concentrate on these frequencies between 3 and 6 a.m., as they are the most likely to produce results. Europe has apparently passed out of the picture almost entirely at the time of writing this. The Japs are coming through some, but should be much improved by the time this is in print. South Americans have been holding up well, being quite generally reported during recent weeks. In other words, everything looks good for the month of April, except the Europeans.

DX'ers Attention!

Readers are invited to send in photographs or snapshots of themselves in their Listening Posts, for publication in the DX Corner. Let other readers see what you and your equipment look like! RADIO NEWS will pay $1.00 for each photo used, to help defray expenses. If a copy of RADIO NEWS appears in the photo, this payment will be doubled.

RADIO NEWS DX Broadcast

The DX Corner extends its thanks to WSVS, Buffalo, for dedicating its March 6th frequency check transmission to RADIO NEWS. Although operating with only 50 watts power, this station was received at the New York City Listening Post with a measured field intensity averaging about 350 microvolts—a thoroughly dependable signal.

This dedication was arranged by Observer Kalmbach.

Special Radio News DX Corner Broadcast

Stan Elcheshen, Official L.P.O. for Ohio, has arranged a special DX broadcast to be dedicated to the RADIO NEWS Broadcast-Band DX Corner by station 10AK, Stratford, Ontario, Canada, on April 14, from 4:30-5:30 a.m., E.S.T. This station uses only 15 watt power and therefore constitutes a prize addition to the DX'ers Log.

On behalf of 10AK and the DX Corner, the editor urges all listeners who hear this little station to send reports to: Joe Dorland, Radio Station 10AK, at 151 Ontario St., Stratford, Ontario, Canada. Mr. Dorland is the Special Program Arranger for this station. Let's snow him under with reports to show that these specials are appreciated by readers of this department.

Advance DX Calendar

The following lists show special and periodic DX broadcasts (E.S.T.) which have been brought to the attention of this department by Observers, or by the DX Clubs or broadcast stations participating. Advance notices of such broadcasts are appreciated. These should reach RADIO NEWS by the first of the month preceding the month in which the broadcast takes place.

Special DX Broadcasts

April 7, Sun., 4-6 a.m., CHRC, Quebec, 580 kc., 100 w.
April 7, Sun., 5-7 a.m., CT1GL, Parede, Portugal, 1031 kc., 5 kw., NNRC.

Periodic DX Broadcasts

Tuesdays, 12-12:30 a.m., CFQC, Saskatoon, Sask., 840 kc., 1 kw. (DX Tips)
Wednesdays (third Wed., each month) 2-2:30 a.m., WROK, Rockford, Ill., 1410 kc., 5 kw.
Thursdays, 12-12:30 a.m., CFQC, Saskatoon, Sask., 840 kc., 1 kw. (DX Tips).
Fridays, 7:45-8 p.m., WORK, York, Pa., 1320 kc., 1 kw. (DX Tips).
Saturdays, 1 a.m., KSL, Salt Lake City, Utah, 1130 kc., 50 kw. NNRC-IDA.
Saturdays, 12:15-12:30 a.m., CKCK, Regina, Sask., 1010 kc., .5 kw. (DX Tips).
Saturdays, 12-12:30 a.m., CFQC, Saskatoon, Sask., 840 kc., 1 kw. (DX Tips).
Saturdays, 12:30-1 a.m., KDKA, Pittsburgh, Pa., 980 kc., 50 kw. (DX Tips).
Saturdays, 12:50-1 a.m., WLAC, Nashville, Tenn., 1470 kc., 5 kw. (DX Tips.)
Saturdays, 2:30-3 a.m., KFI, Los Angeles, 640 kc., 50 kw. (DX Tips).
Sundays, 1 a.m., KSL, Salt Lake City, Utah, 1130 kc., 50 kw. NNRC-IDA.
Sundays, 2-3 a.m., KGER, Long Beach, Calif., 1360 kc., 1 kw.
Sundays, 3 a.m., KVI, Tacoma, Wash., 570 kc., 1 kw.
Sundays, 2-5 a.m., CMCU, Havana, 1255 kc., 150 watts.
Sundays, 3-3:30 a.m., KIDW, Lamar, Colo., 1420 kc., 100 w.
Sundays, Beg. 3:30 a.m., CMBX, Havana, Cuba, 1425 kc., 150 w.
Daily, 1 a.m., WSM, Nashville, Tenn., 650 kc., 50 kw. (DX Tips) NNRC-IDA.
Daily, 3-4 a.m., W6XAI, Bakersfield, Calif., 1550 kc., 1 kw.
Daily, 4 a.m., WNEW, Newark, N. J., 1250 kc., 1 kw. (DX Tips) NNRC-IDA

Official RADIO NEWS Broadcast Band Listening Post Observers

United States

California: Randolph Hunt, Warren E. Winkley
Connecticut: Fred Burleigh, James A. Dunnigan, Philip R. Nichols, R. L. Pelkey
Illinois: Herbert H. Diedrich, Ray E. Everly, H. E. Rebensdorf, D. Floyd Smith
Indiana: E. R. Roberts
Iowa: Lee F. Blodgett, Ernest Byers.
Maine: Danford Adams, Steadman O. Fountain
Maryland: William Rank, Henry Wilkinson, Jr.
Massachusetts: William W. Beal, Jr., Russell Foss, Simon Gelles, Evan B. Roberts
Michigan: John DeMyer, Howard W. Eck
Minnesota: F. L. Biss
Missouri: Dudley Atkins, III.; T. E. Gootee, C. H. Long
Montana: R. W. Schofield
New Jersey: Henry A. Dare, Jack B. Schneider, Alan B. Walker
New York: Jacob Altner, Edward F. Goss, Robert Hough, Robert Humphrey, John C. Kalmbach, Jr., Harry E. Kentzel, Maynard J. Louis, R. H. Tomlinson
North Carolina: Marvin D. Dixon
Ohio: Stan Elcheshen, Donald W. Shields, Richard J. Southward
Pennsylvania: Edward Kocsan, J. Warren Routzahn, Joseph Stokes
Texas: E. L. Kimmons
West Virginia: Clifford Drain
Wyoming: J. H. Woodhead

Foreign

Australia: Albert E. Faull, Victoria; George F. Ingle, New South Wales
Canada: William H. Ansell, Saskatchewan; C. R. Caraven, British Columbia; C. Holmes, British Columbia; Philip H. Robinson, Nova Scotia; Art Ling, Ontario
England: R. T. Coales, Hants; F. R. Crowder, Yorkshire; George Ellis, North Stockport
Irish Free State: Ron. C. Bradley
Newfoundland: A. L. Hynes, Clarenville
New Zealand: L. W. Mathie, Hawke's Bay; R. H. Shepherd, Christchurch; Eric W. Watson, Christchurch
South Africa: A. C. Lyell, Johannesburg
Sweden: John S. Bohm, Malung
Switzerland: Dr. Max Hausdorff, Viganello

The Mystery Station W3XBD

Many readers have reported hearing this station on 900 kc., and have inquired concerning its location. This is the Bell Lab. experimental station at Whippany, New Jersey. Its license permits operation between midnight and 6 a.m. with 5 kw., on 560, 900 and 1340 kc.

Consolidated Foreign "Best Bets"

Following is a list of the foreign stations reported heard by Official Observers in different sections of the U. S. and Canada. An asterisk (*) denotes that the station has been heard in the part of the country represented by the column in which it appears. Where the time is reported a number is employed instead of an asterisk; light face numbers represent a.m. and bold numbers p.m., *local time*. These records provide an excellent tuning guide for DX'ers.

Following are the sections of the country represented by each column, and the Official Observers whose catches are included in this record:

Column 1 (vicinity New York City and Connecticut) Observers Altner, Dunnigan, Goss, Kentzel, Nichols, Pelkey, Tomlinson, Walker.

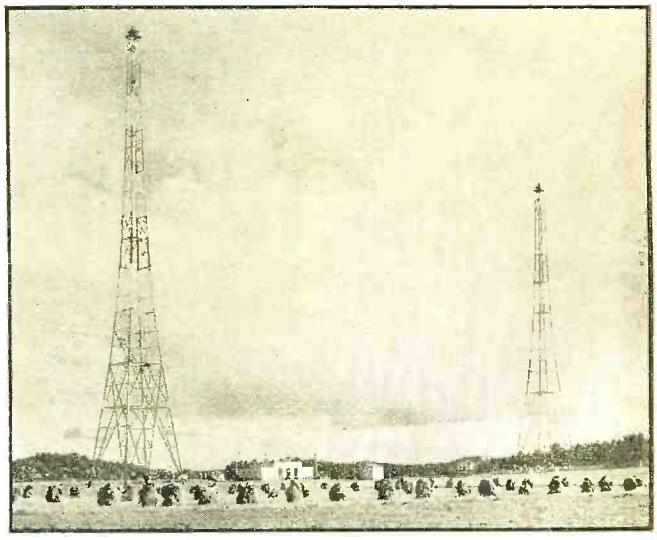
Column 2 (Mass., Maine, Nova Scotia, Newfoundland) Observers Adams, Beal, Foss, Fountain, Hynes, Roberts, Robinson.
Column 3 (W. New York, Ohio, Michigan) Observers Eck, Kalmbach, Lonis, Shields, Southward.
Column 4 (Illinois, Missouri) Observers Atkins, Diedrich, Everly, Rebensdorf, Smith.
Column 5 (N. Carolina, W. Virginia) Observers Dixon, Drain.
Column 6 (Texas) Observer Kimmons.
Column 7 (Minnesota) Observer Biss.
Column 8 (California, Oregon) Observers Hunter, Winkley.

Kc.	Call	1	2	3	4	5	6	7	8
560	XEAO	–	*	–	–	–	–	–	–
560	2CO	–	*	–	*	–	–	–	–
565	TGW	–	*	5	*	–	–	–	–
570	2YA	*	*	–	2	–	–	*	*
574	Stuttgart	2	2	–	–	–	–	–	–
609	FQN	–	*	–	–	–	–	–	–
610	XFX	–	2	*	–	–	–	–	*
610	3AR	*	–	–	–	–	–	*	–
610	JODK-1	–	–	–	–	–	–	–	*
615	XEFF	–	–	–	*	–	–	–	–
625	JOTK	–	–	–	–	–	–	–	*
635	JONK	–	–	–	–	–	–	–	*
635	JODG	–	–	–	–	–	–	–	*
635	5CK	–	*	6	*	–	–	*	–
640	XEOX	–	*	–	–	–	–	–	–
645	JQAK	–	–	–	–	–	–	–	*
645	JOUK	–	–	–	–	–	–	–	*
650	1YA	4	*	5	*	5	3	*	3
655	JOCG	–	–	–	–	–	–	–	*
658	Cologne	2	2	–	–	–	–	–	–
660	XELO	*	–	*	*	–	–	–	*
660	KGOA	–	–	–	–	–	–	–	4
665	2FC	*	–	–	*	–	–	*	–
670	JFAK	–	–	–	–	–	–	–	4
680	JOVK	–	–	–	–	–	–	–	*
680	CMAF	–	*	–	–	–	–	–	–
681	HJN	*	*	–	*	–	–	–	–
700	JOKK	–	–	–	–	–	–	–	*
710	JOJK	–	–	–	–	–	–	–	*
720	JORK	–	–	–	–	–	–	–	*
720	3YA	–	*	–	*	–	–	*	*
735	JOSK	–	–	–	–	–	–	–	*
740	Munich	2	2	–	–	*	–	–	–
750	JOBK-1	–	–	–	–	–	–	–	4
750	KGU	–	*	3	–	–	–	*	*
760	4QG	*	*	6	*	–	–	*	–
770	JOHK	–	–	–	*	–	–	–	3
780	LT1	–	*	–	–	–	–	–	–
785	Leipzig	3	*	–	–	–	–	–	–
790	JOGK	–	–	–	–	–	–	–	*
790	4YA	–	–	–	*	–	–	–	–
795	EAJ-1	–	*	–	–	–	–	–	–
800	3LO	*	*	6	*	–	–	*	–
804	Scottish Regional	6	*	*	–	–	–	–	–
810	JOCK-1	–	–	–	–	–	–	–	*
814	11MI	2	*	–	–	2	–	–	–
830	LR5	*	*	3	*	–	–	*	*
830	JOIK	–	–	–	4	–	–	–	*
850	CX16	–	*	–	–	–	–	–	–
850	JOFK	–	–	–	4	–	–	–	4
855	2BL	*	*	6	*	5	–	*	4
870	LR6	*	*	8	–	–	–	–	–
870	JOAK-1	–	–	–	4	–	–	–	2
877	London Regional	6	*	–	–	–	–	–	–
900	JODK-2	–	–	–	–	–	–	–	4
900	KGBU	–	–	–	–	–	–	–	*
904	Hamburg	*	2	–	–	–	–	–	–
910	LR2	–	*	–	9	–	–	–	–
910	CMHW	–	8	–	–	–	–	–	–
910	4RK	–	–	6	*	–	–	*	*
913	Toulouse	6	5	–	–	–	–	–	–
920	XEFE	–	*	–	–	–	–	–	–
920	JOQK	–	–	–	–	–	–	–	*
930	JOAG	–	–	–	–	–	–	–	*
950	LR3	–	*	8	–	–	–	–	–
950	2GB	*	*	–	*	–	–	*	–
959	Poste Parisien	3	5	*	*	3	–	–	–
960	YV1RC	6	6	7	–	7	–	–	–
970	JOBG	–	–	–	–	–	–	–	*
977	West Regional	6	*	–	–	–	–	–	–
980	JOXK	–	–	–	–	–	–	–	*
990	JOFG	–	–	–	–	–	–	–	*
990	LR4	*	–	*	–	–	–	–	–
1010	3HA	–	–	–	–	–	–	*	–
1025	2UE	*	*	–	*	–	–	*	–
1030	LR9	–	*	–	–	–	–	–	–
1031	CT1GL	–	2	–	–	–	–	–	–
1040	PTT	2	2	2	–	–	–	–	–
1040	CP4	–	–	–	*	2	–	–	–
1050	CX26	–	–	–	*	–	–	–	–
1070	2KY	*	–	–	–	–	–	–	–
1077	Bordeaux	3	*	–	–	3	–	–	–
1085	JOBK-2	–	–	–	–	–	–	–	4
1100	CMCY	–	9	–	–	–	–	–	*
1125	2UW	–	–	–	*	–	–	*	–
1140	Turin	1	*	–	–	–	–	–	–
1145	4BC	*	*	*	*	5	–	*	–
1150	LR8	*	–	–	–	–	–	–	–
1170	4TO	–	–	–	*	–	–	*	–
1175	JOCK-2	–	–	–	–	–	–	–	4
1175	COA	–	2	–	–	–	1	–	–
1180	3DB	–	*	–	*	–	–	*	–
1190	LS2	–	8	7	*	–	–	–	–
1195	Frankfurt	2	1	–	–	*	–	–	–
1210	2CH	–	–	–	–	–	–	*	–
1210	CKBI	–	–	–	*	–	–	–	–
1210	XEFV	–	–	–	–	–	2	–	–
1210	XEE	–	–	–	–	–	2	–	–
1210	XETH	–	–	–	–	–	1	–	–
1222	11TR	1	2	3	–	2	–	–	–
1240	WKAQ	*	–	*	*	–	–	–	–
1245	2NC	–	*	–	–	–	–	–	–
1255	CMCU	*	–	–	–	–	2	–	–
1270	LS9	–	*	–	–	–	–	–	–
1270	XFB	–	–	–	*	–	–	–	–
1270	2SM	–	–	–	–	–	–	–	*

STOCKHOLM
SWEDEN

This 55 kw. Swedish station on 704 kc. is something for DX'ers to strive for inasmuch as it is one of the European stations rarely heard in the U. S.

Courtesy:
Observer Tomlinson



Kc.	Call	1	2	3	4	5	6	7	8
1270	HIX	–	–	*	–	–	–	–	–
1290	WNEL	*	8	*	*	6	1	–	–
1310	XEX	–	*	–	–	–	–	–	–
1310	CJLS	*	–	–	–	–	–	–	–
1320	KGMB	–	*	–	–	4	–	*	*
1325	CMOX	–	–	–	–	–	1	–	–
1360	OA4K	–	–	*	–	–	–	–	–
1380	4BH	–	*	–	*	–	–	*	–
1400	TGX	–	*	–	–	–	–	–	–
1415	2KO	–	*	–	*	–	–	–	–
1425	3AW	–	*	–	–	–	–	–	–
1435	CMBX	1	–	3	–	–	1	–	*
1456	Radio-Normandie	2	2	–	–	2	–	–	–
1460	7UZ	–	*	–	*	–	–	–	–

Foreign Station Locations

This list provides the call, location, frequency and power of each foreign station reported heard during February by Official L.P.O.'s. See the "Consolidated 'Best Bets'," lists for a record of foreign stations heard in your section of the country.

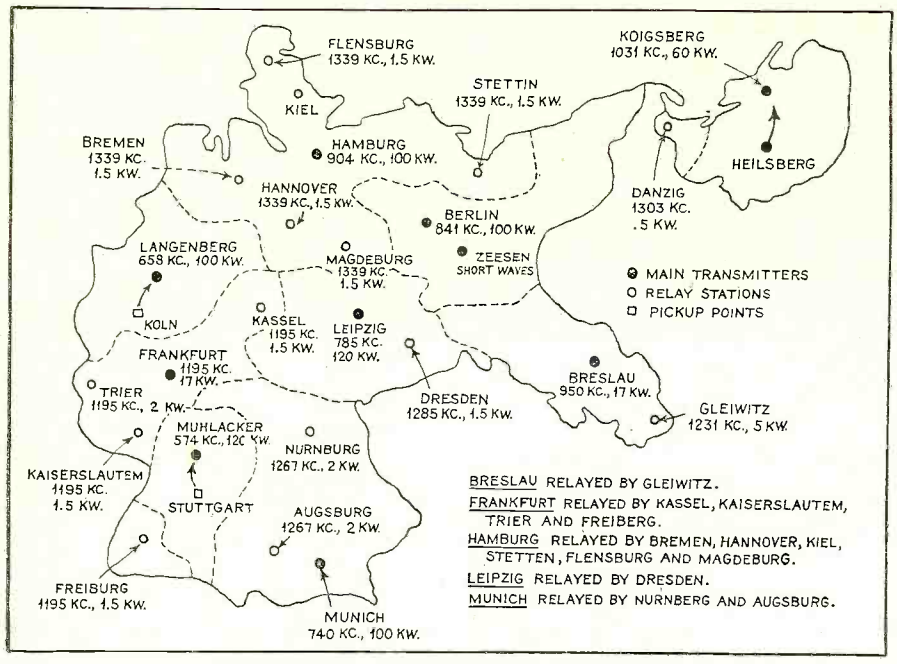
Kc.	Kw.	Call	Location
560	.25	XEAO	Mexicali, Mexico
560	7.5	2CO	Corowa, N.S.W., Australia
565	10	TGW	Guatemala City, Guatemala
570	5	2YA	Wellington, New Zealand
574	100	Stuttgart	Germany
609	.25	FQN	St. Pierre, Miquelon
610	1	XFX	Mexico City, Mexico
610	4.5	3AR	Melbourne, Vict., Australia
610	10	JODK-1	Keijo, Korea. Japan
615	...	XEFF	Mexico, D. F., Mexico
625	.5	JOTK	Matsuye, Japan
635	.5	JONK	Nogano, Japan
635	.5	JODG	Hamamatsu, Japan
635	7.5	5CK	Crystal Brook, Australia
640	.25	XEOX	Saltillo, Mexico
645	.5	JQAK	Dairen, Japan
645	.3	JOUK	Akita, Japan
650	.5	1YA	Auckland, New Zealand
655	.3	JOCG	Asahogawa, Japan
658	100	Cologne	Germany
660	...	XELO	Piedras Negras, Mexico
660	75	XGOA	Nanking, China
665	3.5	2FC	Sydney, N.S.W., Australia
670	10	JFAK	Taihoku, Formosa, Japan
680	.5	JOVK	Hakodate, Japan
680	1	CMAF	Havana, Cuba
681	1	HJN	Bogota, Colombia
700	.5	JOKK	Okayama, Japan
710	3	JOJK	Kanazawa, Japan
720	.5	JORK	Kochi, Japan
720	2.5	3YA	Christchurch, New Zealand
735	1	JOSK	Kokura, Japan
740	100	Munich	Germany
750	10	JOBK-1	Osaka, Japan
750	2.5	KGU	Honolulu, Hawaii
760	2.5	4QG	Brisbane, Qnsld., Australia
770	10	JOHK	Sendai, Japan
780	4	LT1	Rosario, Argentina
785	120	Leipzig	Germany
790	10	JOGK	Kumamoto, Japan
790	.5	4YA	Dunedin, New Zealand
795	5	EAJ-1	Barcelona, Spain
800	5	3LO	Melbourne, Vict., Australia
804*	50	Scottish Regional	Great Britain
810	10	JOCK-1	Nagoya, Japan
814	50	11MI	Milan, Italy
830	16	LR5	Buenos Aires, Argentina
830	10	JOIK	Sapporo, Japan
850	.2	CX16	Montevideo, Uruguay
850	10	JOFK	Hiroshima, Japan
855	3	2BL	Sydney, N.S.W., Australia
870	2.1	LR6	Buenos Aires, Argentina
870	10	JOAK-1	Tokyo, Japan
877	50	London Reg.	Great Britain
900	10	JODK-2	Keijo, Korea, Japan
900	.5	KGBU	Ketchikan, Alaska
904	100	Hamburg	Germany
910	6	LR2	Buenos Aires, Argentina
910	.1	CMHW	Cienfuegos, Cuba
910	2	4RK	Rockhampton, Australia
913	60	Toulouse	France
920	.25	XEFE	Laredo, Mexico
920	.5	JOQK	Niigata, Japan
930	.5	JOAG	Nagasaki, Japan
950	12	LR3	Buenos Aires, Argentina
950	1	2GB	Sydney, N.S.W., Australia
959	100	P. Parisien	France
960	5	YV1RC	Caracas, Venezuela
970	.5	JOBG	Maehashi, Japan
977*	50	W. Regional	Great Britain
980	.5	JOXK	Tokushima, Japan
990	.3	JOFG	Fukui, Japan
990	12	LR4	Buenos Aires, Argentina
1010	.3	3HA	Hamilton, Vict., Australia
1025	1	2UE	Sydney, N.S.W., Australia
1030	5	LR9	Buenos Aires, Argentina
1031	.5	CT1GL	Parede, Portugal
1040	2.5	PTT	Rennes, France
1040	10	CP4	La Paz, Bolivia
1050	2	CX26	Montevideo, Uruguay
1070	1	2KY	Sydney, Australia
1077	12	Bordeaux,	France
1085	10	JOBK-2	Osaka, Japan
1100	.5	CMCY	Havana, Cuba
1125	1	2UW	Sydney, N.S.W., Australia
1140	7	Turin	Italy
1145	.75	4BC	Brisbane, Qnsld., Australia
1150	5	LR8	Buenos Aires, Argentina
1170	.2	4TO	Tounsville, Qnsld., Australia
1175	10	JOCK-2	Nagoya, Japan
1175	.072	COA	Havana, Cuba
1180	.4	3DB	Melbourne, Australia
1190	5	LS2	Buenos Aires, Argentina
1195	17	Frankfurt	Germany
1210	1	2CH	Sydney, N.S.W., Australia
1210	.1	CKBI	Prince Albert, Sask., Canada
1210	.1	XEFV	Juarez, Mexico
1210	.05	XEE	Durango, Mexico
1210	.1	XETH	Mexico, D. F., Mexico
1222	10	11TR	Trieste, Italy
1240	1	WKAQ	San Juan, Puerto Rico
1245	2	2NC	New Castle, N.S.W., Aus.
1255	.15	CMCU	Havana, Cuba
1270	3	LS9	Buenos Aires, Argentina
1270	1	XFB	Jalapa, Mexico
1270	1	2SM	Sydney, N.S.W., Australia
1270	1	HIX	Santo Domingo, Dom. Rep.
1290	.5	WNEL	San Juan, Puerto Rico
1310	.125	XEX	Monterrey, Mexico
1310	.1	CJLS	Yarmouth, N. S., Canada
1320	.25	KGMB	Honolulu, Hawaii
1325	.25	CMOX	Havana, Cuba
1360	.15	OA4K	Lima, Peru
1380	.6	4BH	Brisbane, Qnsld., Australia
1400	.15	TGX	Guatamala City, Guatamala
1415	.5	2KO	Newcastle, Australia
1425	.5	3AW	Melbourne, Australia
1435	.15	CMBX	Havana, Cuba
1456	10	Radio-Normandie	Fe Camp, France
1460	.25	7UZ	Ulverston, Australia

*Frequencies changed Feb. 17, Scottish Regional—804 to 767 kc. West Regional—977 to 804 kc.

"Best Bets" for England

Following are the stations heard by British listeners and reported to this department by Observers Ellis, Coales and Crowder. Observer Crowder, Vice President and General European Representative of the I.D.A. includes in his report those received by him from 12 other English members of the I.D.A. as follows: A. C. Baker, London; Fred Crowder (brother of Observer Crowder), Hull; N. Robinson, Skinningrove; R. Stansfield, Woking; D. C. Stent, London; R. F. Thompson, London; J. M. Wheeler, Lee-on-Solent; W. K. Walton, Cornwall; C. Wright, Manchester; F. Farr, Trowbridge; L. A. Scott, London; and J. C. Tricklebank, Burton-on-Trent:

Kc.	Kw.	Call	Location
590	1	WEEI	Boston, Mass.
590	1	WOW	Omaha, Nebraska
620	20	Cairo	Egypt
630	4.5	LS3	Buenos Aires, Argentina



BROADCAST STATIONS IN GERMANY

Observer Tomlinson sends in this map of Germany, showing locations of the various German stations. Fine business!

660	50	WEAF	New York City
680	5	WPTF	Raleigh, N. C.
680	2.0	VAS	Glace Bay, N. S.
700	500	WLW	Cincinnati, Ohio
710	50	WOR	Newark, N. J.
730	5	CKAC	Montreal, Que.
740	50	WSB	Atlanta, Georgia
750	10	WJR	Detroit, Mich.
760	50	WJZ	New York City
770	25	WBBM	Chicago, Ill.
790	50	WGY	Schenectady, N. Y.
800	50	WFAA	Dallas, Texas
800	50	WBAP	Fort Worth, Texas
810	50	WCCO	Minneapolis, Minn.
820	50	WHAS	Louisville, Ky.
830	50	KOA	Denver, Colorado
830	16	LR5	Buenos Aires, Argentina
850	10	WWL	New Orleans, La.
880	1.	CRCO	Ottawa, Canada
890	50	XEW	Mexico City
910	60	XENT	Nuevo Laredo, Mexico
910	5	CRCM	Montreal, Que.
930	1.	CHNS	Halifax, N. S.
940	1-2.5	WCSH	Portland, Maine
950	12	LR3	Buenos Aires, Argentina
950	5.0	VONF	St. John's, Nfld.
960	10	XEAW	Reynosa, Mexico
980	50	KDKA	Pittsburgh, Pa.
990	12	LR4	Buenos Aires, Argentina
990	50	WBZ	Boston, Mass.
1000	50	WOC	Des Moines, Iowa
1010	1	WHN	New York City
1020	10	KYW	Philadelphia, Pa.
1050	1	CRCK	Quebec City, Que.
1050	50	KNX	Los Angeles, Calif.
1060	10	WBAL	Baltimore, Md.
1060	50	WTIC	Hartford, Conn.
1070	50	WTAM	Cleveland, Ohio
1080	50	WBT	Charlotte, North Carolina
1090	50	KMOX	St. Louis, Mo.
1100	5	WPG	Atlantic City, N. J.
1110	5	WRVA	Richmond, Va.
1130	50	KSL	Salt Lake City, Utah
1140	5	WAPI	Birmingham, Ala.
1150	50	WHAM	Rochester, N. Y.
1160	5	WWVA	Wheeling, W. Va.
1160	10	WOWO	Ft. Wayne, Ind.
1170	50	WCAU	Philadelphia, Pa.
1190	5	LS2	Buenos Aires, Argentina
1190	50	WOAI	San Antonio, Texas
1220	1	WDAE	Tampa, Florida
1230	1	WNAC	Boston, Mass.
1230	2	LS8	Buenos Aires, Argentina
1240	1	CJCB	Sydney, N. S.
1250	1-2.5	WNEW	Newark, N. J.
1290	.5	WNEL	San Juan, P. R.
1300	1	WBBR	Brooklyn, N. Y.
1320	.5	WSMB	New Orleans, La.
1330	1	WDRC	Hartford, Conn.
1340	.5	WFEA	Manchester, N. H.
1360	1-5	WFBL	Syracuse, N. Y.
1400	.5	WBBC	Brooklyn, N. Y.
1410	.5	WAAB	Boston, Mass.
1460	10	WJSV	Alexandria, Va.
1490	5	WCKY	Covington, Ky.

South Americans Sign Off

Observer Robinson and the "Globe Circler" (International DX'ers Alliance) give the following as the sign-off time (E.S.T.) for some of the South Americans: LS2, 9:30 p.m.; LR5, 9:40 or 9:50 p.m.; CX14, 10 p.m.; LR4, 10:05 p.m.; LS8, 10:15 p.m.; and YV1RC, 10:30 p.m.

XEB, Mexico City

A letter from B. Sancristobal, general manager of Station XEB, states that this station is on the air daily from 9 a.m. until 11 or 12 p.m., operating on 1030 kc. with a power of 10,000 watts. He further states that authentic verifications from this station can only be obtained by submitting logs to the station direct. Evidently the management attaches considerable importances to these verifications as all of those issued are signed by two officials.

New Zealand Time Schedule

Following is the time schedule for New Zealand stations. The times given are all morning hours, E.S.T., and indicate the hour at which each station signs off. This time schedule is based on information provided by the National Radio Club:

Daily

Call	*Kc.*	*Sign Off*
2YA	570	M. to Sat.—6:30; Sun.—5:30
1YA	650	M. to Sat.—6:30; Sun.—5:30
3YA	720	M. to Sat.—6:30; Sun.—5:30
4YA	790	M. to Sat.—6:30; Sun.—5:30
1YX	880	Daily—5:30
3ZR	920	M. to F.—5:30; Sat. & Sun. 4:30
4YO	1140	Daily—5:30
2ZD	1170	Daily—5:30
3YL	1200	Daily—5:30
4ZW	1470	Daily—6:30

Monday

Call	*Kc.*	*Off*	*Call*	*Kc.*	*Off*
4ZP	620	5:30	4ZO	1050	6:30
2YB	750	5:30	4ZL	1220	6:30
1ZH	770	5:30	1ZM	1260	5:30
2ZH	820	6:00	4ZC	1280	4:30
2YC	840	5:30	2ZR	1360	5:30
2ZF	960	5:30			

Tuesday

4ZP	620	5:30	1ZB	1090	5:30
1ZH	770	5:30	4ZF	1220	5:30
2ZH	820	6:00	1ZM	1260	5:00
2YC	840	5:30	2ZO	1400	5:30
2ZP	900	6:00	2ZR	1360	5:30
4ZM	1050	6:30			

Wednesday

4ZP	620	5:30	4ZB	1050	6:30
2YB	750	5:30	4ZF	1220	6:30
2ZH	820	6:00	1ZJ	1310	5:00
2YC	840	5:30	2ZR	1360	5:30
2ZF	960	5:30	3ZM	1450	5:30

Thursday

4ZP	620	5:30	4ZL	1220	6:30
1ZH	770	5:30	2ZL	1240	6:30
2YC	840	5:30	4ZC	1280	4:30
2ZF	960	5:30	4ZR	1340	6:00
4ZB	1050	6:30	2ZR	1360	5:30
2ZM	1150	5:30	3ZM	1450	5:30

Friday

4ZP	620	5:30	2ZF	960	5:00
1ZH	770	5:30	4ZO	1050	6:30
2ZH	820	6:00	1ZB	1090	5:30
2YC	840	5:30			

Saturday

2YB	750	5:30	4ZL	1220	6:30
2ZH	820	6:30	1ZM	1260	5:00
2ZF	960	5:30	3ZM	1450	7:30
4ZM	1050	4:30			

Sunday

4ZP	620	5:00	4ZM	1050	5:30
2YB	750	5:30	1ZB	1090	5:00
2ZH	820	6;00	2ZM	1150	5:30
2YC	840	5:30	1ZM	1260	5:00
2ZP	900	5:00	2ZR	1360	5:00
2ZF	960	5:00	3ZM	1450	5:30

The sort of information incorporated in this time schedule is extremely valuable to DX'ers and RADIO NEWS would like to publish more of it. Possibly Official Listening Post Observers and other readers in various foreign countries will be able to obtain such information from their governments for insertion in the Broadcast Band DX Corner. If so, their co-operation will be much appreciated.

Our Readers Report—

Observer Coales: "Many thanks for the very fine Official L.P.O. Certificate. I have had it framed and as I write this it hangs over the radio. It looks swell and I am mighty proud of it. I can use a good many adjectives to describe recent DX conditions in England, but they are all unprintable."

Observer Ellis (England): "Beginning February 17th, frequencies of six British stations were changed as follows:"

	From	*To*
North National	1013 kc.	1429 kc.
Midland Regional...	767 kc.	1013 kc.
Scottish Regional...	804 kc.	767 kc.
West Regional.....	977 kc.	804 kc.
Belfast	1122 kc.	977 kc.
Newcastle	1429 kc.	1122 kc.

Observer Watson (New Zealand): "The New Zealand DX Radio Association now has a membership of well over 700, showing that DX is still popular here. The Australian Postmaster General announces the following National Class A stations with the time each goes into operation:"

North Tasmanian Regional, Kelso, 630 kc., now operating.

Gippsland Regional Sale, 830 kc., May, 1935.

Townsville Regional, Cleveland, 640 kc., November, 1935.

Grafton, N. S. W., 660 kc., August, 1935.

Southwest Regional, West Australia, 560 kc., November, 1935.

Central Regional, N. S. W., 550 kc., November, 1935.

West Regional, Victoria, 580 kc., November, 1935.

Observer Shepherd (New Zealand): "During the 'Iowa on the Air' broadcast only two stations were heard here—WOI, 640 kc., and WMT, 600 kc., both rather weak. KMA, 930 kc., was spoiled by KROW; KSO, 1320 kc., was completely blotted out by KGMB."

Observer Tomlinson (New York): "Advise all DX'ers to watch 1YA, 650 kc., as at times he is equal in volume to KFI here on the East Coast. 1YA is heard beginning about 3 a.m., with best reception 4-4:30 a.m."

Observer Kentzel (New York): "Fine DX Tips are given from KVI, Tacoma, 570 kc., at 3 a.m., Sundays."

Observer Nichols (Connecticut): "Correct street address for Cuban CMBX is Calle San Miguel, 194, Havana, Cuba, and not as listed in some publications."

Observer Beal (Massachusetts): "My log now contains 652 stations with 374 verifications. Following are some stations heard regularly during early morning hours: 3-4 a.m., Sat. or Sun., KLRA; 3 a.m., Fri., KVI; 2-4 a.m., Sat., KRGV; 3-5 a.m., Sat., KGRS; 5-6 a.m., Fri., KFAC; 4-5 a.m., every other Sun., KPAC; 2-5 a.m., every third Sun., KFUO; 3-4 a.m., every third Sun., KGBZ; 2-4 a.m., first Mon. and Wed. each month, WHEF; 3-4 a.m., first Sun. and second Sat. each month, KGIW; 2-3 a.m., first and third Sun. each month, KIDW."

Observer Southward (Ohio): "HIX now heard on 518 kc., instead of 1270 kc. This station uses 1000 watts and is on the air Tues. and Fri., at 8:15 p.m., Sun., at 7:40 a.m., and every day at noon." (EST.)

Observer Smith (Illinois): "1YA, Aukland, N.Z., has been coming in here five mornings out of seven with remarkable signal strength. 2YA is heard about three mornings out of seven. 2BL, 3LO, 4QG, 5CK, and 2CO have been breaking through at times with fair signals. I suggest that all Illinois DX'ers watch the trans-

(*Continued on page* 693)

Build A

REMOTE CONTROL TUNER

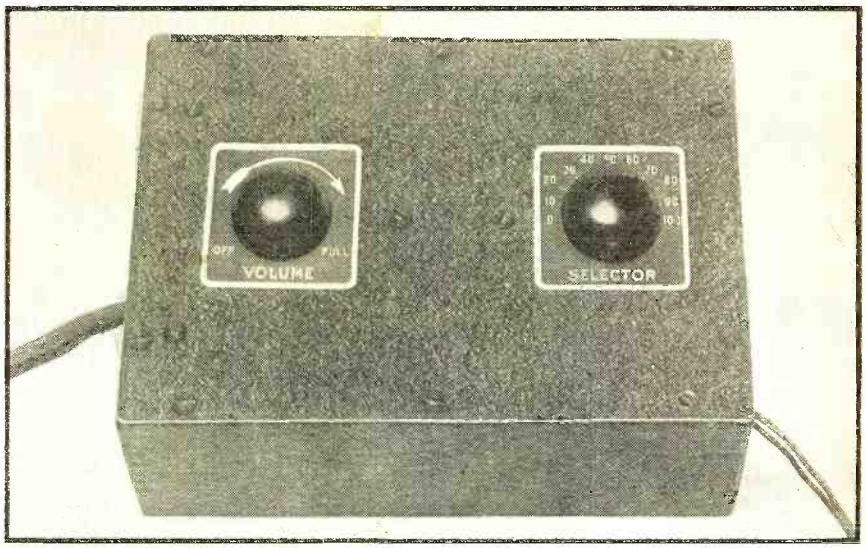
This home-made unit enables you to turn on your receiver, tune it and control volume from your favorite armchair

Richard F. Shea

IT is the purpose of this article to describe a compact remote control unit possessing many desirable features, extremely compact in size, and, best of all, adaptable to any receiver without the slightest change being necessary. The unit turns on the regular set, tunes in the desired stations and controls the volume. Obviously the answer to the prayer of the listener who likes to combine radio entertainment with complete comfort.

Reference to Figure 1 gives the circuit. Fundamentally, it consists of a combined detector-oscillator, using the type 6A7 tube, and a rectifier. The oscillator beats the incoming signal to the desired intermediate frequency—in this case 550 kilocycles—and this is detected and passed along to the regular broadcast receiver, which is permanently tuned to this frequency.

The gain of the device is controlled by varying the bias on the 6A7 and also short-circuiting the antenna coil, thus reducing the gain of the detector section of the tube. The different stations are tuned in by varying the frequency of the oscillator, and hence the station with which it will beat to produce 550 kc. Either the type -37 tube or the newer type 1-v may be used as the rectifier. In the former case, the grid and plate are tied together as shown in Figure 1.



EXTERNAL VIEW

This size of the complete unit is only 7 inches by 5 inches by 2½ inches

The two filaments are connected in series and are lighted directly from the line through a 340-ohm resistance. In the model this resistance was in the form of a so-called "heater cord," such as are made by several of the line cord manufacturers. These heater cords are three conductor cables, one of the conductors being in the form of resistance wire, coiled around an asbestos cord and wrapped with asbestos. By this means the heat is dissipated in the line cord, and not confined within the small space of the control box, where it would cause excessive temperature rise. In use it will be noticed that the line cord gets warm, due to this heat dissipation. It must be noted that this resistance must carry 3/10 of an ampere and dissipate 30 watts, which will require a cord about 12 feet long. If such a heater cord is not available, a ballast type of resistor may be used, as long as it is connected as shown in Figure 1 and connected outside of the remote-control unit. Such a ballast unit, however, will get quite hot, as the 30 watts are now concentrated in much less space.

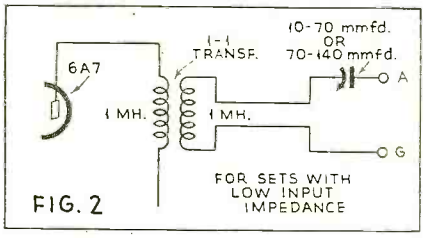


FIG. 2

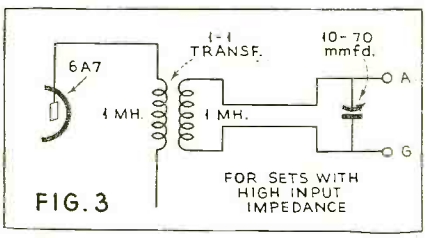


FIG. 3

For the sake of compactness, both the antenna coil and the oscillator coil in the model are of the universal type. Such coils may be obtained from any of the various coil manufacturers. The antenna coil consists of two universal windings spaced about ⅛" apart on a 5/16" wooden dowel. The inductance values follow:

Primary, 2 millihenries; secondary, 265 microhenries; mutual inductance between primary and secondary, 230 microhenries.

The oscillator coil was likewise a universal winding, with the coil opened up about in the middle to form two windings, the inside one being the primary, the outer the secondary. The inductances are:

Primary, 100 mh.; secondary, 115 mh.; mutual inductance, approximately 45 mh.

(*Continued on page 715*)

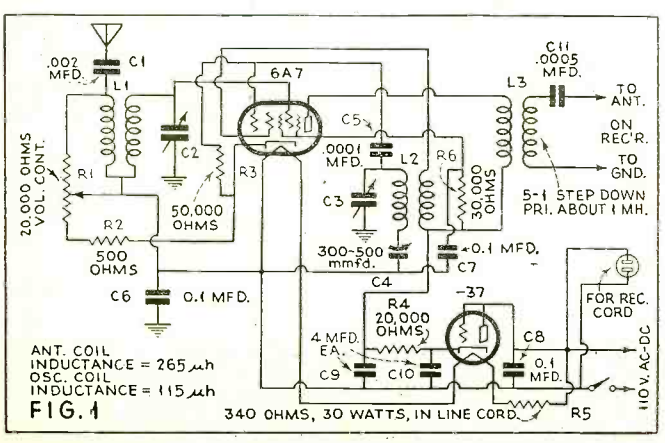
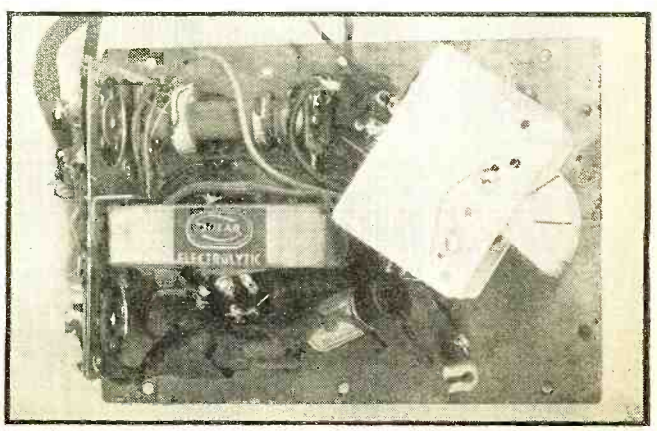


FIG. 1



INTERNAL VIEW

The tubes have been removed to show the compact layout

AMERICAN STATION LIST

NORTH, CENTRAL AND SOUTH AMERICA

(Exclusive of the United States)

NORTH AMERICA

CANADA

(Data furnished by Canadian Radio Commission.)

Call	Location	kc.	kw.
CJRM	Belleplaine, Sask.	540	1.0
CFNB	Fredericton, N. B.	550	0.5
CKUA	South Edmonton, Alta.	580	0.5
CHRC	Quebec, Que.	580	0.1
CKCL	Toronto, Ont.	580	0.1
CJOR	Sea Island, B. C.	600	0.5
CFCF	Montreal. Que.	600	0.4
CRCW	Windsor, Ont.	600	1.0
CKOV	Kelowna, B. C.	630	0.1
CJGX	Yorkton, Sask.	630	0.5
CFCY	Charlottetown, P. E. I.	630	1.0
CJCJ	Calgary, Alta.	690	0.1
CFRB	Toronto, Ont.	690	10.0
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
CKSO	Sudbury, Ont.	780	1.0
CFQC	Saskatoon, Sask.	840	1.0
CRCT	Toronto, Ont.	840	5.0
CFJC	Kamloops, B. C.	880	0.1
CRCO	Ottawa, Ont.	880	1.0
CJIC	Sault Ste. Marie. Ont.	890	0.1
CJAT	Trail, B. C.	910	0.25
CRCM	Montreal. Que.	910	5.0
CFAC	Calgary, Alta.	930	0.1
CKPR	Fort William, Ont.	930	0.1
CFCH	North Bay, Ont.	930	0.1
CKPC	Brantford, Ont.	930	0.1
CFLC	Prescott. Ont.	930	0.1
CHNS	Halifax, N. S.	930	1.0
CRCS	Chicoutimi. Que.	950	0.1
CKY	Winnipeg, Man.	960	15.0
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
CKLW	Windsor. Ont.	1030	5.0
CFCO	Chatham, Ont.	1050	0.1
CRCK	Quebec, Que.	1050	1.0
CRCV	Vancouver, B. C.	1100	1.0
CKOC	Hamilton, Ont.	1120	1.0
CHLP	Montreal. Que.	1120	0.1
CHSJ	St. John, N. B.	1120	0.1
CKX	Brandon, Man.	1120	0.1
CHAB	Moose Jaw, Sask.	1200	0.1
CKTB	St. Catherines, Ont.	1200	0.1
CJCU	Aklavik, N. W. T.	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
CJOC	Lethbridge, Alta.	1230	0.1
CJCB	Sydney, N. S.	1240	1.0
CFRN	Edmonton, Alta.	1260	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
CKCW	Moncton, N. B.	1370	0.1
CJRC	Middlechurch, Man.	1390	0.1
CKFC	Vancouver B. C.	1410	0.05
CKMO	Vancouver, B. C.	1410	0.1
CKGB	Timmins, Ont.	1420	0.1
CKNC	Toronto, Ont.	1420	0.1
CFCT	Victoria, B. C.	1450	0.05
CHGS	Summerside, P. E. I.	1450	0.05
CKCR	Waterloo, Ont.	1510	0.1
CFRC	Kingston. Ont.	1510	0.1

MEXICO

(Data furnished by the Secretary of Communication of Mexico.)

Call	Location	kc.	kw.
XEAO	Mexicali, B. C.	560	0.25
XEPN	Piedras Negras, Coah.	590	50.0
XFX	Mexico, D. F.	610	0.5
XEZ	Merida, Yuc.	630	0.5
XEOX	Saltillo, Coah.	640	0.25
XEAL	Mexico, D. F. (temporarily suspended)	660	1.0
XET	Monterrey, N. L.	690	0.5
XEN	Mexico, D. F.	710	1.0
XEAM	Nuevo Laredo, Tams.	730	0.0075
XELC	Col. del Valle, D. F.	740	0.1
XEBC	Aguacaliente, B. C.	760	5.0
XEYZ	Mexico, D. F.	780	10.0
XFC	Aguascalientes. Ags.	810	0.35
XEP	Mexico, D. F.	820	0.5
XEMO	Tijuana. B. C.	860	2.0
XEW	Mexico, D. F.	890	50.0
XENT	Nuevo Laredo, Tams.	910	150.0
XEFE	Nuevo Laredo, Tams.	920	0.25
XEAA	Mexicali, B. C. (temporarily suspended)	920	0.2
XEFO	Mexico, D. F.	940	5.0
XFO	Mexico, D. F.	940	5.0
XEAW	Reynosa, Tams.	960	10.0
XEAE	Tijuana, B. C. (temporarily suspended)	980	0.25
XEK	Mexico, D. F.	990	0.1
XES	Tampico, Tams.	990	0.25
XEOK	Tijuana, B. C. (temporarily suspended)	1000	2.5
XEJ	Ciudad Juarez, Chih.	1020	1.0
XEB	Mexico, D. F.	1030	10.0
XEA	Guadalajara. Jal.	1060	0.125
XEAF	Nogales, Son.	1080	.25
XEMA	Tampico, Tams.	1080	0.05
XEFG	Mexico, D. F.	1100	0.25
XEWZ	Mexico, D. F.	1150	0.1
XEH	Monterrey, N. L.	1150	0.25
XED	Guadalajara, Jal.	1160	0.5
XEU	Veracruz, Ver.	1160	0.25
XEE	Durango, Dgo.	1210	0.05
XEFV	Ciudad Juarez, Chih.	1210	0.1
XEMZ	Tijuana, B. C.	1210	0.03
XETH	Puebla, Pue.	1210	0.1
XETF	Veracruz, Ver.	1220	0.012
XEFJ	Monterrey, N. L.	1230	0.1
XELA	Saltillo, Coah.	1240	0.05
XEKL	Leon, Gto.	1240	0.5
XEAI	Mexico, D. F.	1240	0.1
XEG	Ensenada, B. C.	1270	0.2
XFB	Jalapa, Ver.	1270	0.25
XEMX	Mexico City, D. F.	1280	0.012
XEC	Tijuana, B. C.	1310	0.03
XEX	Monterrey, N. L.	1310	0.125
XEAJ	Oaxaca, Oax.	1310	0.015
XECW	Mexico, D. F.	1310	0.01
XEFC	Merida, Yuc.	1310	0.1
XEFW	Tampico, Tams.	1310	0.25
XETB	Torreon, Coah.	1310	0.125
XFA	Aguascalientes, Ags.	1310	0.005
XFD	Jalapa, Ver.	1340	0.35
XEI	Morelia, Mich.	1370	0.125
XEFZ	Mexico, D. F.	1370	0.1
XEZZ	San Luis Potosi, S. L. P.	1370	0.1
XEAZ	Guanajuato, Gto.	1420	0.007
XEFB	Monterrey, N. L.	1420	0.1
XEFI	Chihuahua, Chih.	1440	0.25
XEFA	Tacuba, D. F.	....	0.5
XETW	Mexico, D. F. (temporarily suspended)	....	0.5

MIQUELON

FQN	St. Pierre	574	0.25

NEWFOUNDLAND

(Data furnished by Dept. of Foreign and Domestic Commerce, Washington, D. C.)

Call	Location	kc.	kw.
VOWR	St. Johns	700	0.5
VOGT	Bell Island	890	0.1
VOAS	St. Johns	940	0.1
VONA	St. Johns	950	0.025
VOGY	St. Johns	1050	0.075
VOKW	St. Johns	1085	0.03
VONF	St. Johns	1195	5.0
VOAC	St. Johns	1300	0.04
VOX	St. Johns	1300	0.1

CUBA

(Data furnished by the Dept. of Communication in Cuba)

Call	Location	kc.	kw.
CMCQ	Havana	610	0.15
CMGC	Matanzas	630	0.1
CMBY	Havana	635	0.25
CMAF	Havana	680	0.25
CMK	Havana	725	1.5
CMCW	Havana	755	0.15
CMBS	Havana	775	0.13
CMJK	Camaguey	790	0.15
CMCF	Havana	815	0.25
CMQ	Havana	840	0.5
CMHW	Cienfuegos	865	0.1
CMCX	Havana	865	0.15
CMKD	Santiago	882	0.25
CMX	Havana	910	0.65
CMJF	Camaguey	920	0.2
CMW	Havana	930	1.0
CMKM	Manzanillo	940	0.05
CMHD	Caibarien	950	0.25
CMCD	Havana	960	0.25
CMJL	Camaguey	960	0.05
CMGF	Matanzas	987	0.1
CMBZ	Havana	1005	0.12
CMJO	C. de Avila	1010	0.05
CMKC	Santiago	1034	0.15
CMBC	Havana	1035	0.185
CNHI	Sta. Clara	1037	0.15
CMGH	Matanzas	1040	0.015
CMJG	Camaguey	1050	0.052
CMCB	Havana	1060	0.11
CMGI	Colon	1094	0.03
CMCY	Havana	1100	0.25
CMHA	S. la Grande	1100	0.052
CMHJ	Cienfuegos	1125	0.1
CMBG	Havana	1150	0.22
CMJH	C. de Avila	1150	0.055
COA	Havana	1175	0.07
CMJE	Camaguey	1175	0.05
CMCJ	Havana	1200	0.5
CMJI	C. de Avila	1210	0.045
CMHK	Cruces	1225	0.25
CMCA	Havana	1230	0.15
CMHB	S. Spiritus	1245	0.03
CMCU	Havana	1255	0.15
CMCO	Havana	1280	0.15
COX	Havana	1325	0.25
CMBD	Havana	1350	0.2
CMJP	Moron	1360	0.75
CMJF	Helguin	1363	0.03
CMGE	Cardenas	1375	0.03
CMJC	Camaguey	1382	0.15
CMKR	Santiago	1400	0.03
CMCR	Havana	1400	0.15
CMBX	Havana	1425	0.15
COK	Havana	1450	0.184
CMCG	Havana	1475	0.15
CMCN	Marianao	1500	0.25

DOMINICAN REPUBLIC

(Data furnished by the Dept. of Labor and Communication of the Dominican Republic)

HIX	Santo Domingo	580	1.0
HIT	Santo Domingo	1051	0.01
HIL	Santo Domingo	1111	0.02
HIJ	Santo Domingo	1190	0.01
HI5E	Santo Domingo	1304	0.01
HIH	San Pedro de Macoris	1391	0.015

HAITI

(Data furnished by the Director General of Public Works in Haiti)

HHK	Port-au-Prince	920	1.0

CENTRAL AMERICA

COSTA RICA

(Data furnished by the Director General of Communication of Costa Rico)

Call	Location	kc.	kw.
TIEP	San Jose	850	0.5
TIRH	San Jose	930	0.05
TIGH	San Jose	1000	0.5
TIFA	San Jose	1050	0.075
TIRC	San Jose	1100	0.075

GUATEMALA

(Data furnished by Director General of National Telegraphs, Radio and Telephones, Guatemala)

TGW	Guatemala City	565	10.0
TGX	Guatemala City	1400	0.1

HONDURAS

(Data furnished by U. S. Consulate at Tegucigalpa)

HRN	Tegucigalpa	1270	0.0075

NICARAGUA

(Data furnished by U. S. Consulate at Managua)

YNLF	Managua	850	0.5
YNGRG	Granada	937.5	....
YNIGG	Managua	1000	0.25
YNVA	Managua	1070	0.25
YNOP	Managua	1250	0.25

EL SALVADOR

(Data furnished by Bureau of Foreign and Domestic Commerce, Washington, D. C.)

RDN	San Salvador	680	0.5

SOUTH AMERICA

ARGENTINA

(Data furnished by U. S. Consulate General at Buenos Aires)

Call	Location	kc.	kw.
LS10	Buenos Aires	590	5.0
LV1	San Juan	620	1.5
LS3	Buenos Aires	630	4.5
LS4	Buenos Aires	670	6.0
LS1	Buenos Aires	710	5.0
LT4	Mendoza	760	0.2
LT1	Rosario	780	5.0
LR10	Buenos Aires	790	8.0
LU2	Bahia Blanca	800	0.5
LV7	Tucuma	820	0.5
LR5	Buenos Aires	830	16.0
LT8	Rosario	840	0.35

LV10	Mendoza	860	0.5
LR6	Buenos Aires	870	16.0
LV2	Cordoba	880	7.0
LR4	Buenos Aires	890	12.0
LV9	Salta	900	0.5
LR2	Buenos Aires	910	6.0
LR3	Buenos Aires	950	12.0
LR9	Buenos Aires	1030	5.0
LT9	Santa Fe	1060	0.2
LT3	Rosario	1080	3.5
LS5	Buenos Aires	1110	4.5
LV5	San Juan	1120	0.7
LR8	Buenos Aires	1150	5.0
LT5	Resistencia	1160	0.5
LS2	Buenos Aires	1190	25.0
LS8	Buenos Aires	1230	20.0
LV14	La Rioja	1240	0.2
LS9	Buenos Aires	1270	5.0
LU7	Bahia Blanca	1280	0.2
LT1	Santa Fe	1300	0.1
LS6	Buenos Aires	1350	3.5
LU6	Mar del Plata	1380	0.5
LR11	La Plata	1390	.....
LS11	La Plata	1430	0. 7

BOLIVIA

(Data furnished by CP4)

CP4	La Paz	1040	10.0
CPX	La Paz	1300	.....

BRAZIL

(Data obtained by Mr. W. W. Enete, O.R.N.L.P.O. from Brazilian Dept. of Telegraphs)

PRF2	Rio Claro, S. Paolo	725	0.25
PRE6	Uberaba, Minaes Geraes	740	1.5
PRA2	Rio de Janeiro	750	1.5
PRA8	Pernambuco	750	3.0
PRD9	Sorocaba, S. Paolo	769	0.25
PRE7	Sao Paolo	788	1.0
PRB7	Rio de Janeiro	800	0.5
PRA6	Sao Paolo	815	1.0
PRA4	Bahia	857	0.5
PRB3	Juiz de Fora, M. Geraes	857	0.25
PRA3	Rio de Janeiro	860	2.5
PRB2	Curityba, Parana	882	0.25
PRF3	Sao Paolo	895	5.0
PRC3	Pelotas, R. G. do Sul	920	0.25
PRF4	Rio de Janeiro	923	10.0
PRD2	Rio de Janeiro	932	1.0
PRE4	Sao Paolo	941	0.25
PRC6	Rio de Janeiro	980	1.0
PRB8	Sao Paolo	1000	0.05
PRB4	Santos, S. Paolo	1000	1.0
PRB9	Sao Paolo	1017	5.0
PRC8	Rio de Janeiro	1040	0.25
PRC7	Bello Horizonte, M. Geraes	1091	0.25
PRC2	Porto Alegre, R. G. do Sul	1091	3.0
PRA9	Rio de Janeiro	1100	1.0
PRA7	Ribeirao Preto, S. Paolo	1154	0.05
PRB6	Cruzeiro do Sul, S. Paolo	1170	0.25
PRC9	Campinas, S. Paolo	1175	0.25
PRD3	Taubate, S. Paolo	1201	0.25
PRF6	Rio de Janeiro	1282	10.0
PRA5	S. Paolo	1295	5.0
PRC4	S. Paolo	1304	0.05
PRE9	Fortaleza, Ceara	1315	0.5
PRE2	Rio de Janeiro	1330	0.5
PRD4	Arrarraquara, S. Paolo	1364	0.25
PRC5	Belem, Para	1364	0.1
PRF7	Campoos, Rio de Janeiro	1380	0.5
PRD5	Rio de Janeiro	1400	0.5
PRE5	Uberaba, M. Geraes	1410	0.25
PRB5	Franca, S. Paolo	1415	0.05
PRD7	Sorocaba, S. Paolo	1430	0.25

COLOMBIA

(Data furnished by the Ministry of Posts and Telegraphs in Colombia)

HJN	Bogota	682	0.5
HJ3ABH	Bogota	1000	0.05
HJ4ABJ	Armenia	1000	0.05
HJ3ABD	Bogota	1111	0.05
HJ1ABF	Barranquilla	1200	0.05
HJ3ABE	Bogota	1250	0.05
HJ4ABK	Medellin	1250	0.3
HJ1ABA	Barranquilla	1300	0.05
HJ3ABK	Bogota	1320	0.05

CHILE

(Data furnished by U. S. Consulate General at Santiago)

CE32	Los Andes	320	0.05
CE58	Santiago	585	1.0
CE62	Santiago	625	1.0
CE66	Santiago	665	1.0
CE70	Santiago	705	1.0
CE73	Vina del Mar	730	1.0
CE76	Valparaiso	760	10.0
CE78	Santiago	785	1.0
CE81	Valparaiso	810	1.0
CE82	Santiago	825	1.0
CE86	Santiago	865	1.0
CE87	Talcahuano	870	0.1
CE88	Valparaiso	880	1.0
CE90	Santiago	905	1.0
CE94	Santiago	945	5.0
CE98	Santiago	985	5.0
CE100	Santiago	1005	0.5
CE101	Vina del Mar	1010	1.0
CE102	Santiago	1025	0.1
CE103	Valdivia	1030	0.1
CE104	Magallanes	1040	0.1
CE105	Valparaiso	1050	1.0
CE106	Santiago	1065	1.0
CE108	Concepcion	1080	0.1
CE109	Valparaiso	1090	0.1
CE110	Santiago	1105	1.0
CE111	Osorno	1110	0.1
CE114	Santiago	1145	0.1
CE115	Talca	1150	0.1
CE117	Valparaiso	1170	0.25
CE118	Santiago	1185	1.0
CE119	Magallanes	1190	0.1
CE120	Curico	1200	0.1
CE122	Santiago	1225	0.25
CE124	Santiago	1240	0.1
CE125	Valparaiso	1250	0.1
CE126	Santiago	1265	1.0
CE128	Temuco	1280	0.5
CE131	Santiago	1315	0.1
CE133	Osorno	1330	0.1
CE134	Santiago	1345	0.15
CE138	Santiago	1385	1.0
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

ECUADOR

(Data furnished by Bureau of Foreign and Domestic Commerce, Washington, D. C.)

HC2ET	Guayaquil	1153	0.3
HC2JB	Guayaquil	1250	0.03

PARAGUAY

(Data furnished by U. S. Consulate at Asuncion and J. F. Edbrooke, O.R.N.L.P.O. for Argentina)

ZP15	Villarrica	700	.....
ZP1	Asuncion	770	0.5
ZP9	Asuncion	898	1.5
ZP7	Asuncion	1083	0.7
ZP4	Asuncion	1200	0.1
ZP5	Asuncion	1376	0.1

PERU

(Data furnished by the Bureau of Foreign and Domestic Commerce, Washington, D. C.)

OAX	Lima	750	1.5
OA4AR	Lima	1210	0.025
OA4O	Lima	1277	0.1
OA6E	Arequipa	1350	0.03
OA4K	Lima	1360	0.15
OA6D	Arequipa	1400	0.15
OA6U	Arequipa	1443	0.05

URUGUAY

(Data furnished by Mr. J. F. Edbrooke, O.R.N.L.P.O. for Argentina)

CX2	Montevideo	570	.....
CX4	Montevideo	610	1.0
CX6	Montevideo	650	10.0
CX8	Montevideo	690	1.0
CW9	Under construction	720	0.12
CX10	Montevideo	730	1.0
CX12	Montevideo	770	1.0
CX14	Montevideo	810	5.0
CX16	Montevideo	850	2.5
CX18	Montevideo	890	0.05
CW19	Rocha	920	0.1
CX20	Montevideo	930	2.0
CX22	Montevideo	970	0.25
CW23	Salto	1000	0.25
CX24	Montevideo	1010	10.0
CW25	Durazno	1040	0.5
CX26	Montevideo	1050	2.0
CW27	Salto	1080	0.25
CX28	Montevideo	1090	2.0
CW29	Mercedes	1120	0.05
CX30	Montevideo	1130	0.5
CW31	Salto	1160	0.25
CX32	Montevideo	1170	0.5
CW33	Florida	1200	0.075
CX34	Montevideo	1210	0.5
CW35	Paysandu	1240	0.25
CX36	Montevideo	1250	0.25
CW37	Colonia	1280	0.025
CX38	Montevideo	1290	0.5
CW39	Paysandu	1320	0.1
CX40	Montevideo	1330	0.5
CW41	San Jose	1360	0.05
CX42	Montevideo	1370	1.0
CW43	Cerro Largo, Melo	1400	0.02
CX44	Montevideo	1410	1.0
CW45	Durazno	1440	0.03
CX46	Montevideo	1450	0.1
CW47	Canelones	1480	0.1
CX48	Montevideo	1490	1.5

VENEZUELA

(Data furnished by U. S. Consulate at Caracas)

YV1RC	Caracas	960	5.0
YV11BMO	Maracaibo	1034	.....
YV4RC	Sabana Grande, D. F.	1100	.....
YV17BMO	Maracaibo	1153	.....
YV3RC	Caracas	1200	3.0

The DX Corner for the Broadcast Band

(Continued from page 690)

(Readers' Reports, etc.)

pacific channels during April, especially 1YA, 650 kc. These T.P.'s come in best after 3:30 a.m., C.S.T."

Observer Everly (Illinois): "KNX dedicated a new $20,000 antenna system February 2nd, and were received as early as 8 p.m., with a tremendous signal."

Observer Rebensdorf (Illinois): "Have strong hope of raising my verifications to 400 by Spring. They now stand at 339. The new stations in Ponce, P.R., is WPRP. They are testing during March (and probably April) on 1420 kc., with a 20-watt transmitter to determine best location for their permanent station. Following are a few stations heard weekly in the early morning: 2-3 a.m., Sun., KGIW; 3-4 a.m., Sun., KIDW; 3-4 a.m., Sun., KXL; 6-7 a.m., Sat., WHDL." (EST.)

Observer Atkins (Missouri): "Have recently made the RADIO NEWS Tenatuner (February, 1934, issue, page 483) which is well worth making. It increased the volume of many weak stations and probably accounts for receiving LR2. I expect to get some good ones with the Tenatuner connected ahead of my receiver."

S. A. Tucker (Bluff, Alaska): "Here in Alaska we have little static except two or three times a year, accompanying storms. During the winter months we receive the California stations after sundown. Reception of the broadcast band is especially good between November and February. European stations as well as Jap and Chinese come in well. I will be glad to correspond with any listener who may be interested." (Readers interested may address Mr. Tucker at Bluff via Nome, Alaska.)

National Radio Club: "Alec Kinghorn, our representative in Cuba, writes that practically all Havana stations are changing frequencies in March and are installing crystals to enable them to maintain their new frequencies constant."

Midwest Tuning Meter

Apparently the difficulty which has been encountered by owners of Midwest 1934 models 16-tube receivers has been finally overcome. L. G. Shavez, of Los Angeles, has been experimenting with this ever since the advantages of a tuning meter were pointed out in this department some months ago. His conclusion is that the only position in which the meter can be used effectively is in the plate circuit of the first i.f. tube. The meter he uses is an 0-1 milliammeter, shunted by a 200-ohm rheostat, and is connected between the plate filter resistor of this tube and the B-plus line. His meter scale is divided into 10 divisions which he has numbered in reverse. With no signal tuned in, the rheostat is adjusted until full-scale deflection is obtained (zero on his reverse scale). Then any signal tuned in will cause the needle to move back down the scale. A high-power local station such as KFI causes the meter to retard the full length of the scale, distant stations cause less retardation and very weak stations cause a barely appreciable movement. Thus he is able to obtain a definite measure of the signal strength of every station tuned in.

This information from Mr. Chavez will undoubtedly interest a large number of Midwest owners, several of whom have written in asking for specific information on the proper tuning meter connections with this receiver.

1500-1600 KC. Range

Many DX fans have receivers capable of tuning the newly developed addition to the broadcast band extending somewhat above 1500 kc. This range between 1500 and 1600 kc. is being assigned to high-fidelity stations with band widths of 20 kc. instead of the usual 10 kc., to permit the transmission of audio frequencies up to 10,000 cycles. The National Radio Club of York, Pennsylvania, in the monthly news bulletin which they sent out to members, gives the call letters of four such stations as follows: 1530 kc., W1XBS, Waterbury, Connecticut, and W9XBY, Kansas City, Missouri; 1550 kc., W2XR, Long Island City, New York, and W6XAI, Bakersfield, California.

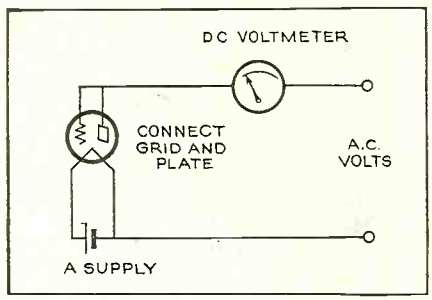
WITH THE EXPERIMENTERS

WILLIAM C. DORF

Employing a D.C. Voltmeter for A.C. Readings

Many experimenters possess a d.c. moving-coil voltmeter but hesitate to invest in an a.c. meter. The accompanying diagram shows how a d.c. instrument can be converted into an a.c. voltmeter with a fair degree of accuracy.

The vacuum tube is used as a half-wave rectifier and any type three-element tube



will answer the purpose. If the voltmeter has a resistance of approximately 1000 ohms per volt the results will be highly successful.

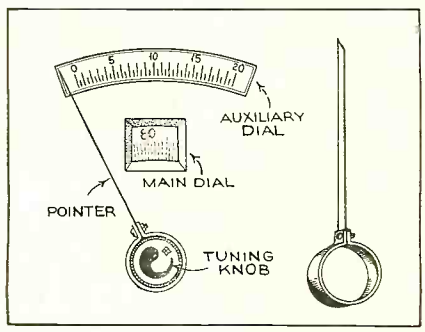
The a.c. voltage to be measured is connected across the terminals and the voltage as indicated by the meter is multiplied by the figure 2.2 to ascertain the r.m.s. value.

R. E. BLAKEY,
Bury, England.

Band Spreading

Ham operators will be interested in this simple auxiliary dial for spreading the amateur bands.

The pointer is made from a strip of soft brass or aluminum. A 6-32 machine screw and nut fastens the pointer to the outside edge of the tuning knob as shown in the drawing. The dial is cut from a piece of



cardboard, numbered and then glued to the receiver panel just above the regular dial opening. The dial I use is approximately three inches long and is divided into twenty equal divisions.

To set this auxiliary dial the main dial is first tuned to the highest frequency end of the desired band and then the band-spread pointer is placed at zero setting and fastened. It must be realized, of course, that the pointer must be reset when it is desired to operate the receiver on a different ham band.

Provided there is no backlash in the main dial mechanism, any station previously logged should come in within a fraction of its old setting.

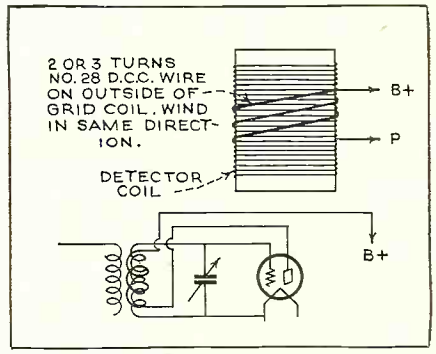
If the pointer is made of heavier brass, fine tuning can be easily accomplished by grasping the pointer near the top, instead of manipulating the knob.

H. S. OUGH,
Pachuca, Mexico.

Improving the Sensitivity of Old Receivers

Two or three turns of No. 28 d.c.c. wire wound over the detector tuning coil and connected as shown in the diagram, will improve both the sensitivity and selectivity of many of the old model broadcast receivers.

The winding should be in the same direction as that of the grid coil. If the cir-



cuit oscillates remove a turn at a time until it operates just below the point of oscillation. For best results it should be regenerative but not oscillating.

I have used this arrangement with success with new sets chiefly where the owner was interested in obtaining long distance daylight reception.

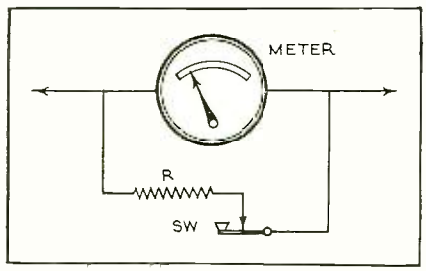
H. D. HOOTON,
Beech Hill, W. Va.

Protecting Meters

The accompanying circuit diagram shows a simple way to protect a meter. The switch SW, normally remains in a closed position and must be pressed by hand to be held in an open position. The value of the shunt resistance R depends on the meter. The value should be such that when the switch is closed and the maximum rated current of the meter is flowing through the circuit, the meter will show about one-half deflection. For an example, suppose the meter has a range of 5 mil-

liamperes, the procedure will be to pass this amount of current through the meter so that it will read at maximum deflection, then place across the instrument a resistance which will show a deflection of the needle of approximately half this amount of current, or 2.5 milliamperes.

When using the instrument with its protective device we first note the reading of



the meter with the switch closed (normal position) and if the meter reads more than 2.5 ma. we will know that excessive current is flowing through the circuit and that the meter will be overloaded if the switch SW. is opened. If, on the other hand, the meter reads less than 2.5 ma. it will be safe to open the switch.

W. D. COSGROVE,
Chicago, Ill.

Repairing Audio Transformers

In many cases audio transformers can be easily repaired, as most troubles are due to open windings caused by the copper deteriorating where the leads are soldered to the terminals. After removing the case the winding should be removed from the core and the outer layers of insulation cut away with a knife; the breaks in the leads will be indicated by corrosion, characteristically green. When continuity is established, ordinary gummed paper can be used to repair the damaged insulation. Likewise, field coils of dynamic type speakers may sometimes be salvaged by ten or fifteen minutes' work.

RUSSELL L. WOOLLEY,
Seattle, Wash.

Chart of Tap and Clearance Drills

In radio construction work experimenters are often confronted with the problem of selecting the correct size drill for tapping, or for drilling a clearance hole to take a certain size machine screw, and the chart accompanying this article gives this information at a glance. It is suggested that the chart be mounted on a piece of heavy cardboard and tacked over the workbench for quick reference. The first

SCREW NUMBER	THREADS PER INCH	DRILL NUMBER FOR TAP	DRILL NUMBER CLEARANCE
3	40	49	39
3	48	45	38
3	56	44	38
4	32	43	31
4	36	42	31
4	40	41	31
5	30,32	40	29
5	36	38	29
5	40	37	29
6	30,32	35	26
6	36	33	26
6	40	32	26
7	30	31	21
7	32	30	21
8	24,30	30	17
8	32	29	17
9	24	29	13
9	28	28	13
9	30	27	13
9	32	25	13
10	24	25	8
10	30	22	8
10	32	21	8

and second columns identify the machine screw, the third column gives the drill size where the hole is to be tapped. If the hole is to be drilled so that the machine

(*Continued on page 709*)

BACKSTAGE IN BROADCASTING

RAY NOBLE

KATHLEEN WELLS

HELEN JEPSON

EDDIE CANTOR

Samuel Kaufman

Chatty Bits on Radio Personalities

RUDY VALLEE was host at a recent luncheon tendered in honor of Ray Noble, England's famous dance conductor and composer. All of the big names in New York's dance music field turned out en masse to pay tribute to the British bandsman who had long before earned an American following through his phonograph recordings. Noble's NBC series is presented Wednesday nights under the sponsorship of Coty's Perfumes. One of his outstanding song successes which had wide acclaim on both sides of the Atlantic was "Goodnight, Sweetheart." He also wrote "Love Is the Sweetest Thing," "The Very Thought of You" and "It's All Forgotten Now." Al Bowlly, vocalist with the Noble aggregation, won such wide acclaim during the early days of the Noble band's visit that he seems headed for stardom in his own right.

THE most recent addition to the stellar Maxwell House Show Boat feature of NBC is Kathleen Wells, former dress shop model who studied singing during her lunch hours. Miss Wells hies from Jersey City and broke into radio gradually through occasional guest appearances.

PHIL BAKER'S Friday night NBC Armour Program is going ahead with full steam, with the accordion jester keeping his place among the air's leading comics.

Estelle Jayne, Broadway musical comedy performer, was a recent addition to the Baker cast. Miss Jayne, a newcomer to the airlanes, is a native of San Francisco and had her first stage experience in the Little Theatre productions of the University of California. She was seen on Broadway in "Rain or Shine," "All the King's Horses" and "The Five o'Clock Girl." On the Baker programs she specializes in dramatic bits.

THE populace of Radio Row is still congratulating Helen Jepson, vocalist of the NBC Thursday night Paul Whiteman Music Hall program, for the sensational success of her début at the Metropolitan Opera House, New York, in the world première of the American opera, "In a Pasha's Garden." It was through her radio efforts that Miss Jepson attracted wide attention to her vocal ability and won a Metropolitan contract—the goal of all vocalists.

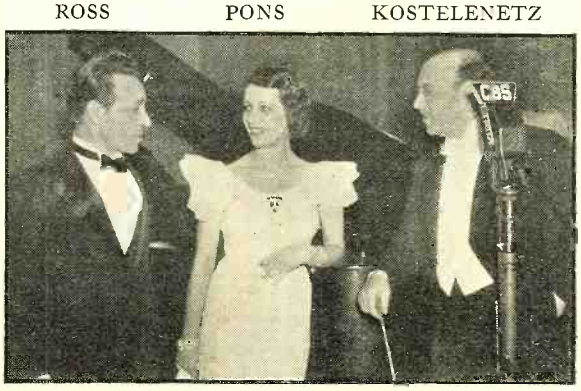
EDDIE CANTOR, one of radio's foremost funsters, recently returned to the air on a new program in direct competition to his old spot on NBC. Eddie's CBS series, sponsored Sundays by Pebeco Toothpaste, is on the air at exactly the same time as the NBC Chase & Sanborn series on which Eddie made his sensational microphone ascent. Eddie brought along Rubinoff and his violin, but adopted a new straight man in Ted Husing, ace CBS sports announcer. An outstanding contribution to the new Cantor program is the work of Harry Einstein, who, as Nick Parkyakakas, has become one of the leading dialecticians of the ether. Until he came to the airlanes, Einstein was a Boston advertising executive. He did not take his hobby of entertaining seriously until he entered radio as "a side line." His broadcasting income soon surpassed his advertising salary.

AN eminent trio of vocalists has been added to the CBS Chesterfield series conducted by André Kostelanetz, projecting the programs to the rating of one of the leading musical features of the air. Lucrezia Bori, whom many term the outstanding lyric soprano of the day, is starred on the Monday programs, while Lily Pons, world-famed coloratura soprano, is the Wednesday headliner. The Saturday Chesterfield program boasts of Richard Bonelli, prominent American baritone, as its star. Kostelanetz has retained the large orchestra and mixed vocal ensemble previously featured on the series.

WE'VE been receiving so many inquiries about Alexander Woollcott of late that we thought it nigh time to run a biographical sketch of CBS's noted Town Crier. He was born in Phalanx, New Jersey, forty-eight years ago, attended the Central High School in Philadelphia, and acquired a Ph.D. degree at Hamilton College. After several years of study, writing and teaching, he became dramatic critic of the

PHIL BAKER

DAVID ROSS LILY PONS ANDRE KOSTELENETZ



LUCREZIA BORI

ESTELLE JAYNE

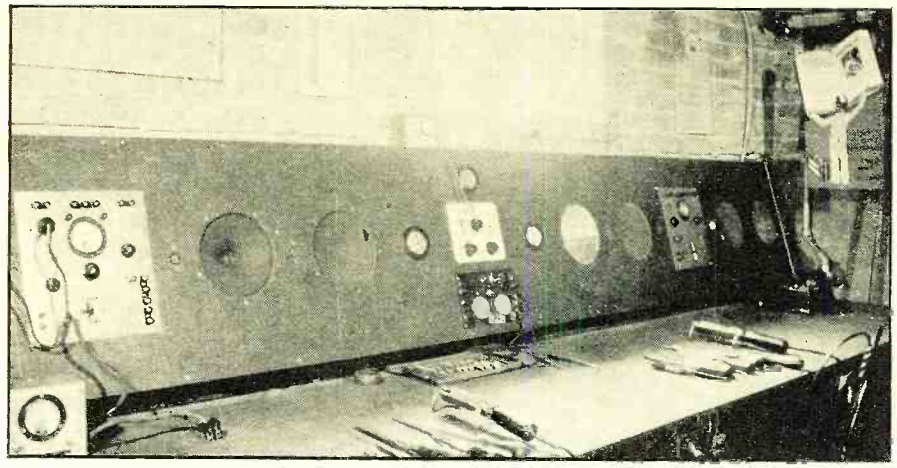
New York Times, holding that post from 1914 to 1922. During this span of years he deserted the New York theatres for World War service overseas. He was one of the publishers of the official newspaper of the American Expeditionary Forces, *The Stars and Stripes.* Later he served as dramatic critic of *The New York Herald* and the New York *World,* and earned additional fame as a contributor to national magazines. He wrote syndicate columns and best-seller books, and his versatility, not limited to the typewriter, brought him to the stage as an actor in "Brief Moment." He was a microphone success since his initial appearance as "The Early Bookworm" in 1930. His radio popularity was further enhanced by his Town Crier rôle which, at present, is heard Sundays.

TWO stars of the musical comedy stage were recently added to the permanent casts of the two network programs sponsored by Bayer's Aspirin. The new Bayer Musical Revue, which succeeded the old American Album of Familiar Music on NBC Sunday nights, continues to feature Frank Munn and the Gustave Haenschen Orchestra, but, in addition, brings Vivienne Segal, the Broadway star, to the network audience. The same sponsor's "Lavender and Old Lace" program on CBS Tuesdays, now co-stars Bernice Claire, stage soprano, with Munn, Miss Claire having been awarded an extended contract as the result of a highly successful guest appearance.

STELLA FRIEND, the vocalist recently added to the Fred Waring musical aggregation heard over CBS Thursdays, is a singing find of Raymond Paige, Los Angeles bandsman. Paige is the lad who

(*Continued on page* 703)

SAMUEL KAUFMAN



THE SERVICE BENCH

ZEH BOUCK

THE service game may be likened to a double-barrel shotgun. There are two business ends to it—the shop proper, where most of the manual and a bit of the brainwork are done, and the office, where the brain stress should be concentrated—on everything from sales to keeping up to date. A reference library of at least a half dozen books is just as important as a full complement of speakers with various input impedances and characteristics. A filing system to keep accounts and transactions straight is fully as essential as an analyzer or test set. And the office should be just as well lighted, equally comfortable and conducive to all-around efficiency as the service shop itself.

A happy wedding of these ideals is illustrated in our heading photograph and in

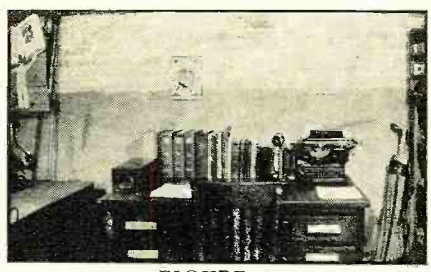


FIGURE 1

Figure 1, which show respectively the service bench and the service desk of the R. A. Brown Radio Service, Waukegan, Ill. The test panel is twelve feet long and twenty inches high, being constructed of Masonite tempered presswood, as is the bench top. Equipment includes eight test speakers with different field values and input transformers (four speakers operating into each control box), an a.c. line meter, high- and low-range ohmmeters, a Clough-Brengle oscillator and a Weston analyzer.

On the office end we have in view a neat desk, an effective library of manuals, periodicals and standard radio texts, telephone, typewriter and card file. Just to prove that it all pays, that the successful serviceman can take plenty of time out for amusement and recreation, we observe to the right a set of golf clubs! Mr. Brown, the manager, specializes in distributor service, and has recently taken over the service department of Echophone. Concerning this receiver, he contributes to—

THE DAY'S WORK

The following item he says might well apply to other receivers using the 24A tube as an oscillator: "The Echophone model S-5 Special seems to keep a lot of the fellows guessing. This receiver is a 7-tube superheterodyne and employs a dynatron oscillator requiring a special type of 24 tube. As it is impossible to obtain 24A tubes that will oscillate satisfactorily over the entire broadcast band, the only thing that can be done is to redesign the oscillator circuit. Any time spent in trying to service this circuit in its present form is simply a waste of time. I might add that I receive sets from all parts of the country to be rebuilt. They are usually in very bad condition, due to the fact that they have been passed around from one serviceman to another." We take it that Mr. Brown means to redesign the oscillator circuit along the more conventional lines indicated a hundred and one times in any good service manual.

A Live-Wire Tip

"Many unhandy and impractical things are applied to the handles of pliers and wire cutters for insulation, or to better the grip when working in cold weather with heavy gloves. Tape is sticky, always coming off, and does not last. Tubing is not heavy enough or too heavy. Force on a pair of inexpensive tricycle handles as shown in Figure 2. Squeeze a bit of cement into the handles first if it is available. Such handles are of a soft but tough, durable rubber, and can be forced neatly over the handles of any ordinary pliers

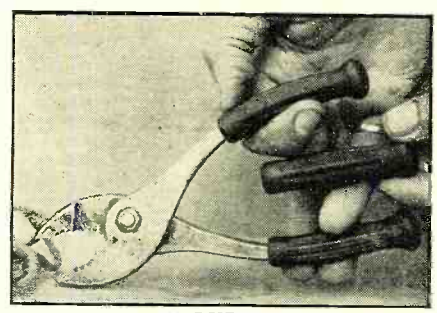


FIGURE 2

on which such an addition is necessary. The small knobs at the ends make an excellent grip." Frank Bentley, Jr., Missouri Valley, Iowa.

A Peculiar Case of Intermittent Reception

The Service Editor, himself, ran into trouble on a friend's set, and almost suffered the humiliation of having said friend call in a serviceman to solve the difficulty.

EXHIBITION CARS TO TOUR THE UNITED STATES

Radio Exhibition Cars

The RCA-Victor Company has launched a fleet of exhibition vans which are literally radio shows on wheels. The fleet will tour the nation in a promotion campaign for radio receivers, tubes, home talkie apparatus and records. Parades will be held in various cities and towns and demonstrations given in front of dealers' stores.

The "magic brain" feature of RCA-Victor is portrayed on the cars' sides and illuminated advertising panels are cleverly worked into the decorative scheme. There are 16 loudspeakers on both sides of each vehicle which can function from either radio receivers or phonographs. Announcements over a built-in p.a. system can also be made. A motion-picture screen is concealed in the top of each car. It rises from the top for the exhibition of talkie programs.

The receiver developed a very loud buzz—completely predominating over the signal—after a half hour or so of operation. The fact that the noise was present with the r.f. section eliminated (by taking out any r.f. tube), but much louder when all tubes were in, suggested that the trouble was common to all r.f. and a.f. circuits—i.e., in the power supply. All resistors and condensers were carefully checked and found okay. Similarly, the voltages were what they should be at all times. It was discovered that by violently disturbing the electrical balance of the circuit—shorting almost any by-pass condenser, for instance—would restore the receiver to normal operation for a short time.

We then disconnected the speaker, and made a good old-fashioned listening test, with the ear close to the power supply. The noise could be distinctly heard as an irregular buzzing. We suspected leakage. As the easiest place to test for it was in the rectifier sockets—two -81's being used—we removed first one rectifier and then the other. The noise was present when either tube was used in one socket, but absent when either tube was plugged into the other socket.

The socket was dismantled, and the trouble exposed. An arc had developed at one time between the plate contact and one filament spring. A serviceman had been called in, and instead of replacing the socket, merely scraped away the charred bakelite. After a time a leak had developed again, and was the cause of the noise. A sudden drop in potential, effected either by turning off the receiver or by short-circuiting the high voltage, was sufficient to stop the leak momentarily. A new socket, of course, did the trick, saving our reputation by a narrow margin!

An Excellent Service Procedure

The above incident suggests a procedure which we recommend to all servicemen. Had we known of the previous repair on the set in question, we should probably have been able to effect the final remedy with considerably more expedition. The case history of every receiver should be tacked somewhere inside the cabinet.

We should like to see all manufacturers supply such cards with their receivers, to be filled out by every serviceman called in to doctor the set. Space should be provided for the following information: Date serviced; Symptoms; trouble; Cure (new parts or repair); Name and Address of the Serviceman.

Until manufacturers do this, the serviceman should supply such data cards himself—for his own information and for the assistance of other servicemen. The following benefits will accrue: The card will serve as a reminder of where to go for service so long as the owner remains in the same locality; the serviceman need not make notes of every job, and may keep his service book clean of all but the most interesting and complicated jobs which may help him in future work; a strange serviceman can get to work much more efficiently when he knows what has been done on the receiver before.

A Familiar Tube Complaint

"I received an 8-tube super for repair with the complaint that the set played satisfactorily at 1500 kc. and up as high as 750 kc., but cut out definitely on all longer waves. I checked the tubes, condensers, resistors, voltages, etc., but found everything okay. Replacing tubes, I located the trouble in a type 24—which played all right in other sockets." J. A. Good, Manchester, Pa. Though Mr. Good does not mention the fact, the defective tube was undoubtedly in the oscillator socket. Many tubes that will not oscillate effectively on the longer waves are still good amplifiers. Another point in favor of an oscillating check on tubes!

SERVICE NOTES

FIGURE 3

A trend toward small, door-top refrigerators for home, camp and office use has become definitely established, and Frigidaire makes the latest contribution to this low-priced line (Figure 3).

RADIO PHYSICS COURSE

ALFRED A. GHIRARDI

Lesson 40. Capacity of Condensers

WHEN condensers are connected in parallel as in (A) of Figure 1, the effect is to increase the total surface area of the plates connected on each side of the line. Thus in (A) of Figure 1 the area of plate A is added to that of D, and the area of plate B is added to that of E, etc. The result is that the plate surface area is increased to the sum of the individual surface areas, as shown at (B), and the total combined capacitance is equal to the sum of the individual capacitances connected in parallel. This may be stated thus:

$$C = C_1 + C_2 + C_3 + C_4 + \text{etc.}$$

where C = the combined capacitance C_1, C_2, C_3, etc., are the individual capacitances.

This fact may be made use of in making up condensers of odd capacitances by connecting several condensers of standard size in parallel. Thus, to make up a capacitance of say .00075 mfd. a standard size condenser of .0005 mfd. and one of .00025 mfd. can be connected in parallel.

With condensers connected in parallel, the voltage rating of the combination is limited by the safe working voltage rating of the lowest-voltage condenser in the group, and the voltage applied across the combination should never exceed this value.

When two or more condensers are connected in series as shown at (A) of Figure 2, the effect is really to increase the total dielectric thickness and thereby reduce the capacitance. However, the increase in total dielectric thickness makes the series combination able to safely withstand higher voltage without breaking down.

Thus, in (A) electrons are transferred from one outside plate around through the external circuit to the other outside plate during charging of the condenser. The two center plates really do not add to the capacitance in any way, as any charges induced on them will be electrically opposite and will therefore neutralize each other. The effect then is the same as though the two inner plates were eliminated and the individual condensers C_1 and C_2 were replaced by a single condenser C, having a total thickness of dielectric equal to the sum of the dielectric thickness of the individual condensers, as shown at (B). If the condensers are of unequal capacitances, the plate area must also be considered.

The total capacitance of two or more condensers in series is found from the formula:

$$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \text{etc.}$$

where C = the total combined capacitance C_1, C_2, C_3, etc., are the individual capacitances.

The above formula may be put into a somewhat more convenient form for calculation, as follows:

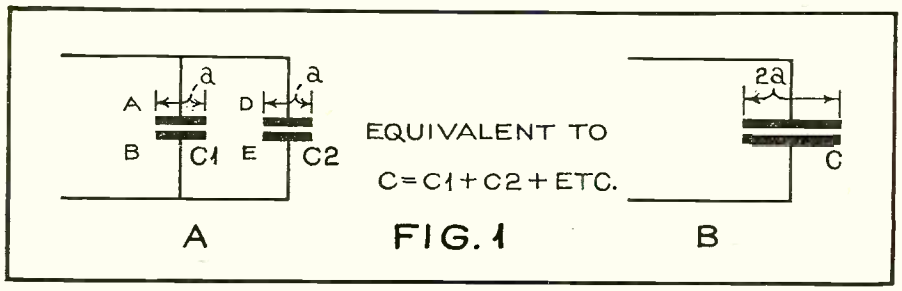


Figure 1. When two or more condensers are connected in parallel, we obtain the effect of adding their plate surface areas, thus increasing the total capacitance.

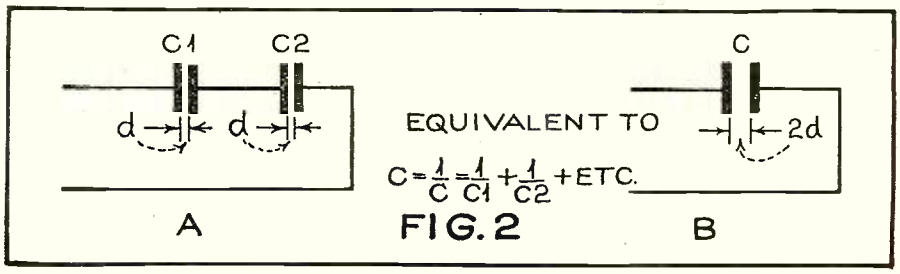


Figure 2. When two or more condensers are connected in series, the effect is to increase the thickness of the dielectric between the active plates. This results in a decrease of the capacitance, and an increase in the breakdown voltage which would be required to rupture the dielectric.

$$C = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \text{etc.}}$$

The total capacitance of any number of condensers in series is smaller than the capacitance of the smallest condenser in the group. It is thus possible to obtain capacitances of smaller value by using two or more condensers in series.

Condensers of medium voltage rating are very often connected in series where high voltages are to be withstood, but it should be remembered that in any case of series condenser connection, the resultant capacitance is less than that of the smallest condenser in the group. The calculation of the resultant voltage rating of condensers connected in series is rather complicated, unless the condensers connected in series are of the same capacity, voltage rating and power factor.

When condensers of equal capacity are connected in series, any voltage applied

across the combination will distribute itself equally across each condenser and the voltage across each condenser will be equal to the voltage across the combination divided by the number of condensers connected in series, provided the insulation resistances or power factors of the condensers are equal. When the insulation resistances are not the same for each condenser, the voltage distribution across the condenser will be affected to a greater or lesser extent, depending on the wave-form of the applied voltage. The effect of unequal voltage distribution can be minimized by the use of resistor balance (high value resistors across the condensers).

The voltage distribution among several condensers connected in series, for condensers of fairly low power factor, will be proportional to the product of the capacity by the power factor.

S.W. Reception

(*Continued from page* 674)

carry to the peoples of the world the very choice of our national talent in music, song, drama and sports. I believe that within the near future the United States will employ a national short-wave transmitter, molded after those in use by Daventry, Zeesen and Pontoise, which will put on daily programs of national importance for various parts of the world.

What does all of this bring us to. Simply that in the future we will have a complete selection of national programs from every important country on earth. These will bring to the microphone the very life ebb and flow of these peoples, with all that goes to make it characteristic or unique, from other nations. These broadcasts will tend to preserve and intensify the traditions and national heritages of each country and to mold for it a permanent place in the lives of the radio listeners of the world. We will not realize just how much some particular station or country really means in our everyday existence until some emergency removes it temporarily from our dials, and then we will realize, with somewhat of a shock, that we miss that program and that no other can take its place.

New S.W. Unit

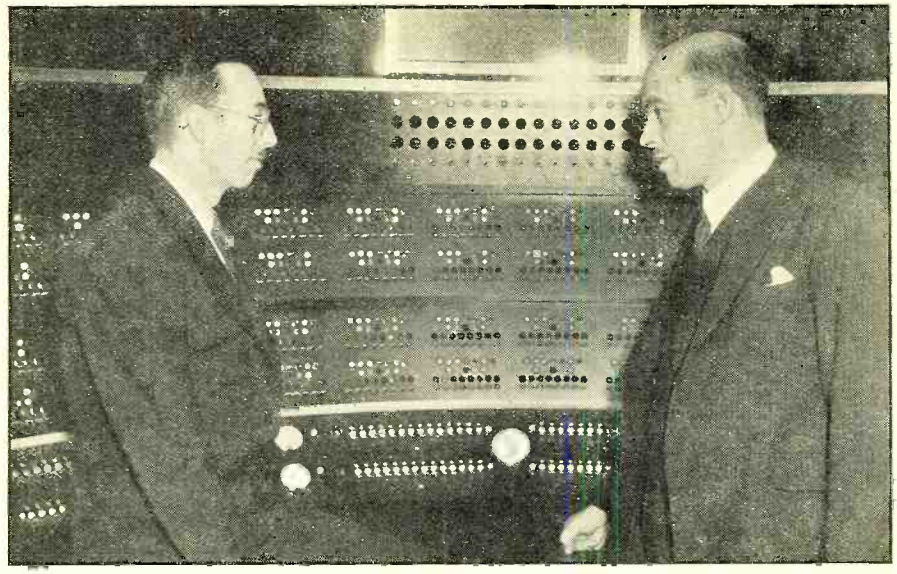
(*Continued from page* 668)

circuit to compensate for detuning caused by aerial trimmer variation. It is adjustable without affecting calibration, and without the slightest body capacity effect, by a knob on the converter panel.

An unusual feature is the headphone outlet, which permits 'phone reception with the loudspeaker silent, 'phone and speaker reception together, or tuning stations on the 'phones and then turning them on the speaker. It also allows the "Explorer" to be used alone with an appropriate plate supply as an independent short-wave receiver for headphone reception.

The converter operates on 110 volts a.c. or d.c. for its filament power supply. The plate current of only 3 to 5 milliamperes is drawn from the receiver by means of a wire, slipped under a tube prong. This permits grounding of the converter circuit, filament by-passing, and further filtering for quietest operation.

When the converter is turned off, the aerial is connected to the antenna post of the receiver, making possible regular broadcast reception wtihout disconnecting any wires.



QRD? QRD? QRD?

CONDUCTED BY GY

TO our ears has come the knowledge of the ITK, now known as the International Radio Fraternity, which has almost 400 members composed of men who have been in amateur radio for an average of ten years. Ages generally above thirty. Only licensed amateurs with stations can become members. There are five grades of membership: "Junior" membership, open to any licensed amateur; "Knight of the Key," Class A license and three years' experience; "Sparks," five years' experience plus consistent radio amateur performance; "L. J." degree, same as sparks except this includes a commercial ticket or military service; "Honor" degree, on any member who has saved life, property, etc., in a major emergency. Members hold local chapter meetings for social contacts. IRF as a group engages in no political fights except on a vote of membership. Dues are a buck a year, with members being entitled to half rates on some publications. Prospective members must be pledged by a member in good standing. Just a get-together gang of hams for the purpose of out-lying one another.

Well, the official dope on Mathison, formerly vice-president of the ARTA, has been put on the mahogany top and the boiled-down substance is that Brother Volney (from the attitude of the members, the law courts and the various political outfits on the West Coast) went right ahead and declared himself in on everything but free eats . . . and the boys wouldn't stand for it. As our Westcoaster sez . . . Volney Mathison has resigned his offices in ARTA, which action takes ARTA out of politics and back into radio where it belongs . . . amongst other things he supported Sinclair for Governor. Te-r-r-r-r-ific, what?

H. J. McDade of Buffalo, N. Y., was appointed delegate for the Los Angeles area by Hoyt Haddock, who feels he is not only a capable man at delegating, but is also trustworthy and can be entrusted with the delicate task of bringing new members in and keeping those already in satisfied to remain so. Considerable comment was made on this appointment because, as some suggested, the job should have been given to some of the men on the beach who in the past have been giving their time and effort gratis to the organization. We note with satisfaction that Brother Haddock did the right thing by putting some one in the job whom he knew and trusted.

Three new trawlers of the R. O'Brien Company fleet originally supplied with the New England Telephone Company's marine radio-telephone, have just been equipped with Mackay radiotelegraph apparatus. This comes on the heels of the announcement of the Mass. Trawling Company, owner of the "Boston," "Trimount," and "Shawmut," raising the salaries of ops to $135.00. Not so bad, what ho.

Well, advancement seems to continue to be in the wind. We quote a telegram sent to the New York office of the ARTA from Brother Pyle, the San Francisco Secretary of the outfit . . . Quote signed agreement with McCormick Steam stop Chamberlain and Wood Companies signing same agreement stop terms of agreement radio work coastwise one hundred dollars radio clerical intercoastal one hundred twenty-five radio clerical offshore foreign one hundred forty all ops furnished by ARTA stop many other good clauses Unquote. This telegraph was the result of a strike action taken by the membership on the West Coast after repeated requests for arbitration had failed to move the shipowners. Which seems to your humble servant that the effect was only directed by the cause.

Shipping has been slow down around the gulf ports, we understand, and word has been forwarded to the "snowbird" brethren of the Lake regions of this condition so that they will remain in their woolen undies for the rest of the winter session. This condition is expected to let up shortly with the Lykes SS Company taking a few of their vessels out from "layups" and the UFCO doing the same. Perhaps with the advent of summer weather shipping will pick up extensively, which will mean more berths and less beachers.

Our Westcoaster announces . . . That Merv Rathbourne is taking a greater interest in the ARTA affairs and in view of his being the instigator of the CRPA and his abilities along these lines, he should be given some official position within the organization. This we believe is in accordance with the best interests of the organization in mind and no favorites . . . That the "Y" radio school in Los Angeles gets occasional jobs for its graduates, yet some of the regular ops are on the beach. Why? Take notice, ye organizations, and get busy

. . . That the unemployment situation in the Airways is getting rotten. There is a tendency to combine radio facilities in the various lines with other duties. A new gag in California is to let out the ops and hire amateurs who are sent up to get their third grade tickets. This of course saves the employers money . . . . ! That Seattle broadcast men tried a strike recently but a "sister" organization union furnished ops to replace the strikers. A good suggestion would be for all outfits to combine into one unit to aid the radiomen and technicians so that this condition would never occur . . . That seven prominent radio technicians of California are being sued for patent violations, yet they continue the work. He sez he knows one in Mexico who forgot to comply with the patent peculiarities. He misses the U. S. weather . . . That the Tuna fleet are getting the habit of raiding operating amateurs and renting their portable Xmtrs. This is not a bad idea, if the apparatus is all paid for, because if anything should go out of whack, the Tunafishers might get peeved and throw the darn thing away . . .

Well, things on the West Coast are so tough, sez a correspondent, that an op he knows was offered a job as Secretary to a Congressman, but told him he didn't like the Washington climate when Congress was in session—too windy—(a pun) and anyway he wanted to be a Senator or nothing, and to date it has been nothing.

Now that the SS Mohawk has been taken off the books a few bright spots stand out from the darkness of the disaster, such as the intrepidness of the radioman who shot out the SOS (without special permission of the copyright owners) . . . The new legislation that is being brought forward to this session of Congress so that there might be no recurrence of the past years' disasters. Those who have gone down have acted as necessary martyrs to the cause of future generations. It is terrible that things like that have to happen in order to effect necessary changes. The child must ask "Why can't proper laws be put into effect without the necessity for horrors to bring facts squarely forward"? But so goes it, and each new piece of legislation costs so much. So with this for a thought for future operators, the fear of the sea will be lessened to such an extent that the days of dangerous crossings will be but memories gleaned from books . . . ge . . . 73 . . . GY.

"Backstage"

(*Continued from page* 697)

helped Bing Crosby, the Boswell Sisters and Vera Van in their early professional efforts. Stella is not new to Waring's Pennsylvanians, having appeared with the band for a three-year period in vaudeville. It was at Station KHJ, Los Angeles, that Stella met the male trio composed of Paul Gibbon, Charles Leitch and Roy Wingwald. She joined forces with the unit, the new act being billed as Stella and the Fellows. The Fellows, too, are with Stella on the current Waring series.

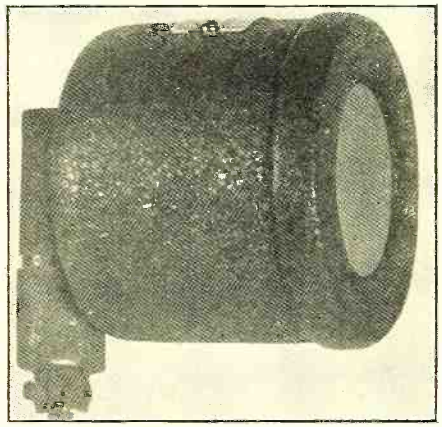
RUTH ETTING, the former Ziegfeld star who can present sentimental ballads in a more heart-throbbing fashion than any other radio songster, has returned to NBC microphones as star of the Kellogg College Prom presented each Thursday evening. Red Nichols' Orchestra and a male trio complete the permanent cast of the series. The collegiate angle referred to in the program's title is taken care of by the weekly billing of an outstanding college coach or athlete as guest speaker.

WHAT'S NEW IN RADIO

WILLIAM C. DORF

A Moving Coil Microphone

Sound engineers will be interested to hear of the new Thomaston Laboratories moving-coil type microphone, designed to meet the requirements of broadcast, recording and



all types of high-quality sound work. The microphone incorporates the following features: fidelity of reproduction, ruggedness and immunity to wide variations of temperature and humidity. No batteries or external power source are required. The output level of the microphone is approximately 75 db. down.

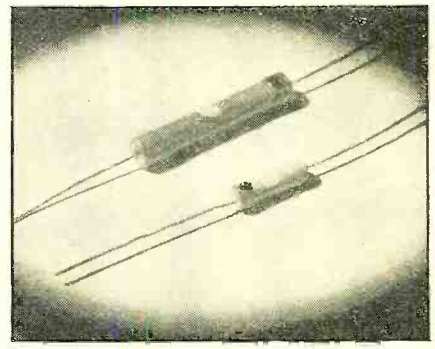
All-Wave Console

Housed in this striking console cabinet is the new Westinghouse model WR30 ten-tube all-wave superheterodyne receiver which covers a tuning range from 540 to 22,500 kilocycles. The set is equipped with micrometer tuning, shadowgraph tuning, full automatic volume control and a 12-inch size dynamic type speaker capable of handling 18 watts power output. The tube equipment is as follows: a 78 as an r.f. amplifier, a 76 for the oscillator, a 77 for the first detector, a 78 for the i.f. amplifier and

a 6B7 type as a combined second detector, first audio and a.v.c. control tube. A type 42 is used in the second a.f. driver stage and is followed by two type 6A6 tubes in the output stage. An 83 type tube is used for rectification.

New Type of Resistor

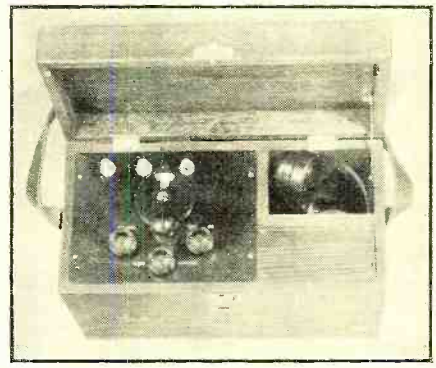
Here is a new, inexpensive, extruded ceramic composition resistor which the manufacturer, Henry L. Crowley Company claims is capable of performance heretofore identified with wire-wound units. Briefly, the development of this resistor



rests on the production of a solid, homogeneous material of high resistance value with a greater or less admixture of another resistive material of lower value to provide a desired ohmage in a mass of fixed length and diameter. This method of construction results in a uniform, rock-like element, with unusual current-carrying capacity, stability, long life and freedom from noise.

Transceiver

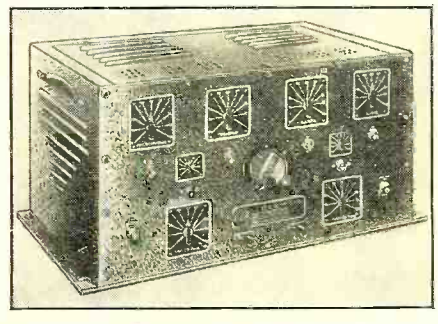
The National model TRW transceiver, as the name implies, is a combination receiver and transmitter designed for portable use



on the 56-megacycle band. Two tubes are employed, a type 30 and a 33. When used as a receiver, the 30 functions as a self-blocking super-regenerative detector which is transformer-coupled to the 33 used as an audio amplifier. When utilized as a transmitter, the type 30 tube functions as an oscillator and the type 33 as a modulator.

P. A. System

The Columbia Sound Company introduces a new nine-tube sound-reproducing

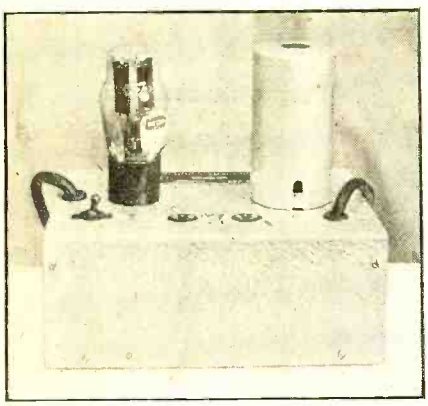


system capable of operating from either a 110-volt a.c. lighting line or from a 6-volt storage battery and designed to offer a

choice of three different output levels, 5 watts true Class A, 25 watts Class B using two new type 6A6 tubes or 50 watts Class B using four 6A6 tubes. This complete sound system includes on the one chassis a high-gain pre-amplifier, the Class A and B voltage amplifiers, a 6-volt and a 110-volt a.c. power supply and a four-position mixer-fader control panel.

Pre-Amplifier

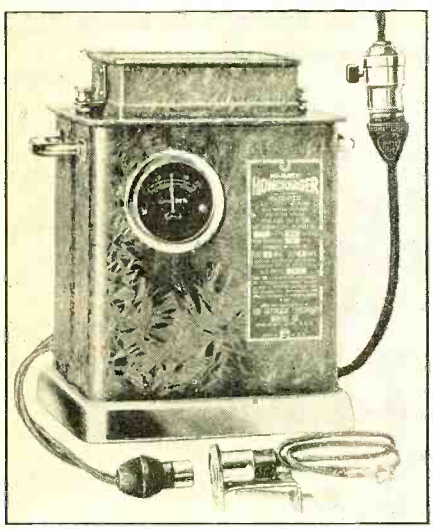
A new pre-amplifier manufactured by the Sound Systems, Inc., for use with their crystal microphone and portable amplifiers. A feature of this pre-amplifier is that, due to the excessive gain provided, two or three crystal type microphones can be used in parallel without the use of mixing equipment. While there is some loss in this procedure, the manufacturer states that the



gain provided through use of the pre-amplifier is so great that only about one-fourth of the potential power of the main amplifier is used.

A New Battery Charger

The Automatic Electrical Devices Company announces the "Hi-Rate Home-Charger" for conveniently recharging automobile batteries in your own garage. This company points out that automobile batteries are being subjected to an ever in-



creasing drain by auto radios, extra lights, etc., and with this in mind the manufacturer has designed this new charger to provide a 10-ampere initial charging rate which automatically tapers off as the battery becomes charged. It is equipped with a clamp-on plug-in type receptacle.

A New Ribbon Type Microphone

The Bruno velocity DeLuxe Model M microphone has been designed to meet the requirements of broadcasting and recording studios and all forms of sound-equipment and public-address work. Two cobalt magnets are used to produce a strong magnetic field in which is suspended a spe-

cially-treated aluminum alloy ribbon. The manufacturer advises that it is ruggedly constructed and that it has a flat frequency response curve from 30 to 14,000 cycles. The coupling transformers in these units are wound on permalloy cores having an output-matching impedance of either 200 or 500 ohms, but other impedance values can be supplied.

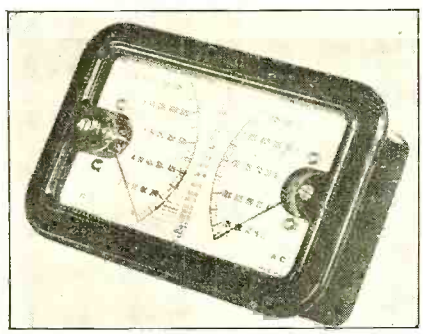
Home Phonograph Attachment

A multi-purpose phonograph oscillator is being marketed by RCA Manufacturing Company for both servicing and amateur application. The manufacturer terms the device "a miniature broadcast station for every receiver." Known as the RK-24 phonograph oscillator, the unit is actually a small broadcast-band oscillator which can be attached to all types of radio sets. It was primarily designed for use with the R-93 record player of the same manufacturer, but it can also be used for attaching any type of magnetic pick-up to any receiver with slight modifications—usually

the adding of an input transformer. The chief application of the unit is to insure efficient phonograph reproduction through a receiver while avoiding the need for circuit changes. Practical leads with special contacts are provided to obtain filament and plate power for the unit to eliminate internal wiring to the chassis. The oscillator is actually a miniature transmitter, modulated with the output of the phonograph pick-up. Connections are simply made and the unit can be removed with equal ease.

Multi-Meter in Kit Form

Servicemen and experimenters will be interested in the Triplett announcement that their popular model No. 1200 volt-,



ohm- and milliampere-meter is now available in kit form. This multirange meter is the same as the master model, except that

(*Continued on page* 707)

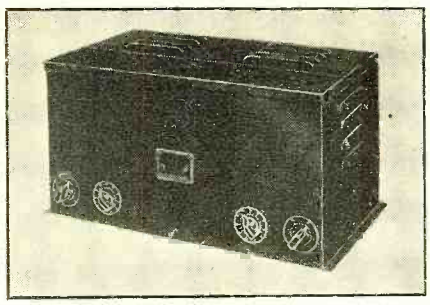
Improved Auto-Radios

(*Continued from page 663*)

ceiver proper fits out of the way above the steering column, behind the dash. The control unit fits in the ash receptacle opening in the center of the instrument panel, while the separate dynamic loudspeaker is located in the headbar of the car, above the occupants' heads. All closed models have an efficient antenna built into the roof. The regular charging generator is considered sufficient to take care of the radio receiver, although the Ford company can supply what it calls a police generator for cars also equipped with hot water heaters and other accessories consuming considerable current.

A Mobile Amplifier

Coast-to-Coast offers a 26-watt Class "B" amplifier suitable for all mobile applications. It can be operated from a 6-volt storage battery or from 110 volts a.c. It has the following features: input



mixer-fader, self-contained current supply for double-button microphones, and universal-impedance input and output transformers. The power consumption of the amplifier is between 75 and 95 watts.

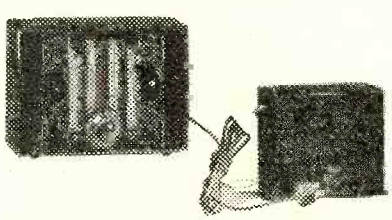
The straight 6-volt model of this amplifier uses a 77 tube and three 6A6 tubes. A universal model, operating on either battery or line current, employs an 83 rectifier for a.c. service. The gain of this amplifier is claimed to be 86 db. at 1,000 cycles.

Has Special Panel Control

In Hudson cars a special head or control dial is mounted directly in the instrument panel. The higher-priced line of cars carries a radio receiver as standard equipment, and in the other lines the panel is drilled and the hole covered with a medallion so that the set can be installed conveniently at any time. The receiver is a 6-tube superheterodyne of the two unit type, made especially for Hudson. The installation is such that other makes of receivers are not easily adapted or installed in the space provided. In view of the use of steel roofs in the 1935 cars, it was necessary to design a special antenna. An under-runningboard type, made of brass tubing, has been adopted.

Combination Auto and Home Receiver

The Kadette Model 90 duplex auto and home radio is a 4-tube midget superhet-



erodyne designed to work directly off the 110-volt, 60-cycle a.c. line in the home, and off the storage battery in the car through the use of an unusual vibrator-type converter that delivers 110-volt, 100-cycle a.c. The receiver uses a molded bakelite case and measures 8⅛ by 6¼ by 3¾.

New Auto-Antenna System

The Lynch A-3 antenna system is one answer to the aerial problem in cars with all-steel tops. The antenna consists of a triangle of heavy wire stretched under the car between the flywheel housing and the ends of the rear axle. This is connected to the receiver by means of a shielded transmission line with impedance matching transformers at both ends of the lead-in. With a rating of 100% for a large roof top antenna, Lynch claims a relative effectiveness of 85% for the undercar system, with the matching transformers. The antenna is supplied in kit form, complete with all necessary mounting hardware and fixtures.

New Accessories

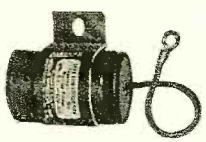
For all-steel and turret top cars, Insuline is supplying a running board antenna made of a single piece of Electralloy 35 inches long and 8 inches wide. This material is

non-magnetic and non-corrosive and is unaffected by the weather. It is furnished with three heavy springs and suitable insulating washers for mounting.

They have also a new suppressor of a material called Insulex, which is impervious to moisture and extreme changes of temperature such as encountered in automobile operation. Models to fit all types of spark plugs and distributors are available.

"Linen" Replacement Condensers

Aerovox type 1130 condensers, which are available in sizes from .007 to .07 mfd., are designed for use with auto radio vibrators, and are particularly suited as replacements. They use linen paper and are oil impreg-



nated in soldered steel cans. The Types 1120 and 1140 condensers are intended for ignition systems as interference suppressors. They are non-inductively wound, have drawn shell containers, and will withstand temperatures up to 160 degrees F.

Built-In Antennas

All 1935 Packard cars are completely engineered for radio reception. They have built-in roof antennas with shielded lead-ins, and heavy-duty, air-cooled generators. An important feature of the ignition system lies in the fact that the coils are located as close to the distributor as possible. This reduces the length of high-tension wire and keeps leakage and interference radiation at a minimum. Provision is made in the instrument board for the installation of controls in a panel which forms a decorative feature of the board. In some of the larger cars remote-control panels are sometimes installed in one of the arm rests of the rear seat. Any standard makes of radio

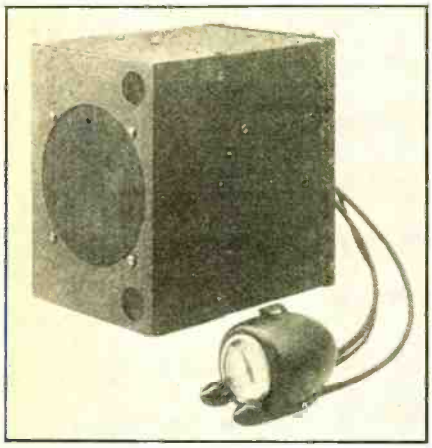
receivers can thus be installed easily and quickly.

Auto Power Systems

Pioneer "Gen-E-Motors," which are small dynamotors, are available in a dozen different models, with outputs ranging from 180 volts, 30 milliamperes, to 300 volts, 100 milliamperes. The Model JW is a special, compact unit intended to replace vibrator type power supplies and B batteries in old receivers. Ball bearings and permanently lubricated shafts are used in all models. Filter systems are included in the metal cases, which provide thorough shielding against noise radiation.

Streamlined Remote Control

General Electric introduces four new 1935 model automobile sets all equipped with a novel streamlined remote-control unit for steering-post mounting. The model D50 illustrated below is a single-unit set with an improved 6-inch electro-



dynamic type speaker. The remaining receivers include the model D51, also a single-unit set, and the models D52 and D72, both two-unit sets, with the speaker separate from the receiver chassis. In this design the reproducer can be conveniently mounted under the dashboard or above the windshield.

What's New in Radio

(*Continued from page 705*)

it does not have the panel, the adjustable feature on the meter, the batteries or case—but does have index marking. It is furnished complete with all shunts, resistors, condensers, coils, drilling template, blueprints and instructions.

A New Voltage Fuse

The Littlefuse Laboratories introduces a new line of neon discharge potential fuses called "Tattelites." They are really voltage fuses protecting equipment against excessive voltages, whereas the regular fuses protect against excessive currents. They operate by shunting out the overload. They are available with breakdown potentials of 100, 250, 500, 1000 and 2000 volts. These new fuses can be used for protecting all kinds of measuring instruments, condensers, radio receivers against lightning surges and for numerous other purposes.

A New Automobile Radio Spark Plug

Motor-car radio enthusiasts will be glad to hear of the new Defiance radio spark plug made to eliminate radio interference at its source and do away with the necessity of the additional radio suppressor unit.

"Amateur" Receiver

(*Continued from page* 668)

the set on the short-wave broadcast bands it demonstrated its ability to bring in even the most distant stations "on" at that time. A perusal of the log shows reception of stations in Japan, Australia (all three), Java, Russia (on 25 and 50 meters), Portugal, etc.—really too numerous to mention. The European and South American stations could be considered "locals" under normal receiving conditions.

As a "Ham" receiver, the set is really ideal, as it can be used with headphones or with the loudspeaker. The fact that it contains a sensitivity control separate from the volume control is another distinct advantage for this purpose. Another advantage is found in the fact that the right-hand switch enables it to be used as a "monitor" while transmitting. On the short waves signals were received and identified from amateur and commercial sources all around the globe and when using the full crystal selectivity, signals could be read on this receiver that could not be separated on a standard test receiver. On telephone, a single log sheet shows the following: 80 meters—W8PK, W8HLM. On 6400 kc—PF115, WO9, VK1, IS3 (whoever they are). On 15400 kc.—KEE transmitting to JOAK for observation. On the 20-meter band—W9GFH, W9PLM, W9ATB, W9ARK, W9DEG, W9CPM, Portable W9CRQ, W9ARW, W9DUD, W9FBZ, W9DXE, W9JRY, W9GOI, W9BJ, W9ARE, W9PJJ, W9PDI, W9GHI, W8HIH, W8CPC, W7AO, W7EVO, W6DTS, W6HFP, W6CKU, W6EIP, W6PT, W5ZS, W5BMM, W5BBB, W5BAT, W5BEE, W5UN, W4BUX, W4WT, W4LT, W3BFH, W3EHS, numerous 2's and 1's, as well as HI7G, VE1DO, X2AH, K6BAZ, XIG, K4SA, LU4CN. Some others on 40 meters were CE2QE, EA4AO, VE4NI, K6XO. It would be tiresome to go on with the results obtained as shown on other log sheets on the 75-meter and 160-meter bands, but they were rated as excellent by a number of Hams who dropped in to see how the set performed.

Taken all in all the performance of the set was found to be excellent and its stability and ease-of-operation make it a simple thing to handle (outside of a slight tendency to "cabinet-resonance" when sensitivity and volume control are both turned up full. This volume of sensitivity was never required in the tests that we made, however). The set was tested on a 200-foot antenna as well as on an antenna system using a double-doublet and also on a 50-foot wire. The size of the antenna seemed to have very little to do with either the sensitivity or selectivity.

Thermionic Voltmeter

(*Continued from page* 665)

voltage read. It must be remembered that exact values of d.c. voltages are given, while for a.c. the voltage of the positive peak is read. This value must be multiplied by

$\frac{1}{\sqrt{2}}$, (0.7071) to give r.m.s. values.

The resistor R5 is included simply as a sensitivity control to prevent the milliammeter from going too far off scale on the preliminary trimming and when the meter is being used on the higher ranges. It is advisable on the first tests of the completed meter to work with considerable resistance inserted at this point. For maximum sensitivity B3 should be 90 v.

Upon first consideration this meter may seem rather complicated compared with the conventional instrument, but its advantages far outweigh this objection. The cost should not be great as the builder will probably find considerable material in the scrap box that can be utilized. In the author's case the outlay for new equipment was about eight dollars.

List of Parts

R1—2000 ohm rheostat
R2—500,000 ohm carbon resistor
R3—50,000 ohm potentiometer
R4—200 ohm wire wound resistor
R5—50,000 ohm rheostat
R6—40,000 ohm carbon resistor
R7—200 ohm wire wound resistor
R8—20 ohm potentiometer
R9—1000 ohm potentiometer
R10—1000 ohm potentiometer
R11—10,000 ohm potentiometer
R12—100 ohms (minus resistance of milliammeter)
R13—1000 ohm with 1% accuracy
R14—10,000 ohm with 1% accuracy
R15—100,000 ohm with 1% accuracy
R16—20 megohms carbon resistor
R17—wire wound resistor equal to resistance of milliammeter
C1—.01 mfd. 500 volt mica condenser
C2—.25 mfd. 200 volt condenser
I, V—0-1 milliammeter
S1, S2, S3, S4—Triple pole single throw switches
S5—Triple pole double throw switch
S6, (S7)—Double pole single throw switch
S8—Single pole double throw switch with low capacity

Three above-panel sockets, 4 prong, 5 prong and 6 prong.

Oscillograph

(*Continued from page* 670)

calibrations of the scale at various distances from the center of the "zero" spot of the tube.

It should be noted in Patterns 1 and 2 that the deflecting plates have been drawn outside the tube for illustration purposes, but are actually enclosed within the bulb to secure the highest possible deflection sensitivity.

In some circuits there is not enough voltage available to deflect the spot across the screen, although such circuits may carry currents of considerable magnitude. Magnetic deflection of the beam may be used in these cases. This is illustrated in Patterns 3 and 4. By the application of an external coil, the tube has been caused to act as an ammeter, the electron beam being deflected by the magnetic field set up by current in the coils.

This deflection can be calibrated against a scale in the same manner as a voltage, by applying measured values of direct current through the coils and noting the resulting deflection. The amount of deflection indicates the peak current value. Reference to Patterns 3 and 4 shows that the deflection of the beam is at right angles to the common axis of the coils.

In some measurements it is of value to read current along one axis of the screen and voltage along the other. This can be done by applying a set of coils to cause deflection in the desired direction and using one set of plates to cause a deflection at right angles. The unused deflecting plates should be shorted and grounded.

The second article of this series will discuss the sweep circuit by means of which the utility of the cathode-ray tube is tremendously increased.

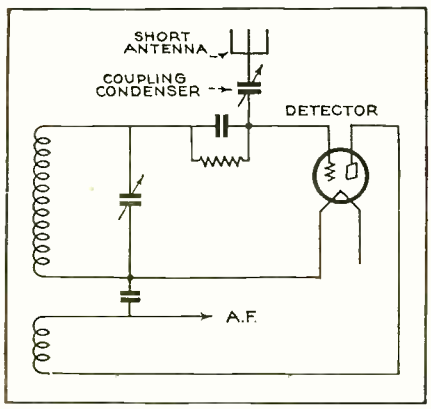
With the Experimenters

(*Continued from page 695*)

screw passes through the hole, then the size drill is selected under the column headed "Clearance."

Unusual Method of Antenna Coupling

It is the usual practice with simple regenerative short-wave receivers to connect the antenna through a small compression type condenser directly to the top of the grid coil. In my experiments. I find that reception is considerably improved by con-



necting the antenna through this coupling condenser direct to the grid of the tube as shown in the circuit diagram.

Employing this method with an aerial measuring less than 10 feet in length, I have received stations 5000 miles away with plenty of volume.

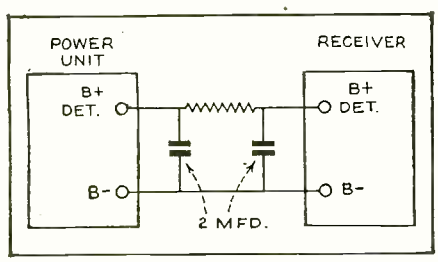
H. D. HOOTON,
Beech Hill. W. Va.

To Prevent Motorboating

Here is a simple circuit to overcome motorboating generally due to interactive coupling betwen stages.

This circuit consists of a network of condensers and a resistance connected between the power unit and the detector B+ terminal of the set, as shown in the diagram. I use this circuit in resistance-coupled amplifiers where the trouble of motorboating is most commonly encountered. However, this circuit is also applicable to any type of audio amplifier troubled with this condition.

It is preferable to locate the resistance at a point close to the receiver rather than at



the power unit. The value of the resistance is dependent to a certain extent upon the characteristics of the receiver and power unit. With some amplifiers I find the value of 10,000 ohms to be satisfactory, while with others a resistance of 50,000 to 100,000 ohms is required. A resistance of 50,000 ohms seems to be satisfactory in most cases. In using these higher values it may be found desirable to increase the voltage somewhat, to compensate for the drop across the resistor.

NORMAN CASE,
New York City, N. Y.

The "Ham" Shack

(*Continued from page* 686)

code sending by experts and are intended for beginners desirous of learning to read code, as well as for those with experience who desire to increase their speed. A modulated note is employed which can be picked up on any regular broadcast receiver which is capable of tuning to 1530 kc.

A Preamplifier

(*Continued from page* 667)

between the limited and peaked response of a diaphragm microphone and the perfect response of the velocity microphone and pre-amplifier. The combination is not only perfect for public address and studio, but can also be used for the highest type of laboratory work.

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This is to certify that the average circulation per issue of RADIO NEWS for the six months' period July 1st to and including December 31st, 1934, was as follows: Copies sold, 65,120; copies distributed free, 1,017; total, 66,137. (Signed) Lee Ellmaker, Publisher. Subscribed to and sworn before me on this 13th day of March, 1935. Edythe E. Tompkins, Notary Public, Bronx County Clerk's No. 62, Register's No. 66T36, New York County Clerk's No. 390, Register's No. 6T267. Commission expires March 30, 1936.

The Browning 35

(*Continued from page* 685)

be found in the top of T3. With the set in operating condition and connected to a short antenna, tune in a signal. Turn on the beat-frequency oscillator by means of the switch in the rear of the chassis. The AVC should be turned off (Turn clockwise). If the oscillator is adjusted to the right frequency a beat note or whistle will be heard. If it is not adjusted to the right frequency only a slight reduction in signal strength will be obtained. Rotate the adjusting screw in the top of T3 *very slowly!* With the proper adjustment, a note will be heard. This may be varied from a very high to a low pitch. The beat-frequency oscillator should then be turned off and another station tuned in. The oscillator should again be switched on, with the result that a beat-note should be obtained. The reason for checking this adjustment is that it is possible to adjust the beat-frequency oscillator to a frequency very close to a broadcasting station's frequency, with the result that a whistle will be heard on one particular station but will not be heard on any others.

The beat-frequency oscillator which is incorporated as an integral part of the receiver makes an excellent device for proper tuning, even of broadcast signals. If the frequency of this oscillator is set for a very low pitch accurate tuning may be accomplished in the following manner: Turn on the beat-frequency oscillator. Signals will be tuned in with a whistle. At one particular setting this whistle will be so low in pitch as to be inaudible, while either side of this setting the pitch rapidly rises. When the receiver is tuned to the lowest pitch its frequency accurately matches the transmitted frequency and the set is in perfect tune. Of course the beat-frequency oscillator should then be switched off when the program is received. This oscillator may be properly set by tuning in a short-wave station and adjusting the condenser to zero beat by means of the screw on the top of T3.

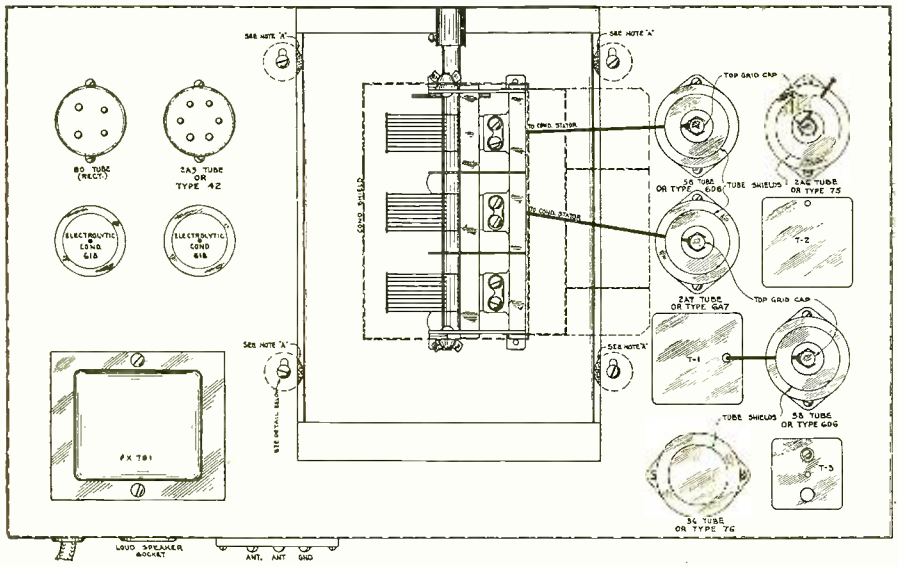
A few suggestions on tuning the radio receiver may be pertinent. Let us first consider the broadcast band. The receiver is extremely sensitive and may be operated with satisfaction on a short antenna, except when trying for very distant stations. The auxiliary volume control (a 10,000-ohm resistor, in series with the cathode of the 58 amplifier tube) may be somewhat retarded except where maximum sensitivity is required. Retarding this i.f. sensitivity control results in a better signal-to-noise ratio. It has already been stated that the receiver is very selective but has a "broad-nose" tuning curve. As a consequence, on the broadcast band, the vernier may be rotated several divisions without an appreciable diminution from a local station but it will be noted that when this knob is turned a fraction of a degree *farther* that the station *goes out completely!*

In tuning for short-wave stations, either American or Foreign—the positions of which are marked on the dial—it is essential to turn even this micro-vernier adjustment, slowly, otherwise the stations will be passed by. In the case of tuning on the two short-wave bands (bands Nos. 1 and 2) it is well to use the auxiliary volume control for it will usually give sufficient control of signals.

Do not expect to get short-wave stations at frequencies higher than 10 to 12 megacycles *at night!* Usually reception on the very high frequencies is poor at night. However, stations operating on these high frequencies generally come in well in the daytime. The reason for this is that the shorter waves (or higher frequencies) seem to prefer a daylight path between the transmitter and the receiver, thus Bandoeng, Java, operating on 18.82 megacycles, should come in best just as it is getting light in Eastern United States, for the difference in time is 12 hours. On the other hand, stations below 10 or 12 megacycles come in best after dark, for these frequencies seem to travel best with a night-time path between the transmitter and the receiver, thus, English, German, and other stations operating on 6.0 megacycles and lower frequencies, will be received better after dark. Consult the time-table of short-wave stations in this magazine for the best time to tune for specified stations.

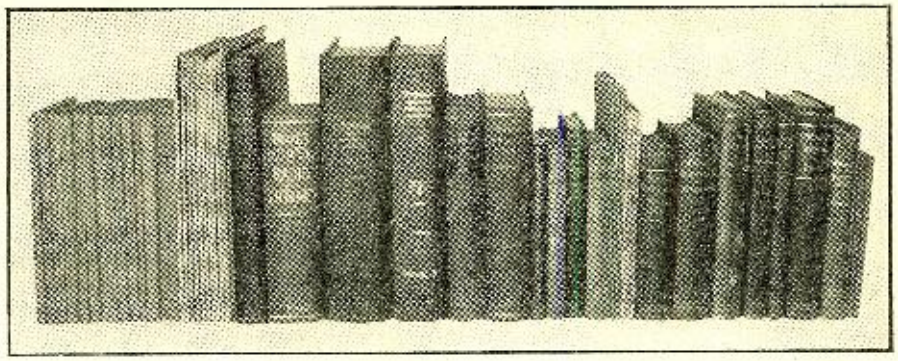
It will be found (at times) that there is "noise" on short waves. Ignition systems from automobiles are probably the worst offenders (at frequencies from about 12 megacycles up), while (from about 12 megacycles down) all kinds of electrical appliances with rotating contacts may create a disturbance. In some areas, where noise is bothersome, relief may be obtained

(*Continued on page* 712)



AN EXAMPLE OF THE PROGRESSIVE DIAGRAMS

This is a minature reproduction of one of the wiring diagrams prepared by the designer. The whole set contains five of these "blueprints."



THE TECHNICAL REVIEW

BY THE STAFF

The Use of the Radio in Leisure Time, by Lyman Bryson; *Music as Presented* by Peter W. Dykeman, published by The Radio Institute of the Audible Arts. These are two of a series of booklets published by the Institute which are intended to show the listener how to get the most from his radio receiver. The idea is that the present programs contain such a variety of educational and cultural matter that anyone can find something worth while in it. These and other booklets can be obtained from the Radio Institute of the Audible Arts, 80 Broadway, New York City.

New Vistas in Radio by Leopold Stokowski, Atlantic Monthly for January 1935. In this article Mr. Stokowski tells in which respects radio fails to be a satisfactory means of transmitting symphonic music and proposes several ways of improving fidelity and volume range. Mr. Stokowski's remarks on music are very interesting, his technical explanations are much better than one would expect, although he uses some technical terms incorrectly. It seems to us that the "zone plan" mentioned in the article is as bad as the present system. During daylight it is possible to transmit up to 13000 cycles *at the present time* because local stations are spaced 50 kc. apart. The necessary volume range could be obtained by the "expandor" and "compandor" which are already in use on the transatlantic service.

Die Patente der Funkempfangstechnik, (The Patents of the Radio Receiver Technique) by Dr. Curt Borchardt, published by Union Deutsche Verlagsgesellschaft, Berlin, Germany.

This book is especially useful to the manufacturer and engineer, who is forever wondering whether a given circuit is patented and whether the patent is still in force. Although German patents only are covered, it will be of interest to readers in other countries.

The text is divided into chapters on tubes, tuning, antenna-ground, etc. The patent number and date of issue are given for every improvement together with a short technical explanation. In the back is a list of all patents which were still in force on January 1, 1934, giving the number and date of expiration of each.

An Electronic Voltage Regulator, by P. H. Craig and F. E. Sanford, Electrical Engineering for February 1935. A discussion of circuits for maintaining constant current or constant voltage employing a grid controlled gaseous rectifier (Kathetron) which had its grid external to the tube. The system is claimed to act instantaneously, which makes it applicable to short-period variations in load, such as welding.

Twenty-fifth Anniversary Year Book, Radio Club of America, Incorporated. The oldest radio club in the world was 25 years old in 1934. In commemoration of the event, the club has issued the Anniversary Year Book. The greater part of this book is devoted to a history of the club and its members, richly illustrated with reproductions of letters, newspaper clippings, pictures of apparatus and their constructors.

The first meeting was held on January 2, 1909 in the Hotel Ansonia of New York City. At that meeting there were five members and the Club was then called the "Junior Wireless Club, Limited." The president, Mr. W. E. D. Stokes, Jr., was 14 years old and had made his own wireless set. Apparently, the entrance requirements were that you had to make your own set.

By 1911, the members had become sufficiently numerous to warrant issuing a typewritten list. At this time the name of the Club was changed to "Radio Club of America." The Club fought for the rights of amateurs and succeeded in preventing an unfavorable bill from being passed in Washington.

Many members of the Club have become important figures in the radio industry, contributing many new ideas. A list of papers read before the Club and a list of members are included in the book. The membership is now 320.

Claims New Resistors Are Not Carbon: The Lynch Manufacturing Company calls attention to the article entitled "A New Type of Carbon Resistor" which appeared on page 556 of the March issue of RADIO NEWS. Mr. Ralph Sayres, president of this company, states that these new resistors are of a new ceramic composition which should not be confused with the compositions used in the ordinary carbon resistor.

The Browning 35

(*Continued from page* 711)

by the installation of a proper antenna system. The theory on which this type of interference-reducing antenna is based is briefly as follows: Man-made static, created by electrical appliances with moving contacts, generally travels a relatively short distance through the air but these disturbances are conducted through the lighting circuit to a considerable distance and radiation takes place from these metallic conductors. It has been found that if an antenna is erected at least 50 feet from conductors it picks up relatively little noise. It is necessary, however, to get the signal from the antenna to the receiver, and the lead-in, unless properly constructed,

itself *picks up noise!* One method of eliminating noise pick-up on a lead-in would be to shield it, but when this is done the capacitance between the grounded shield and the inner conductor is so great as to by-pass a percentage of the signal. In order to do away with this transmission loss, impedance-matching transformers should be connected to either end of the lead-in. One transformer matches the impedance of the antenna, while the other transformer (at the receiver end) matches its input impedance. Consequently, if *maximum signal* with *minimum noise* are to be obtained, it is advantageous to have a set transformer which is matched to the receiver being used.

This receiver may be conveniently used as a tuner employing various audio circuits by simply plugging in an audio amplifier in place of the 2A5 tube. Many servicemen and experimenters will find that there are individuals who have high-grade receivers lacking the short-wave feature. These may be readily converted into an all-wave receiver by the method above suggested.

The DX Corner (Short Waves)

(*Continued from page 683*)

son, Charles Horton, J. M. Coleman, James G. Moore, James Haley, Douglas S. Catchim, Charles Miller, H. L. Pribble, Virgil C. Tramp, Oliver Amlie, Floyd Waters, William Kochnlein, George Pasquale, A. J. Leonhardt, Herman Freiss, J. M. Kelley, Guy R. Bigbee, Albert E. Emerson, Noda Orientes, C. D. Hall, Lawrence Swenson, Charles Spealman, John Wojtkiewic, Dr. Evelio Villar, Edgar J. Vassallo, D. W. Winfree, John C. Kalmbach, Jr., S. E. Hodges, J. M. Malast, Charles Wailonas, Harvey McLeod, Chas. M. Kuhlman, A. Fabius, Harry Mayers, A. W. Schmidt, Albert Restuccia, Howard Morse, R. L. Weber, Edward Pohlig, C. W. Bourne, James B. Wynkoop, R. S. Houghton, Carl P. Peters, Donald W. Shields, H. Kemp, L. M. Divinia, B. C. Grant, C. S. Leonard, C. H. Skatzes, Emerson Cobb, George H. Fletcher, Luis Garcia, George C. Sholin, Danford Adams, C. H. Armstrong, R. H. Tomlinson, D. R. D. Wadia, C. Waltner, S. E. Arendale, H. Lennartz, J. F. Edbrooke.

Code Practice Transmissions

Those desirous of learning to read the code will be interested in a series of early-evening code lessons being put on the air three days each week. A detailed announcement of these will be found in the "Ham Shack" this month.

Stations HJB-HJP and Their Transmissions

An official communication from the Marconi Wireless Telegraph Co., Ltd., at Bogota, Colombia, states that Stations HJB and HJP are commercial telephone stations which communicate with WNC. Verifications of telephone calls and private traffic cannot be given, since this is a violation of the international regulations. Some listeners have requested "veris" of the regularly scheduled calls from HJB to WNC. Since these calls are always at the same time, with standard phrases, such reports do not constitute proof of reception and no verification can be given. Occasionally the stations are used to rebroadcast programs, on such occasions verifications will be given to the listener.

A Service Meter

(*Continued from page 671*)

paper. After the broadcast band is calibrated it is easier to calibrate the high-frequency bands than it would appear on first thought. Since the radio-frequency oscillator is rich in har-

monics, it is a simple matter to tune in a short-wave carrier, then check its frequency by using the harmonics of the broadcast band of the oscillator that has already been calibrated. By getting zero beat of the coil that covers that band and going through this procedure on all the high-frequency bands, complete calibration may be secured.

For the benefit of those who are not familiar with the harmonic method of frequency checking, the method is, in brief: When an oscillator is on 1000 kc., it is also generating its harmonics which will be in this order, 2nd—2000. 3rd—3000. 4th—4000, 5th—5000. 6th—6000. etc. Since we know the fundamental frequency (from the calibration chart) therefore we can soon find all the harmonic frequencies by multiplying it by 2, 3, 4, 5. etc.

Now let us say that on a short-wave carrier we have the r.f. oscillator adjusted to 1200 kc. We now move the broadcast oscillator until we get another zero beat of a harmonic and we find that it is at 1000 kc. Now let us check the harmonics and see which harmonic comes out on the same frequency. The 5th harmonic of 1200 kc. is 6000 kc., and the 6th harmonic of 1000 kc. is also 6000 kc., therefore. the frequency of the carrier that we are checking is 6000 kc.

When using this method of checking, the possibility of picking the wrong harmonic is negligible, since there is only one frequency that is a harmonic of two frequencies, which are not an even multiple. such as 500 kc. and 1000 kc., or 600 kc. and 1200 kc.

It is very essential in equipment of this type to "cable" all leads possible. to make them rigid in order that frequency variation may be held to a minimum. All leads that cannot be cabled (the grid leads) should be made out of heavy wire and as rigid as possible, otherwise, the oscillator will not hold calibration properly.

The exact coil specifications cannot be given for the oscillator section due to the variation in construction that will be encountered. Table 1 gives the approximate winding information and any correction that is necessary should be made on the grid end of the coils, and unless a large change is made it will not be necessary to move the cathode tap. However, if it is necessary to move the cathode tap it should be placed one-third the way between B negative and grid end of coil.

A coil of three turns is placed on the inside of each tank coil and leads from one end of these coils go to the front plate on switch S4, the other ends being tied together to the lower input terminal. By using various coupling coils, almost any type of circuit can be effectively coupled to the oscillator (See Figure 1).

The grid lead to the peak voltmeter must be kept well clear of the rest of the wiring since any stray capacity will tend to short-circuit the r.f. voltages to the grid, thereby causing inaccurate r.f. measurements.

The operation of the peak voltmeter is as follows: R1, R2, and R3 make a bleeder (Figure 2) in which R1 supplies the plate voltage to the tube, R2 is the zero setting resistor, and potentiometer R3 supplies the grid-bias bucking voltage, which gives direct reading by bucking out the voltage impressed on the grid.

To take a reading, turn the peak-voltmeter "on" and set R2 with maximum resistance in circuit and turn R3 so that there is zero voltage between the arm on R2 and R3, then *slowly* reduce the resistance in R2 until the O-1 ma. shows .04 ma., then return the arm of R3 to the negative end. *This should be done at once,* and the voltmeter at vm. should read between 300 and 400 volts, depending on the power transformer used. *Caution*: Next make sure that the voltage divider S1 is set in the position that will make the voltage applied to the grid less than the voltage shown on the voltmeter at vm. Next apply the voltage to be measured, then *slowly* reduce the voltage on the voltmeter with R3 until the O-1 ma. again shows .04 ma, then read voltmeter. The voltage on the voltmeter multiplied by the ratio of the voltage divider S1 used is the actual peak voltage that you are measuring.

The voltage divider is calibrated by using the d.c. voltage from a power-pack that is within range of the d.c. voltmeter on hand. By this method the resistance in the voltage dividers do not have to be accurate in the first place as the calibration corrects for any variation in their resistance.

Let us see what voltage can be measured with an external divider of two 2 meg. 1 Watt resistors, such as in Figure 4a and 4b. Measure a low voltage d.c. source (say 100 volts) with the voltage divider S1 set as in Figure 4a, and we find that the peak voltmeter reads 55 volts, then the divider ratio is 1.82. Let us say that you have found that the voltage divider S1 has a ratio of 4.1 when set as in Figure 4b, then if a voltage is applied to the circuit (Figure 4b) gives a reading of 250 volts, the unknown voltage would be 1865.5 volts peak, or, 250 x 4.1 x 1.82 = 1865.5 volts.

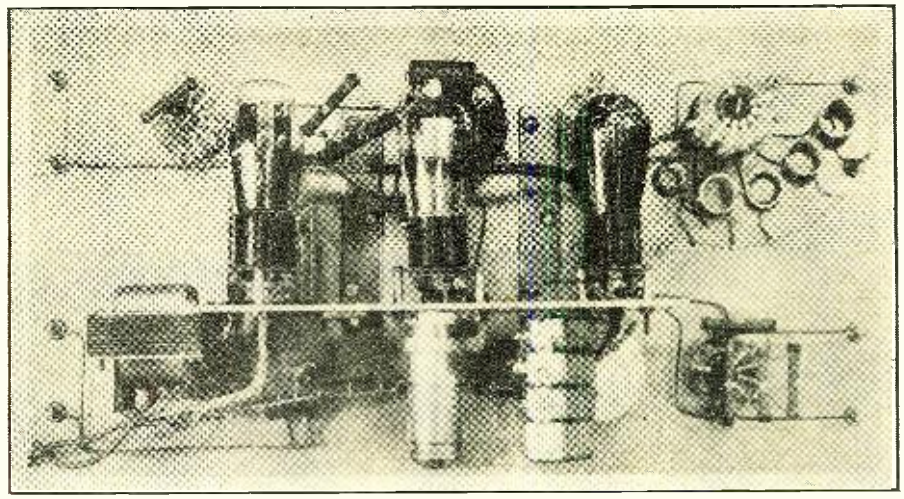
If this 1865.5 volts is the secondary of an a.c. transformer then to get the r.m.s. value multiply the peak voltage by .707 (the ratio of peak voltage to r.m.s. voltage of a sine wave) which would be 1310 volts r.m.s.

The switch S2 and resistor R5 are not essential but are useful as a safety device for the O-1 milliameter and also increase the speed of making peak voltage measurements.

On position 1, the meter is short-circuited completely, in position 2 it throws the ½ meg. resistor in series with the meter, allowing the approximate settings of R2 and R3 to be found quickly, without the possibility of injuring the meter. In position 3 the meter is in the circuit direct for the final adjustment.

In using the unit, there is only one thing that has to be watched and that is, that S3 and S6 are in proper position for the type of measurement to be made. It is possible to have the circuits through S3 and S6 so interlocked that part of the voltage divider on the peak voltmeter is short-circuited.

It should also be noted that the setting of R3 should always be at the negative end while the beat oscillator is being used as the setting of this resistor has a slight effect on the calibration of the oscillator. A list of parts follows:



PARTS LIST

S1—Yaxley 1216 Switch
S2—Yaxley 1216 Switch
S3—Yaxley 1226 Switch
S4—Yaxley 1246 Switch
S5—Yaxley 10 Switch
S6—Yaxley 1225 Switch
S7—Yaxley 1315 Switch

1 Weston Model 301 0-1 Milliammeter
1 National Vernier dial
Switch Dials—Yaxley—1 No. 376, 2 No. 372, 1 No. 373 and 1 No. 374
1 Receiver replacement transformer with 250 to 350 volts center tapped, 5 volt Fil. and 2.5 volt windings
1 15 Henry 40Ma. choke
1 Type 224 tube
1 Type 227 tube
1 type 280 tube
8 Yaxley No. 418 pin jacks
8 Yaxley No. 15 plugs
C1, C6—.5 Mfd. 400 volt paper condensers
C2, C5—.5 Mfd. 200 volt paper condensers
C3—.002 5000 volt Mica condensers
C4—.0035 Mica condenser
C7, C8—Mallory M1, 8-8 Electrolytic condenser
C9—250 MMF. midget variable (National STH250)
C10—.1 Mfd. paper condenser

R1—4000 ohm 2 watt carbon
R2—3000 ohm wire wound (Yaxley M2MP)
R3—50,000 ohm potentiometer (Yaxley E50MP)
R4, R5—500,000 ohm 1 watt carbon resistor
R6, R7—25,000 ohm 1 watt carbon resistor
R8—20,000 ohm 1 watt carbon resistor
R9—100,000 ohm 1 watt carbon resistor

Remote Control

(*Continued from page* 691)

The variable condenser used is a two-gang t.r.f. job, having two identical sections of 365 mmfd. maximum capacity each. The shields and end plates should be cut as short as possible, to conserve space. The condenser is mounted directly on the top panel, as is a small sub-panel as shown in the photographs. This sub-panel carries the two tube sockets and most of the filter and by-pass condensers. The coils are attached directly to the top panel. It will be noted that a resistance type of filter is used, thus saving the space necessary for a choke coil. The two tubes mount on either side of the variable condenser, and the volume control is between these tubes.

There are several factors influencing the choice of the proper intermediate frequency. The low-frequency end of the broadcast spectrum is best, as there the receiver has its best selectivity. However, if there happens to be some powerful local station located at or near 550 kc. in the user's locality, it may be necessary to use some other frequency slightly higher. Generally it is best to set the broadcast set at its very lowest frequency.

Now to adjust the remote-control unit. Let us suppose that our broadcast receiver goes down to 540 kilocycles. We set and leave it there, and turn the volume control up to nearly full. Next we turn on the remote-control unit, and also the receiver, and tune in some station around 1500 kc. with the remote control. Then we adjust the two compensators on the variable condenser to bring this station in fairly well up on the scale (say about 15 degrees for a 1500 kc. station) and tune it in with maximum volume. Then we tune in another station with the remote-control unit, this time about 600 kc., and adjust the 300-500 mmfd. trimming condenser, continually resetting the variable condenser until this station is loudest. Then we retune in the 1500 kc. station and realign the compensators and the unit is ready to use. If the coils are correctly made and the above procedure properly followed, we should find that the remote-control unit now nicely covers the broadcast band from one end to the other. The trimming condenser mentioned above is of the compact mica insulation type used in i.f. transformers.

It will be noted in using this device that best operation will result if the volume control of the regular receiver is not turned any higher than necessary to get full desired volume on the weakest station ordinarily listened to. Thus, if our favorite stations happen to be WEAF, WJZ, WABC and WOR, and the latter station happens to be the weakest, set the volume control on the regular receiver so that, with the remote control unit on full WOR is received with satisfactory volume.

It will be noticed in localities where there is a strong local near the 550 kc. end of the dial that there is a "birdie" or whistle on the background of the weaker stations. This can be helped considerably by improving the selectivity of the broadcast set to the undesired station, and also by reducing the pick-up of this station. Figures 2 and 3 illustrate two methods of improving this selectivity by tuning the receiver input circuit to the chosen intermediate frequency. Figure 2 applies to those sets which have low input impedance; that is, where the primary of the antenna coil consists of a relatively small number of turns. The trick consists of using a fairly high inductance coupling coil in the remote-control unit, and series tuning the loop circuit by means of a small trimmer

condenser. If the antenna input impedance is very low, a 70-140 mmfd. condenser may do, or a 10-70 mmfd. if the impedance is higher. If the antenna coil uses a high-inductance primary of several millihenries, shunt tuning must be used, as indicated in Figure 3.

The output coils shown in Figures 1, 2 and 3 are universal wound, consisting of two coils very closely coupled together and having the inductances shown.

Parts List

C1—Micamold or Solar mica condenser, .002 mfd.
C2, C3—General Instrument two-gang condenser, .000365 mfd. max.
C4—Hammarlund or Solar padding condenser, 300-500 mmfd.
C5—Micamold or Solar mica condenser, .0001 mfd.
C6, C7, C8—Micamold or Solar by-pass condenser, .1 mfd., 200 volts
C9, C10—Micamold or Solar filter block, 4-4 mfd., 200 volts
C11—Micamold or Solar mica condenser, .0005 mfd.
L1—Sickles, Meissner antenna coil, universal wound
L2—Sickles, Meissner oscillator coil, universal wound
L3—Sickles, Meissner output coupler
R1—Clarostat or Centralab volume control wtih switch, 20,000 ohms
R2—Carbon resistor, 500 ohms, ½ watt
R3—Carbon resistor, 50,000 ohms, ¼ watt
R4—Carbon resistor, 20,000 ohms, ½ watt
R5—Gavitt or Ohmite resistance cord, 340 ohms, 30 watts
R6—Carbon resistor, 30,000 ohms, ¼ watt
One 5-prong socket, one small type 7-prong socket

On ¾ Meter

(*Continued from page* 669)

100 mmfd., but should be physically small. The capacity has very little to do with the frequency of oscillation, a change of 20 times (.002) being just noticeable on a Lecher wire system. Varying L_1 or L_2 a sixteenth of an inch has more effect! The only parts not found in most radio shacks are the 955 tube and socket.

The milliammeter is necessary at first but may be dispensed with after adjustments are completed. In the event maximum possible input is to be used the meter had better be installed permanently because several of the 955's that were used showed a tendency to "run away" when overloaded. This action is similar to that in many other receiving tubes when used at high voltages, notably the 59 and 46, the indication being a steady rise in plate current which, if allowed to continue, would wreck the tube. The most logical way to prevent this occurring is to use some cathode bias (as with the 59 and 46) to limit the plate current, 300 or 400 ohms by-passed with a .002 condenser being satisfactory. However, the writer has found that if the tube ratings are not exceeded, the tubes are well-behaved and do not require cathode bias with a consequent loss in efficiency.

The milliammeter also serves to check for advanced states of oscillation, super-regeneration, parasitics or whatever else the presence of a second mode of oscillation might be called. The plate voltage is first applied followed by the filament voltage. As the tube heats (and it comes up fast) the meter rises and then dips as oscillation starts. There should not be a second dip for this would indicate a second state of oscillation, the result being 100% distortion! Increasing antenna coupling, decreasing the value of grid leak or short-

ening the lead from cathode to ground will cure this condition. It was found useful to use a copper or aluminum shield under the baseboard.

All the usual methods of frequency measurement are rather out-of-place here. The logical step is to measure the wavelength by means of Lecher wires. This is a very simple means for rough measurement but requires a great deal of caution for accurate determination. However, the state of the art being as it is, it is unnecessary to observe any definite tolerances regarding frequency. Bare, stiff wire should be used, the spacing being about an inch and the length somewhat over a wavelength long (about 29 inches). A half-wavelength is all that is needed but an additional nodal point serves as a check and, also, greater accuracy is possible with a longer set of wires. The Lecher wire system is coupled to the transmitter by means of the same loop which is used for the antenna coupling. The Lecher wires can be run from the terminals in Y form until they have proper spacing and they remain parallel. It will be necessary to readjust the coupling by bending the loop up or down. Although an r.f. meter to indicate current maxima is very desirable it can hardly be called a low impedance shunt at 75 cm. When a solid bar is used as a slider, the plate milliammeter must be used as an indicator of resonance and this is none too good either. But why worry about being 1 cm off-wave as long as transmitter and receiver resonate? All the wavelengths below 2½ meters are available so there is space and more space! It is interesting to note that, with a 100 mmfd. condenser connected directly across the socket prongs, the wavelength was 53 cm.

List of Parts

A—Bent stiff wire 13½ inches long
AFC—30 hy. 25 ma. Heising choke
C1—Mica condenser, 100 mmfd. or more, pigtail type
C2—2 pieces copper strip ½ inch by ¼ inch
C3—Mica condenser, .001 mfd.
C4—By-pass condenser, 1 mfd., 200v.
C5—Electrolytic Condenser, 10 mfd., 25 v.
L1, L2—No. 18 wires, ¾ to ⅞ inch long
MA—Weston milliammeter, 0-10 ma.
R1—15,000-25,000 ohms, ½ watt
R2—5,000 ohms, ½ watt
R3—600 ohms, ½ watt
R4—150,000 ohms, ½ watt
RFC—1 inch winding of No. 30 silk $\frac{3}{16}$ inch diameter
T1—Thordarson microphone-to-grid transformer
VT1—955 "Acorn" tube and Communications Eng. Co. socket for same
VT2—41 Pentode
2—National type GS-2 stand-off insulators
4—¾ inch stand-off insulators (2 for elevating "acorn" tube socket, 2 for choke terminals)

Radio in Aircraft

(*Continued from page 673*)

low-wing monoplane, and because of its high speed it was necessary to have a radio apparatus giving a very sharp definition of the "cone of silence" (for which a mast antenna is the best), yet at the same time possessing long range and an ample volume of signal input. Things happen quickly at 200 miles an hour.

The antenna system here consists of a relatively short metal mast antenna, mounted in front of the pilot, just back of the engine; and a longitudinal-L antenna between the top of the mast and the top of

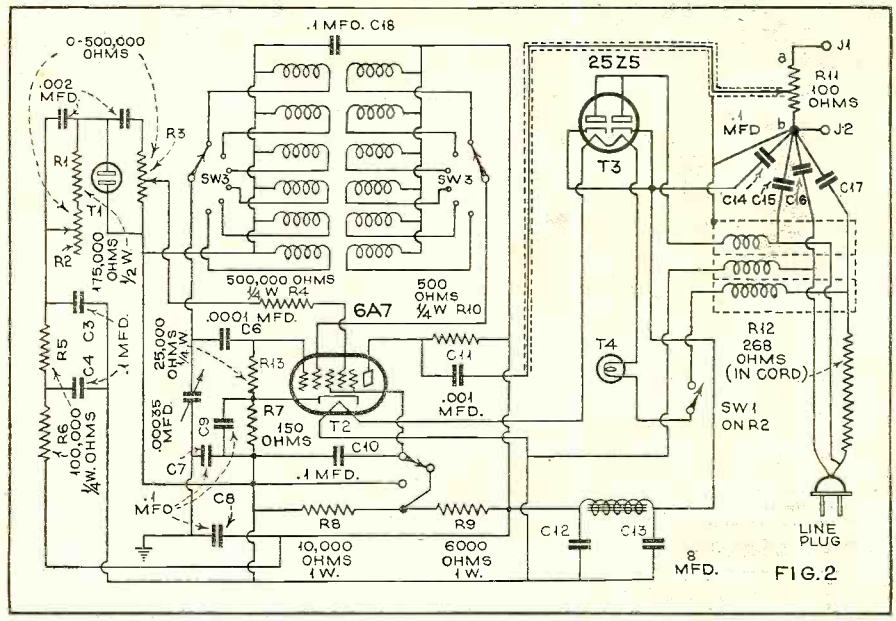


FIG. 2

RADIO NEWS SIGNAL GENERATOR

Herewith is shown the improved circuit diagram of the RADIO NEWS *Signal Generator which was described in the February and March (1935) issues. This new circuit, which replaces Figure 2, page 482, of the February issue, does not make any change in the parts as listed in the above mentioned articles. It does make several advantageous changes in the wiring and this new circuit should therefore be followed by all those who build this instrument.*

the vertical fin of the tail unit, with the lead-in located at the mast. The two antenna systems are independent, and a switch is provided in the cockpit, permitting the pilot to select the antenna best suited to his needs.

Let us now return to the work now going on on the field and see what else there is on today's schedule at the Aeronautical Radio. Routing checking, servicing generators, inspection and repair of shielding and bonding occupy most of the mechanics' time. The storage battery in each ship is carefully checked, and only too often is found to need refilling or even replacement—it is an item which needs frequent attention and is almost invariably neglected by all until the ship comes to the radio man.

A thousand and one things may require attention, and often the most baffling problems have the simplest solutions. For instance, here is a pilot complaining of excessive engine noise. Let us see for our-

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selves. We start the engine and switch on the radio. Why, that noise is purely mechanical and not electrical. There is nothing wrong with his radio, and a pair of sponge-rubber covers for his earphones will remedy the trouble forever!

Unfortunately, few pilots know radio, and few radio men know flying. Modern aircraft radio equipment is sturdy and reliable, and if properly maintained, will not fail the pilot in his hour of need. Yet the pilot may need more than rudimentary knowledge of radio in order to cope with an emergency, and the knowledge of where to look for trouble may spell the difference between safety and disaster. Tell your pilot-customers all you can about their radios, and tell it often.

Tube Outputs

(*Continued from page 672*)

the incoming signal swings the grid between $E_c = 0$ and $E_c = -45$ volts.

The maximum possible power output will now be given by the formula

$$P_{max} = (\Delta I_p)^2 R_L$$

when ΔI_p = rms change in plate current.

The maximum current flows when $E_c = 0$. From the diagram we see that this is $I_{max} = 16$ milliamperes. Similarly, I_{min} 1.5 milliamperes, when $E_c = -45$ volts.

Assuming that we are dealing with a sinusoidal current, both I_{max} and I_{min} are peak values, and must be reduced to rms values by dividing $\sqrt{2}$. Hence, we have, finally:

$$P_{max} = \left(\frac{\Delta I_p}{2\sqrt{2}}\right)^2 R_L$$

Substituting the numerical values for the conditions given above, we have:

$$P_{max} = \tfrac{1}{8} \times .0145 \times .0145 \times 7000$$
$$= .184 \text{ watts} = 184 \text{ milliwatts}$$

By changing the value of R_L, it is possible to obtain higher values for P_{max}. It should be noted, however, that this will bring the operating path down on the curved portions of the characteristics when the grid is most negative. This results in distortion of the output signal.

The percentage of second harmonic distortion may be calculated by means of the following formula:

$$\%\ \text{2nd harmonic distortion} = \frac{\frac{I_{max} + I_{min}}{2} - I_p}{I_{max} - I_{min}} \times 100$$

For the numerical case given above:

$$\%\ \text{2nd harmonic distortion} = \frac{\frac{16 + 1.5}{2} - 8}{14.5} \times 100$$
$$= 5.2\% \text{ approximately}$$

When selecting the value of output resistor, it is considered good practice not to exceed 5% second harmonic distortion.

The above method can be employed to obtain the undistorted power output and percent harmonic distortion of any Class A triode, when the operating conditions are given. In a second installment it will be shown how the maximum power output can be determined when the proper operating voltages and the proper load are not known.

Information on Short-Wave Antennas

Although it is agreed that the ideal radio antenna is one that is well insulated, and strung high above the earth and surrounding objects, it is nevertheless true that remarkable results can in many cases be obtained on the short-waves with simple indoor aerials ranging in length from three to thirty feet. High-frequency signals seem to possess extraordinary powers of penetration, and even find their way into receivers that have no aerials at all connected to them. There are plenty of cases of foreign reception received on simple two- and three-tube receivers using curtain rods and bed springs, etc., as antennas.

The height of the wire above ground is not as important as some textbooks would have us believe. One short-wave fan who lives in a restricted suburban community, where outside aerials are banned, listens to real DX short-wave reception via 25 feet of bell wire nailed to the cellar rafters. The wire is just barely above the street level.

A radio aerial doesn't necessarily have to go "up"; it can be hung down in some cases and work very well. For instance, a radio fan who lives on the tenth floor of a twenty-story hotel in New York simply drops forty feet of strong, seven-stranded flexible wire out of his window, with the core of an old audio transformer tied securely to the end to keep it straight.

ROBERT HERTZBERG,
New York City, N. Y.

Frequency Shift

Many owners of short-wave receivers report an annoying trouble in the form of apparent calibration shift. If a crystal-controlled transmitter of known frequency is tuned in when the set is first turned on, the signal may disappear in ten or fifteen minutes, but can be brought right back to normal strength with a very slight movement of the tuning dial. Some people blame this on fading, others on a swinging antenna or an unstable local oscillator in their superhets.

The trouble is more likely to be due to a very small expansion of the tuning condenser plates and tube elements, as the entire receiver warms up to operating temperature. While the effect of any such capacity changes is very small at broadcast frequencies, because of the large ratio of normal tuning capacity to variable parts-capacity, it may be quite appreciable at the higher frequencies.

The power transformer, the bleeder resistor and the tubes all generate a considerable amount of heat during normal operation. This is gradually absorbed by the metal chassis and everything mounted on it assumes a certain temperature, depending on how crowded the parts are and how good the ventilation is. When this condition is reached the receiver becomes stable and this signal shifting is eliminated.

The importance of constant temperature in receivers is indicated by the protective measures taken by commercial communication companies. At the Riverhead, L. I., receiving station of RCA, for instance, the unused plug-in coils of the short-wave receivers are kept inside the receivers themselves, so that they are warmed up and ready for instant use. Previously, when the coils were kept outside the set, it was found that retuning was invariably necessary after new coils had been plugged in. For a commercial company, this drifting may mean message repeats, for the DX listener it may mean a lost announcement.

ROBERT HERTZBERG,
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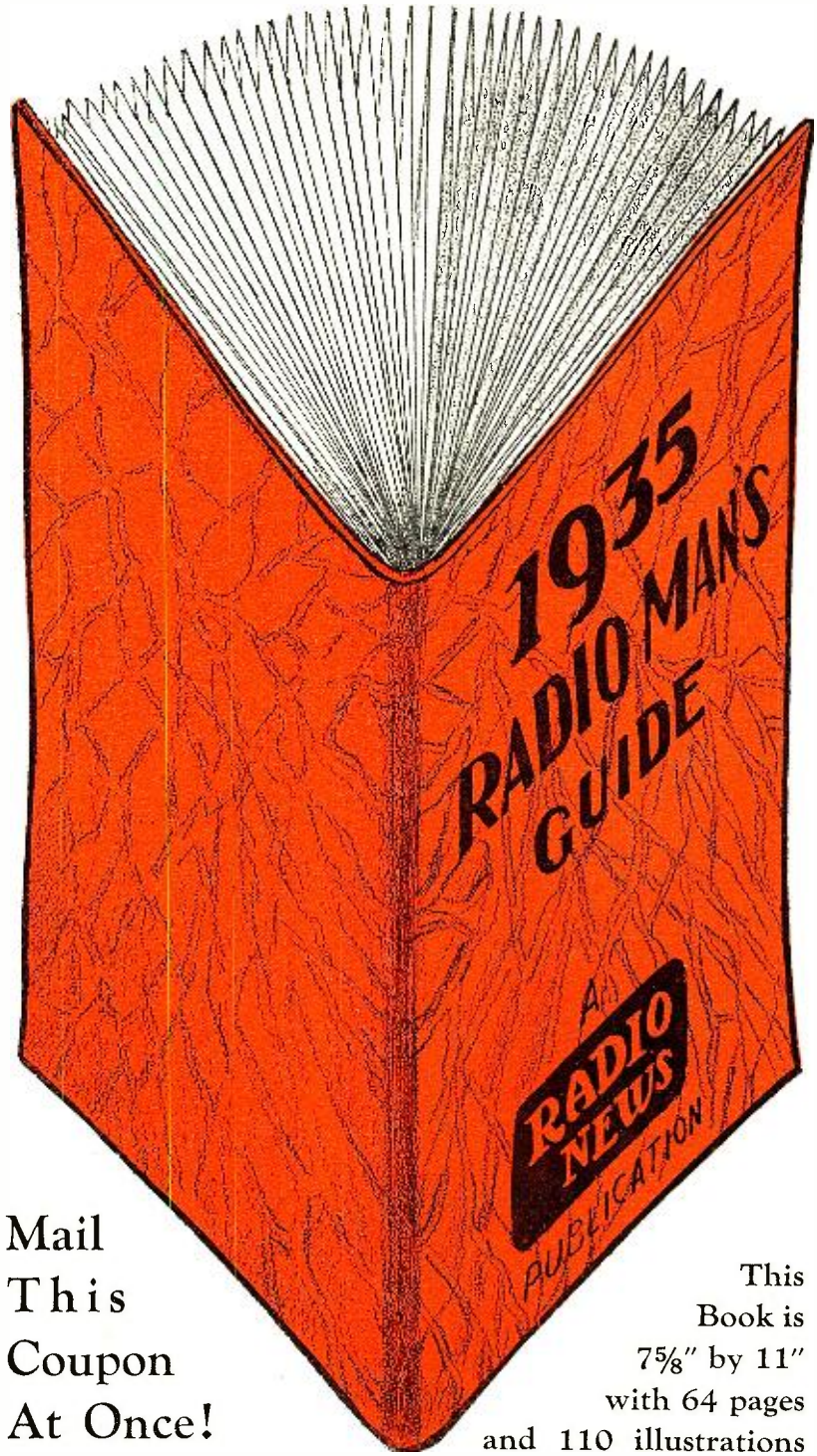

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