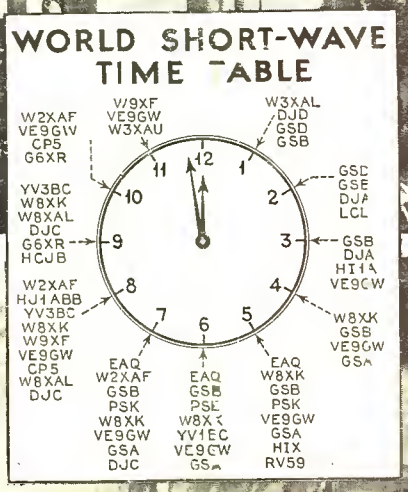
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RADIO NEWS and The SHORT-WAVE

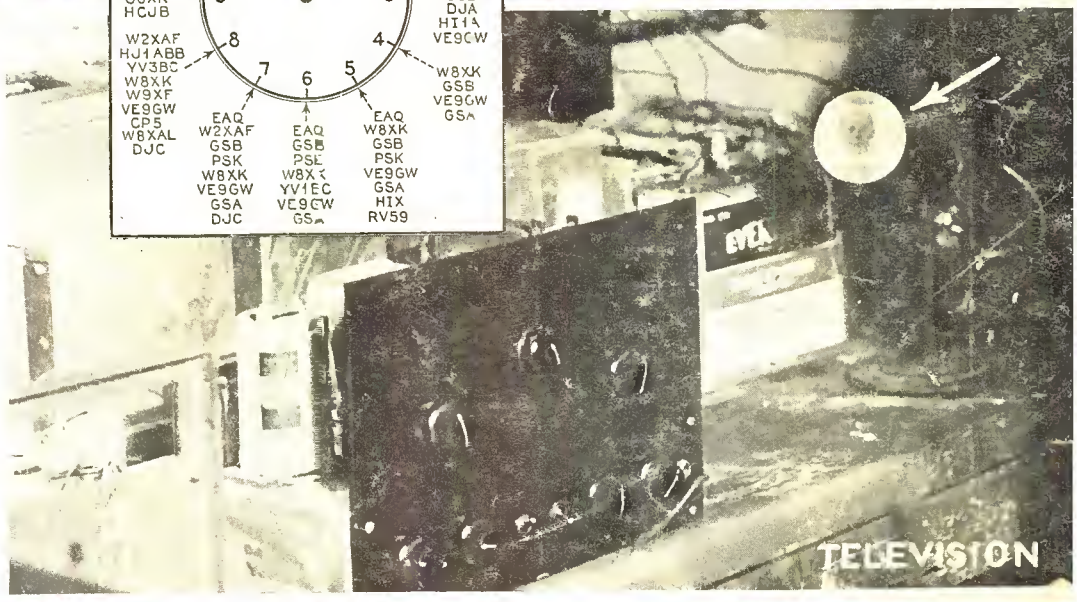
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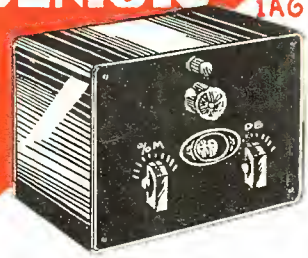
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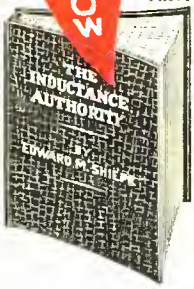
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FOR short-wave work particularly, for reduction of the dielectric leakage to a quantity so minute as heretofore considered impossible, Victron sockets should be used in conjunction with tubes having Victron bases, otherwise the commonplace socket material would practically destroy the advantages gained by use of the scientific tubes. The new sockets, which, like the tube bases, are of the finest grade Victron AA, amber-colored, are of the wafer type, mounting holes 1 11/16 inches apart.

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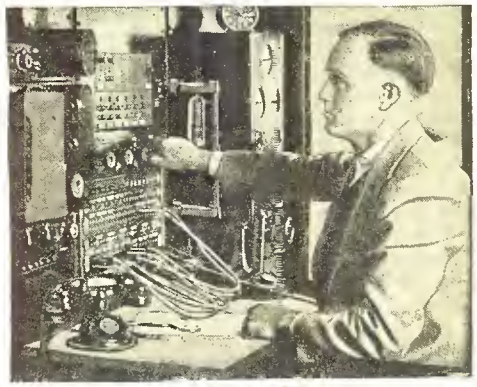
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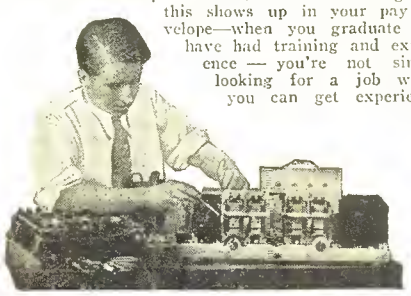
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Vol. XV
No. 10

RADIO NEWS

April, 1934

Edited by LAURENCE M. COCKADAY

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Television

Short Waves

Servicing

Electronics

Amateur Radio

NEXT MONTH—

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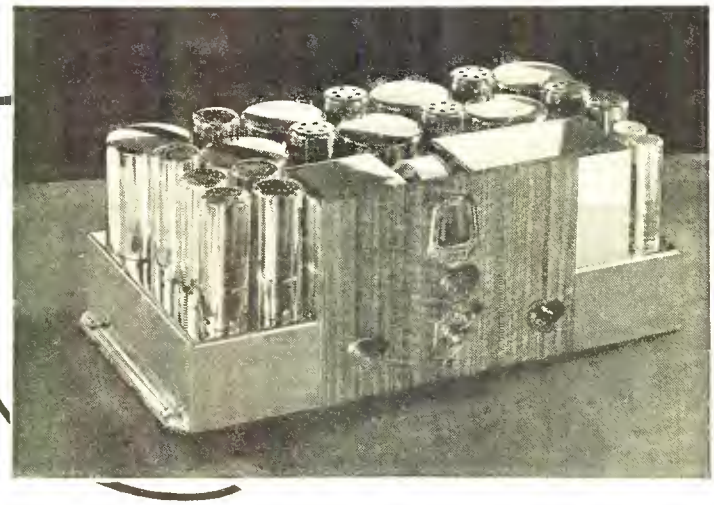
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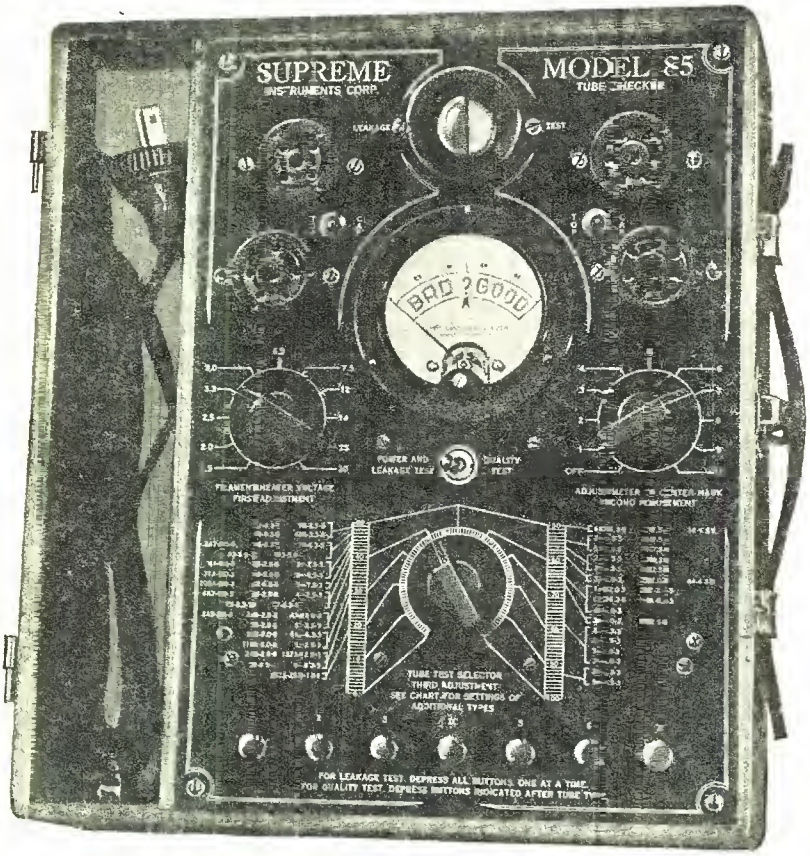
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3. Large neon glow lamp indicates "shorts" and leakages up to 100,000 ohms between ALL tube elements. Indicates any offending element.

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4. Complete listing of all present tubes on chart, with ample space for future tubes.
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3. Only 4 sockets—tube cannot be placed in wrong socket—no adapters required.
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Short but Interesting Items from the Month's Radio News

Radio Installed in White House Packards

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Radio-Equipped Soviet Balloon Sets New Altitude Record But Trip Ends in Tragedy

MOSCOW—The Soviet stratosphere balloon Syrius, with a crew of three men, recently are reported to have climbed to a height of more than 13 miles at Koloma, about 60 miles from Moscow. The special



radio operator announced the progress up to the time they were 71,000 feet above the earth. At this time they were carrying out scientific observations, including measurements of the cosmic rays. Later they stated they were disconnecting the radio, and that was the last heard from them until next day, when the heavy gondola was found crashed on the ground and containing their bodies. This is the second Soviet flight equipped with radio, and it is believed that, although tragedy overtook the expedition, a new record has been set, beating the previous one by Lieut. Commander T. G. M. Settle of the United States Navy when he took off from Akron, Ohio, with Major Chester L. Fordney. Another earlier flight was that of Professor Auguste Piccard of Belgium. The Settle and the Russian expeditions both carried radio equipment.

Radio in Taxicabs Banned by Bolan But Okayed by O'Ryan

NEW YORK—Since the editorial in

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Homer Hogan, Gen. Manager, Radio Station KYW, Chicago,
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4 BIG WORKING OUTFITS INCLUDED

These are probably the biggest and most expensive Working Outfits ever included with a home-training Course. You use them to build up testing equipment — to experiment with — to do actual Radio work. It's Shop Training for the home

SOUND PICTURES, P. A. SYSTEMS, PHOTO CELLS, TELEVISION, ETC. ALL INCLUDED

Radio service work is just the starting point in R-T-I Training. From there we take you up through the very latest developments in Radio, and then on into the new and larger field of Electronics—Sound Pictures, Public Address Systems, Photo Cells, and Television. This feature alone makes R-T-I the outstanding home training in Radio.

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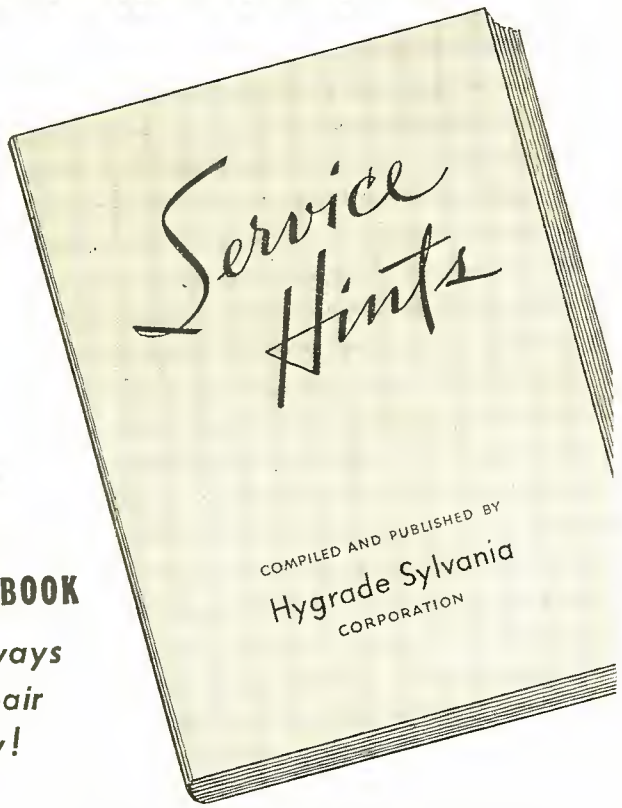
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RADIO NEWS on "Taxi Radio," two Police Commissioners in New York City have been playing "In again, Out again, Finnegan" with these radio installations. The outgoing Commissioner issued an order that they be removed from cabs as distracting, but the new Commissioner, John F. O'Ryan, shortly after taking office, issued an order giving them his okay if they did not play louder than a predetermined authorized maximum sound volume and if they did not play while the engine was not running. A number of radio cab operators, questioned in New York, made the following statements: "Radio is good for both the passenger and driver. It relieves monotony and helps both the driver and the rider." "I think radios in cabs are very good. I have seen no traffic hazzard caused by them. Most of the passengers play the radio even on short runs, and they get a kick out of it." "No danger in radios in taxicabs as far as I can see. Most of the riders like it, and if they don't, they simply shut it off." One interesting use of the taxi radio was reported recently where a Wall Street financier dashed into the street, hailed a radio-equipped taxicab and told the driver to ride until a broadcast he was interested in was completed. He wanted to listen in to the début, on the air, of Lady Orr-Lewis. The taxi bill mounted to a rather formidable porportion, but My Lady's admirer did not seem to begrudge it in the least as he paid, smiled and went his way.

Bernard Shaw Infuriated by Oxford Accents on the Radio

LONDON—George Bernard Shaw, in a recent letter to the *Times*, said that "An Oxford accent is considered by many graduates of that University to be the perfection of current English. But unfortunately over large and densely populated districts of Britain it irritates some listeners to the point of switching off and infuriates some others so much that they smash their wireless sets because they cannot smash the talker." George Bernard Shaw also declared that "if King George V delivered one single speech in an 'Oxford' accent on that same day his people would rise up and proclaim a republic." Some announcers take note!

Automobile Radio Sales to Exceed Million Mark in 1934

NEW YORK—"Automobile radio sets will exceed the million mark by a comfortable margin during 1934," is the statement by B. G. Erskine, president of the Hygrade Sylvania Corporation. "Auto radio was established firmly in 1930 with a sale of some 34,000 sets; 1931 brought the sales volume up to 110,000. In 1932 close on to 150,000 new sets were installed. Approximately 750,000 were installed in 1933."

Gold Medal for Industrial Research

NEW YORK—For pioneering in industrial research, the General Electric Company was presented on Thursday, February 1st, with a gold medal by the American Institute of the City of New York. The Institute, which was founded more than one hundred years ago, includes among its objectives the recognition of achievements in science which have profoundly influenced human affairs. The Institute has decided that the establishment and maintenance by the General Electric Company of its large laboratory for pure research has been of lasting benefit to human progress and industry. Dr. H. H. Sheldon, president of the Institute, made the presentation, and the medal was accepted by Dr. William D. Coolidge, present director of the laboratory.

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Radio News

April, 1934

On The

SHORT WAVES

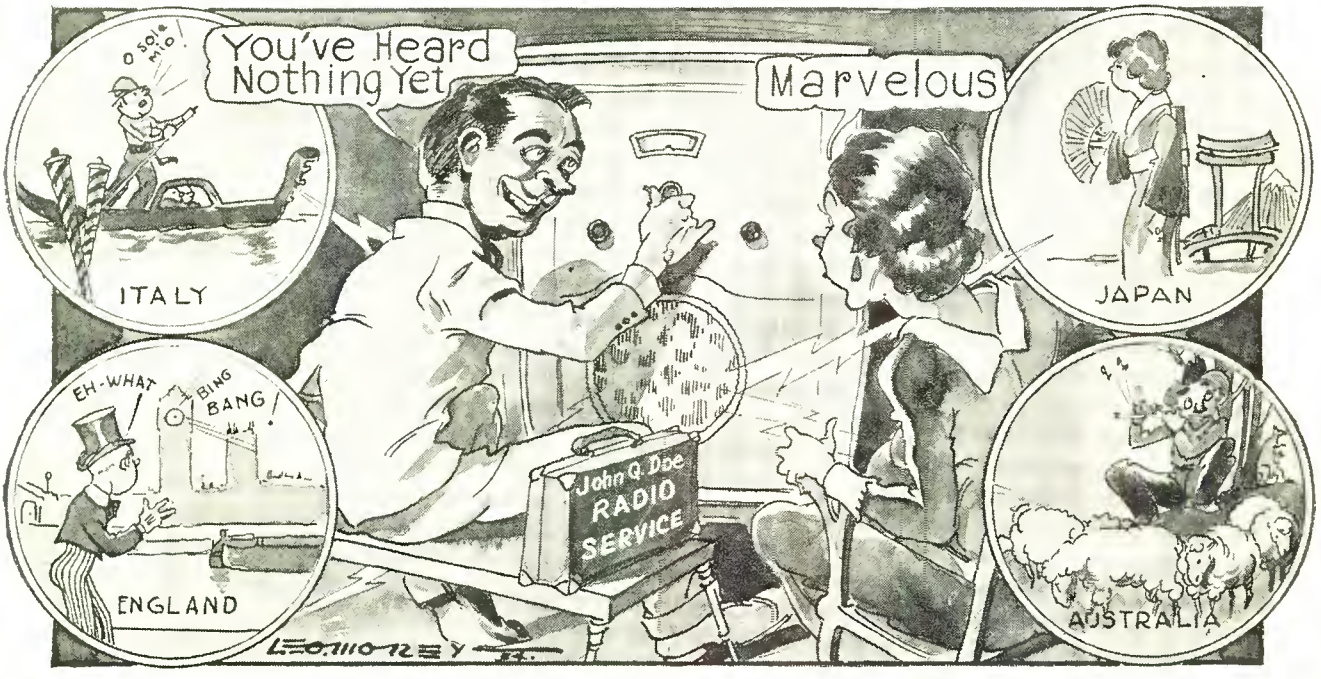
The Editor—To You

Another opportunity for radio's expansion. The short waves offer a field that is surely becoming radio's most progressive activity. Have you a friend or acquaintance who is interested in this field? Show him this page of the magazine whether he is a fan, a serviceman or a dealer. There is information in every issue of RADIO NEWS he will appreciate

IT is only a matter of time when every radio set will include facilities for tuning in all the bands of the short waves. Why? Because with a short-wave set one is able to listen in, not only to stations in his own city, but to stations located, literally, all over the globe! People are becoming internationally-minded, as far as radio is concerned, and those who are fortunate enough already to own a short-wave receiver or an all-wave receiver find that there are broadcasts of greater interest on the short waves. The regular broadcast band furnishes their standard broadcast fare but when they want *thrills* and *new features* they get them on the short waves!

In the old days, radio listeners interested in distance had to wait till the late hours of night or early morning to be able to hear stations even as far as 2000 or 3000 miles away on the broadcast band. This was then considered excellent DX. Today, however, anyone can be a "distance" fan: All that is needed is an all-wave or a short-wave receiver and one does not have to stay up nights to do it either! You can listen to London for breakfast, lunch and supper. You can hear musical concerts from Rome with your afternoon tea. You can hear the news from Australia with your morning setting-up exercises and at almost any time during the day or night you may hear the news reports from many stations encircling the globe. And these news reports are *news!* They won't be in the newspapers, in many cases, until the next day!

And now a word to the serviceman reader of RADIO NEWS. From time to time these readers write in to us questioning the advisability of publishing so much short-wave material in the magazine. They bring up the question, "What have the short waves to do with servicing? Is there any direct relation between these two fields?" Our answer is most decidedly, "Yes." We must bring home to the serviceman a definite understanding that unless he keeps pace with (*Continued on page 636*)



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A SAMPLE OF RESULTS

Above is a photograph of the screen of the cathode-ray tube employed in the receiver described in this series of articles. Note the complete absence of lines or other flaws; also the clarity and detail of the image. The quality is excellent, in spite of the losses attendant in making the photograph of the screen and then the halftone cut from which this is printed. The photograph of Mr. Wilder shown on the opposite page was used as the subject at the transmitter, the output of which was carried over wires to the receiver in the authors' laboratory

TELEVISION

(With Cathode-Ray Tubes)

This, the sixth article of this series on cathode-ray tubes and their applications, describes a double-sweep circuit which can be synchronized by the received television signal

J. M. Hollywood, M. P. Wilder

IN the article in the March issue, a system was described for transmitting pictures by wire, using cathode ray tubes at both ends of the line. One tube caused a spot of light to scan a photographic negative, while the second tube was used to obtain a positive picture on its fluorescent screen. Scanning was synchronized at both ends by use of a common sweep circuit.

In that article, the processes of scanning the picture to be sent, converting light variations into electrical energy variations and amplifying them, converting electrical energy back into light by the cathode ray tube at the receiving end, and scanning at the receiving end, were covered. The system was actually used for wired television, and the photograph shown here is a sample of the results obtained.

In television by radio, certain problems are met that do not enter into transmission by wire. At the transmitter there are many difficulties that will not be considered here. In reception, use of cathode ray tubes has eliminated many difficulties, but there are still four main difficulties found in television reception but not in sound reception. The first is that of obtaining high picture frequency amplification without loss of details. (The term "picture frequency" is used here in the same way that "audio frequency" is used in speaking of sound reception.) By using low gain per stage and many stages, it is possible to make picture frequency amplifiers of high gain that will handle the details of pictures of any number of lines likely to be used. The amplifier described in the last issue exemplifies the solution of this problem.

A second difficulty is that of making a detector circuit which will detect the high frequency modulation components as well as the low frequency ones. The radio-frequency carrier is modulated by frequencies of over 200 kilocycles in the case of a 120 line picture. In order not to discriminate against the higher modulation frequencies, all coupling resistors in the detector which couple the picture frequency to any circuit in any way must be small compared to the inpedances of the capacitances by-passing them. Simple grid leak and condenser detection is impossible because of the large by-pass condenser across the grid leak, which acts as a sort of coupling resistor. Plate detectors, duodiode detectors, and simple rectifier de-

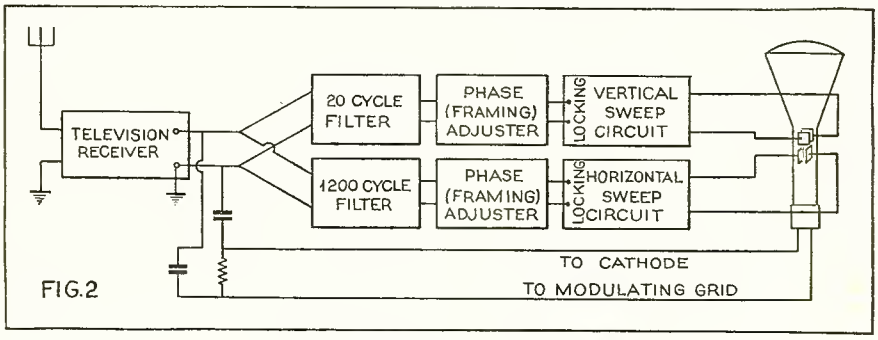
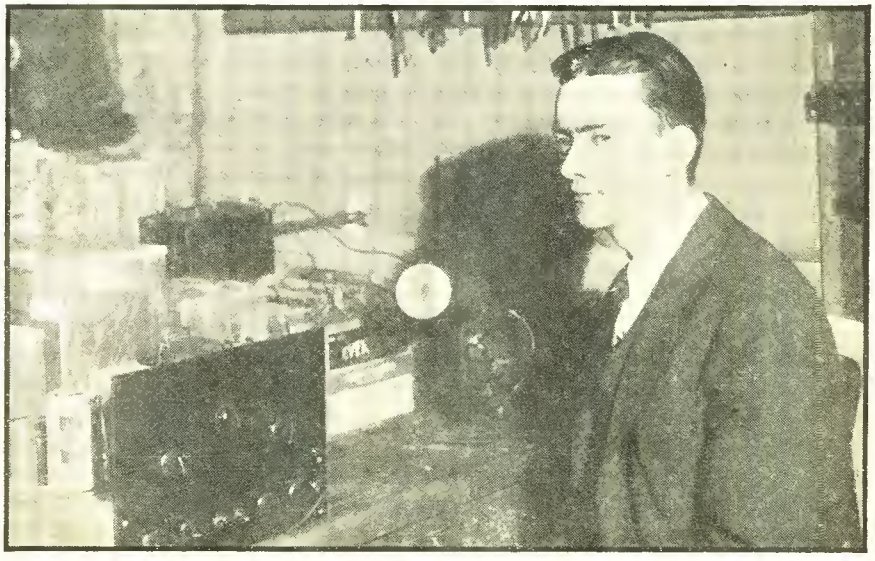


FIG.2

THE RECEIVER IN OPERATION

(Below) A view of the authors' laboratory with the equipment in operation as described in this and the preceding article of this series. Note the image on the screen of the cathode-ray tube. It shows up vaguely here, due to the bright illumination of the room required in making this photograph. Mr. Hollywood is operating the equipment.



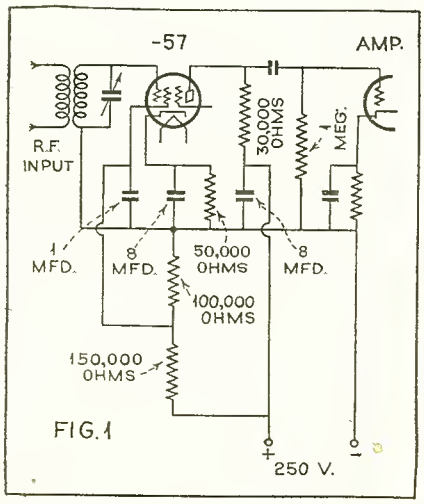


FIG.1

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tectors are satisfactory if the coupling resistors for the picture frequency and the capacitance across them are kept small, for instance 30,000 ohms and 20 mmfd. For example, Figure 1 shows a suitable plate detector circuit and its coupling to the following amplifier.

In detectors for sound reception, simple filters are often used to prevent radio-frequency detector output from being fed into the audio amplifier. These must be made very small or omitted entirely for television reception, because they by-pass too much of the higher picture frequencies.

A third difficulty is that of making a high-gain radio-frequency amplifier that does not cut off the higher side-band frequencies. To preserve the details of a 120 line picture the radio-frequency amplifier must pass a band width of about 450 kilocycles. The simplest way to obtain such broad tuning is to use ordinary tuned coupled circuits with resistance in series or parallel to broaden the tuning. Unfortunately, this reduces the amplification per stage greatly. The solution to this problem probably lies in the use of some sort of band pass filter circuits.

The fourth problem, and one which is particularly important in cathode ray tube reception, is that of scanning synchronization at the receiver and transmitter. Where the receiver and transmitter are operated on the same a.c. power system, it is possible to use two sweep circuits, one for vertical scanning and one for horizontal scanning, and synchronize both circuits by "locking" the frequencies in step with a multiple or sub-multiple of the power line frequency. For example, if the number of pictures per second is 20, the number of lines 60, and the power line frequency 60 cycles, one sweep can be locked at one third of the 60 cycle frequency, and the other at twenty times this frequency. If the a.c. locking voltage is fed into the grid of the gas-filled discharge-tube or "thyratron" in the sweep circuit simply through a transformer, locking will be successful but the picture obtained may appear in the wrong position on the screen. This may be corrected by shifting the phase of the a.c. locking voltage, which is easily done by shunting a condenser of about .05 mfd. with a 250,000 ohm variable resistance, and connecting the combination in series with the transformer primary to which locking voltage is applied, if this is an ordinary audio transformer. This synchronizing system is simple, but is suitable only where sending and receiving equipment are served by the same power system, and even then requires much manipulation and frequent readjustment if reception is mainly through reflection from the Heavyside layer.

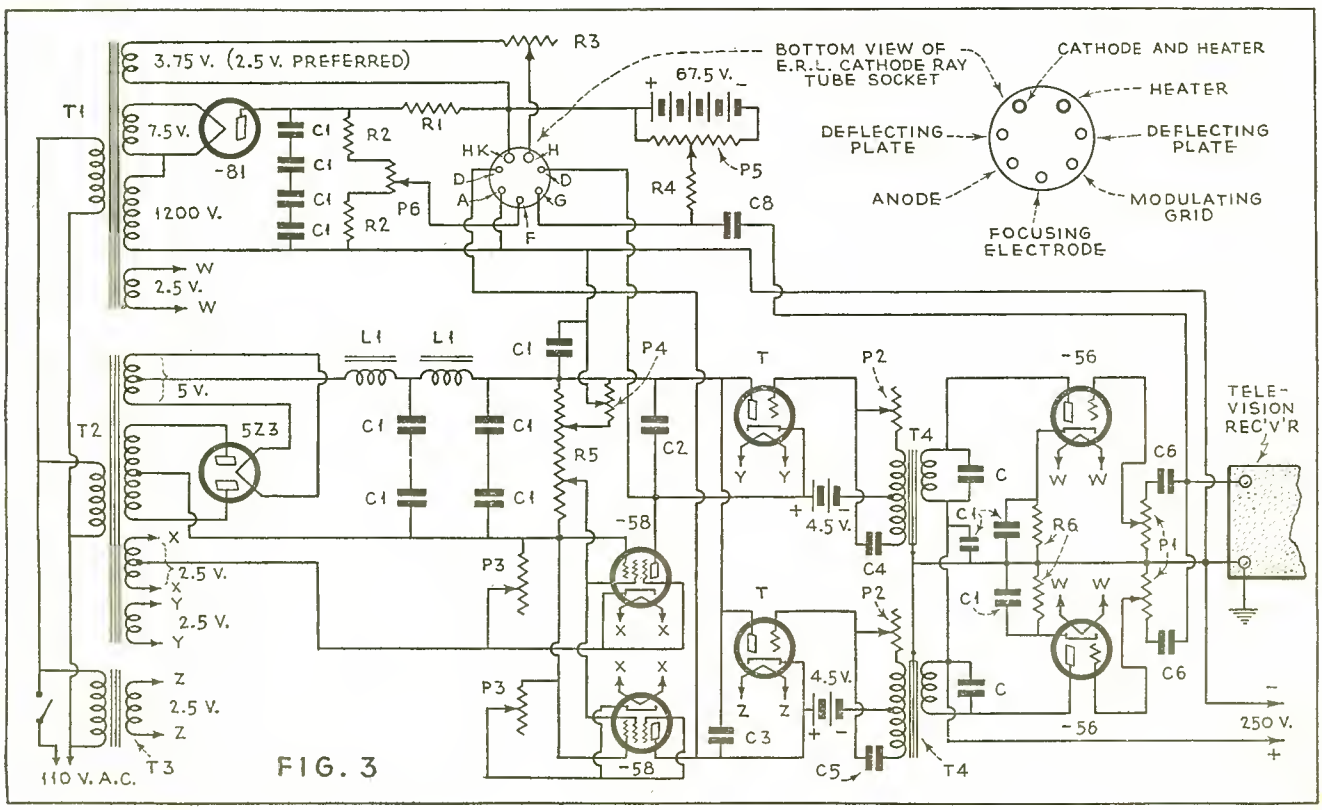
A better method of synchronizing is to obtain synchronizing frequencies from the received signal itself. There are several methods of doing this, but some of them require receiving apparatus made only for special types of transmission and will not be discussed here. The system to be described is not so good as some of these special methods, but works quite well on any television signal. Practically all television pictures are sent with "frame lines," black borders on the edges of the picture. These lines give strong frequency components in the resulting signal, of 20 and 1200 cycles in the case of a 20 frame, 60 line picture. By means of filter circuits, these frequencies can be picked out of the combined picture frequencies and used for locking the two sweep circuits at 20 and 1200 cycles.



The phase of the locking voltage can be adjusted to give correct framing.

Such a system, with constants given for 20 frame, 60 line pictures, is shown in block diagram form in Figure 2, and the complete circuit in Figure 3. The television receiver apparatus up to the point of delivery of the picture frequencies to the sweep circuits and cathode ray tube is not shown, because it can be similar to the same apparatus as used for mechanical scanning methods, and the subject has been covered by many other writers.

The action of the system of Figure 2 is almost self-evident if one understands the wired television system described before. The output of the receiver is just the same as the output from the wire line, and in the same way acts on (*Continued on page* 637)



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"HAMS" *to the* RESCUE

Another noble deed is chalked up to the credit of the radio amateur, this time in providing the communication link which resulted in the rescue of three persons stranded in the frozen Canadian wilds



Photo by courtesy N. Y. Evening Journal

AMATEUR RADIO STATION W2CSM

These two New York "hams," Arthur Ozsvath, owner, seated, and G. Robert Kapp, were instrumental in the rescue of the passengers and pilot of a plane forced down in Northern Canada. They intercepted the distress signals, relayed the message to Montreal by land wire and as a result a rescue was promptly effected

ONCE more the invincible spirit of amateur radio, and the "never say die" attitude of the professional radio operator have been made manifest. This time in the rescue of an airplane party stranded in the ice-bound wilds of the Hudson Bay country in Canada. History is replete with such instances, where, always with the guiding hand of unselfish, persevering humans behind it, radio has provided the intangible link which has accounted for the saving of countless lives.

Times without number, when all other means of communication have failed, radio amateurs have stepped into the gap, transmitting and receiving emergency messages, without thought of compensation. In some instances the well-being and even the very lives of entire communities have thus been safeguarded. This represents one of the reasons why the United States has been foremost in reserving channels in the crowded radio spectrum, for the exclusive use of the radio amateur—channels where he can indulge his hobby and where, when emergency arises, he is more than willing and is able to shoulder his responsibility to humanity without count of cost or sacrifice to himself.

In the present instance a high-school boy in White Plains, a suburb of New York City, operating his low-power amateur transmitter, was instrumental in effecting the rescue of three people whose plane had been forced down in an isolated wilderness and who were already experiencing the ravages of hunger and cold. Here is the story as told by one of the boys, G. Robert Kapp:

"For more than two years Arthur Ozsvath, owner of amateur radio station W2CSM, has been building up his radio transmitter until at the present time he has a highly effective installation.

"On Monday morning, January 15th, I happened to drop in at the "studio" of his station. He has a very business-like transmitter, as evidenced, not only by the dozens of QSL cards on the walls but by the equipment itself, which represents about two hundred dollars worth of material and the hundreds of hours of time that went into its construction.

"I had been there only a few minutes when the distress signals came in. They were faint and at times died out completely.

"Later we learned that, on December 20th, Dick Bibby and two passengers left Montreal by plane for the far north. The passengers were a trapper and his wife, who were flying to their cabin hundreds of miles away from civilization, along the frozen wastes on the east side of the Hudson Bay, about 700 miles north of James Bay. This flight in itself was a tremendous undertaking, when one considers the distance and the flying conditions prevailing. When they had not been heard from for some time, anxiety was felt for their safety, and a systematic search for them was started. Mounted police and trappers in the vicinity searched without success.

"It seemed the only way to locate them was from the air, so a rescue plane was sent out and, after long days of frantic effort, the pilot saw a spot beneath him which might be the grounded plane. It was the missing plane and its doomed crew. After landing and exchanging greetings, Mr. Lymburner, the radio operator of the rescue plane, and his pilot found the missing plane had crushed the landing gear and was unable to rise. Lymburner tried to send out his message that he had located the missing ones but was unable to contact any of the Canadian Airway radio stations. As a last resort, he went over to the 40-meter amateur band in the hope of getting his message through to someone that way.

"His message did come through, and Arthur Ozsvath received it. When he had the news down in black and white, we ran across the street to my house (there being no phone in his) and telephoned the Canadian Airways at Montreal. While waiting to get our party to the phone, we had a little time to realize the nature of the message entrusted to us and were, of course, tremendously thrilled that we were the ones to give the good news. At last we delivered the news to an official, who could not find words to express his joy that the flyers were safe and that a rescue could be effected. Realizing that W2CSM was in contact with them, he asked us to deliver a message back to them. This message merely said that help would be sent.

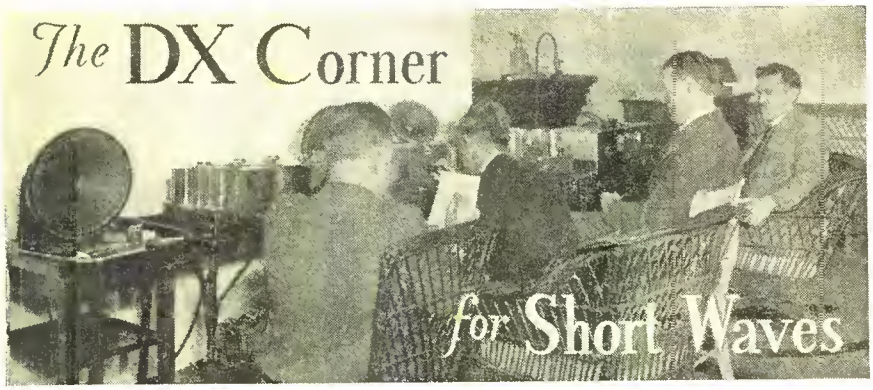
"'Art' sent the message once, twice, and always the same answer, 'Repeat MSG,' so he kept at it until at last Lymburner had received the message and signed off.

"Shortly afterwards the Canadian Airways sent still another plane roaring into the frozen north, where a forced landing usually means death due to a crash, or death due to the severe weather or starvation, thus sparing no expense in their effort to return the stranded pilots and passengers. Now they are all safely back to civilization and friends, with the exciting memories of their forced stay through zero weather, waiting for help to come.

"It must have been one of the happiest moments in their lives when the plane roared into view, bringing them food and transportation home.

"The real credit does not belong to Art and me, but to Mr. Lymburner, whose name has hardly been mentioned in the newspaper reports. It was he who took off in a plane, located the wrecked plane and had presence of mind enough, after (*Continued on page* 623)

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S. W. TIME SCHEDULE

LAURENCE M. COCKADAY

THIS is the first anniversary of the new DX Corner, a leading feature of which has been *Short-Wave Best Bets*, which now appears under the title *World Short-Wave Time-Table*. This time-table has regularly contained a growing list of world short-wave stations logged at the RADIO NEWS Short-Wave Listening Post in Westchester County, New York, and at other Official RADIO NEWS Listening Posts throughout the world. (Listed in a box on this page.) Since this idea was originated, many letters have been received asking where the RADIO NEWS Westchester Listening Post was located and who operated the post. Up to this time the Editor of this department and the Westchester Listening Post Operator (one and the same person) has remained incognito, but as a celebration of the anniversary we are letting our friends know who he is—he is your Editor. (Note: The photo above shows the Westchester Listening Post in the Editor's home in Pelham, N. Y. Photos of our other Listening Posts will appear in future issues.)

Reception Conditions This Month

The past month has given us some excellent reception on the short waves throughout the world. The best band has been the 49-meter band, during the afternoon and evening hours, with the 19- and 25-meter bands shows up quite well during the morning. During the following months the 19-, 25- and 31-meter bands will improve, with some falling off of 49-meter band reception, during the afternoons, but with good results expected at night.

Outstanding S.W. Reception Features of the Past Few Months

The Byrd transmissions from Antarctica still may be considered as "front page" items. Another feature, in America, has been the reception of Roman programs, on about 30 meters, so loud and strong during midday they seem to be locals. We do not know what station is transmitting or retransmitting the I2RO programs, but they are sure coming in excellently. One of the new South Americans (station HJ1ABB) is also being received clearly and with unusual strength. The Australian stations VK2ME and VK3ME always give a thrill to those willing to get up early enough to hear them. Can you add to these features? Send us in notes on your standing transmissions, heard on the short waves.

New W1XAZ Transmissions

An official communication received from station W1XAZ, now located at Millis, Massachusetts, about 25 miles from Boston, states that they have been on the air from 5 p.m. to 1 a.m. with a power of 750 watts and that they are now on the air with 10,000 watts from 7 a.m. until 1 a.m., carrying the same programs as WBZ-WBZA. The frequency is 9570 kc. All times are E.S.T.

XETE Transmissions

An official communication from XETE states that they are on the air from 7 to 9 p.m., C.S.T., on a wavelength of 31.25 meters.

VE9JR Transmissions

An official communication from station VE9JR at Winnipeg, Manitoba, states that they are on the air from 7 to 10:30 p.m., C.S.T., on 25.6 meters, a frequency of 11,720 kc.

Station VE9HX Transmissions

An official communication from VE9HX at Halifax, N. S., states that they are operating on a daily schedule, from 9:30 to noon, E.S.T., and from 5 to 11 p.m., on a frequency of 6110 kc. with a power of 200 watts. They announce every half hour.

W9XF Transmissions

An official communication from station W9XF advises that they are on the air from 3:30 to 7 p.m. and from 8:30 p.m. to 1 a.m., week days, and from 3:30 to 6 p.m. and 8 p.m. to 1 a.m. Sundays, C.S.T., on a frequency of 6100 kc. with a power of 5 kw. They do not broadcast Saturdays.

VE9GW Transmissions

An official communication from station VE9GW at Bowmanville, Ontario, states that they are on the air on 6095 kc. from 2 p.m. to 11 p.m. Mondays, Tuesdays and Wednesdays, from 3 p.m. to midnight on Thursdays, from 7 a.m. to midnight on Fridays and Saturdays and from noon to 9 p.m. Sundays, with a power of 500 watts. All times are E.S.T.

VE9DR Off Air

An official communication from station VE9DR at Montreal, Canada, states that they have not been operating their station for the past two or three months, although they expect to be back on the air shortly.

W9XAA Transmissions

An official communication from station W9XAA at Chicago, Illinois, states that they are on the air with a regular schedule on Sundays from 10:30 a.m. to 8:15 p.m., C.S.T. Their week-day schedule is extremely irregular, as week-day operation is on an experimental basis. They have a power of 500 watts and their regular transmissions are on 6080 kc. Their license allows them to use 11,830 and 17,780 kc., occasionally.

YV2AM Off Air

An official communication from station YV2AM at Maracaibo, Venezuela, states that they are off the air for the time being while the station is being reorganized.

W8XK Transmissions

An official communication from W8XK at Pittsburgh, Pennsylvania, states that they are on the air on 21,540 kc., daily, from 8 a.m. to 2 p.m.; on 15,210 kc., daily, from 10 a.m. to 4:15 p.m.; on 11,870 kc., daily from 4:30 to 10 p.m., and on 6140

(*Continued on page* 590)

Official RADIO NEWS Listen-in Post Observers

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

In the United States of America:

Alabama, J. E. Brooks; **California,** Earl G. DeHaven, C. H. Canning, A. E. Berger; **Florida,** E. M. Law, J. F. Dechert; **Georgia,** C. H. Armstrong; **Illinois,** R. L. Weber; **Indiana,** F. C. Balph, J. R. Flannigan; **Kentucky,** W. A. McAllister; **Maine,** R. I. Keeler; **Maryland,** H. Adams, Jr., J. W. Smith; **Massachusetts,** H. K. Miller, D. Smith, E. F. Orne, A. Hamilton, R. Sanders; **Mississippi;** Dr. J. P. Watson; **Missouri,** C. H. Long; **Nebraska,** G. W. Renish, Jr., H. Hansen; **New Jersey,** W. Dixon, R. H. Schiller, W. F. Buhl; **New York,** I. H. Kattell, D. E. Bame; **Nevada,** D. H. Townsend, Jr.; **North Carolina,** H. O. Murdoch, Jr., W. C. Couch; **Ohio,** R. W. Evans, C. H. Skatzes; **Pennsylvania,** K. A. Staats, C. T. Sheaks, George Lilley, J. A. Leininger, F. L. Stitzinger; **Tennessee,** A. Smith; **Texas,** H. Johnson; **Virginia,** D. W. Parsons; **Washington,** A. D. Golden, G. E. Dubbe, C. G. Payne; **West Virginia,** K. Boord, R. E. Sumner; **Wisconsin,** W. M. Hardell, W. A. Jasiorkowski.

British Guiana, E. S. Christiana, Jr.

Canada, D. Wood, Jack Bews, A. G. Taggart, W. H. Fraser.

Cuba, F. H. Kydd.

England, C. L. Wright, J. J. Maling, A. Barber, D. Burns.

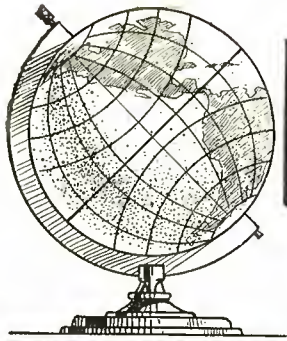
South Africa, C. McCormick, M. Kruger.

Switzerland, Ed. J. deLopez, Dr. M. Hausdorff.

New Zealand, Dr. G. Campbell.

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

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WORLD SHORT WAVE TIME-TABLE



The schedule of short-wave broadcasting stations listed below includes only those that are received best in RADIO NEWS LISTENING POSTS. The schedule is from 10 G. M. T. to 05 G. M. T. Both wavelength and frequency, in kilocycles, are noted for each station under STATION LOCATIONS. Unless otherwise noted these stations are heard daily.

Short-Wave "Best Bets"

Wavelengths in Meters	*Call Letters*	*Frequency in k.c.*
10 G. M. T. 5 A. M. E. S. T.		
19.8+	HVJ	15123
30.5	J1AA	9870
31.2+ Sun.	VK2ME	9590
31.5 Wed., Sat.	VK3ME	9510
42.9+	LCL	6984
70.2 Except Sun.	RV15	4273
11 G. M. T. 6 A. M. E. S. T.		
30.5	J1AA	9870
31.2+ Sun.	VK2ME	9590
31.5 Wed., Sat.	VK3ME	9510
42.9+	LCL	6984
49.4+ Irregular	W8XAL	6060
70.2 Except Sun.	RV15	4273
12 G. M. T. 7 A. M. E. S. T.		
13.9+	W8XK	21540
16.8+	GSG	17790
19.6+	FYA	15243
19.7	DJB	15200
23.3+ Sun.	CNR	12830
25.3	GSE	11865
25.5+ Ex. Tues., Wed	PHI	11730
31.2+ Sun.	VK2ME	9590
31.3+	WIXAZ	9570
31.8	PLV	9415
42.9+	LCL	6984
49.2 Fri., Sat.	VE9GW	6095
49.4+ Irregular	W8XAL	6060
70.2 Except Sun.	RV15	4273
13 G. M. T. 8 A. M. E. S. T.		
13.9+	W8XK	21540
16.8+	GSG	17790
19.6+	FYA	15243
17.2	J1AA	17380
19.7	DJB	15200
23.3+ Sun.	CNR	12830
25.3	GSE	11865
25.1+ Sun.	RV50	11923
25.5+ Ex. Tues., Wed	PHI	11730
31.2+ Sun.	VK2ME	9590
31.3+	WIXAZ	9570
31.8	PLV	9415
42.9+	LCL	6984
49.2 Fri., Sat.	VE9GW	6095
49.4+ Irregular	W8XAL	6060
49.5 Sun.	OXY	6060
70.2	RV15	4273
14 G. M. T. 9 A. M. E. S. T.		
13.9+	W8XK	21540
26.8 Sun.	CT3AQ	11180
31.2+ Sun.	VK2ME	9590
31.3+	W1XAZ	9570
31.5+	GSB	9510
40.5 Except Sun.	HJ3ABD	7402
42.9+	LCL	6984
47.8 Tues., Fri.	HI1A	6272
49.0+	VE9HX	6110
49.0+Sun.	VV1BC	6112
49.2 Fri., Sat.	VE9GW	6095
49.3+ Sun.	W9XAA	6080
49.4+ Irregular	W8XAL	6060
49.4+	UOR2	6060
49.5+	GSA	6050
49.6	W4XB	6040
49.6 Sun.	W1XAL	6040
17 G. M. T. 12 Noon E. S. T.		
13.9+	W8XK	21540
16.8	W3XAL	17780
19.6+	W2XE	15270
19.7	W8XK	15210
23.3	HJ1ABB	12800
25.2	FYA	11900
25.4	12RO	11810
25.6 Sat.	VE9JR	11720
30.6+	GCW	9790
31.2+	W3XAU	9590
31.2+ Sun.	VK2ME	9590
31.3+	W1XAZ	9570
31.5+	GSB	9510
40.5 Except Sun.	HJ3ABD	7402
42.9+	LCL	6984
47.5 Sun.	HIZ	6315
47.8 Tues., Fri.	HI1A	6272
49.0+ Ex. Sat., Sun.	VE9HX	6110
49.2 Fri., Sat., Sun.	VE9GW	6095
49.3+ Sun.	W9XAA	6080
49.4+ Irregular	W8XAL	6060
49.4+ Tues., Thurs.	UOR2	6060
49.5+	GSA	6050
49.6	W4XB	6040
49.6 Sun.	W1XAL	6040
18 G. M. T. 1 P. M. E. S. T.		
13.9+	W8XK	21540
16.8	W3XAL	17780
19.7	W8XK	15210
25.2	FYA	11900
25.5	GSD	11750
25.6 Sat.	VE9JR	11720
30.4 Sat.	EAQ	9860
30.6?	12RO?	9798
30.6+	GCW	9790
31.2+	W3XAU	9590
31.3+	W1XAZ	9570
31.5	GSB	9510
42.9+	LCL	6984
46.6 Fri.	W3XL	6425
47.5	HIZ	6315
47.8 Sun.	HI1A	6272
48.7	VV3BC	6162
48 8+	W8XK	6140
49.0+ Sun.	VV1BC	6112
49.1 Except Sat.	W9XF	6100
49.1+ Sat.	W3XAL	6100
49.2	VE9GW	6095
49.3+ Sun.	W9XAA	6080
49.4+ Irregular	W8XAL	6060
49.5 Temporary	OXY	6060
49.5+	GSA	6050
49.6	W4XB	6040
49.9+	COC	6000
49.9+	HIX	6000
50.0	RV59	6000
69.4	OHU	4320
22 G. M. T. 5 P. M. E. S. T.		
16.8 Except Sat.	W3XAL	17780
25.2	W8XK	11870
25.4	12RO	11810
26.8	CT3AQ	11180
30.4	EAQ	9860
31.2+ Tues., Fri.	CT1AA	9590
31.2+	W3XAU	9590
31.3 Sat.	HBL	9580
31.3+	W1XAZ	9570
31.5	GSB	9510
35.5	PRAG	8450
36.6	PSK	8185
38.4+ Sat.	HBP	7790
42.9+	LCL	6984
45.0+ Sun	HC2RL	6668
46.6+ Fri.	W3XL	6425
47.5	HIZ	6315
47.8	HI1A	6272
48.7	VV3BC	6162
48.8+	W8XK	6140
49.0	W2XE	6120
49.0+	VE9HX	6110
49.1+ Sat.	W3XAL	6100
49.0+	VV1BC	6112
49.1+ Except Sat.	W9XF	6100
49.2	VE9GW	6095
49.3+ Sun.	W9XAA	6080
49.4+	W8XAL	6060
49.5 Temporary	OXY	6060
49.5+	GSA	6050
49.6	W4XB	6040
49.9+	COC	6000
49.9+	HIX	6000
50.0	RV59	6000
50.4	HJ2ABA	5880
50.6 Irregular	HJ4ABE	5860
69.4 Sun.	OHU	4320
48.5+	TGW	6180
48.7	VV3BC	6162
48.8+	W8XK	6140
49.0	W2XE	6120
49.0+	VE9HX	6110
49.0+	VV1BC	6112
49.1+ Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2	VE9GW	6095
49.3+	CP5	6080
49.3+ Sun.	W9XAA	6080
49.4+	W8XAL	6060
49.4+	W3XAU	6060
49.6 Sun.	W1XAL	6040
49.8	DJC	6020
49.9+	COC	6000
49.9+	HIX	6000
50.4 Irregular	HJ2ABA	5880
50.6 Mon., Wed., Fri.	HJ4ABE	5860
69.4	G6RX	4320
73.0+ Except Mon.	HCJB	4107
02 G. M. T. 9 P. M. E. S. T.		
25.2	W8XK	11870
25.5	DJD	11760
25.6 Except Sun.	VE9JR	11720
31.2+	XETE	9600
31.3+	WIXAZ	9570
31.4+	W2XAF	9530
40.5+ Except Sun.	HJ3ABD	7402
45.0+ Tues.	HC2RL	6668
45.3 Thurs.	PRADO	6618
46.1	HJ5ABD	6504
46.5	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.5 Sat.	HIZ	6315
47.8	HI1A	6272
48.5+	TGW	6180
48.7	YV3BC	6162
48.8+	W8XK	6140
49.0	W2XE	6120
49.0+	VE9HX	6110
49.0+	YV1BC	6112
49.1+ Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2	VE9GW	6095
49.3+	CP5	6080
49.3+ Sun.	W9XAA	6080
49.4+	W8XAL	6060
49.4+	W3XAU	6060
49.6	W4XB	6040
49.8 Irregular	DJC	6020
49.9+	HIX	6000
50.4 Irregular	HJ2ABA	5880
50.6 Mon., Wed., Fri.	HJ4ABE	5860
69.4+	G6RX	4320
73.0+ Except Mon.	HCJB	4107

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WAVE TIME TABLE

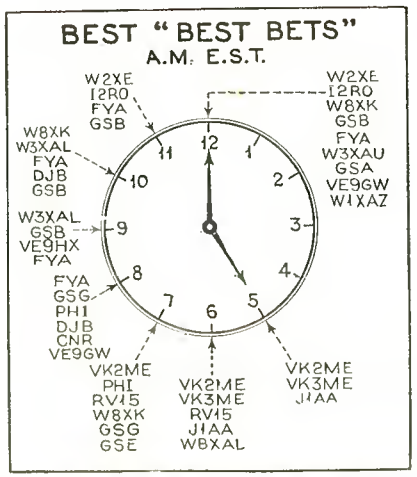
16.8+	W3XAL	17780
19.6+	FYA	15243
19.7	DJB	15200
25.3	GSE	11865
25.5+ Ex. Tues., Wed	PHI	11730
25.6 Except Sun.	VE9JR	11720
31.2+ Sun.	VK2ME	9590
31.3+	WIXAZ	9570
31.5+	GSB	9510
31.8	PLV	9415
42.9+	LCL	6984
49.0	VE9HX	6110
49.1+ Sun.	YV1BC	6112
49.2 Fri., Sat.	VE9GW	6095
49.4+ Irregular	W8XAL	6060
49.4+ Su., Tu., Thur.	UOR2	6060

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

13.9+	W8XK	21540
16.8+	W3XAL	17780
19.6+	FYA	15243
19.6+	W2XE	15270
19.7	W8XK	15210
19.7	DJB	15200
19.8	VE9DN	15130
25.3	GSE	11865
25.4	I2RO	11810
26.8 Sun.	CT3AQ	11180
31.2+ Sun.	VK2ME	9590
31.3+	WIXAZ	9570
31.5+	GSB	9510
42.9+	LCL	6984
49.0+	VE9HX	6110
49.0+ Sun.	YV1BC	6112
49.2 Fri., Sat.	VE9GW	6095
49.4 + Irregular	W8XAL	6060
49.4+	UOR2	6060
49.6	W4XB	6010

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

13.9+	W8XK	21540
16.8	W3XAL	17780
19.6+	W2XE	15270
19.7	W8XK	15210
19.7	DJB	15200
23.3	HJ1ABB	12800
25.2	FYA	11900
25.4	I2RO	11810
25.6 Except Sun.	VE9JR	11720



47.5 Sun.	HIZ	6315
47.8 Sun.	HI1A	6272
49.2 Fri., Sat., Sun.	VE9GW	6095
49.3+ Sun.	W9XAA	6080
49.4+ Irregular	W8XAL	6060
49.4+ Tues., Thurs.	UOR2	6060
49.5 Temporary	OXY	6060
49.6	W4XB	6040
49.6 Sun.	W1XAL	6040

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

16.8	W3XAL	17780
19.5 Ex. Tu. Th. Sat.	W2XAD	15330
19.7	W8XK	15210
25.2	FYA	11900
25.3+	W2XE	11830
25.4	I2RO	11810
25.5	GSD	11750
25.6 Ex. Sat., Sun.	VE9JR	11720
30.4 Sat.	EAQ	9860
30.6?	I2RO?	9798
30.6+	GCW	9790
31.2+	W3XAU	9590
31.5	GSB	9510
37.3+ Sun.	CNR	8035
41.0 Sun.	HAT2?	7300
42.9+	LCL	6984
47.5 Sun.	HIZ	6315
47.8	HI1A	6272
49.0+ Sun.	YV1BC	6112
49.2 Except Thurs.	VE9GW	6095
49.3+ Sun.	W9XAA	6080
49.4+ Irregular	W8XAL	6060
49.4+ Tues., Thurs.	UOR2	6060
49.5 Temporary	OXY	6060
49.6	W4XB	6040
50.2+	HVJ	5969
69.4	OHU	4320

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

16.8 Except Sat.	W3XAL	17780
19.5+ Ex. Tu. Th. Sat	W2XAD	15330
19.7	W8XK	15210
25.2	FYA	11900
25.3+	W2XE	11830
25.4	I2RO	11810
25.6 Ex. Sat., Sun.	VE9JR	11720
30.4 Sat.	EAQ	9860
30.6?	I2RO?	9798
30.6+	GCW	9790
31.2+	W3XAU	9590
31.3+	WIXAZ	9570
31.5	GSB	9510
37.3 Sun	CNR	8035
41.0?	HAT2?	7300
42.9+	LCL	6984
47.8 Sun.	HI1A	6272
49.0+ Sun.	YV1BC	6112
49.1+ Sat.	W3XAL	6100
49.2	VE9GW	6095
49.3+ Sun.	W9XAA	6080
49.4+ Irregular	W8XAL	6060
49.5 Temporary	OXY	6060
49.6	W4XB	6040
49.6	GSA	6050
50.0	RV59	6000
69.4	OHU	4320

21 G. M. T. 4 P. M. E. S. T.

19.7	W8XK	15210
25.2	FYA	11900
25.2	W8XK	11870
25.3+	W2XE	11830
25.4	I2RO	11810
30.6?	I2RO?	9798
30.6+	GCW	9790
31.2+	W3XAU	9590
31.5	GSB	9510
37.3 Sun.	CNR	8035
42.9+	LCL	6984

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

25.2	W8XK	11870
26.8 Tues., Thurs.	CT3AQ	11180
30.4	EAQ	9860
31.2+ Tues., Fri.	CTIAA	9590
31.3	GSC	9585
31.3 Sat.	HBL	9580
31.3+	WIXAZ	9570
35.5	PRAG	8450
36.6+	PSK	8185
38.4+ Sat.	HBP	7790
45.0+ Sun.	HC2RL	6668
46.5	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
48.7	YV3BC	6162
48.8+	W8XK	6140
49.0	W2XE	6120
49.0+	VE9HX	6110
49.0+	YV1BC	6112
49.1+ Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2	VE9GW	6095
49.3+	CP5	6080
49.3+ Sun.	W9XAA	6080
49.4+ Sun.	W8XAL	6060
49.4+	W3XAU	6060
49.5+	GSA	6050
49.5 Temporary	OXY	6060
49.6	W4XB	6040
49.6 Sun.	W1XAL	6040
50.6 Tues., Th., Sat.	HJ4ABE	5860

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

25.2	W8XK	11870
25.6 Except Sun.	VE9JR	11720
30.4	EAQ	9860
31.3	GSC	9585
31.3+	WIXAZ	9570
31.4+	W2XAF	9530
35.5	PRAG	8450
36.6+	PSK	8185
40.5	HJ3ABD	7402
45.0+ Sun.	HC2RL	6668
46.1	HJ5ABD	6504
46.5	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.8	HI1A	6272
48.5	TGW	6180
48.7	YV3BC	6162
48.8+	W8XK	6140
49.0	W2XE	6120
49.0+	VE9HX	6110
49.0+	YV1BC	6112
49.1+ Sat.	W3XAL	6100
49.1+ Ex. Sat., Sun.	W9XF	6100
49.2	VE9GW	6095
49.3+	CP5	6080
49.3+ Sun.	W9XAA	6080
49.4+	W8XAL	6060
49.4+	W3XAU	6060
49.5+	GSA	6050
49.6	W4XB	6040
49.6 Sun.	W1XAL	6040
50.4 Irregular	HJ2ABA	5880
50.6 Ex. Wed., Sun.	HJ4ABE	5860
69.4	G6RX	4320

01 G. M. T. 8 P. M. E. S. T.

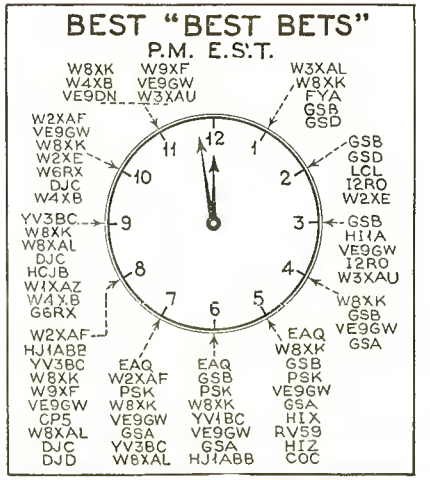
25.2	W8XK	11870
25.5	DJD	11760
25.6 Except Sun.	VE9JR	11720
31.2+	XETE	9600
31.3+	WIXAZ	9570
31.4+	W2XAF	9530
37.5	HC2JSB	8000
40.5+ Except Sun.	HJ3ABD	7402
46.1	HJ5ABD	6504
46.5	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.8	HI1A	6272

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

25.5	DJD	11760
25.6 Sat.	VE9JR	11720
31.3+	WIXAZ	9570
31.4+	W2XAF	9530
40.5+ Except Sun.	HJ3ABD	7402
45.0+ Tues.	HC2RL	6668
45.3 Thurs.	PRADO	6618
46.5	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.5 Sat.	HIZ	6315
47.8	HI1A	6272
48.5	TGW	6180
48.8+	W8XK	6140
49.0	W2XE	6120
49.0+	VE9HX	6110
49.0+	YV1BC	6112
49.1+ Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2 Except Sun.	VE9GW	6095
49.3+	CP5	6080
49.4+	W8XAL	6060
49.4+	W3XAU	6060
49.6	W4XB	6040
49.8	DJC	6020
49.9+ Sat.	HIX	6000
50.6 Mon. Wed., Fri.	HJ4ABE*	5860
69.4+	G6RX	4320

04 G. M. T. 11 P. M. E. S. T.

25.6 Sat.	VE9JR	11720
31.3+	WIXAZ	9570
45.0 Fri.	TGW	6180
45.0+ Tues.	HC2RL	6668
46.6+ Fri.	W3XL	6425
48.8 Sat.	VE9CL	6150
48.8+	W8XK	6140
49.0	W2XE	6120
49.1+ Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2 Thurs., Fri., Sat.	VE9GW	6095
49.3+	CP5	6080
49.4+	W8XAL	6060
49.4+	W3XAU	6060
49.6	W4XB	6040
49.9+ Sat.	HIX	6000
49.9+	VE9DN	6005



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kc., daily from 4:30 p.m. to sign off. There are four complete stations with a licensed power of 40 kw.

Reports from California

Mr. J. C. Hayes of San Rafael, California, reports that EAQ is best received there. Other stations he hears regularly are the British Empire stations, FYA, VK2ME, VE9GW. Stations KKH and KKZ are heard relaying the Byrd programs.

The British Empire Transmissions

An official communication received from the British Broadcasting Company states that the Empire transmissions will be as shown in Best Bets for this month, with the following possible alternatives: GSD may be substituted for GSE; GSB may be substituted for GSC, or vice versa.

A Report from Louisville, Kentucky

Mr. George Krebs of Louisville, reports the following Best Bets: GSD, GSB, DJC, FYA, YV3BC, W2XE, W3XAL, W3XL, W8XK, W2XAF, W1XAZ, VE9GW, VE9JR. He uses a two-tube receiver employing a regenerative detector and a –71 audio tube.

Heard at Roanoke, Virginia

Mr. E. C. Webber of Roanoke, reports the following Best Bets: EAR58 on 41.6 meters, VK2ME, HVJ, GSB, W3XL, XDG on 32.09 meters.

An Official Report from Maryland

Mr. Howard Adams, Jr., reports from Baltimore: Not much change in reception conditions from those of a month ago. The 50-meter stations are good from 4 p.m. on through the evening. The 25-meter trasmissions are good from 8 a.m. to noon and sometimes up to 2 p.m., when the 31-meter band picks up. He notes that G6RX comes in quite well during the evenings. He also notes that the South American stations seem to be coming in better on 50 meters. He sends in the following list of Best Bets in his location: GSG, FYA, DJB, DJD, EAQ, VK2ME, GSC, DJA, W2XAF, YV3ME, YV3BC, PLV, HC2RL, HJ1ABB, W3XAL, W9XF, VE9GW, W8XAL, GSA, W1XAL, DJC, HIX, HJ2ABA, HJ4ABE, HCJB.

A Report from England

Mr. L. H. Collurn of Chentsey, Surrey, reports the following Best Bets in his location: W3XAL, DJB, W2XAD, FYA, W8XK, GSE, I2RO, EAQ, CT1AA, VK2ME, GSC, DJA, W2XAF, OXY, GSB, LCL, RV72, VE9GW, VQ7LO, GSA, DJC, RV59, HVJ. All of these stations have been verified.

Official Report from Ontario

Douglas Wood of Somcoe, Ontario, reports the following Best Bets in his location: GSA, GSB, GSC, GSD, DJC, DJB, DJD, I2RO, FYA, VE9GW, W8XK, W8XAL, W2XE, W9XAA, W3XAU, W2XAF, VK2ME, EAQ, HJ4ABB, HJ1ABB, HJ4ABE, YV1BC, HJTY. He also reports hearing CT3AQ on 11,181 kc. at 12:38 p.m. and a station he thought signed "RFN," approximately 12,000 kc., with a lecture in Russian, and asks if any of our listeners know who it can be.

Two Stations on About 30 Meters

A number of our Listening Posts report hearing GCW, playing all sorts of phonograph records and readings, during a series of tests on 9790 kc., during midday. They report him "extremely loud" and say that he tests on a full side-band transmission, half side-band transmissions and also on transmissions without a carrier wave. Another station on a slightly shorter wavelength than this has been listed tentatively in this month's Best Bets. It carries the programs of I2RO and comes in between EAQ and GCW. It has been received throughout the United States with extreme steadiness and with much greater volume than I2RO itself. Does anyone know who this is, or if it is a new Italian transmitter carrying the same program as famous old I2RO?

Station Locations

WL.	*Call*	*KC.*	*Location*
13.9+	W8XK	21540	Pittsburgh, Pa.
16.8+	W3XAL	17780	Bound Brook, N.J.
16.8+	GSG	17790	Daventry, England
17.2+	J1AA	17380	Kemikawa-Cho, Japan
19.5	W2XAD	15330	Schenectady, N. Y.
19.6	FYA	15243	Pontoise, France
19.6+	W2XE	15270	New York, N. Y.
19.7	W8XK	15210	Pittsburgh, Pa.
19.7	DJB	15200	Zeesen, Germany
19.8	HVJ	15123	Vatican City
23.3	CNR	12830	Rabat, Morocco
23.3	HJ1ABB	12800	Bogota, Colombia
25.1+	RV50	11923	Moscow, Russia
25.2	FYA	11900	Pontoise, France
25.2	W8XK	11870	Pittsburgh, Pa.
25.3	GSE	11865	Daventry, England
25.3+	W2XE	11830	New York, N. Y.
25.4	I2RO	11810	Rome, Italy
25.5	GSD	11750	Daventry, England
25.5	DJD	11760	Zeesen, Germany
25.5+	PHI	11730	Huizen, Holland
25.6	VE9JR	11720	Winnipeg, Canada
26.8	CT3AQ	11180	Funchal, Madeira
30.4	EAQ	9860	Madrid, Spain
30.5	J1AA	9870	Kemikawa-Cho, Japan
30.6 ?	I2RO ?	9798	Rome, Italy
30.6+	GCW	9790	Rugby, England
31.2+	XETE	9600	Mexico City, Mex.
31.2+	W3XAU	9590	Philadelphia, Pa.
31.2+	VK2ME	9590	Sydney, Australia
31.2+	CT1AA	9590	Lisbon, Portugal
31.3	HBL	9580	Geneva, Switzerl'd
31.3	GSC	9585	Daventry, England
31.3+	W1XAZ	9570	Springfield, Mass.
31.4+	W2XAF	9530	Schenectady, N. Y.
31.5	VK3ME	9510	Melbourne, Aust.
31.5	GSB	9510	Daventry, England
31.8	PLV	9415	Bandoeng, Java
35.5	PRAG	8450	Porto Alegre, Brazil
36.6+	PSK	8185	Rio de Janeiro, Brazil
37.3	CNR	8035	Rabat, Morocco
37.5	HC2JSB	8000	Guayaquil, Ecuad.
38.4+	HBP	7790	Geneva, Switzerl'd
40.5+	HJ3ABD	7402	Bogota, Colombia
41.0 ?	HAT2 ?	7300	Budapest, Hungary
42.9+	LCL	6984	Jeloy, Norway
45.0+	HC2RL	6668	Guayaquil, Ecuad.
45.3	PRADO	6618	Riobamba,Ecuador
46.1	HJ5ABD	6504	Cali, Colombia
46.5	HJ1ABB	6450	Barranquilla, Co.
46.6	W3XL	6425	Bound Brook, N. J
47.5	HIZ	6315	San Domingo,D.R.
47.8	HI1A	6272	San Domingo, D.R.
48.5	TGW	6180	Guatemala City
48.7	YV3BC	6162	Caracas, Venez.
48.8	VE9CL	6150	Winnipeg, Man.
48.8+	W8XK	6140	Pittsburgh, Pa.
49.0	W2XE	6120	New York, N. Y.
49.0+	VE9HX	6110	Halifax, N. S.
49.1+	YV1BC	6112	Caracas, Venez.
49.1+	W3XAL	6100	BoundBrook,N.J.
49.1+	W9XF	6100	Chicago, Ill.
49.2	VE9GW	6095	Bowmanville, Can.
49.3+	W9XAA	6080	Chicago, Ill.
49.3+	CP5	6080	La Paz, Bolivia
49.4+	W8XAL	6060	Cincinnati, Ohio
49.4+	UOR2	6060	Vienna, Aust.
49.4+	W3XAU	6060	Philadelphia, Pa.
49.5	OXY	6060	Skamlebaek, Den.
49.5	GSA	6050	Daventry, England
49.6+	W4XB	6040	Miami, Fla.
49.6+	W1XAL	6040	Boston, Mass.
49.8	DJC	6020	Zeesen, Germany
49.9+	VE9DN	6005	Montreal, Que.
49.9+	HIX	6000	San Domingo
49.9+	COC	6000	Havana, Cuba
50.0	RV59	6000	Moscow, U.S.S.R.
50.2+	HVJ	5969	Vatican City
50.4	HJ2ABA	5880	Tunja, Colombia
50.6+	HJ4ABE	5860	Medellin, Colombia
69.4	OHU	4320	..... Austria
69.4	G6RX	4320	Rugby, England
70.2	RV15	4273	Khabarovsk,Siberia
73.0	HCJB	4107	Quito, Ecuador

Some Dope on HCJB

Mr. A. Faber of Hudsonville, Michigan, writes in response to a RADIO NEWS query that station HCJB was built by a missionary two years ago last Christmas and has been operating daily since its erection (except Mondays) on 73 meters, 4107 kc., with a power of 250 watts. They operate nightly from 8 to 10, Quito time (15 minutes slower than E.S.T.). There is a noonday service, as well as Sunday morning services direct from the Christian and Missionary Alliance Chapel. The builders of this station are Eric Williams and Clarence Jones of Chicago, Illinois.

The Mysterious Mexican Station

Mr. R. Wright of Brooklyn, New York, writes in that *he* also has heard the Mysterious Mexican Station announcing "Hello, America, Bueno, Bueno Mexico," and that it has a theme tune, "I don't mind being alone with you," and occasionally plays "Where do you worka, John?" It is on the same wavelength as the South Pole expedition.

Report from Ohio

Mr. O. L. Ramsey of Struthers, Ohio, reports the following Best Bets in his location: EAQ, FYA, PHI, GSB, GSE, GSD, GSC, GBP, DJD, DJA, I2RO, CNR, VK2ME, VK3ME, LSX, LSN, PSK, HJ3ABD, YVR, KKH, KEE, KKQ, W8XK, W2XAF, W1XAZ, WEF, VE9JR. He uses a National S.W. 3, using a power with two –47 pentode tubes in the output. He uses a 30-foot length of insulated wire twisted around the lead-in of a 100-foot broadcast receiver aerial for his antenna.

A Report from Savannah

Mr. J. L. Davis of Savannah, Georgia, reports that he has just received an official verification card from radio station COC, Havana, Cuba. They state that they are on the air daily from 4 p.m. to 5 p.m., E.S.T. The address is P. O. Box 98 and they operate on 49.9 meters.

"Neighborly Listening Posts"

Mr. E. F. Orne, Official RADIO NEWS Short-Wave Listening Post Observer for Massachusetts, writes as follows: "It seems to me that a good idea would be to publish in RADIO NEWS the names and addresses of all Listening Post Observers with the suggestion that when any listener, who is not an observer, receives short-wave stations he cannot identify or which he would like to obtain further information about, to get in touch with the nearest RADIO NEWS Short-Wave Listening Post Observer, who can no doubt help him. I believe that observers, as in my case, are better equipped with short-wave data than the average listeners, and stand ready to furnish such help to further the growing interest in short waves. Doubtless the occasional listener might have the luck to hear certain announcements from a station that he might perhaps pass along to a neighborly Official Observer who could include this information in his monthly compilation of data for the DX Corner. I am sure Official Observers would reciprocate by offering helpful information and suggestions to such informers and the cycle would be complete." A good idea, and we feel sure that our Observers *would* help. Any letters written to Listening Posts, care of RADIO NEWS, will be forwarded to the Listening Posts in question.

An Official Report from Johannesburg

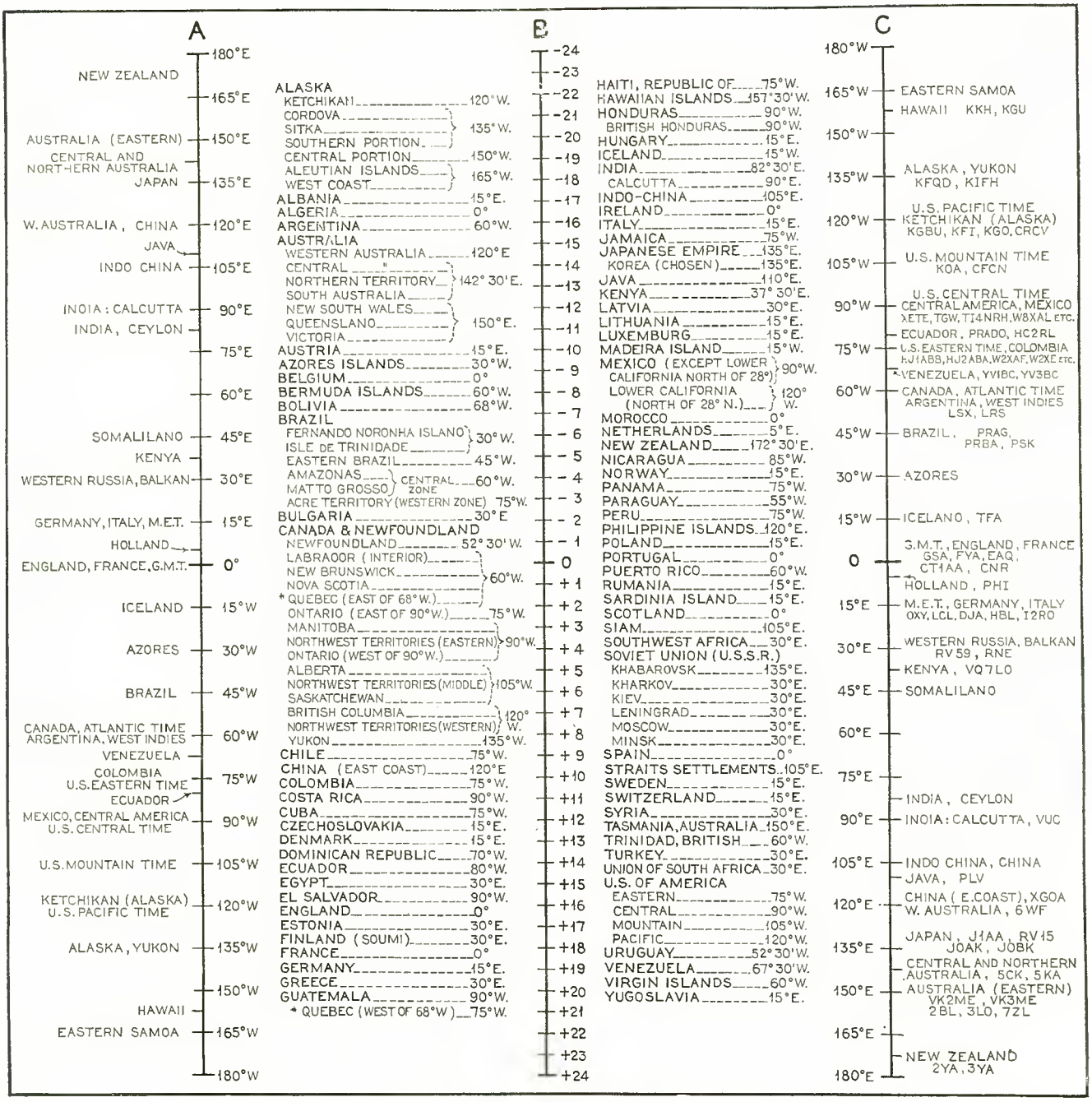
Official Listener Mike Kruger reports the following Best Bets at Yeoville, Johannesburg, South Africa: FYA, DJD, DJC, W3XAL, PHI, all the Daventry transmissions, W8XK, W3XL, W3XAL, HBL, VK2ME, RV59, VQ7LO (Nairobi, Africa, 49.5 meters), W8XAL, I2RO, HVJ, W9XAA, FIQA (Tananarive, Madagascar, 52.7 meters), CR7AA, W1XAZ,

(*Continued on page* 637)

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WORLD TIME CONVERSION CHART

The short-wave listener can, with the aid of this chart, instantly determine the time in any part of the world corresponding to any given hour in his own location



How to Convert Foreign Time to Your Local Time

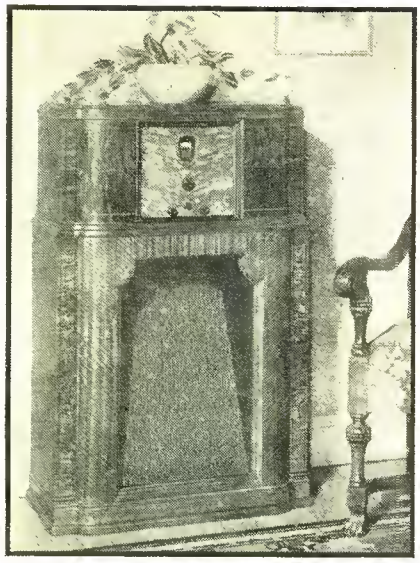
FIRST locate your country, or your section of your country, in the alphabetical list, to find its longitude. Then locate this longitude on line A. Next consult the alphabetical list to determine the longitude of the country whose time you want to find, and locate this longitude on line C. Now lay a ruler or other straight-edge across the chart so that it connects these two points on lines A and C. The point at which it crosses line B shows the time difference between these points. If the hour is preceded by a plus sign, add this figure to the time in your locality. If a minus sign is shown, deduct the hours from your time.

The following concrete example will illustrate the simplicity of the procedure: Suppose a New York City listener wants to determine the time in New Zealand. He first consults the list (U. S. A.—Eastern Time) and finds his longitude to be 75 degrees West. This he locates on line A. He again consults the list and finds the longitude of New Zealand to be 172 degrees, 30 minutes East (60 minutes equals 1 degree, therefore New Zealand lies 172½ degrees, East). This point is then located on line C. A ruler laid across the chart to connect 75 on line A with 172½ on line C intersects line B at plus 16½ hours. He therefore adds this number of hours to his own time to find the corresponding New Zealand time. Thus if it is 9 a.m. in New York, he finds that in New Zealand the clocks show 1:30 a.m. of the next day.

If he desires to know the corresponding hour in Hawaii he will find it to be his local time minus 5½ hours, or 3:30 a.m. if his local time is 9 a.m.

From the foregoing it is evident that the use of this chart represents an utterly simple method of accurately determining the time in any part of the world, corresponding with that in any other part. If desired, a strip of cardboard may be employed in place of a ruler, pivoting one end on line A in a position corresponding to one's own location so that the straight-edge may be swung through an arc sufficiently long to reach all points on line C. This will still further simplify the use of the chart.

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A New ALL-WAVE SUPER

(Philco Model 16-X)

THE Philco Model 16-X superheterodyne receiver is intended for those who desire radio reception of an extremely high order, both from the standpoints of faithful reproduction of speech and music, and of general performance. Some refinements are included which are not to be found in the average modern receiver—refinements which add to the cost of production and purchase but which are fully justified in the eyes of the discriminating radio listener.

The 16-X is an 11-tube all-wave superheterodyne, housed in a console cabinet as shown in the accompanying illustration. The complete schematic circuit diagram, including service data, is shown below. It covers all broadcast frequencies between 530 kc. and 23,000, continuously, in five ranges with adequate overlap between ranges. Also, of course, all other types of modulated reception, in addition to broadcasting, within this wide range. The ranges provided are five in number, as follows:

530-1500 kc.; 566-200 meters
1500-4000 kc.; 200-75 meters
3200-6000 kc.; 93.8-50 meters
5800-12000 kc.; 51.7-25 meters
11000-23000 kc.; 27.3-13 meters

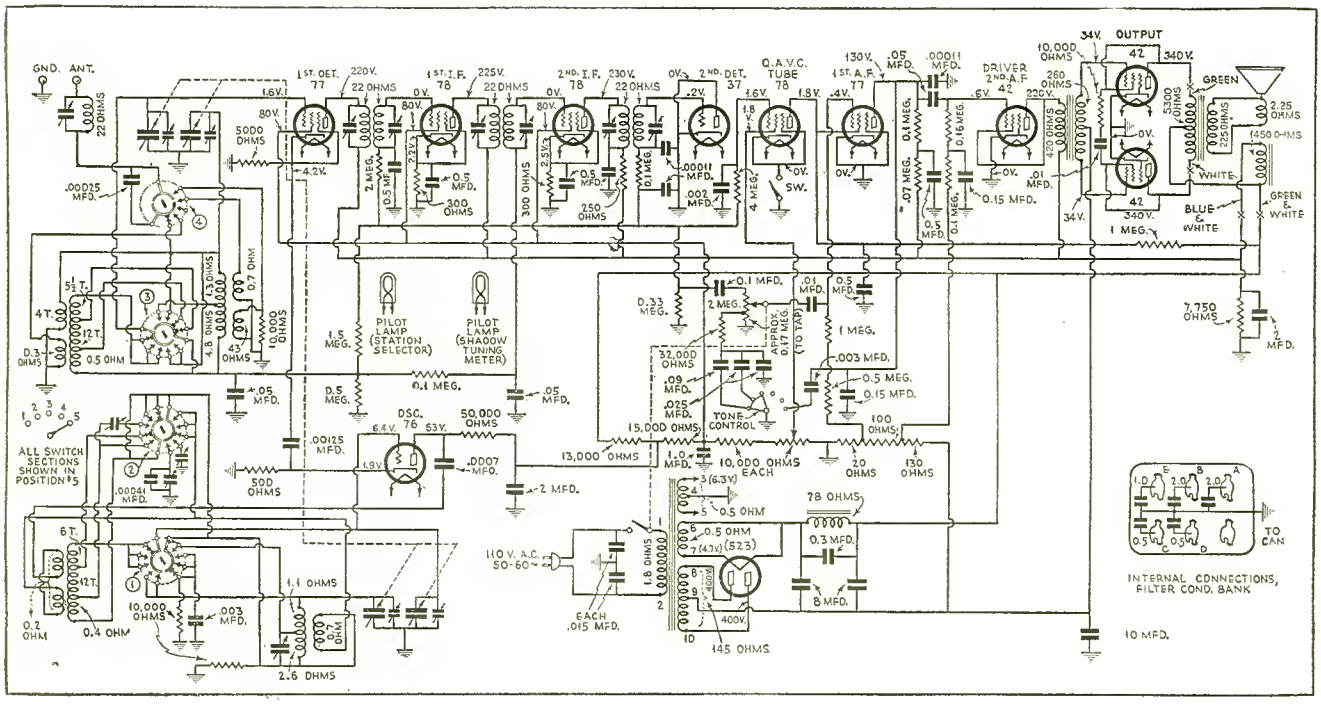
The tuning dial is accurately calibrated throughout each range, in frequencies, and in addition the various types of services such as standard broadcast, s.w. broadcast, police, amateur, aircraft, ship and 'phone are all shown directly on the dial, indicating at just which portions of each range these various services may be tuned in.

A study of the circuit shown below discloses that the receiver employs 2 dual-tuned i.f. stages, providing a total of 6 i.f. tuned circuits. The intermediate frequency employed is 460 kc. One of the unique features of the circuit is a 460 kc. wavetrap included in the antenna input circuit. Its purpose is to trap out any interference which might result from commercial or other stations operating on approximately this frequency. This is a feature which will be especially appreciated by anyone living along the coast where commercial transmissions or their harmonics cause code interference in superheterodyne receivers, by forcing their way through the tuned input circuits and thus reaching the i.f. amplifier where they are amplified sufficiently to be audible at the receiver output.

The quiet tuning or noise suppression circuit has been developed to a highly practical and effective degree in this Philco model. One of its features is the switch connected between the cathode of the 78 Q.A.V.C. tube and ground. This switch is mounted on the side of the console and provides a means for cutting the noise suppression system in and out at will. Thus, in ordinary operation on local stations, the switch is thrown to one side, cutting in the noise suppression system so that no station below a certain signal strength will be heard and no noise will be heard when tuning between these stations. This minimum control signal strength is fixed, by the adjustment of a thumb-nut at the rear of the chassis, when the receiver is installed and is set at a level to meet the noise conditions found in that particular location. When tuning for distant stations the noise suppression switch is thrown to the other side, thus permitting the reception of weak stations. Noise will be heard at such times, of course, but when one is fishing for DX reception he is willing to tolerate the attendant noise.

Another feature which simplifies the tuning of the receiver is found in the unusually effective tuning meter. The image of the indicator in this meter is thrown on a small rectangular, illuminated window immediately above the station selector dial. This image takes the form of a wide band of shadow, which narrows as a station is tuned to resonance. In the case of a powerful local station the shadow narrows to a thin line. On more distant stations the effect is less, but even on weak signals it is sufficient to be readily perceptible.

There are four control knobs located on the front panel. A large knob just below the dial (*Continued on page* 633)



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UNITED STATES AND WORLD-WIDE MILEAGE CHART

MOSCOW, U.S.S.R.	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
KHABAROVSK, 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
LOS ANGELES, U.S.A.	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
NEW YORK, 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
ST. LOUIS, 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
CARACAS, VENEZUELA	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
CAPETOWN, SOUTH AFRICA	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
GENEVA, SWITZERLAND	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
MADRID, SPAIN	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
LISBON, PORTUGAL	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
MANILA, P.I.	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
OSLO, NORWAY	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
WELLINGTON, NEW ZEALAND	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
HUIZEN, NETHERLANDS	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
RABAT, MOROCCO	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
MEXICO CITY	38	46	100	80	63	33	58	21	25	70	20	11	59	19	56	57	61	38	64	96	62	70	103	92
NAIROBI, KENYA	82	64	55	75	37	71	55	75	89	58	76	81	42	79	42	40	39	50	36	38	38	70	49
BANDOENG, JAVA	36	93	18	32	67	107	95	98	82	36	121	110	69	118	74	73	68	66	66	25	69	36
TOKIO, JAPAN	35	114	50	48	57	103	117	64	47	12	88	74	55	89	60	60	56	38	56	32	61
ROME, ITALY	52	69	83	101	5	65	57	44	55	56	58	54	9	63	9	7	7	80	5	45
CALCUTTA, INDIA	58	102	42	57	43	108	92	77	70	20	102	92	43	106	49	49	44	70	41
BUDAPEST, HUNGARY	49	73	81	99	2	69	61	44	52	51	61	55	6	66	9	7	4	76
HONOLULU, HAWAII	28	75	68	51	76	66	82	46	27	50	57	48	71	55	72	74	72
BERLIN, GERMANY	45	73	85	101	3	68	61	40	49	51	58	52	2	63	6	5
PARIS, FRANCE	47	68	89	105	6	62	56	37	49	56	54	48	6	58	2
LONDON, ENGLAND	45	69	91	106	9	61	58	35	47	55	53	46	6	57
QUITO, ECUADOR	56	22	99	83	63	14	29	31	43	99	5	16	63
COPENHAGEN, DENMARK	43	74	85	99	5	68	62	39	47	50	58	51
HAVANA, CUBA	40	43	110	90	54	29	42	15	28	83	14
BOGOTA, COLOMBIA	55	29	98	88	59	15	28	28	42	98
NANKING, CHINA	43	122	44	50	51	112	112	70	56
VANCOUVER, CANADA	13	70	92	78	52	70	69	21
TORONTO, CANADA	29	56	113	96	43	52	52
RIO DE JANEIRO, BRAZIL	81	12	83	72	61	16
LA PAZ, BOLIVIA	69	13	90	80	68
VIENNA, AUSTRIA	48	73	83	99
SYDNEY, AUSTRALIA	73	72	20
PERTH, AUSTRALIA	83	76
BUENOS AIRES, ARGENTINA	83
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	54	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	184	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

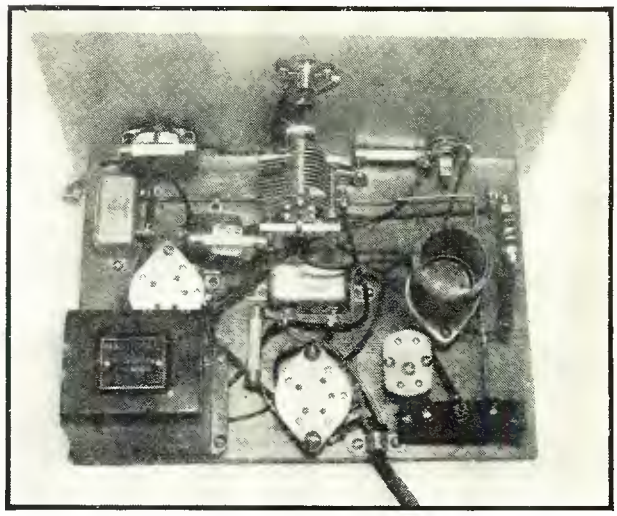
To determine mileage between any two of the listed cities in the world, first find these two cities on the world chart (top triangle). Follow the horizontal column across the chart from the upper city, and the vertical column up from the lower city. The box at which these two columns intersect shows 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.

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GETTING ACQUAINTED *with* SHORT WAVES

This is the fourth article of a series for the beginner which will provide a short-wave primer dedicated to an intelligent understanding of short waves and how to derive the greatest pleasure from them

James Millen



THE TOP VIEW

Figure 6. This shows the general layout and constructional details of the complete set

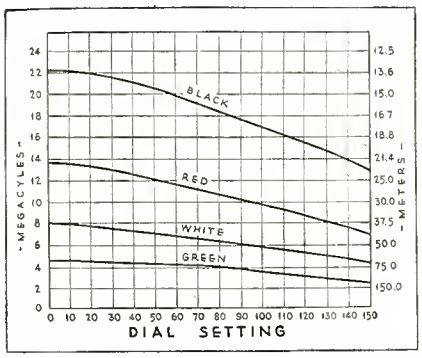
THE construction and study of a short-wave receiver presents an excellent lesson in the theory and practice of radio in general. At the same time it offers a fascinating introduction into the short-wave field which is becoming increasingly interesting and important. The purposes of this article are to describe in detail the construction of such a receiver, and then next month to take it apart, theoretically, to see just *how* and *why* it works.

Accordingly, we have designed a short-wave receiver operable from power lines or batteries, which is so simple that anyone can build it, regardless of their mechanical ability or experience. As a matter of fact, we start with the assumption that the reader's practical acquaintance with things electrical is limited to fixing a floor plug or replacing a fuse.

It is first recommended that the prospective short-wave enthusiast familiarize himself with the general idea of short-wave reception by reading the first three articles of this series—appearing in RADIO NEWS for January, February and March of this year. Next, check the family tool chest for the necessary tools. You will need a medium-size screwdriver, a small saw, wire-cutting pliers, a hand-drill and an electric soldering iron. A good iron can be bought for about one dollar. If you are missing the drill, your local garage man will be glad to drill the few holes in the panel. (However, we recommend the acquisition of the drill, for the chances are this will not be the last set you'll build!)

THE TUNING CHART

Figure 5. These are the tuning curves for the four most popular coils

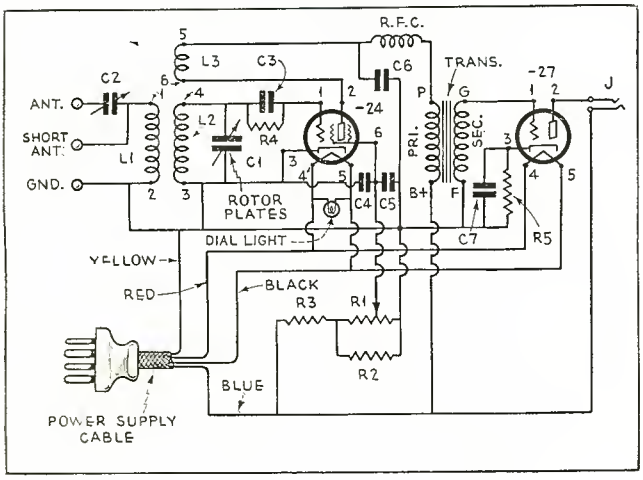


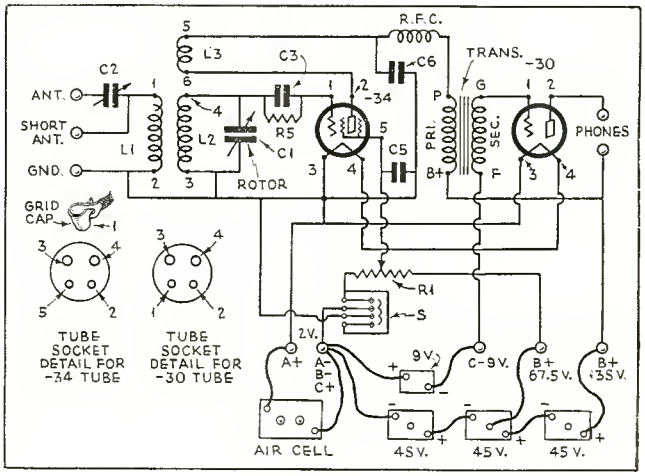
Read this article at least twice before attempting to build the receiver. Study the circuit diagrams, layout drawings and photographs. Figure 1 is the a.c. set wiring diagram drawn with the conventional radio symbols. Figure 2 is a picture diagram of the same which will probably be of greater significance to the beginner. Figure 3 is the schematic diagram of the battery set. Compare these drawings and endeavor to identify the various parts in Figures 1 and 3. They carry the same labels as in Figure 2 and in the parts list (except for changes in the battery set).

The first step in actually building the short-wave set is to drill the holes in the front panel in accordance with the layout of Figure 4. While the parts list calls for an aluminum panel, considerable latitude in size (larger) and material may be permitted in the construction of a beginner's first receiver. Hard rubber or bakelite make excellent panels, but even clean, dry plywood can be used. The panel is mounted on the base-board, which may be made from any convenient slab of wood. Here, too, the constructor may vary somewhat from the mechanical procedure indicated

SCHEMATIC CIRCUITS FOR A.C. AND BATTERY OPERATION

Figure 1. (Left) The circuit of the simple a.c.-operated short-wave receiver for beginners. Figure 3. (Right) by making minor changes in wiring and parts, the a.c. circuit of Figure 1 is converted for battery operation





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in the illustrations. The panel can be mounted by means of small angle brackets, obtainable in any hardware store, or, if the base-board is thick enough, the panel can be screwed directly to its front edge. While "feet" contribute to the appearance of the completed job, they are of course not essential.

When the panel and base-board have been joined, mount the condenser C1, jack (J), resistor R1, the dial and the pilot light. The legs supporting the tuning condenser, binding-post strips, sockets and transformer can be obtained from most hardware stores, but if more convenient, they can be built up with the required number of washers. The dial is fastened to the panel by small screws coming through the back, after first prying off the hub and loosening the set-screw so that the dial will slip over the tuning condenser shaft. Move the rotor as far out as it will go—that is, counter-clockwise—and set the dial on zero. Now tighten the set-screw and replace the hub-cap. When the condenser is turned all the way to the right, the dial should show the one hundred and fiftieth division. (Though there are 200 dial divisions, only three-quarters of them are used with a 270° condenser.)

The dial light is connected in parallel with the heater of the tube—that is, two wires (which should be twisted as shown in Figures 2 and 6) run from the two heater connections, 4 and 6, to the pilot light.

Now mount C4, the sockets and binding-post strips. The remainder of the parts are mounted as they are wired, being held in place by the bus-bar wire which also makes the connections. Flexible leads are used only in connecting parts which are rigidly mounted. Inspection of the top-view photo will indicate where the stiff wire is employed.

Wire the sockets first, then go along with the rest of the connections in any order of sequence you please. Twist all heater leads as shown in Figures 2 and 6. The numbers in Figures 1, 2 and 3 identify just where the connections are made on the coil and tube sockets. The transformer connections are initialed as indicated. Be sure to connect the rotor plates of C1 to the wire running to the ground post.

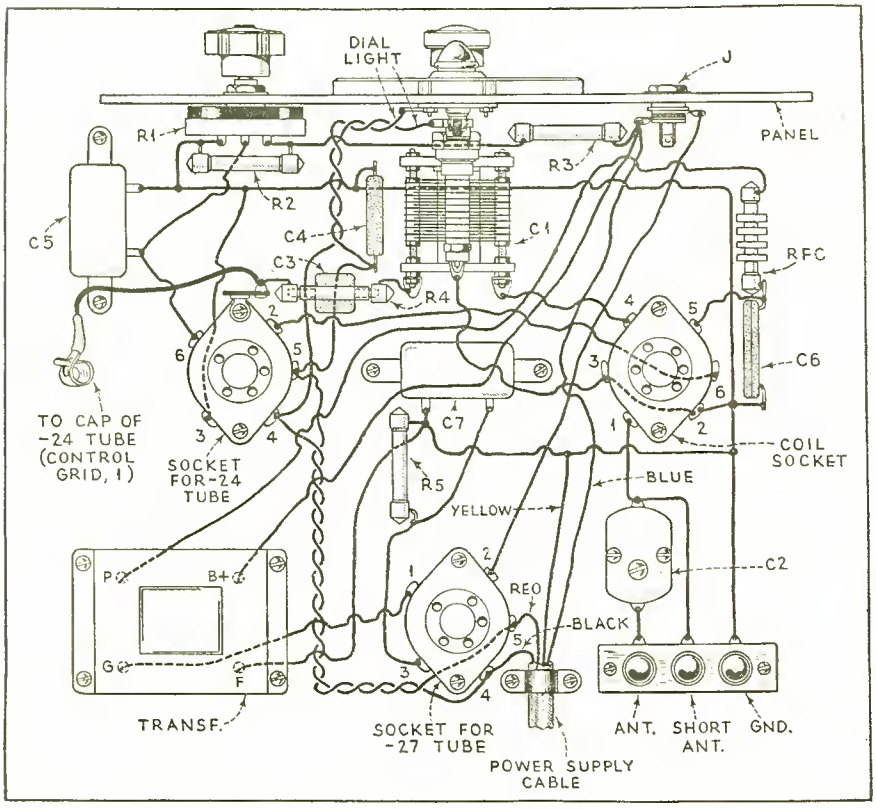


THE BEGINNER'S KITCHEN WORKSHOP

In addition to indulging an intriguing hobby, this radio beginner avoids the job of drying the dinner dishes while the lady of the house acts the part of the "kibitzer"

THE PICTURE-WIRING DIAGRAM

Figure 2. Reproducing Figure 1 as a picture diagram



The color-code of the power cable must be followed as indicated. Care should be exercised in wiring the volume control exactly as shown in Figure 2. If the outside connections are reversed, the volume will increase as the knob is turned backwards.

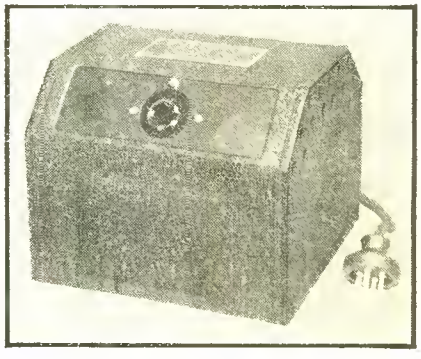
Further constructional details will be evident from the picture diagram, Figure 2, and the top-view photograph, Figure 6. While these illustrations were made from the a.c. version, the changes in the battery set are so slight that they may still be used as a guide.

In the battery set, switch S is mounted in place of the jack, J, on the panel. Be sure to make this connection exactly as shown. A misplaced wire here would still permit the switch to turn "on and off" the filament of the –34 tube, but would result in the rapid drain of half the B battery through the volume control 1.

If the dial light is used, *make certain that it is the .06-ampere type*, otherwise the air-cell battery may be discharged in a short time. The correct bulb can be identified by the *pink* glass bead supporting the filament. The additional binding posts required in the battery set may be conveniently mounted on a strip at the back of the base-board. (*Continued on page* 632)

THE POWER SUPPLY

Figure 7. This power supply unit provides both heater and plate voltages for the a.c. short-wave model



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SHORT-WAVE FIRST-AIDS

The data presented here will help the short-wave listener in his explorations into the realm of short waves

FISHING for stations transmitting on the lower wavelengths is made much more productive and is considerably simplified if the listeners knows where the various types of stations are to be found. Detailed information concerning the location of regular short-wave broadcast stations will be found in the "World Short-wave Time-table" which appears elsewhere in this issue. But when the urge comes to wander afield to see what other types of transmissions have to offer, the following list will be of interest. The frequency bands indicated here contain just about everything of any conceivable interest to the short-wave fan. The police, aviation, amateur, experimental and ship telephone bands are all included—certainly a wide enough variety to provide spice for short-wave tuning. The frequencies listed here can be converted to wavelengths, if the reader prefers, by referring to the chart on the opposite page.

Frequency in kc.	*Type of Service*
550–1500	Broadcast
1500–1600	Experimental Broadcast–Aviation–Police
1600–1700	Television
1704–1708	Aviation
1712	Police
1715–1875	Amateurs, c.w. (code)
1875–2000	Amateurs, 'phone
2000–2300	Television
2316	Aviation
2340–2410	Aviation ship service, etc.
2410–2430	Police
2440–2470	Police
2470–2490	Aviation
2504–2508	State Police
2610–2650	Aviation
2750–2850	Television
2850–3100	Aviation and Government
3125–3150	Ship 'phone
3155–3265	Government and Aviation
3420–3440	Coast 'phone
3445–3490	Government and Aviation
3490–3495	Experimental
3500–3900	Amateurs, c.w. (code)
3900–4000	Amateurs, 'phone
4110–4130	Aviation
4175–4200	Ship 'phone
4750–4775	Coast 'phone
4795–4800	Experimental
4915–4920	Aviation
5375–5380	Aviation
5565–5695	Aviation and Government
6010–6150	Shortwave Broadcast
6420–6430	Experimental
6400–6480	Coast 'phone
6490–6640	Aviation
6650–6670	Ship 'phone
7000–7300	Amateurs, c.w. (code)
8220	Aviation
8540–8560	Coast 'phone
8650–8660	Experimental
9500–9600	Broadcast
11370–11400	Coast 'phone
11700–11900	Shortwave Broadcast
12330	Aviation
12855–12870	Experimental
13185–13260	Ship 'phone
14000–14150	Amateurs, c.w. (code)
14150–14250	Amateurs, 'phone
14250–14400	Amateurs, c.w. (code)
15100–15340	Shortwave Broadcast
16440	Aviation
17080–17120	Coast 'phone
17300–17320	Experimental
17600–17640	Ship 'phone
17750–17810	Shortwave Broadcast
21460–21540	Shortwave Broadcast
22675–22725	Coast 'phone
23100	Experimental
25700	Experimental
26000	Experimental
27100	Experimental
28000–30000	Amateurs, c.w. (code)
34600	Experimental
41000	Experimental
43000–46000	Television
48500–50300	Television
51000–53000	Experimental, Government
51400	Experimental
56000–60000	Amateurs, 'phone
60000–80000	Television
80000–400000	Experimental
400000–401000	Amateurs, c.w. (code)
401000-above	Experimental

Wavelength-Frequency Chart

Formerly all short-wave enthusiasts thought in terms of wavelengths and receivers, if calibrated at all, were calibrated in wavelengths. Now, however, the trend is definitely toward the use of frequencies rather than wavelengths.

Because of this changing situation it is often found necessary to convert frequency listings to terms of wavelengths and vice versa. A common practice is to divide the known unit into 300,000 to determine the unknown unit. Thus if one knows that a certain broadcast station transmits on 25 meters, and wants to find the frequency, he divides 25 into 300,000 and the answer—12,000—is correct to an accuracy of a fraction of 1 percent. Or if he knows the frequency of this station and wants to find the wavelength, he simply reverses the process, dividing 12,000 into 300,000.

While this method is simple, it becomes somewhat tedious in the case of fractional wavelengths or odd frequencies—and most such computations will be found to involve such odd values. The table shown on the opposite page has been developed to overcome this difficulty by showing instantly, with no calculation, the frequency equivalent of any wavelength, or the wavelength equivalent of any frequency.

The chart lists all wavelengths from 10.1 meters to 100 meters in steps of one-tenth meter, and the corresponding frequencies. However, its usefulness is not by any means limited to this 90-meter range. By shifting the decimal point to left or right, the chart covers any desired wavelength (and corresponding frequency) throughout the entire radio spectrum.

If it is desired to find the frequency equivalent of any wavelength between 10.1 meters and 100 meters, or the wavelength equivalent of any frequency between 29,690 and 2998, the chart may be read directly. Outside of this range the reading is made by shifting the decimal points. Thus, if one desires to find the frequency equivalent of 101 meters, for instance, shift the decimal point of the first item in the wavelength column one place to the right and the decimal point of the frequency one place to the left. This will show the frequency to be 2969 kc. If the frequency corresponding to 1010 meters is required, shift the wavelength decimal of the first item two places to the right and the frequency decimal two places in the opposite direction, and from this it will be found that the required frequency is 296.9 kc.

In the same way, if the wavelength for a given frequency is desired, simply locate the frequency nearest to this value in the frequency column, moving the decimal point if necessary, and opposite it will be shown the corresponding wavelength, always shifting the decimal point in one column the same number of places (but in the opposite direction) as the point was shifted in the other column.

Where the frequency is known in terms of megacycles, its equivalent in kilocycles is found by simply adding three ciphers to the megacycle figure. Thus 56 megacycles is equal to 56,000 kilocycles. Looking down the frequency column, the figure 5604 is found. To make this approach 56,000, one decimal place is added; therefore the point in the wavelength opposite is moved one place to the left and gives the corresponding wavelength as 5.35 meters. Or, an alternate method is to find 56 in the wavelength column (the figures in both columns can be considered as either wavelength or as frequency in kilocycles), move the decimal point three places to make this 56,000 kc. and move the decimal point in the other column three places to the left, arriving at 5.354 as the equivalent wavelength.

The ability to use the figures in either column to represent either wavelength or frequency makes the chart extremely flexible in application. Its accuracy is of an extremely high order, the error never exceeding 1/20 of 1 percent.

International Call Letters

Call letters of code stations as well as broadcasters heard are of special interest to the short-wave fan because from these it is possible to tell the nationality of the transmitter. Thus any call beginning with K, N or W indicates a station in the United States, its territories or its ships. The larger countries of the world have similar assignments: G for Great Britain, F for France, D for Germany, etc. Smaller countries with fewer transmitters have more limited assignments. Morocco, for instance, is assigned all calls which employ CN as the first two letters. The list of these "International Call Letter Assignments" is given below.

In code transmission the call letters are always preceded by - · · · (de). The letters of the station called are usually repeated 3 times, followed by the letters of the caller, also repeated 3 times, thus: XAB, XAB, XAB de KNL, KNL, KNL, would indicate a U. S. station calling a Mexican station.

Inasmuch as c.w. (code) transmissions carry further than 'phone or broadcast signals, and as many c.w. stations employ high power, it is possible to log many countries in this way, who either do not have broadcast transmitters or whose broadcast transmitters do not reach out to

Call Signal	*Country*
CAA-CEZ	Chile
CFA-CKZ	Canada
CLA-CMZ	Cuba
CNA-CNZ	Morocco
CPA-CPZ	Bolivia
CQA-CQZ, CRA-CRZ	Portuguese colonies
CSA-CUZ	Portugal
CVA-CVZ	Roumania
CWA-CXZ	Uruguay
CZA-CZZ	Monaco
D	Germany
EAA-EHZ	Spain
EIA-EIZ	Irish Free State
ELA-ELZ	Liberia
ESA-ESZ	Estonia
ETA-ETZ	Ethiopia
F	France and colonies and protectorates
G	Great Britain
HAA-HAZ	Hungary
HBA-HBZ	Switzerland
HCA-HCZ	Ecuador
HHA-HHIZ	Haiti
HIA-HIZ	Dominican Republic
HJA-HKZ	Colombia
HRA-HRZ	Honduras
HSA-HSZ	Siam
I	Italy and colonies
J	Japan
K	United States of America
LAA-LNZ	Norway
LOA-LVZ	Argentina
LZA-LZZ	Bulgaria
M	Great Britain

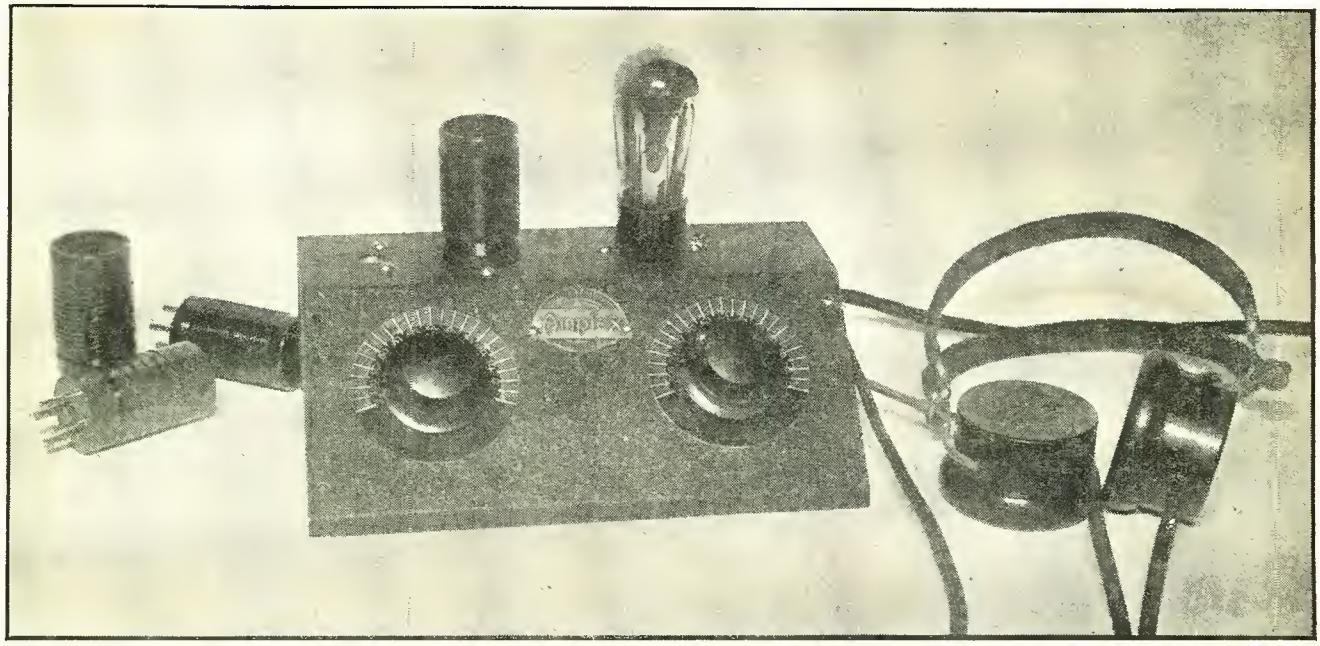
(*Continued on page* 634)

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WAVELENGTH-FREQUENCY CHART

M.	KC.	M.	KC.	M.	KC.	M.	KC.	M.	KC.	M.	KC.	M.	KC.	M.	KC.	M.	KC.
10.1	29,690	20.1	14,920	30.1	9,961	40.1	7,477	50.1	5,984	60.1	4,989	70.1	4,277	80.1	3,743	90.1	3,328
10.2	29,390	20.2	14,840	30.2	9,928	40.2	7,458	50.2	5,973	60.2	4,980	70.2	4,271	80.2	3,738	90.2	3,324
10.3	29,110	20.3	14,770	30.3	9,895	40.3	7,440	50.3	5,961	60.3	4,972	70.3	4,265	80.3	3,734	90.3	3,320
10.4	28,830	20.4	14,700	30.4	9,862	40.4	7,421	50.4	5,949	60.4	4,964	70.4	4,259	80.4	3,729	90.4	3,317
10.5	28,550	20.5	14,630	30.5	9,830	40.5	7,403	50.5	5,937	60.5	4,956	70.5	1,253	80.5	3,724	90.5	3,313
10.6	28,280	20.6	14,550	30.6	9,798	40.6	7,385	50.6	5,925	60.6	4,948	70.6	4,247	80.6	3,720	90.6	3,309
10.7	28,020	20.7	14,480	30.7	9,766	40.7	7,367	50.7	5,913	60.7	4,939	70.7	4,241	80.7	3,715	90.7	3,306
10.8	27,760	20.8	14,410	30.8	9,734	40.8	7,349	50.8	5,902	60.8	4,931	70.8	4,235	80.8	3,711	90.8	3,302
10.9	27,510	20.9	14,350	30.9	9,703	40.9	7,331	50.9	5,890	60.9	4,923	70.9	4,229	80.9	3,706	90.9	3,298
11.0	27,260	21.0	14,280	31.0	9,672	41.0	7,313	51.0	5,879	61.0	4,915	71.0	4,223	81.6	3,701	91.0	3,295
11.1	27,010	21.1	14,210	31.1	9,641	41.1	7,295	51.1	5,867	61.1	4,907	71.1	4,217	81.1	3,697	91.1	3,291
11.2	26,770	21.2	14,140	31.2	9,610	41.2	7,277	51.2	5,856	61.2	4,899	71.2	4,211	81.2	3,692	91.2	3,288
11.3	26,530	21.3	14,080	31.3	9,579	41.3	7,260	51.3	5,844	61.3	4,891	71.3	4,205	81.3	3,688	91.3	3,284
11.4	26,300	21.4	14,010	31.4	9,548	41.4	7,242	51.4	5,833	61.4	4,883	71.4	4,199	81.4	3,683	91.4	3,280
11.5	26,070	21.5	13,950	31.5	9,518	41.5	7,225	51.5	5,822	61.5	4,875	71.5	4,193	81.5	3,679	91.5	3,277
11.6	25,850	21.6	13,880	31.6	9,488	41.6	7,207	51.6	5,810	61.6	4,867	71.6	4,187	81.6	3,674	91.6	3,273
11.7	25,630	21.7	13,810	31.7	9,458	41.7	7,190	51.7	5,799	61.7	4,859	71.7	4,182	81.7	3,670	91.7	3,270
11.8	25,410	21.8	13,750	31.8	9,428	41.8	7,173	51.8	5,788	61.8	4,851	71.8	4,176	81.8	3,665	91.8	3,266
11.9	25,200	21.9	13,690	31.9	9,399	41.9	7,156	51.9	5,777	61.9	4,844	71.9	4,170	81.9	3,661	91.9	3,262
12.0	24,990	22.0	13,630	32.0	9,369	42.0	7,139	52.0	5,766	62.0	4,836	72.0	4,164	82.0	3,656	92.0	3,259
12.1	24,780	22.1	13,570	32.1	9,340	42.1	7,122	52.1	5,755	62.1	1,828	72.1	4.158	82.1	3,652	92.1	3,255
12.2	24,580	22.2	13,510	32.2	9,311	42.2	7,105	52.2	5,744	62.2	4,820	72.2	4,153	82 2	3,647	92.2	3,252
12.3	24,380	22.3	13,440	32.3	9,282	42.3	7,088	52.3	5,733	62.3	4,813	72.3	4,147	82.3	3,643	92.3	3,248
12.4	24,180	22.4	13,380	32.4	9,254	42.4	7,071	52.4	5,722	62.4	4,805	72.4	4,141	82.4	3,639	92.4	3,245
12.5	23,990	22.5	13,330	32.5	9,225	42.5	7,055	52.5	5,711	62.5	4,797	72.5	4,135	82.5	3,634	92.5	3,241
12.6	23,800	22.6	13,270	32.6	9,197	42.6	7,038	52.6	5,700	62.6	4,789	72.6	4,130	82.6	3,630	92.6	3,238
12.7	23,610	22.7	13,210	32.7	9,169	42.7	7,022	52.7	5,689	62.7	4,782	72.7	4,124	82.7	3,625	92.7	3,234
12.8	23,420	22.8	13,150	32.8	9,141	42.8	7,005	52.8	5,678	62.8	4,774	72.8	4,118	82.8	3,621	92.8	3,231
12.9	23,240	22.9	13,090	32.9	9,113	42.9	6,989	52.9	5,668	62.9	4,767	72.9	4,113	82.9	3,617	92.9	3,227
13.0	23,060	23.0	13,040	33.0	9,086	43.0	6,973	53.0	5,657	63.0	4,759	73.0	4,107	83.0	3,612	93.0	3,224
13.1	22,890	23.1	12,980	33.1	9,058	43.1	6,956	53.1	5,646	63.1	4,752	73.1	4,102	83.1	3,608	93.1	3,220
13.2	22,710	23.2	12,920	33.2	9,031	43.2	6,940	53.2	5,636	63.2	4,744	73.2	4,096	83.2	3,604	93.2	3,217
13.3	22,540	23.3	12,870	33.3	9,004	43.3	6,924	53.3	5,625	63.3	4,736	73.3	4,090	83.3	3,599	93.3	3,214
13.4	22,370	23.4	12,810	33.4	8,977	43.4	6,908	53.4	5,615	63.4	4,729	73.4	4,085	83.4	3,595	93.4	3,210
13.5	22,210	23.5	12,760	33.5	8,950	43.5	6,892	53.5	5,604	63.5	4,722	73.5	4,079	83.5	3,591	93.5	3,207
13.6	22,040	23.6	12,700	33.6	8,923	43.6	6,877	53.6	5,594	63.6	4,714	73.6	4,074	83.6	3,586	93.6	3,203
13.7	21,880	23.7	12,650	33.7	8,897	43.7	6,861	53.7	5,583	63.7	4,707	73.7	4,068	83.7	3,582	93.7	3,200
13.8	21,730	23.8	12,600	33.8	8,870	43.8	6,845	53.8	5,573	63.8	4,699	73.8	4,063	83.8	3,578	93.8	3,196
13.9	21,570	23.9	12,540	33.9	8,844	43.9	6,830	53.9	5,563	63.9	4,692	73.9	4,057	83.9	3,574	93.9	3,193
14.0	21,420	24.0	12,490	34.0	8,818	44.0	6,814	54.0	5,552	64.0	4,685	74.0	4,052	84.0	3,569	94.0	3,190
14.1	21,260	24.1	12,440	34.1	8,792	44.1	6,799	54.1	5,542	64.1	4,677	74.1	4,046	84.1	3,565	94.1	3,186
14.2	21,110	24.2	12,390	34.2	8,767	44.2	6,783	54.2	5,532	64.2	4,670	74.2	4,041	84.2	3,561	94.2	3,183
14.3	20,970	24.3	12,340	34.3	8,741	44.3	6,768	54.3	5,522	64.3	4,663	74.3	4,035	84.3	3,557	94.3	3,179
14.4	20,820	24.4	12,290	34.4	8,716	44.4	6,753	54.4	5,511	64.4	4,656	74.4	4,030	84.4	3,552	94.4	3,176
14.5	20,680	24.5	12,240	34.5	8,690	44.5	6,738	54.5	5,501	64.5	4,648	74.5	4,024	84.5	3,548	94.5	3,173
14.6	20,540	24.6	12,190	34.6	8,665	44.6	6,722	54.6	5,491	64.6	4,641	74.6	4,019	84.6	3,544	94.6	3,169
14.7	20,400	24.7	12,140	34.7	8,640	44.7	6,707	54.7	5,481	64.7	4,634	74.7	4,014	84.7	3,540	94.7	3,166
14.8	20,260	24.8	12,090	34.8	8,616	44.8	6,692	54.8	5,471	64.8	4,627	74.8	4,008	84.8	3,536	94.8	3,163
14.9	20,120	24.9	12,040	34.9	8,591	44.9	6,678	54.9	5,461	64.9	4,620	74.9	4,003	84.9	3,531	94.9	3,159
15.0	19,990	25.0	11,990	35.0	8,566	45.0	6,663	55.0	5,451	65.0	4,613	75.0	3,998	85.0	3,527	95.0	3,156
15.1	19,860	25.1	11,950	35.1	8,542	45.1	6,648	55.1	5,441	65.1	4,606	75.1	3,992	85.1	3,523	95.1	3,153
15.2	19,720	25.2	11,900	35.2	8,518	45.2	6,633	55.2	5,432	65.2	4,598	75.2	3,987	85.2	3,519	95.2	3,149
15.3	19,600	25.3	11,850	35.3	8,494	45.3	6,619	55.3	5,422	65.3	4,591	75.3	3,982	85.3	3,515	95.3	3,146
15.4	19,470	25.4	11,800	35.4	8,470	45.4	6,604	55.4	5,412	65.4	4,584	75.4	3,976	85.4	3,511	95.4	3,143
15.5	19,340	25.5	11,760	35.5	8,446	45.5	6,589	55.5	5,402	65.5	4,577	75.5	3,971	85.5	3,507	95.5	3,139
15.6	19,220	25.6	11,710	35.6	8,422	45.6	6,575	55.6	5,392	65.6	4,570	75.6	3,966	85.6	3,503	95.6	3,136
15.7	19,100	25.7	11,670	35.7	8,398	45.7	6,561	55.7	5,383	65.7	4,563	75.7	3,961	85.7	3,498	95.7	3,133
15.8	18,980	25.8	11,620	35.8	8,375	45.8	6,546	55.8	5,373	65.8	4,557	75.8	3,955	85.8	3,494	95.8	3,130
15.9	18,860	25.9	11,580	35.9	8,352	45.9	6,532	55.9	5,364	65.9	4,550	75.9	3,950	85.9	3,490	95.9	3,126
16.0	18,740	26.0	11,530	36.0	8,328	46.0	6,518	56.0	5,354	66.0	4,543	76.0	3,945	86.0	3,486	96.0	3,123
16.1	18,620	26.1	11,490	36.1	8,305	46.1	6,504	56.1	5,344	66.1	4,536	76.1	3,940	86.1	3,482	96.1	3,120
16.2	18,510	26.2	11,440	36.2	8,282	46.2	6,490	56.2	5,335	66.2	4,529	76.2	3,935	86.2	3,478	96.2	3,117
16.3	18,390	26.3	11,400	36.3	8,260	46.3	6,476	56.3	5,325	66.3	4,522	76.3	3,929	86.3	3,474	96.3	3,113
16.4	18,280	26.4	11,360	36.4	8,237	46.4	6,462	56.4	5,316	66.4	4,515	76.4	3,924	86.4	3,470	96.4	3,110
16.5	18,170	26.5	11,310	36.5	8,214	46.5	6,448	56.5	5,307	66.5	4,509	76.5	3,919	86.5	3,466	96.5	3,107
16.6	18,060	26.6	11,270	36.6	8,192	46.6	6,434	56.6	5,297	66.6	4,502	76.6	3,914	86.6	3,462	96.6	3,104
16.7	17,950	26.7	11,230	36.7	8,170	46.7	6,420	56.7	5,288	66.7	4,495	76.7	3,909	86.7	3,458	96.7	3,101
16.8	17,850	26.8	11,190	36.8	8,147	46.8	6,406	56.8	5,279	66.8	4,488	76.8	3,904	86.8	3,454	96.8	3,097
16.9	17,740	26.9	11,150	36.9	8,125	46.9	6,393	56.9	5,269	66.9	4,482	76.9	3,899	86.9	3,450	96.9	3,094
17.0	17,640	27.0	11,100	37.0	8,103	47.0	6,379	57.0	5,260	67.0	4,475	77.0	3,894	87.0	3,446	97.0	3,091
17.1	17,530	27.1	11,060	37.1	8,081	47.1	6,366	57.1	5,251	67.1	4,468	77.1	3,889	87.1	3,442	97.1	3,088
17.2	17,430	27.2	11,020	37.2	8,060	47.2	6,352	57.2	5,242	67.2	4,462	77.2	3,884	87.2	3,438	97.2	3,085
17.3	17,330	27.3	10,980	37.3	8,038	47.3	6,339	57.3	5,232	67.3	4,455	77.3	3,879	87.3	3,434	97.3	3,081
17.4	17,230	27.4	10,940	37.4	8,017	47.4	6,325	57.4	5,223	67.4	4,448	77.4	3,874	87.4	3,430	97.4	3,078
17.5	17,130	27.5	10,900	37.5	7,995	47.5	6,312	57.5	5,214	67.5	4,442	77.5	3,869	87.5	3,427	97.5	3,075
17.6	17,040	27.6	10,860	37.6	7,974	47.6	6,299	57.6	5,205	67.6	4,435	77.6	3,864	87.6	3,423	97.6	3,072
17.7	16,940	27.7	10,820	37.7	7,953	47.7	6,286	57.7	5,196	67.7	4,429	77.7	3,859	87.7	3,419	97.7	3,069
17.8	16,840	27.8	10,780	37.8	7,932	47.8	6,272	57.8	5,187	67.8	4,422	77.8	3,854	87.8	3,415	97.8	3,066
17.9	16,750	27.9	10,750	37.9	7,911	47.9	6,259	57.9	5,178	67.9	4,416	77.9	3,849	87.9	3,411	97.9	3,063
18.0	16,660	28.0	10,710	38.0	7,890	48.0	6,246	58.0	5,169	68.0	4,409	78.0	3,844	88.0	3,407	98.0	3,059
18.1	16,560	28.1	10,670	38.1	7,869	48.1	6,233	58.1	5,160	68.1	4,403	78.1	3,839	88.1	3,403	98.1	3,056
18.2	16,470	28.2	10,630	38.2	7,849	48.2	6,220	58.2	5,152	68.2	4,396	78.2	3,834	88.2	3,399	98.2	3,053
18.3	16,380	28.3	10,590	38.3	7,828	48.3	6,207	58.3	5,143	68.3	4,390	78.3	3,829	88.3	3,395	98.3	3,050
18.4	16,290	28.4	10,560	38.4	7,808	48.4	6,195	58.4	5,134	68.4	4,383	78.4	3,824	88.4	3,392	98.4	3,047
18.5	16,210	28.5	10,520	38.5	7,788	48.5	6,182	58.5	5,125	68.5	4,377	78.5	3,819	88.5	3,388	98.5	3,044
18.6	16,120	28.6	10,480	38.6	7,767	48.6	6,169	58.6	5,116	68.6	4,371	78.6	3,814	88.6	3,384	98.6	3,041
18.7	16,030	28.7	10,450	38.7	7,747	48.7	6,156	58.7	5,108	68.7	4,364	78.7	3,810	88.7	3,380	98.7	3,038
18.8	15,950	28.8	10,410	38.8	7,727	48.8	6,144	58.8	5,099	68.8	4,358	78.8	3,805	88.8	3,376	98.8	3,035
18.9	15,860	28.9	10,370	38.9	7,707	48.9	6,131	58.9	5,090	68.9	4,352	78.9	3,800	88.9	3,373	98.9	3,032
19.0	15,780	29.0	10,340	39.0	7,688	49.0	6,119	59.0	5,082	69.0	4,345	79.0	3,795	89.0	3,369	99.0	3,028
19.1	15,700	29.1	10,300	39.1	7,668	49.1	6,106	59.1	5,073	69.1	4,339	79.1	3,790	89.1	3,365	99.1	3,025
19.2	15,620	29.2	10,270	39.2	7,648	49.2	6,094	59.2	5,065	69.2	4,333	79.2	3,786	89.2	3,361	99.2	3,022
19.3	15,530	29.3	10,230	39.3	7,629	49.3	6,082	59.3	5,056	69.3	4,326	79.3	3,781	89.3	3,357	99.3	3,019
19.4	15,450	29.4	10,200	39.4	7,610	49.4	6,069	59.4	5,047	69.4	4,320	79.4	3,776	89.4	3,354	99.4	3,016
19.5	15,380	29.5	10,160	39.5	7,590	49.5	6,057	59.5	5,039	69 5	4,314	79.5	3,771	89.5	3,350	99.5	3,013
19.6	15,300	29.6	10,130	39.6	7,571	49.6	6,045	59.6	5,031	69.6	4,308	79.6	3,767	89.6	3,346	99.6	3,010
19.7	15,220	29.7	10,090	39.7	7,552	49.7	6,033	59.7	5,022	69.7	4,302	79.7	3,762	89.7	3,342	99.7	3,007
19.8	15,140	29.8	10,060	39.8	7,533	49.8	6,020	59.8	5,014	69.8	4,295	79.8	3,757	89.8	3,339	99.8	3,004
19.9	15,070	29.9	10,030	39.9	7,514	49.9	6,008	59.9	5,005	69.9	4,289	79.9	3,752	89.9	3,335	99.9	3,001
20.0	14,990	30.0	9,994	40.0	7,496	50.0	5,996	60.0	4,997	70.0	4,283	80.0	3,748	90.0	3,331	100.0	2,998

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The All-Wave "SCOUTMASTER"

A. G. Landres and B. J. Montyn

THERE is perhaps no greater thrill to the dyed-in-the-wool DX hunter than to log another hard-to-catch station many thousands of miles away. This is especially so if the set is home-made.

Now that some of the large manufacturers have placed on the market powerful short-wave superheterodynes, which are sold in large quantities, the simple one-tube circuit is likely to be forgotten. Yet this type of set, when properly constructed, is capable of giving surprisingly good results. It *is* possible to listen to foreign short-wave stations with a one-tube receiver.

Readers who wish to build their own short-wave receivers, especially if it is their first constructional effort, will be interested in something simple and yet able to bring in foreign programs. Later, when some experience has been gained, a more complicated circuit can be attempted.

The "Scoutmaster" was designed to meet this demand. It possesses some of the most desirable features. Simplicity, economy and ease of construction should commend it to the prospective builder. Moreover, the chassis and circuit have been designed with a view to future additions. It will be possible to add a radio-frequency stage and an audio stage later on, and all this without impairing its appearance or discarding any parts. It will bring in stations from foreign countries as well as numerous police stations, amateurs, broadcasters in the United States and Canada.

Several variations of the one-tube regenerative circuits were tried at different locations in order to determine which one would be most desirable from all standpoints. The circuit of Figure 1 is the one which was selected as being the most satisfactory and also gave the most service per dollar.

Try This on Your Kitchen Table

THERE are radio enthusiasts in many walks of life who have felt the urge to try their hands at the assembly and wiring of a radio receiver, but have hesitated over the complications of modern multi-tube designs. The little receiver described here is one which offers extremely interesting possibilities. When completed it will be capable of providing headphone reception from a wide variety of short-wave broadcast, police and amateur stations, including some stations thousands of miles away. Yet it is so simple to build that it will offer no difficulty, even to one who has had no previous experience in receiver construction. A little practice with a soldering iron and the ability to use a screw driver represent the only requirements. Even a knowledge of circuit diagrams is not necessary, because the instructions which are supplied with the kit describe all connections in detail. For the youngster establishing his first intimate contact with radio—or for the oldster who indulges in radio as a hobby, the assembly of this receiver promises a couple of hours of entertaining occupation during construction and many hours of absorbing interest in later listening-in on the world.

A single-tube receiver could not be powered otherwise than by dry batteries, of course, and since headphones are employed directly in the plate circuit, the choice of the type –30 tube is most logical. Its drain on the A battery and the B battery is very small, so it will give several hundred hours of enjoyable reception with one set of batteries.

The choice of coupling between antenna and tuned secondary was decided in favor of the antenna-coupling condenser rather than the inductive method because of the greater volume obtainable.

Control of regeneration can be accomplished in several ways, and although some prefer the series resistance method, this would call for an extra B battery, and even then it will affect the tuning of the set. Consequently, the variable condenser is considered the most desirable for this type of circuit.

Plug-in coils were designed to cover all wavelengths continuously, with overlap, from 15 meters to 200 meters in four coils (shown in the illustration). Coils to cover the broadcast band have also been designed. The individual ranges of the short-wave coils are: 10 to 20 meters, 20 to 40 meters, 40 to 80 meters and 80 to 200 meters.

The Scoutmaster employs a unique type of chassis. It is formed in such a way that it serves at the same time as chassis, panel, cabinet and tube shelf. Moreover, the tube socket and coil sockets are within easy reach. This chassis, all cut and drilled, and all other parts are available in kit form.

The set is of the simplest construction and there are only six wires to connect after the cable, antenna and ground wires are attached.

Construction is best done in the following order: The sockets should be mounted first; be sure to place them with the filament holes (the large holes) in the right positions. The tube socket has its filament holes towards the right when looking at the chassis from the front and the top. The coil socket has its filament holes towards the back; the

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filament terminals have been marked in Figure 2.

The antenna coupling condenser, C3, can now be mounted. The tip-jacks should be fastened with a long and a short bolt. The longer bolt serves as a support for the choke. Lugs should be placed under the nuts and the chassis should be scraped clean around the holes before inserting bolts and nuts. Do not mount the choke yet.

The grid leak, 5 meg., and grid condenser, C4, are of the right length to be soldered directly to the socket terminals. The filament resistor, R1, should be soldered to the negative filament terminal of the tube socket. The battery cable is then brought through the hole, H2, in the back. The green wire is soldered to the free end of the filament resister, the yellow wire to the nearest lug on the chassis, the red one to the pin-jacks and the black wire connects to the remaining filament terminal on the socket.

The antenna and ground lead and the wires interconnecting the two sockets and the antenna condenser can then be soldered in place. The radio-frequency choke may now be mounted on the long bolt supporting the phone tip-jack, and its terminals connected.

When mounting the tuning condensers and the dials, be sure to place them as shown in the diagrams and fasten the dials so they will read zero with the plates completely unmeshed.

Connect two No. 6 dry cells and a single 45-volt B battery to the cable as shown in Figure 3. Place a type –30 tube in the tube socket (right hand) and one of the coils in the other socket. The black wire should be connected to a good ground; the blue one connects to the aerial.

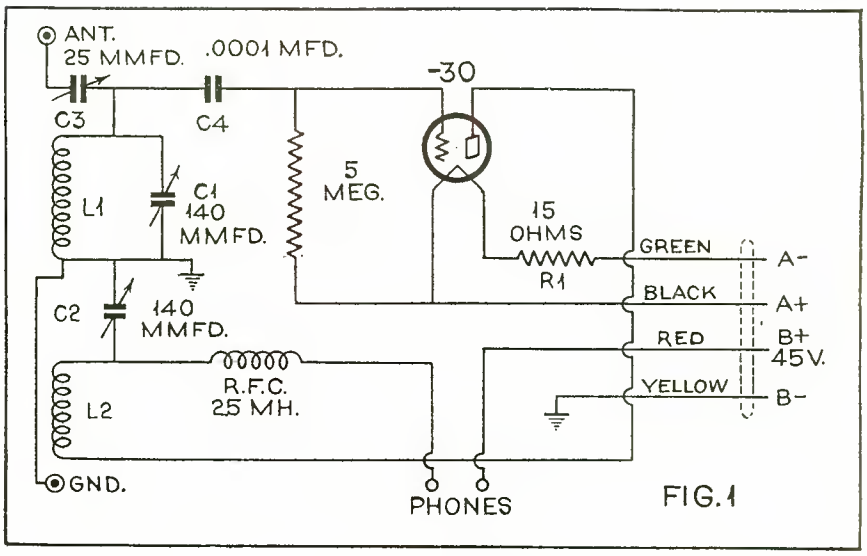


FIG. 1

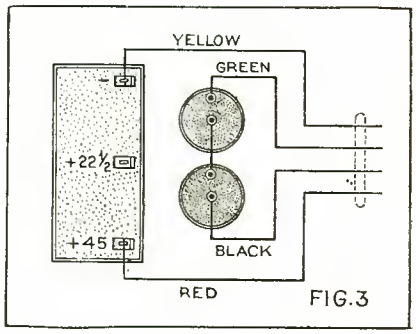


FIG. 3

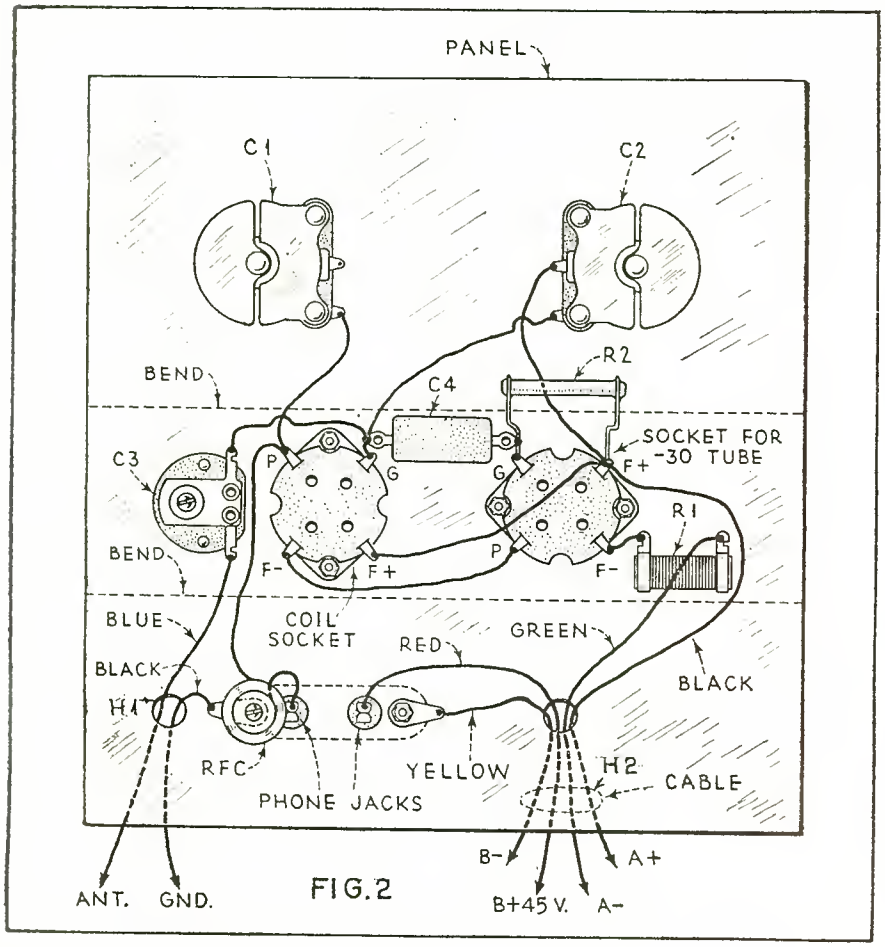


FIG. 2

There is no switch on the set; therefore, in order to switch off the set, simply take the tube out of the socket.

When trying the set for the first time it would be best to begin with the longer waves; use the coil with the largest winding. Turn the regeneration control (left dial) to the left until you hear a click. Then tune with the right-hand dial, and wherever there is a station a whistle will be heard. Tune in the whistle until it is loudest and turn the left dial slowly towards the right, which will clear up reception and make the whistle disappear. A slight readjustment of the tuning dial may be necessary.

Now take a screw-driver and adjust the antenna condenser for best reception. This condenser need only be readjusted for different antennas or different coils.

Do not be disappointed if you cannot receive long distance immediately; the operation of this little set requires a little patience and practice and, then again, one must look for certain stations at the right time. The reader should follow the data presented in the DX Corner and read the other articles which discuss the peculiarities of short waves.

List of Parts

C1, C2—Amplex variable condensers, .00014 mfd.
C3—Amplex antenna coupling condenser, .000025 mfd.
C4—Mica grid condenser, .0001 mfd.
L1, L2—Set of Amplex plug-in coils (red, 80-200 meters; black, 40-80 meters; brown, 20-40 meters; green, 10-20 meters)
R1—Wire-wound resister, 15 ohms
R2—Grid leak resister, 5 megohms
RFC—Amplex radio-frequency choke, 2.5 millihenries
One Amplex "Cha-Set" chassis
Two four-prong, wafer-type sockets
Two dial scales
Two knobs
One twin phone tip-jack

(*Continued on page* 635)

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Remedies for POOR NOTES *and* KEY CLICKS

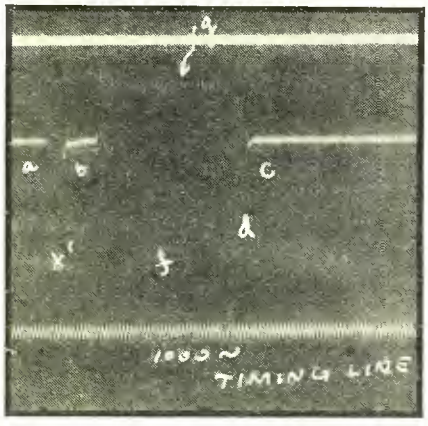
In this second article the author studies poor notes due to modulation caused by ineffective filters

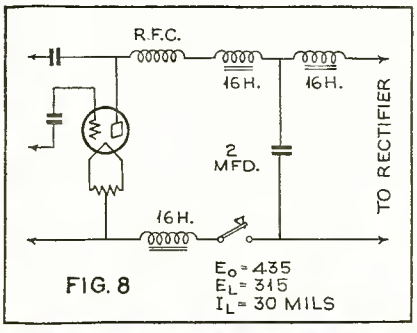
Christ Kardas*

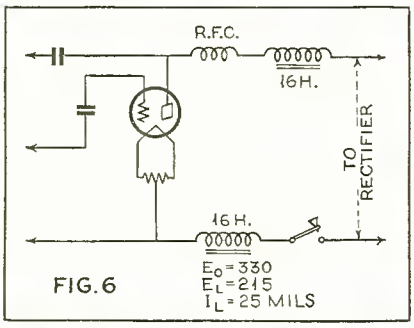
Part Two

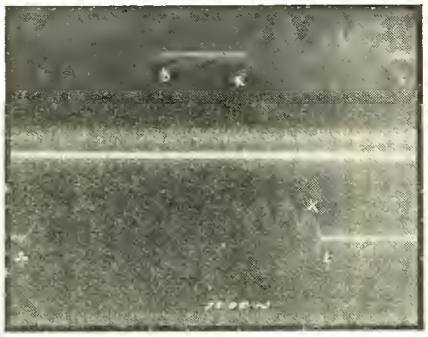
THE previous installment included a description of the apparatus employed and oscillograms intended to illustrate the effect of various filter circuits on voltage regulation. The oscillograms in this article illustrate the amount of modulation with several types of filters.

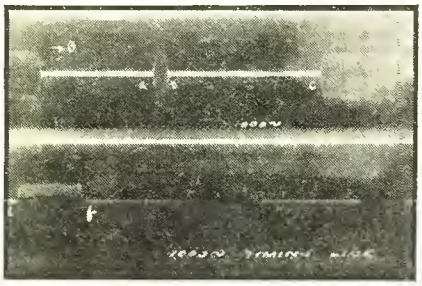
Figure 5 is the result when using pure a.c. on the plate (see circuit diagram). Wave α represents a dot, but on account of the a.c. on the plate of the oscillator, every other pulsation was effective in producing the signal. Note that each part of the oscillations, such as *ak*, *kk'* and *k'b* of wave α (dot) builds up and decays properly. However, on account of the alternating current, the signals were badly modulated, as can be seen in the photograph. They were very broad and, of course, had an undesirable note. Such waves as these cause a great deal of interference and are prohibited in good practice.

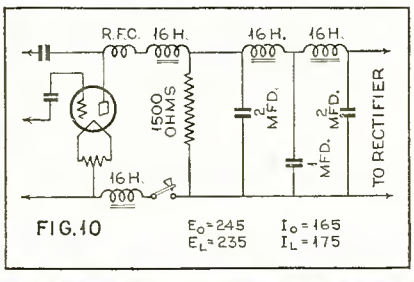


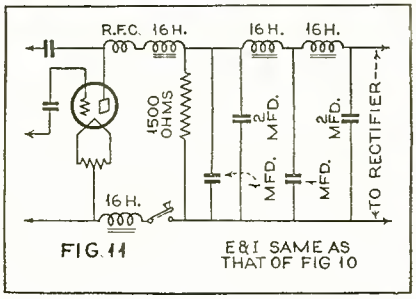












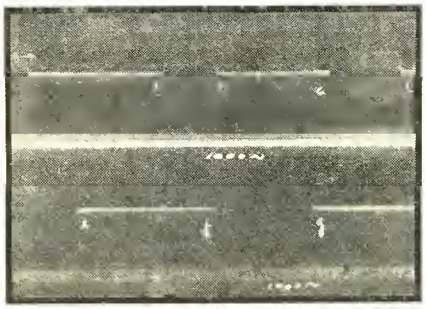


Figure 6 is about the same as that of Figure 6, except for the 1500-ohm resister shunting the power supply, thus regulating the voltage and thereby avoiding the *a* effects shown in waves of Figure 6. Note now the *a* of Figure 6 as compared with that of Figure 7.

To better the plate supply, one 16-henry choke and one 2 mfd. condenser were used. Figure 8 shows the results.

The portion indicated by *x'* is not due to any fault of the transmitter, but is due to the "chatter" of the keying relay. There is a slight change in frequency at the beginning of the signal, but the decay is fairly good. At *f*, note the 120-cycle modulation on account of insufficient filter.

The circuit of Figure 9 is practically the same as that of Figure 8, except that its supply is shunted by the 1500-ohm resister. This shunt has improved the wave formation somewhat, as is seen in the photograph. Investigating signal α, it will be noticed that the frequency remains about the same throughout. At *a* the signals build up and at *b* die down very nicely. And again, on account of not enough filter, the wave has a tendency to be modulated. This latter effect, however, is not detrimental to the characteristic of the signal.

In an effort to improve the wave form of the emitted signal, several condensers were added in the filter circuit.

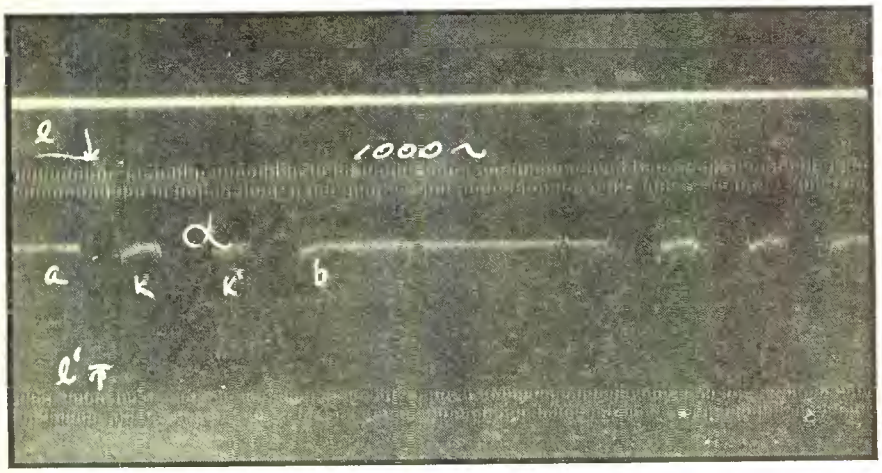
The circuits corresponding to oscillograms 10 and 11 gave better signals than those of circuit 9. Although a slight modulation appears in photographs 10 and 11, the fact is that when listening to these signals a better note was heard. The slight modulation was not due to causes at the transmitting end, but to stray audio frequency in the amplifier. Such modulation occurred even in waves of Figure 12—that of pure d.c. (storage-battery power) on the plate.

The frequency of the signal as recorded in Figure 12 was about a 3000-cycle note. It was very sharp, clean-cut, clear and very pleasant to listen to.

The records made with various rectified power (*Continued on page* 625)

* Owner and operator of short-wave amateur station W9FOK.

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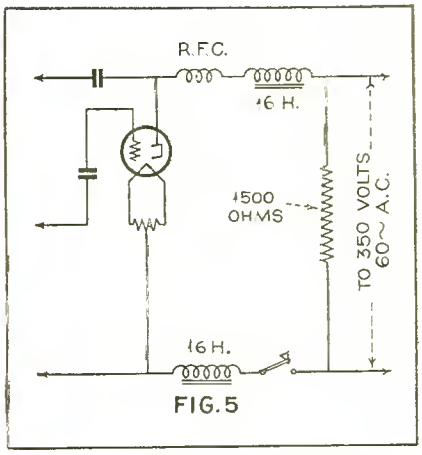


FIG. 5

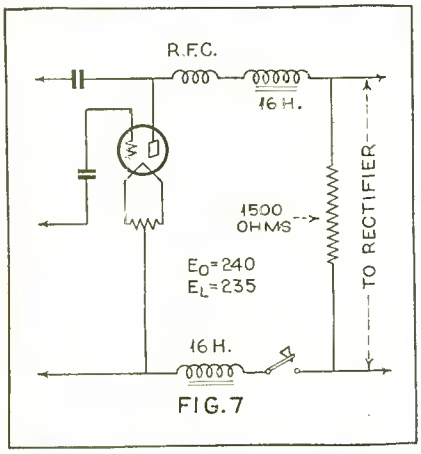
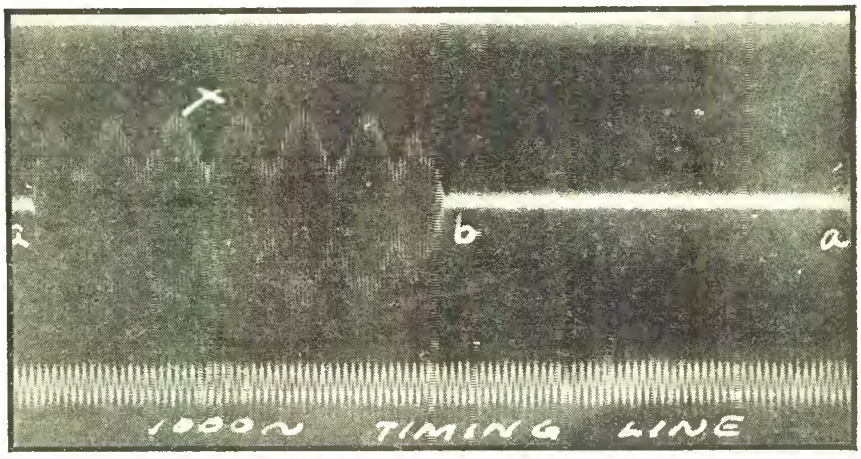
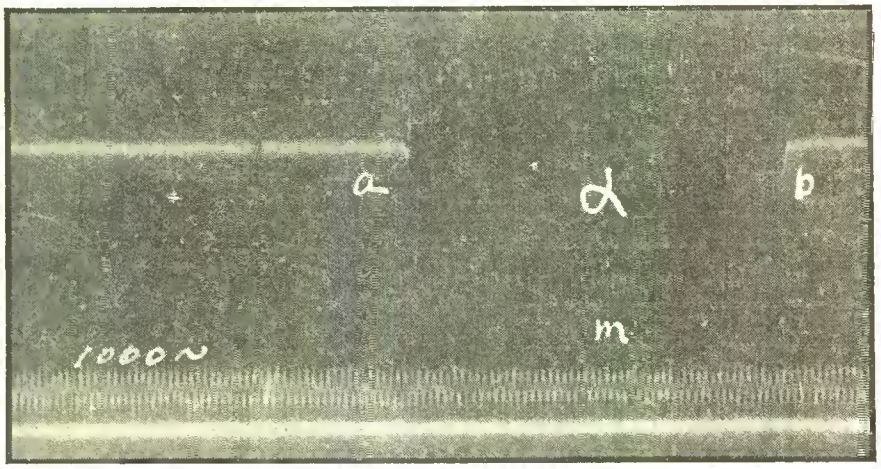


FIG. 7





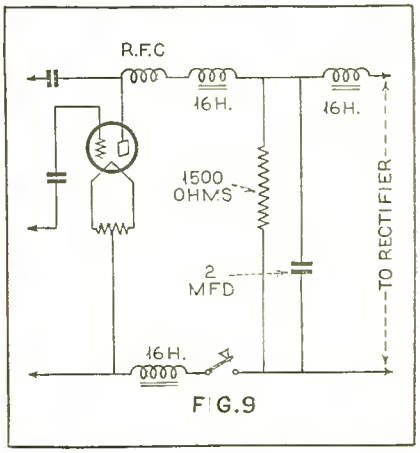


FIG. 9

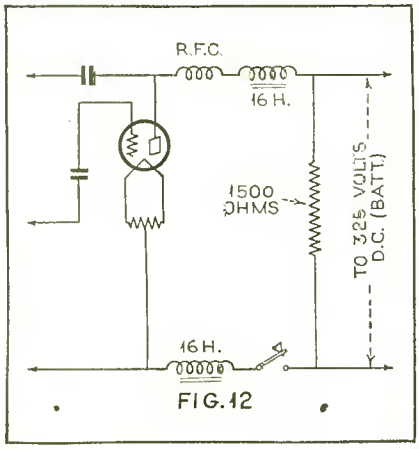
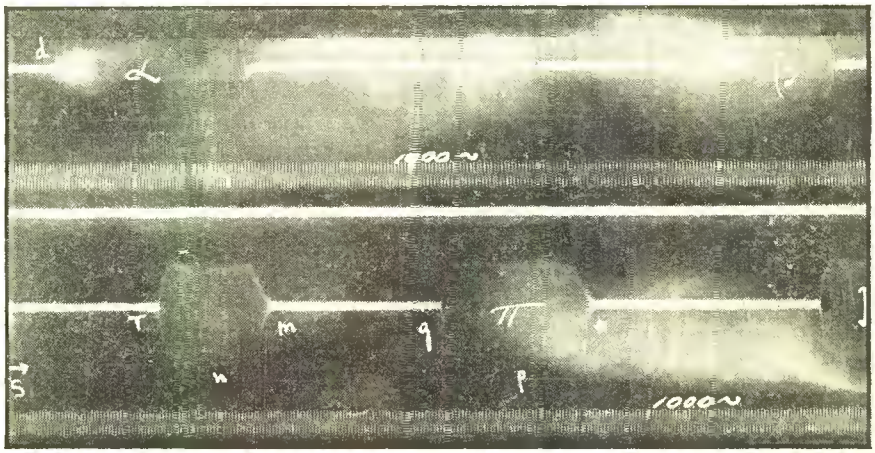
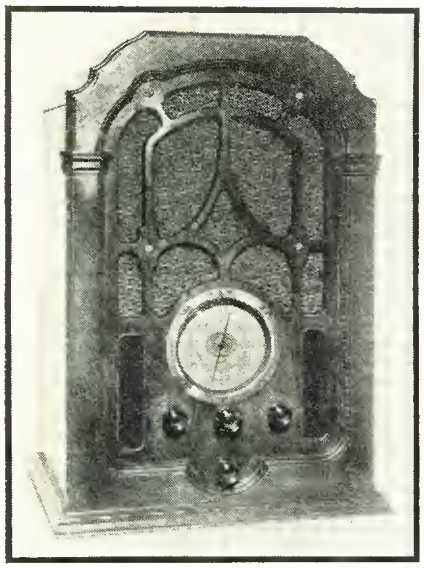


FIG. 12



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A New ALL-WAVE SUPER
(G. E. Model K-80)

SHORT-WAVE fans, prospective short-wave fans and the regular broadcast listener will no doubt appreciate the appearance on the market of several new all-wave receivers now being introduced by large manufacturers.

The General Electric receiver K-80 is a good example of the new trend in all-wave sets. This superheterodyne covers a waveband from 16.7 meters to 555 meters (540-18,000 kc.) continuously in four overlapping steps. A special European model is available which has an additional fifth band covering from 732 to 2000 meters (150-410 kc.). Individual ranges are identified by letters, which appear on the wave range switch and on the dial. The range A covers the American broadcast band 540-1500 kc.; range B begins at 1500 kc. and ends at 3900 kc., including police stations, amateurs and aviation services. Range C includes two short-wave bands, near 49 meters and 31 meters, its range is from 3900 to 10,000 kc. Range D, 8000-18,000 kc., includes the 31 meter band again. Stations in this band are preferably received on range D. This range includes four short-wave broadcast bands and two amateur bands.

The clock-type dial is employed which incorporates calibration in kilocycles or megacycles for each band. Moreover, to help locate the most popular stations, the short-wave broadcast bands have been marked, and the police bands, too, are shown on the dial.

The intermediate frequency is 445 kc. and there is but one i.f. stage while a radio-frequency stage is employed on ranges A, B and C and two radio-frequency stages on band D. This scheme has several advantages: The first is a better signal-to-noise ratio; the second, less chance of side-band cutting; third, it helps to eliminate repeat points; fourth, it supplies more amplification on the shortest waves where it is needed.

Tubes employed are eight in number. Both radio-frequency stages and the one i.f. stage employs 58 type tubes, the oscillator-detector is a 2A7, the second-detector, a.v.c. tube is a 2B7. The audio amplifier employs a 56 driving a 53 twin Class-B output tube. The rectifier employed is type 80. A schematic of the circuit is shown herewith; values of resistors and condensers have been marked on it. This circuit includes the fifth or "X" band. For other models disregard this set of coils.

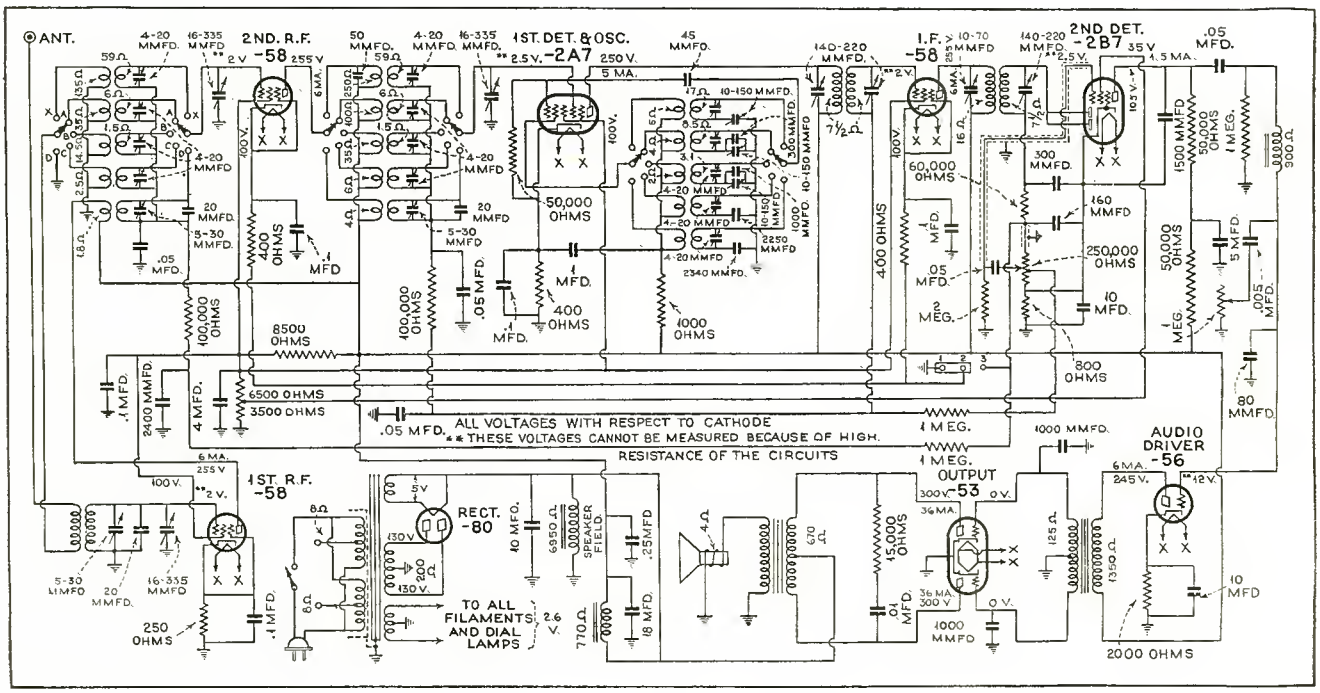
The power transformer primary is in two sections, each having one tap. By suitable series or parallel connections, the transformer can be employed for different voltages such as 100-115 volts, 115-125 volts, 200-230 volts or 230-250 volts.

Provisions have been made to connect a phonograph pick-up, the terminals for which are at the back of the chassis.

The manufacturer recommends the use of two aerials because the efficiency of the antenna is not the same for long and short-waves. In the broadcast band a total length of 50 to 100 feet is recommended — including lead-in. Short waves are best received on an antenna of but 24 to 29 feet in length, again including lead-in. The latter should be as far away as possible from metal objects, power lines or any other sources of interference. A compromise antenna, suitable for all bands, could have a total length of 100 to 150 feet. The ground-wire should be as short as possible and preferably be connected to a cold-water pipe.

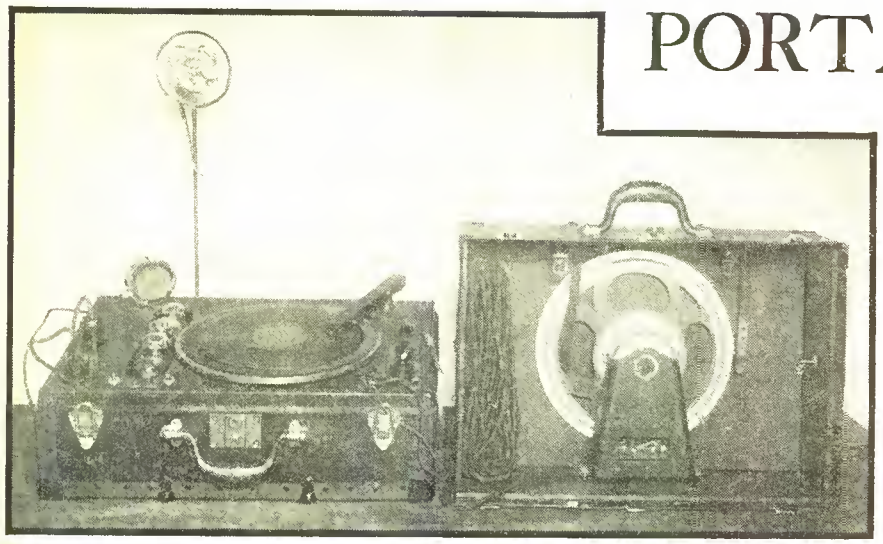
The upper middle knob with the little crank is the station selector. To the left of it is the band selector switch, to the right, the volume control. The lower knob in the center is an on-off switch combined with a tone control.

The receiver was set up in the RADIO NEWS laboratory for a preliminary test and then removed to one of the listening posts in a residential section of New York City. This is not a good location but may be considered average or below. Antennas employed were a 75-foot outside antenna (including lead-in) and a 25-foot indoor antenna which was tried also. (*Continued on page* 635)



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PORTABLE P. A.



The equipment described here is available in kit form and includes a crystal phonograph pick-up and crystal microphone for high quality input to the amplifying apparatus

Leon Littman

THE portable public address system described here, equipped with the new crystal phonograph pick-up and crystal microphone, has a number of features to recommend it to the serviceman and radio dealer as a profitable side-line for rental or permanent installations in auditorium, sound trucks, etc.

The equipment comprises a high-power, three-stage resistance-coupled amplifying system capable of delivering a total output of 12 watts, a 12-inch dynamic type speaker, a carbon or crystal microphone, a crystal phonograph pick-up, a 12-inch size phonograph motor turntable, 50 feet of speaker extension cable and a microphone floor stand. The microphone stand is converted from an inexpensive standard music rack. The microphone ring is attached to the stand by means of a screw and wing nut.

All the above equipment is compactly housed in a single carrying case measuring 21 inches long by 15½ inches wide by 14½ inches high, as illustrated by the photograph on this month's cover. The carrying case, made of fibroid, is sturdily constructed to stand up under hard usage.

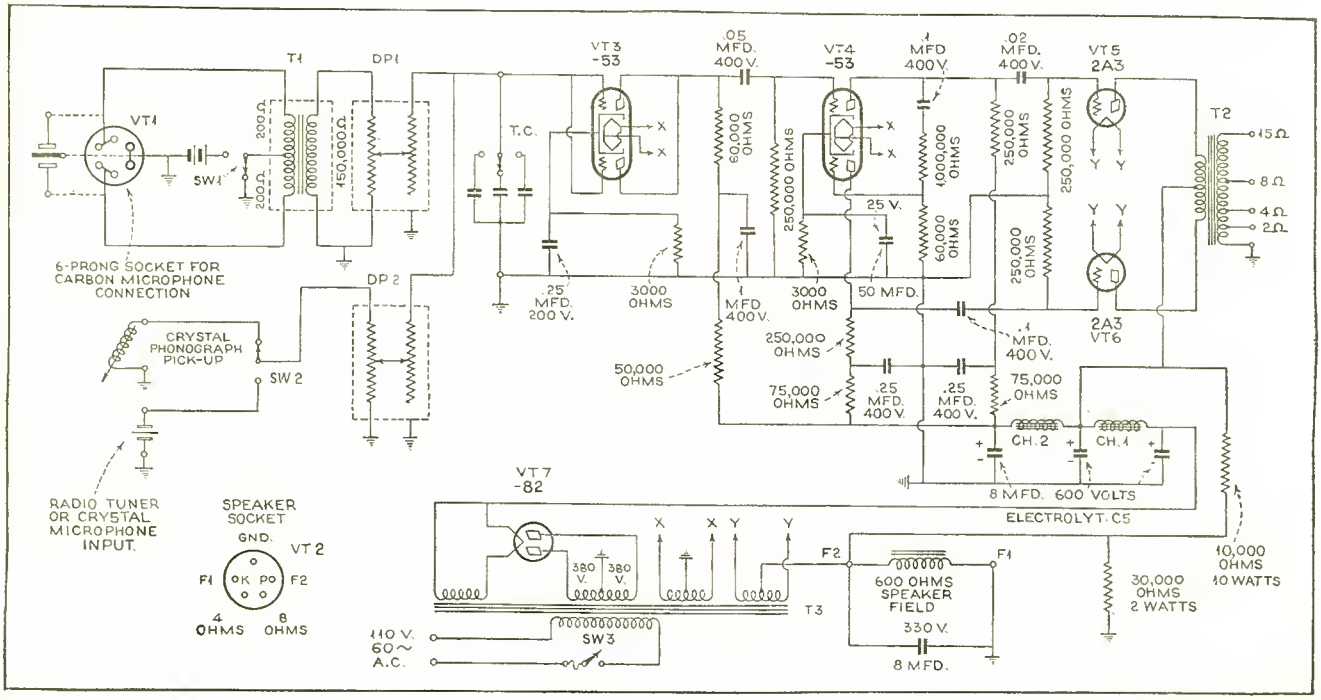
As shown in the illustration, the speaker is mounted in one half-section of the case, which provides a baffle for the speaker, and there is ample room left for storing extension cables, microphone and microphone stand.

The crystal phonograph pick-up is non-resonant, non-magnetic, freely damped and exceptionally light in weight. This type of pick-up requires only about one-third the amount of pressure on the record that is required by the conventional magnetic type pick-up. The pick-up head weighs only one ounce and the pick-up arm weighs two ounces. This crystal pick-up is designed to provide the highest quality of reproduction with practically no needle-scratch noise. It has a high impedance and is connected directly through a 500,000-ohm dual potentiometer to the input of the amplifier.

Terminals are provided on the control board for connecting either a radio tuner or a crystal type microphone. The crystal microphone is a high-impedance device, requires no batteries for its field current and may be connected directly to the amplifier input tube. A crystal microphone features wide frequency range, flexibility, directional properties, ruggedness and absence of hissing or rushing background noises.

The amplifier control panel is equipped with switches and separate volume controls for the various input circuits, making it possible to superimpose one type of program on another, as, for instance, phonograph music as a background for speech.

Probably the outstanding feature of the amplifier is its unusual gain with absence of hum. This is due partly to the fact that the amplifier is resistance coupled throughout and does not use a single audio transformer or audio choke excepting, of course, the speaker-matching transformer. Thus when the crystal pick-up, radio tuner or crystal microphone is used, there is actually no transformer (*Continued on page* 621)



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TWO NEW TUBES

(2B7 and 6B7)

J. van Lienden

THE recent 2B7 and 6B7 tubes are known as "duplex-diode pentodes" which means that they consist of a full-wave rectifier and a pentode with a common cathode. There is not supposed to be any coupling between the diodes and the pentode. These tubes can be used for diode detection and amplification, simultaneously, with automatic volume-control added. The pentode amplifier stage can either be *before* or *after* the detection. Besides these applications some special, more involved ones have been developed. Let us consider them one by one.

The characteristics of the types 2B7 and 6B7 are the same; their only difference is in the heater. The circuits and applications discussed in this article are suitable for either type. Figure 1 illustrates the use of the tube as a full-wave diode detector and audio amplifier with fixed bias. Figure 2 illustrates the tube used as a half-wave rectifier, a.v.c. and audio-frequency amplifier. The diodes are connected together in this case. It is often desirable to make the a.v.c. circuit independent of the detector circuit, so the time-constant and the sensitivity of the a.v.c. can be controlled better. This has been done in Figure 3; one diode serves for the detector and the other for a.v.c. This second diode plate can now be given a negative bias by means of the battery Eb which prevents the a.v.c. from working unless the incoming signal has reached a given minimum amplitude. Figure 4 illustrates the use of a 2B7 or 6B7 as an i.f. or r.f. amplifier and detector and automatic volume control. These represent the four most typical applications of the duplex-diode pentode, but many others are possible.

Curves of the pentode unit of these tubes are shown in Figures 5, 6 and 7 and the characteristics in Table I. The high amplification factor of the pentode unit makes it a desirable tube for resistance-coupled, audio-frequency amplification. The diode plates are left unusued in this case. A diagram for this application is shown in Figure 8. Table II shows the constants to be used and voltages applied to the tube, together with the voltage gain obtainable. The voltage output (peak volts) refers to the voltage across the plate resistor, R2. The value to the left is the maximum undistorted output obtainable, the value to the right represents the maximum output with some distortion.

Most of the circuits now employed

FULL-WAVE DETECTOR FIXED-BIAS AMPLIFIER

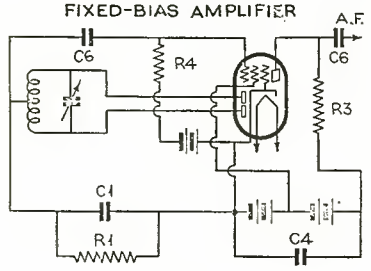


FIG. 1

HALF-WAVE DETECTOR, AND A.V.C., FIXED-BIAS AMPLIFIER

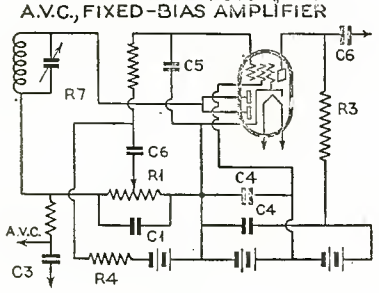


FIG. 2

HALF-WAVE DETECTOR, SEPARATE A.V.C., FIXED-BIAS AMPLIFIER

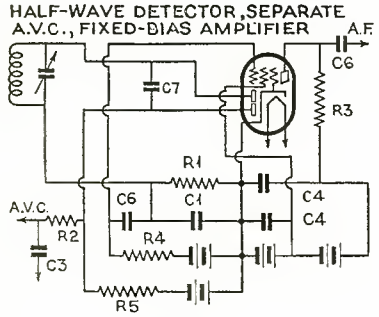


FIG. 3

HALF-WAVE DETECTOR FIXED-BIAS H-F AMPLIFIER

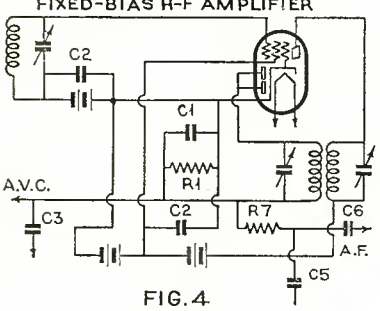


FIG. 4

TABLE OF VALUES

NOTE: SUPPRESSOR CONNECTED TO CATHODE WITHIN BULB

C1 = 150 MMFD. FOR 500-1500 KC.
450 " FOR 175 KC.
C2 = 0.1 MFD. C3 = 0.1 MFD.
C4 = 0.5 MFD. OR LARGER
C5 = 0.0001 MFD OR SMALLER
C6 = 0.01-0.1 MFD.
C7 = 0.0005-0.001 MFD.
C8 = 0.1 MFD. OR LARGER
R1 = 0.5-1.0 MEGOHM
R2 = 1.0-1.5 MEGOHMS
R3 = 0.1-0.2 MEGOHM
R4 = 0.5-1.0 MEGOHM
R5 = 1.0 MEGOHM
R6 = 30,000-100,000 OHMS
R7 = 0.1-0.2 MEGOHMS
E_b = VOLTAGE FOR SENSITIVITY CONTROL

TABLE I

	2B7	6B7
Ef	2.5	6.3
If	0.8	0.3
OVERALL LENGTH	4 9/32" - 4 17/32"	4 9/32" - 4 17/32"
MAX. DIAMETER	1 9/16"	1 9/16"
BULB	ST-12	ST-12
BASE	SMALL 7-PIN	SMALL 7-PIN

PENTODE UNIT 2B7 AND 6B7 CLASS A

Ep	100	180	250	250 MAX.
E_{SG}	100	75	100	125 MAX.
E_G	-3	-3	-3	-3
mu	285	840	800	730
rp	.3	1.0	0.8	0.65
Gm	950	840	1000	1125
Ip	5.8	3.4	6.0	9.0
I_{SG}	1.7	0.9	1.5	2.3
CATHODE CURRENT CUT-OFF AT BIAS OF	-17	-13	-17	-21

DIODE UNITS WITH 10 VOLTS D.C APPLIED TO PLATE, CURRENT SHOULD EXCEED .5 MA. WITH NO LOAD.

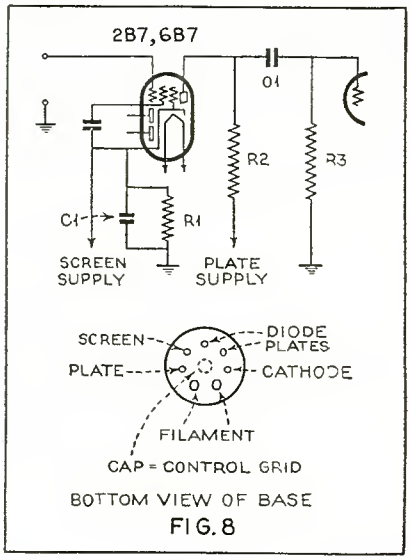


FIG. 8

TABLE II
2B7 AND 6B7 AS RESISTANCE COUPLED-AMPLIFIERS

PLATE SUPPLY VOLTS	100				135				180				250			
SCREEN SUPPLY VOLTS	20	20	20	20	20	20	20	20	25	25	25	25	50	50	50	50
GRID BIAS VOLTS	-2.00	-2.50	-2.15	-2.60	-1.80	-2.25	-1.95	-2.40	-2.10	-2.60	-2.10	-2.60	-4.5	-5.0	-4.5	-5.0
CATHODE RESISTOR OHMS	5550	12,200	9350	19,250	3800	8300	4850	10,900	3700	7600	3500	7300	5500	11,400	5500	11,400
PLATE RESISTOR MEGS	0.25	0.50	0.25	0.50	0.25	0.50	0.25	0.50	0.25	0.50	0.25	0.50	0.25	0.50	0.25	0.50
GRID RESISTOR * MEGS	0.25	0.25	0.50	0.50	0.25	0.25	0.50	0.50	0.25	0.25	0.50	0.50	0.25	0.25	0.50	0.50
PLATE CURRENT M.A.	0.27	0.15	0.23	0.13	0.35	0.20	0.30	0.16	0.43	0.26	0.45	0.26	0.65	0.35	0.65	0.35
VOLTAGE OUTPUT (PEAK VOLTS)	28-30	25-27	36-38	32-33	38-40	32-35	48-50	42-44	50-53	45-48	65-68	64-66	55-65	55-60	65-70	65-75
VOLTAGE AMPLIFICATION	35	36	47	46	36	38	53	56	50	53	63	70	54	55	65	75

* GRID LEAK OF NEXT TUBE.

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for a.v.c. are not perfect; they do not keep the carrier amplitude constant over all ranges although they do smooth out variations in amplitude. It appears from this, that the voltage applied to the grids of the controlled tubes is not large enough and this control-voltage should be amplified. The 2B7 and 6B7 type tubes are very well suited for this purpose. In this case the tube is employed as a.v.c. tube exclusively and is not a detector. The pentode section is employed for amplifying the signal at radio frequency and an additional tuned transformer transfers the signal to the diode plates where it is rectified. The rectified voltage is used to bias the grids of the preceding tubes.

The demand for smaller receivers is responsible for the development of intricate circuits which make a single tube do the work of two, three and even four tubes. It is possible, for instance, to employ the 2B7 and 6B7 type tubes as an i.f. (or r.f.) amplifier, a detector, reflex the signal back to the pentode unit, get a stage of audio and include a.v.c. to boot. Moreover, the input to the detector and to the audio stage can be controlled with the same gain control. The simplest type of reflex circuit is shown in Figure 9. Here no a.v.c. has been included. A volume control on the previous amplifiers is recommended. The action of the circuit is as follows: The signal is fed to the grid of the pentode unit and amplified. In the plate circuit is a circuit tuned to the intermediate frequency while the a.f. load resistor is bypassed by the .0001 mfd. condenser. The secondary of the i.f. transformer is connected to the diodes and the rectified signal is developed across the resistor. This a.f. signal, after passing through a resistance-capacity network, is applied to the grid of the pentode again. In the plate circuit, the transformer primary offers a low impedance to the signal while the resistor functions as a load. The next tube is coupled to this by means of a .01 mfd. condenser and ½ meg. grid resistor. It is obvious that (*Continued on page* 630)

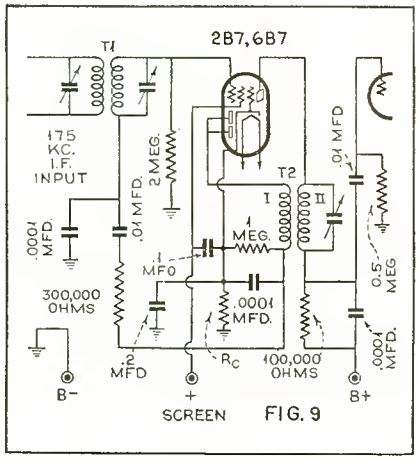


FIG. 9

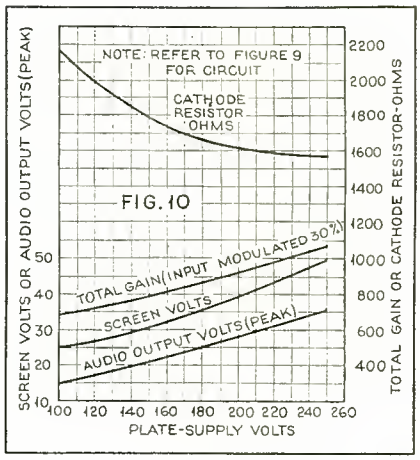


FIG. 10

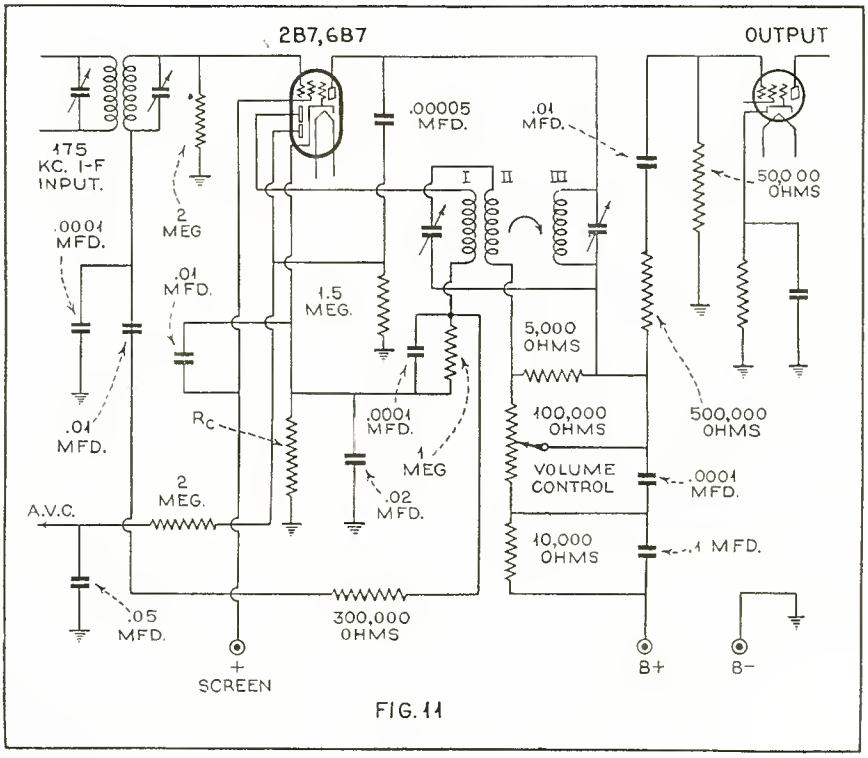


FIG. 11

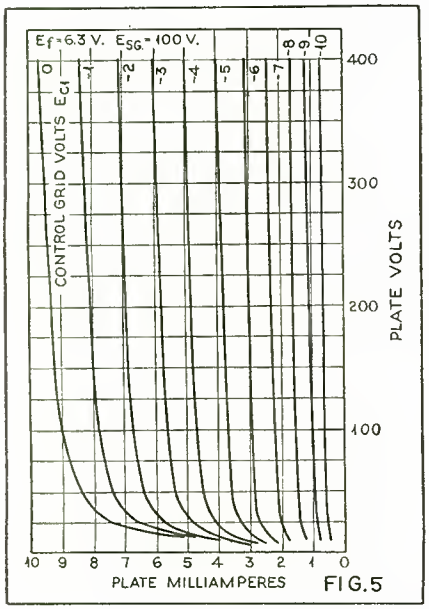


FIG. 5

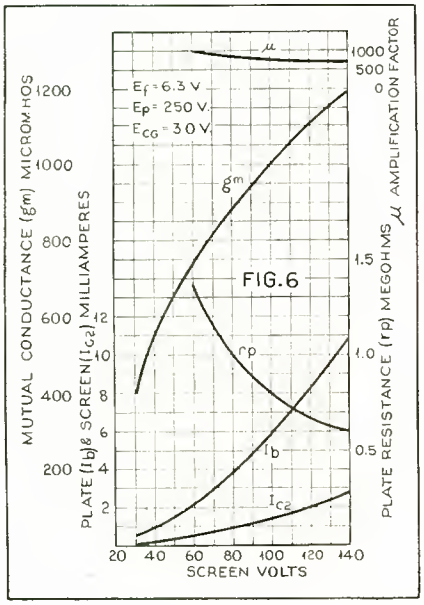


FIG. 6

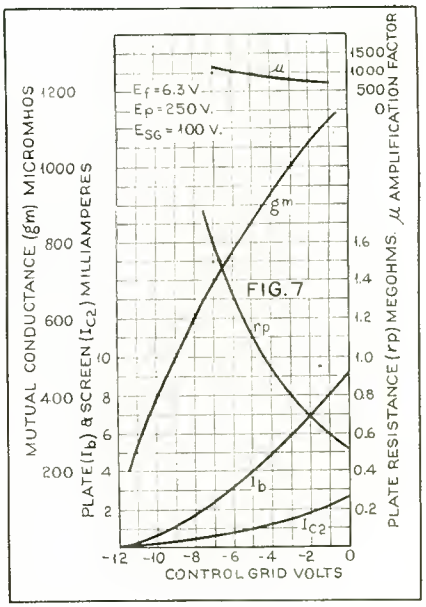


FIG. 7

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"AY-VEE-SEE"

(Its Purpose, Applications and Limitations)

The author, a consulting design engineer, continues his unusually comprehensive discussion of this highly important subject

Edgar Messing

Part Two

THE previous installment covered the principles of a.v.c. systems and ended by pointing out the advantage of so-called "delayed" systems. It is by means of delayed a.v.c. that the full output can be realized.

How far to delay is quite a problem. From Figure 3 it would seem obvious enough that a.v.c. action should not begin until Y input is reached and corresponding maximum undistorted output is obtained. This presupposes almost perfect a.v.c. which will keep the output substantially constant; also that Y is a single value signal.

In the first place, perfect a.v.c. doesn't exist in commercial receivers; good engineering tolerance says that the output in volts, with 1 volt, 30% modulated, input to the receiver, should not be more than 1.5 times the output at 100 microvolts. Larger ratios are permissible but not desirable. In the second place, while the a.v.c. action is dependent on the r.f. carrier, the output from the set depends on the percentage of modulation of the carrier. This means that "U" in Figure 3 might represent the output with a carrier input of Y, which is 30% modulated, or might also represent the output obtainable with a carrier greater than Y but with only 10% modulation. Similarly, smaller carriers with larger modulation percentages will give the same output.

Nor is the modulation percentage constant for any program. Furthermore, even the average modulation percentage for each of a group of stations may differ widely from others in this group. Some stations make 100 percent the maximum modulation percentage, while a large number have 20 percent as the limit. So perfect a.v.c. is not desirable under normal conditions of broadcast reception.

With such a variation in conditions a compromise must be effected to determine actual working conditions. The scientific method would be to design a set to receive a certain station perfectly —a commercial impossibility. Each engineer has his own set theory of how to establish the threshold; the following is intended for guidance only.

The strongest signal we may logically expect in an average urban neighborhood would be about .5 volt, modulated 90 percent. The a.v.c. tends to keep the input to the second detector relatively constant. The manual audio control is between the audio detector and the output stage. Any overload on tubes previous to the manual control cannot be governed by the manual control—with incorrect delay, overload of these tubes may occur on a strong local with resulting poor quality even though the manual volume control is turned way down. Under no conditions, therefore, must the tubes previous to the volume control be overloaded. From this condition the a.v.c. threshold may be determined. The procedure would be to set up a signal of .5 volt, 90 percent modulated, and then to adjust the delay bias until the tubes preceding the manual control start to overload. Another limitation might be—until the maximum undistorted power is reached. Obviously, in many localities the .5-volt signal is excessive and a more appropriate value should be chosen. With proper circuit design there is always some leeway between the point when the output tube overloads and the quality goes sour, and when the previous tubes overload. The delay adjustment may be made to allow the output tube barely to overload. The limitations on delay are the positions where output is limited by too much a.v.c. action and where a.v.c. begins so late as to eliminate its value.

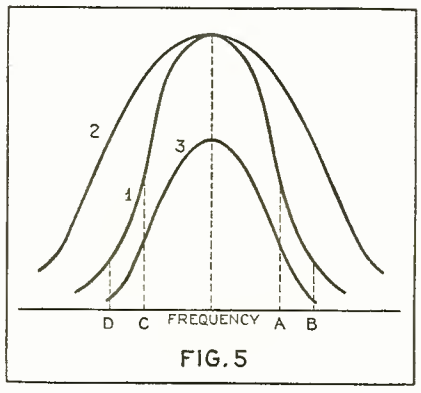


FIG. 5

In auto sets the problem is intensified because the lower limitation—fading elimination—is more important than overload prevention. This means that the a.v.c. threshold should be as low as possible. In order to maintain output with a low threshold value we must make the set highly sensitive so that even the lowered threshold does not limit output.

A good auto set should have a sensitivity well below 1 microvolt and the a.v.c. should begin operating at 5 to 8 microvolts. It is not possible to have control action take place below these values, because set noise alone usually corresponds to about 2 microvolts.

So much for delay; it has not been the object here to give actual values—rather it was sought to point out what delay is and how threshold values may be determined.

The effect of a.v.c. on selectivity, or why selectivity curves may mean nothing, sounds as though it were a deep and highly mathematical problem. And judging from published diagrams of home experimenters' models, *it is* quite a mystery.

Figure 4 shows a typical receiver with a.v.c. control on three tubes. One of the duplex diode tubes is shown with one diode plate and the cathode forming the audio detector circuit and the other diode plate, coupled to the first plate through condenser C, with the cathode forming the control circuit.

We note that up to the point where the a.v.c. controlling voltage is tapped off by C, six tuned circuits have been in use. Suppose we let curve 1 in Figure 5 represent the resultant selectivity of these six tandem circuits. Suppose further that we take actual measurements to check this; take an output reading at resonance, move the carrier to "A" and record the output, and repeat this for "B," "C" and "D." Very curiously we note that these readings describe a curve that may approximate curve 2—which, obviously enough, is far from being as selective as curve 1. And the difference between the curves is the effect of a.v.c. on selectivity.

A moment's consideration will tell us just why this apparent broadening takes

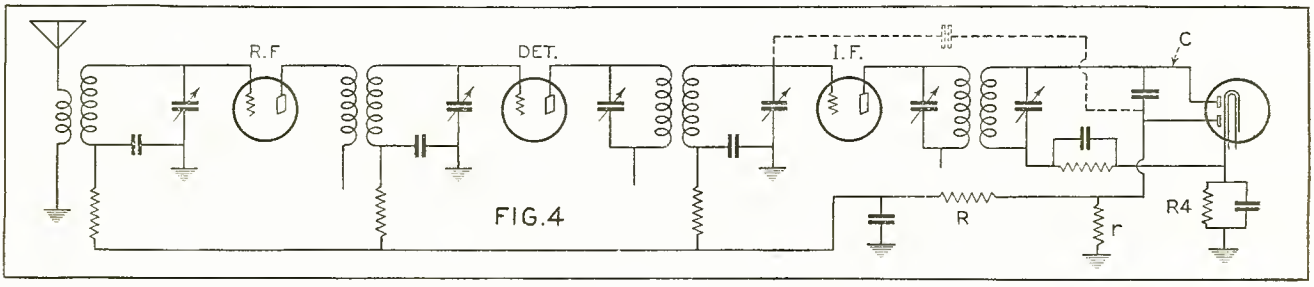


FIG. 4

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place. On resonance the a.v.c. is working and the sensitivity is relatively low. As the signal is moved off resonance the selectivity of the tuned circuits cuts down the signal applied to the second detector and a.v.c. tube, the a.v.c. voltage is decreased and the sensitivity rises, tending to keep the voltage at the second detector substantially constant. The output therefore decreases only slightly relative to the change the circuits' curve shows. And our set apparently broadens out. The effect apparent to the operator of such a set is that of tuning from one station right into another with no break between. Tuned-circuit selectivity curves evidently means nothing. Similarly, we can see that when a signal is tuned in, the real existing selectivity—ability to discriminate between stations—is bettered because the sensitivity has dropped. Curve 3 illustrates this effect.

The cure for the broadening of the curve lies in making the a.v.c. action less sharp for variations of signal frequencies than the variation of audio detector output, with input.

In other words, arrange the circuits so while the signal frequencies are changed to "B," the controlling voltage on the a.v.c. tube and consequently the sensitivity of the receiver is kept constant. If the input circuits to the audio detector are unchanged, the output of the set will vary more closely as the curve of the tuned circuits' rules.

Suppose, for example, that the input of the controlling voltage to the a.v.c. tube is made as shown by the dotted lines in Figure 4, instead of to the other diode plate.

This simple change creates a new picture to which Figure 6 is the key.

Curve "A" is the selectivity afforded by the tuned circuits up to the diode plate. Curve "B" is the selectivity curve up to the point where the controlling voltage for the a.v.c. is taken off. This means that as we tune off a station, the tendency for the a.v.c. to render the set more sensitive and therefore less selective is greatly decreased, and the reason is that the a.v.c. action is comparatively constant over a wide range. By the time the operator has reached a point where the a.v.c. action has made the set highly sensitive, the signal reaching the audio diode detector has become negligible.

Obviously, taking the a.v.c. controlling voltage from only one tuned circuit back may not be sufficient to achieve the effect described. The limitation at the other end is to make the selectivity to the a.v.c. input so broad that the a.v.c. will be operated by a strong local station in the channel next to the one being heard. The faults of such operation are obvious.

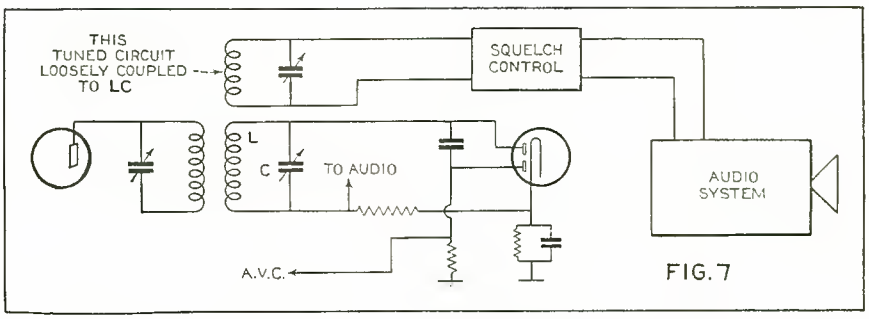


FIG. 7

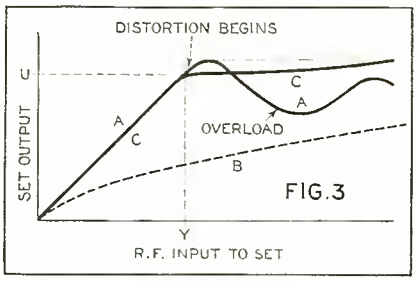


FIG. 3

Another and somewhat evasive method of securing apparently good selectivity lies in the utilization of q.a.v.c.—quiet automatic volume control. The mechanics of q.a.v.c. or "squelch" are beyond the scope of this discussion, but it is sufficient for our purpose to know that the action of a q.a.v.c. set is to allow no signal through the audio system until it is above a certain threshold value. Similarly, as the set is tuned off the station the signal suddenly disappears and nothing is heard until the next channel is reached. The blank space between the channels gives the appearance of good selectivity. Furthermore, it is easily possible to have the squelch circuit input made highly selective and the circuit itself so adjusted that the squelch will operate 2 kc. off resonance. This means that when the set is tuned only 2 kc. off resonance the squelch operates and the signal is cut out. Figure 7 shows a circuit with which this selectivity is obtainable and curve "C" in Figure 6 shows the apparent selectivity.

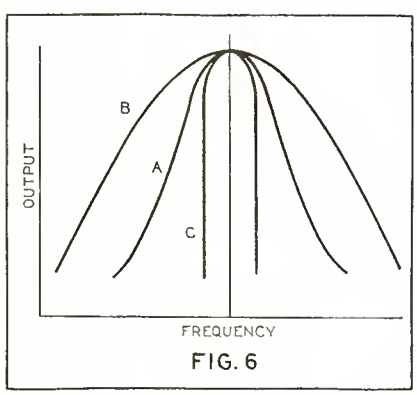


FIG. 6

The use of such a circuit in a receiver compels the set operator to tune almost exactly to resonance, for he won't hear anything unless he is within 2 kc. The system has therefore been called automatic tuning by some and it eliminates the use of tuning meters, shadowgraphs and other devices whose function is to indicate when the station is exactly tuned in.

A study of a.v.c. systems reveal an interesting feature—tapped systems; see Figure 8. Here, it will be noticed, the first r.f. tube gets the fully developed a.v.c. voltage, the second tube, which is in this particular case a first detector, gets somewhat less of this voltage and the third controlled tube gets even less. The reason for this lies in the fact that the plate voltage swing due to signal input is greater in each succeeding tube; that is, the a.c. voltage in the plate circuit of the i.f. tube will be much greater than in the r.f. tube. If this a.c. tends to be greater than the power supply voltage, a distorted output will result. If the grid is made more negative by a.v.c. action and the plate voltage is made low because of the a.c. voltage swing, the tube may be operating very close to cut-off and distortion may result.

In sets having more than one i.f. stage it is considered quite usual good practice to have the second stage uncontrolled.

A.V.C. sensitivity, by which we mean the variation of output with change of input when the a.v.c. is working, deserves a few words. Consider a circuit in which all of the controlled tubes are self-biased. This means that when the a.v.c. backs off the bias the decreasing plate current of each tube tends to nullify the a.v.c. (*Continued on page* 634)

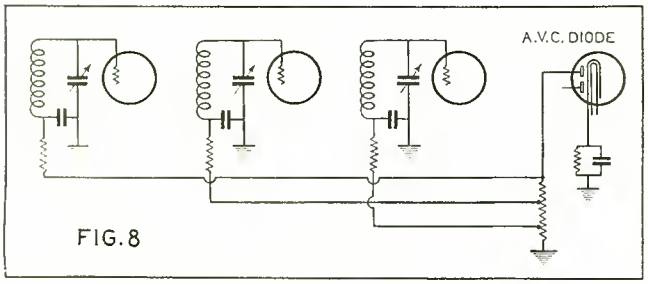


FIG. 8

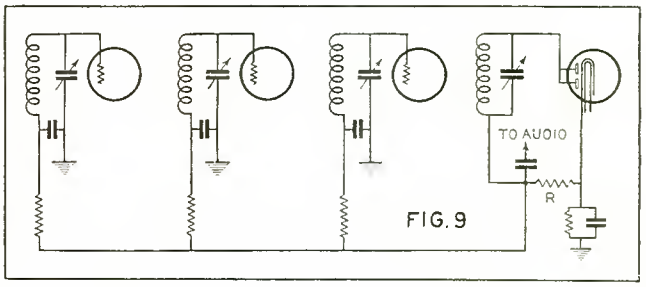
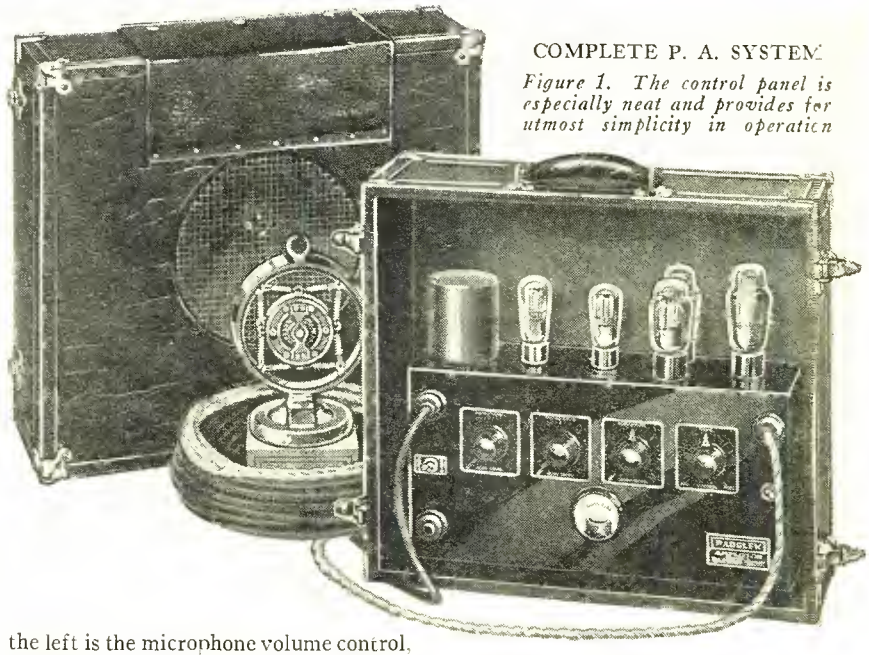


FIG. 9

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6 WATTS *of* QUALITY

A new portable P. A. system entirely self-contained



COMPLETE P. A. SYSTEM

Figure 1. The control panel is especially neat and provides for utmost simplicity in operation

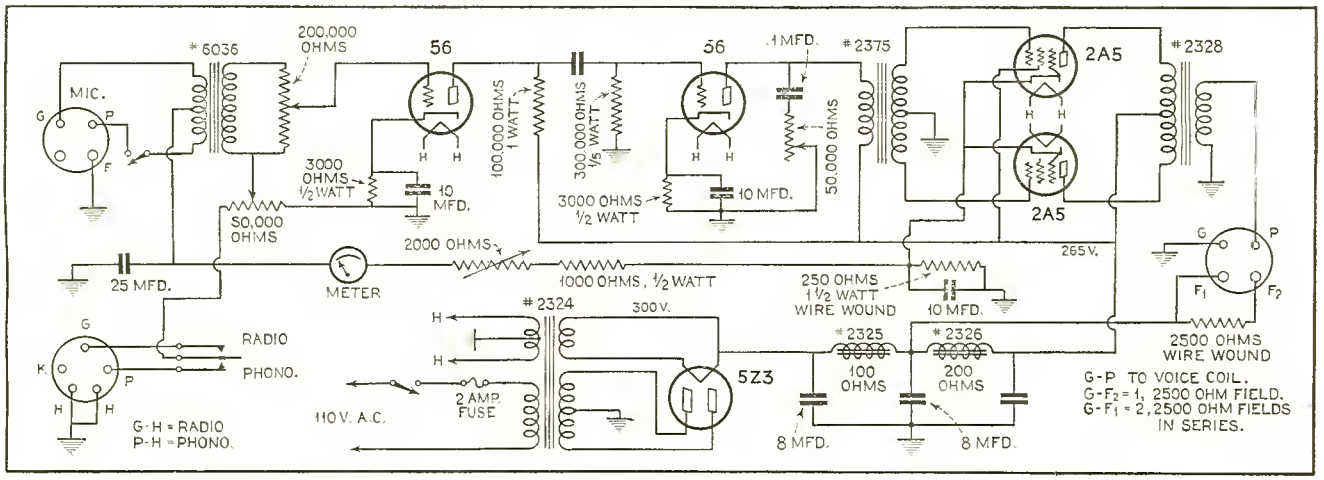
THE design of portable public-address systems has progressed rapidly during the past year. New tubes, smaller and more efficient components and advancement in engineering knowledge have all contributed their share toward the creation of compact, effective units. Where formerly clumsy devices, portable in name only, were necessary for even medium-sized temporary installations, the unit to be described weighs only forty pounds, is completely housed in a single case 12½ by 18½ by 16½ inches and can be carried with one hand. It can be set up and put in operation in two or three minutes, has a coverage of 1000 to 3000 people and, best of all, does not sacrifice efficiency. Figure 1 shows the complete unit. The amplifier proper is built into a heavy metal case which is, in turn, mounted in a substantial leatherette-covered wooden box. The speaker is mounted on the cover of this box, which, when removed, serves as the baffle. The cover and speaker may be placed at a convenient distance from the amplifier unit; a 50-foot cord and connection plug are provided for this.

The output socket is located at the upper right-hand corner of the amplifier chassis. The two input sockets, one for *phonograph-radio* input and the other for *microphone* input, are located on the left of the chassis, the upper being for the microphone input, which allows for short leads and therefore minimum hum pick-up in this more critical circuit. Input and output sockets are "poled" so that no error in connection can result. The four panel controls are labeled and are simple to operate. At the left is the microphone volume control, a potentiometer. The next control is for radio or phonograph input level; the combined use of the first and second controls providing a simple but effective fader and mixer, allowing any percentage of either speech and music to be mixed. The diagram in Figure 2 shows the circuit as used. The meter normally reads the total current to both buttons of the microphone, but by use of the two toggle switches on the left chassis wall the current can be read in each button separately, thus allowing microphone button current equalization. The radio-phonograph switch is located between the two input sockets and by the use of two double cords, attached to the phono-radio input plug, both units can remain permanently connected, a mere flip of the switch selecting either. The tone control is connected in conventional fashion and can be used to correct the acoustics of the room, minimize needle scratch and to some degree eliminate acoustic feedback trouble. The "on-off" switch is immediately below the output plug.

The unit is designed to work directly from a 105-125 volt, 50-60 cycle a.c. line. It employs three stages; two –56 tubes and a pair of push-pull 2A5 tubes, with a 5Z3 rectifier tube. The microphone is coupled through an impedance-adjusting transformer in the grid of the first –56 tube and through the fader-mixer circuit. The phono-radio input, requiring less gain, is tied directly into the grid of this tube, the plate circuit of which is resistance-coupled to the second –56 tube. This tube is in turn transformer-coupled to the two grids of the 2A5 tubes, the plates of which are transformer-coupled to the speaker system.

The circuit and internal construction of the unit are shown in the wiring diagram, Figure 2, and the pictorial diagram, Figure 3. While the circuit itself is more or less conventional, a good deal of care was necessary in order to avoid the ever-present bugbear of hum and electrical feedback found in systems of this class. In a high-gain amplifier suitable for good microphone response without an excessively sensitive and expensive microphone, a great amount of trouble is usually encountered in hum elimination, particularly in a compact unit where all of the parts must be closely associated. The first rule, of course, is to have an adequately filtered power supply. Inspection of the circuit diagram will show a good big brute-force filter (*Continued on page* 630)

FIGURE 2. THE CIRCUIT DIAGRAM



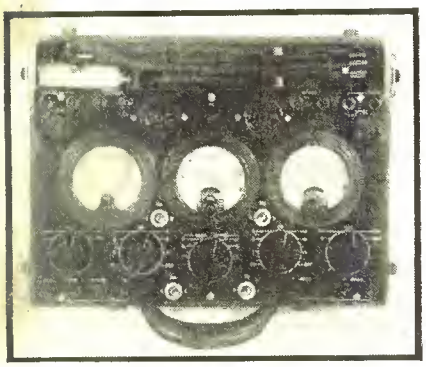
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WHAT'S NEW IN RADIO

William C. Dorf

Set Analyzer Brought Up to Date

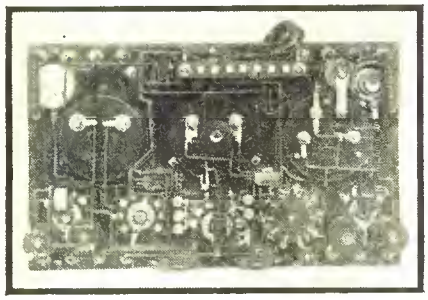
Description—The many thousands of owners of the old Weston model 547 set tester will be interested in this improved, rewired, three-meter analyzer as brought up to date by Mr. Jacob Grand, of the Sun Radio Company. The new tester takes care of all the present-day tubes, including both the large and small 7-prong type tubes and by using additional adapters it will handle any new multi-element tubes that may be introduced in the future. In the new design it provides three resistance ranges (0-1000, 0-10,000 and 0-100,000 ohms), a three-range output meter (0-1, 0-10 and 0-100) and capacity measurements of .1 to 6 microfarads. The a.c. and d.c. voltage measurements have been increased to 1000 volts for the highest range, and the instrument is conveniently



arranged for point-to-point tesing by use of either ohms or volts.

The new a.c. voltage ranges are 4, 8, 40, 200 and 1000 volts and the d.c. voltage ranges 5, 50, 250 and 1000 volts. The d.c. current ranges remain the same as in the old instrument: 0-20 and 0-100 milliamperes.

The original three meters and most of the parts have been retained in this revised instrument, and the only additional new parts required for the new circuit are a



new panel, a testing cable and plug, the necessary adapters, a rectifier for the output meter, five new switches and the necessary resistors for increasing the voltage ranges.

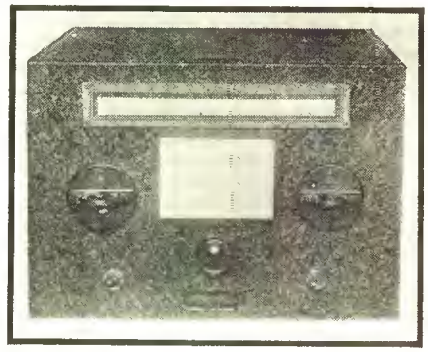
This analyzing circuit is also adaptable to the old Jewell models 408 and 409 testers, if one is willing to discard one meter. The circuit may also be used to advantage on the Weston model 565 tester and the 400 series of Supreme diagnometers, if the oscillator and tube checker features are discarded.

The designers of this revised circuit make the announcement that they are in a position to supply a set of three large-size blueprints showing the complete wiring circuit panel, engraving layout, and a full-size dimensional drawing for mounting the various parts. These prints are complete with operating and constructional information. They also advise that they can furnish the parts and that they have facilities for rewiring the analyzer.

Maker—Sun Radio Co., 227 Fulton St., New York City.

"Ham" Super

Description—The new National FB7A is a seven-tube laboratory-built short-wave superheterodyne receiver using five sets of

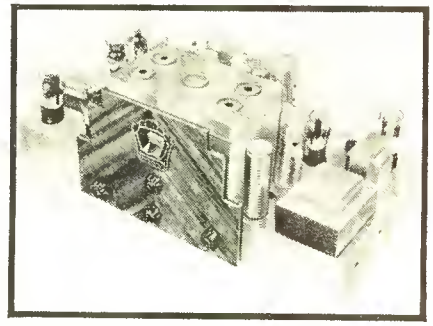


plug-in coils, covering a wavelength range from 15 to 200 meters. The set is designed primarily for the discriminating amateur and incorporates such modern refinements as air-tuned, Litz-wound i.f transformers; band-spread and full-range coils; offset c.w. beat tuning; full-vision velvet vernier dial; double shielding and electron-coupled oscillators. The tuning curves are mounted on the front panel, along with the beat oscillator switch and the "send and receive" switch. The gain control is calibrated directly in "R" units. The plug-in coils set into shielded wells in the face of the panel, which makes wave changing extremely easy. The following type tubes are used: –24's for the receiver and beat-frequency oscillator, a –57 for the r.f. stage, –58's for the two i.f. stages, a –56 for the second detector and a –59 type tube in the power stage.

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

All-Wave Superheterodyne

Description—The new Midwest sixteen-tube all-wave superheterodyne receiver covers two frequency ranges, from 150 kc. to 370 kc. and from 530 kc. up to 33,000

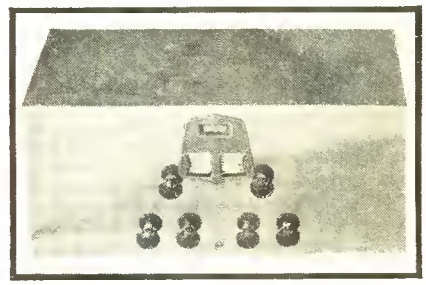


kc.; or, translated in wavelength, 9 to 565 meters and from 850 to 2000 meters. The following type tubes are employed: a 6D6 for the r.f. stage, a 6C6 for the first detector, a –56 as an oscillator, two –78's for the i.f. amplifier, 6B7's for the second detector and automatic volume control, –37's for the first and second a.f. stage and for the statomit circuit. Four –45 type tubes are used in parallel push-pull output stage. The 5Z3 tube is used for rectification. The receiver features automatic volume control, rubber-floated chassis, variable tone blender, automatic tone compensation and a novel wave-band switching arrangement. To simplify tuning, the various frequency ranges as employed for the broadcast stations, police, amateur, etc., are marked by these designating words directly on the dial.

Maker—Midwest Radio Corp., Cincinnati, Ohio.

All-Wave Laboratory-Built Superheterodyne

Description—Announcement is made of the new McMurdo Silver Masterpiece II all-wave superheterodyne receiver, covering a wavelength range from 10.7 to 567 meters. It is designed in two units, the tuner chassis being separate from the power amplifier and speaker. The manufacturer calls attention to the many new refinements, including air-tuned intermediate transformers, tone control, four-position automatic wave-band switching arrangement, interstation noise suppressor system, built-in beat oscillator, band-spread tuning on short waves, automatic volume control and auditorium dynamic type reproducer. The tube equipment comprises –58's for the r.f., three intermediate-frequency stages and the beat oscillator circuit, a 2A7 pentagrid type tube for the combined oscillator and first detector, –56's for the second detector, automatic volume control and first a.f. stage. The 2A3 type tubes are employed in the push-pull power stage.

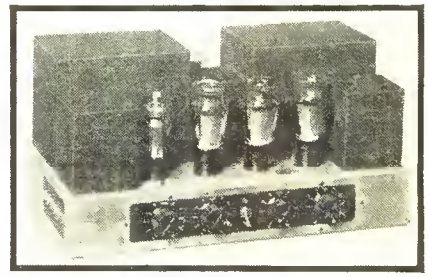


The type 5Z3 tube is used for rectification.

Maker—McMurdo Silver, Inc., 1733 Belmont Ave., Chicago, Ill.

Audio Amplifying Systems

Description—The Simplex Electric Company introduces a new line of quality sta-

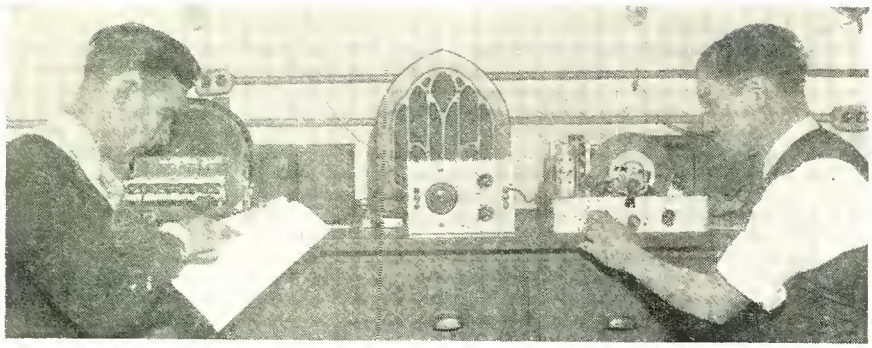


tionary and portable audio amplifying systems. The unit illustrated herewith is known as their type No. 6B, a five-tube amplifier, utilizing two –59 type tubes in the Class B power output stage. The remaining tubes comprise one –57, one –59 as a Class A triode, and the –83 type rectifier. The rated gain of this amplifier is 86 db. and its power output is 25 watts. It is designed with universal input and output connections and is especially adapted to sound truck and general portable work. Its shipping weight is 63 pounds.

Maker—Simplex Electric Co., Inc., 100

(*Continued on page* 620)

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THE DX CORNER

FOR BROADCAST WAVES

LETTERS received from readers are strongly in favor of the continuance of this department as a regular monthly feature. Plans are being made accordingly. These plans involve increasing the space now allotted to this section, and the appointment of Official Listening Posts. But in formulating these plans it is important that the editors know just what sort of material listeners would like to see included in the future. All DX listeners are therefore cordially invited to submit their suggestions, along with reception reports or other DX information which they consider of interest for publication. Applications for appointment as Official Listening Posts are likewise welcome. The successful applicants will be those who submit the best monthly material for publication between now and the time appointments are made.

DX Clubs

The DX fan who is out to better his log of distant stations should by all means identify himself with some one or more of the numerous DX clubs. Most of these clubs have monthly bulletins or "tip sheets" which are invaluable in that they carry announcements of special DX programs, reports on hours of transmissions of foreign stations, information as to what distant stations are being best received each month, etc. Such information as this saves a vast amount of time which otherwise is wasted in dial twisting and enables the listener to shoot for something definite which he knows is on the air rather than search around aimlessly, finding and holding stations only to find that they are nothing more than semi-locals.

Moreover, most of the special DX programs are arranged for by these clubs whose officers in practically every case function without compensation. Without the support of adequate membership behind these men there would be difficulty in arranging for these special programs and, of course, monthly bulletins would necessarily be scanty in their proportions.

The cost of membership in these DX organizations is negligible, being one dollar or less per year in practically every instance, this amount being devoted principally to covering the cost of preparing and mailing the bulletins to members.

RADIO NEWS will be glad to bring individual DX clubs to the attention of readers, in this department, upon receipt of information concerning membership requirements, objects, dues, etc., from responsible officers. This will be done either in the form of announcements or possibly a permanent register of DX clubs will be included monthly as a regular feature of the DX Corner. It is suggested that club officials, in sending in information on their organizations, include a sample copy of their bulletin or other material furnished to members.

For the "Old-Timers"

The Society of Wireless Pioneers is a new affiliate of the International DX'ers Alliance which has just been organized and which will interest fans who have grown up with the game. Membership is limited to those "having ten years or more acquaintance with high-frequency or short-wave work." The editors have not as yet obtained full information concerning the organization but hope to have it by next month. In the meantime, readers who are interested may obtain applications and information from M. Mickelson, Vice-Pres., Society of Wireless Pioneers, 3229 Bloomington Ave., Minneapolis, Minn.

Special DX Broadcasts

Due to the fact that copy for RADIO NEWS must be completed a considerable time in advance of the publication date, it is difficult to include timely announcements of special DX broadcasts. As a rule such programs are arranged for only a few weeks prior to the broadcast.

This month three programs have been called to our attention by the International DX'ers Alliance of Bloomington, Illinois, all scheduled far enough ahead to enable some readers to listen in. These are:

Saturday, March 10, 2-3:30 a.m., E.S.T., CX26, Montevideo, Uruguay, 1050 kc., 2 kw.

Sunday, March 11, 3-4 a.m., E.S.T., YV3BC, Caracas, Venezuela, 1200 kc., 1 kw.

Monday, March 12, 5:30-6:30 a.m., E.S.T., VQ7LO, Nairobi, Kenya, Africa, 858 kc., 1 kw.

These stations will appreciate reports from listeners who hear them during these broadcasts.

Chinese Stations

Following is a list of Far Eastern stations using over 100 watts power, submitted by P. A. Sargeant, Manager, DeLuxe Radio Corporation, Shanghai, China. Mr. Sargeant states: "I am sending you this information with the full consent of Dr. Y. C. Wen, Adviser to the Chinese Government Broadcasting Committee of Nanking, China." This list is doubly valuable because it has been extremely difficult to obtain any authentic list of Chinese stations.

Call	*Location**	*Frequency*	*Power*
XQHE	.....	1460	1000
XHHK	.....	1420	100
FFZ	.....	1400	250
XQHD	.....	1360	200
XQHC	.....	1270	500
XHHN	.....	1200	100
XHHU	.....	1160	500
XGCU	.....	1140	100
XHHS	.....	1100	100
XHHH	.....	1040	100
XHHG	.....	1020	100
XGOD	Chekiang Province	977.8	1000
XHHF	.....	940	100
XHHI	.....	900	100
XHHV	.....	880	100
XOST	.....	857	500
XQHA	.....	850	1000
ZBW	Hongkong	845	2000
XQHB	.....	820	100
XGOY	Yunan Province	698	500
CNB	Kwenchow	677	1000
XGOA	Nanking	660	75000
XTON	Tientsin	625	500

*Location not given for all stations.

Poste Parisien Well Received in U. S.

The Poste Parisien station which was announced last month as being well received in New England, and as putting on a special program in English every Sunday evening from 6-6:30, E.S.T., is now operating on a frequency of 959 kc. with 60 kw. power and is expected to continue these special transmissions for some time to come. This station is also reported as being regularly well heard throughout the eastern and middle states beginning at 2:10 a.m., E.S.T., daily.

That Station on 610 KC.

A letter from T. William Kelly of San Jose, California, quoted in the February DX Corner, mentioned frequent reception of a station operating on about 610 kc. whose call he had never been able to catch due to interference from a code station. Warren Winkley, Hughson, California, passes the good word along that the station is KZRM, the 50 kw. station at Manila, P. I., which broadcasts a Willys-Knight automobile program daily between 2 and 3 a.m., P.S.T., on a frequency of 618 kc. This seems to check with Mr. Kelly's report that the station in question seems to be discussing a motor of some sort.

Mr. Winkley appears to be upholding the honor of California, incidentally, so far as DX reception on the broadcast band is concerned. He reports 31 Japanese stations, 2 New Zealanders, 5 Australians, 2 Hawaiians, 2 Alaskans and one each in the Philippines, Porto Rico, China, Indo-China and Buenos Aires. He also lists 28 Canadians and 26 in Mexico and Panama. His total log to date, including U. S. stations, numbers 468.

A West Coast Mexican Station

Several readers have reported a new station, XEAC, at Agua Caliente, Baja California, Mexico, operating on 815 kc. Eugene S. Allen, Reedley, California, reports that this station is heard from 12 to 1 a.m., P.S.T. Don C. Townsend of Fallon, Nevada, writes that this station started operations on January 7 and is soon to be the most powerful on the Pacific Coast. Both of these listeners also report that the trans-Pacific stations are coming in numerous and well.

English Broadcast from China

C. H. Long of Winston, Missouri, writes that in a recent verification from XGOA, 660 kc., 75 kw., it is stated that news reports are broadcast in English daily from 8:40 to 9 p.m., Chinese time (6:40 to 7 a.m., C.S.T.). Also that Western records are broadcast as well.

On a Crystal Receiver

From a lady fan, Miss Millisent Utter of Oneonta, New York, comes a letter which says in part: "I dug up a long-forgotten crystal set just for fun, under the impression that crystal receivers are good for only 20 miles or so. Here are the results, all stations being received clearly: WENR, WGY, WTAM, WLW, WOWO, KMOX, WCCO, WJZ, WLS, WSM, WABC, WCAU and WTIC. The nearest of these stations, WGY, is nearly 80 miles from my location."

(*Continued on page 635*)

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When to Tune for

DOMESTIC *and* OVERSEAS 550-1500 kc. DX

This is the first of two articles on this subject. The present article discusses the general factors influencing long-distance reception. The article next month will provide a month-by-month analysis of reception conditions in various countries

C. H. Long

IT is important for success in broadcast band reception of distant stations to know when to listen for the station, or stations, one is seeking. The mere fact that a station is on the air does not guarantee its reception; for a station in any given location there are seasonal, daily, and hourly variations in reception conditions that must be taken into account.

It is widely recognized that for long distance broadcast band reception darkness must prevail over practically the entire path of the wave. Occasionally freak conditions modify this rule slightly, but, in general, nothing in the way of real distance reception is to be expected when the sun is as much as half an hour high at either the transmitting or receiving end, and for best results it should not be more than 5 minutes high. For example, a listener in the United States could not expect to hear the English stations at 4 a. m. C. S. T., for it is then 10 a. m. and hence broad daylight in England. When in doubt, one should always consult a time chart and determine for any particular season of the year that the path of the wave lies in darkness.

For best results in long distance reception on the broadcast band cool weather should prevail over a large portion of the wave travel, particularly at the transmitting and receiving ends, and especially if the signal has an appreciable land journey at either end. Thus mid-winter in the United States is, in general, not very favorable for the reception of Australian stations, since it is summer-time in Australia and hence warm at the transmitting end. This matter will be treated more fully under seasonal variations.

Signals are weakened much more rapidly when transmitted over land than when transmitted over water. For this reason the best location for both transmitter and receiver, in order to cover long distances, is near the seacoast with no appreciable intervening land bodies. For this reason also, if signals have an especially long land journey to make, their reception becomes peculiarly difficult, and possible only when conditions are just right. In order to be fully advised on this point, it will well repay one to check up the signal paths on a globe—never a wall map—of the distant stations in which he is interested. For example, Mexican stations are not heard well in England and Northern Europe, and when one checks the signal path it is found that a land journey of some 3000 miles is involved at the outset, which explains the difficulty of reception. Even a comparatively short distance between receiving locations (or transmitting locations) can, and often does, make a great difference in the nature of the path of the signal. For example, the Japanese signals reach the Pacific Coast by an all-water route, but beginning at Alaska they traverse the length of North America in order to reach the central United States.

For the reception of distant stations local interference, including static, must be of a low order. This requirement limits long distance reception on the broadcast band, in general, to temperate to cool or cold weather. For successful distance reception there must be a minimum of interference from other signals on the same or adjacent channels. Station interference in many cases becomes a limiting factor, which it is possible to avoid only by arranging for special transmissions. This is true in the main of the reception of South American, European, and African stations in this country and of African stations in Europe.

In general, autumn and spring are the best seasons for general distance reception on the broadcast band. These are the only seasons giving moderately cool weather in both hemispheres, and hence are the most suitable for reception between hemispheres. These seasons are also good for the reception of stations in the same hemisphere, hence are the best for general distance reception. The reception conditions are generally at their best, especially for communication between hemispheres, when it is early spring (or late winter) at the receiving end. Thus March and April are the best months for the reception of the Australian and New Zealand stations here in the United States. The autumn months of October and November are also good for such reception, but take second place. During these seasons it will be noted that signal losses are a minimum owing in large part to the fact that land losses are a minimum. Naturally, the question of land losses affects especially the reception of inland stations. Thus the inland Australian stations are well received here in the United States only during the spring and fall (or late winter and summer) months.

The winter season, December, January, and February in the northern hemisphere, June, July and August in the southern, is also good for the reception of distant stations, more especially of those located in the same hemisphere. Thus here in the United States the Japanese and European stations are heard well in this season. It will be noted that in either case cool weather prevails over the entire path of the waves, thus lessening absorption losses and otherwise making for increased range. The low local static level prevailing at this season is a great aid to distance reception. However, this season is not the most favorable for reception between hemispheres, though such reception is possible in a limited way. Stations so located that the signals have no appreciable land journey at the outset and especially those located nearer the equator are reasonably well received in the winter season. However, other stations in the opposite hemisphere are not so well heard except over moderate distances, unless the station is one employing super-power. For example, the Brisbane and Sydney stations can be received here reasonably well in the winter, but the Melbourne and Adelaide stations very poorly. In subtropical regions the winter season is the only one giving sufficiently low static levels for long distance reception, hence it is obvious that such regions are much curtailed in the possibilities of distance reception.

Though summer is ordinarily very unfavorable for distance reception on the broadcast band, still it is sometimes possible to receive distant stations during this season. This is more especially true of stations located in a westerly direction from the listener and in the opposite hemisphere. Sometimes the static level is sufficiently low shortly before sunrise to permit hearing these stations.

The period just preceding sunset and for a short time thereafter, especially in mid-winter, is favorable for reception from the east. At this time of day the static level is still low, local station interference has not reached its maximum, and signals from the east usually show good strength. On and near the Atlantic Coast European stations can sometimes be heard satisfactorily at this hour. Australian and New Zealand listeners when conditions are favorable regularly hear the American stations successfully beginning at this hour—they are fortunate in not being hurdened with the deluge of local station interference that we have here in North America.

In general, as darkness increases, the static level rises until around midnight, when it begins a gradual decline, falling off sharply at daybreak. At the same time signal strength from distant stations usually increases as the night wears on—(*Continued on page* 629)

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2 WORTH WHILE DX ACCESSORIES

Sol Perlman

TWO features which are almost indispensible in real DX receiving equipment, for use on either the broadcast or the short-wave bands, are a heterodyne beat oscillator which permits the location of stations by their "birdie" whistles, and provision for headphones. The advantages of headpones require no emphasis as anyone will appreciate them who has attempted to decipher the call of a station so weak as to be almost below the noise level.

The advantages of the heterodyne beat oscillator are perhaps less well known. Briefly, such an oscillator serves a three-fold purpose. First, it facilitates the location of weak stations when tuning because the distinctive whistle is more easily heard against a background of noise than is a regular modulated signal. This whistle is heard if the station's carrier is on the air—even during the gaps in a program when the carrier is not being modulated. Second, if the receiver employed is a superheterodyne, the oscillator serves as an exact resonance indicator. If the oscillator is pretuned to fixed resonance with the intermediate frequency employed in the receiver then any station tuned to the zero beat will be tuned exactly to resonance. In this respect the oscillator serves the same purpose as a tuning meter. Third, the oscillator permits reception of c.w. signals—signals which are, of course, unmodulated and therefore inaudible.

As Technical Advisor to the New York Chapter of the International Short-wave Club, the author has found an extensive demand for these DX "tools" to be used in conjunction with standard receivers. As a result he has designed and has now placed on the market two inexpensive pieces of equipment known as the "Phone Receptor" and the "Beat Note Oscillator". In order to assist readers of RADIO NEWS who may have the ability, parts and time, and who prefer to construct their own units, the circuits and other necessary information are given herewith.

The photo, Figure 1, shows the Phone Receptor unit. You will observe two adapters at the end of a five wire cable and also a wire with a clip. The adapters are placed under the push-pull power tubes of the receiver and the clip is fastened to the ground binding post or the metal chassis. At the other end of the cable is a metal box housing a special jack. When the earphones are not plugged into the jack the receiver operates in a normal fashion and the signals are heard from the loudspeaker. Plug the 'phones into the jack circuit and the speaker is automatically silenced and the signals are heard. Listening is then through the headphones.

Tracing the circuit of Figure 2 (b) it will be seen that when the 'phones are plugged into the jack it connects them across the secondary of the push-pull input transformer and the grids of the power tubes are disconnected from this transformer and grounded through the wire with the clip. Here, however, a precaution must be observed. If the power tubes are biased in the filament or cathode circuit, it is perfectly safe to fasten the clip to the metal chassis because the normal bias is maintained on the grids. If, however, the receiver is one in which the bias is provided in the grid return and the center tap of the secondary winding of the input push-pull transformer is not grounded, then the following additional precaution is to be observed; if the power tubes are of the –45 type, a 45 volt B battery is used to provide an external C bias. If the power tubes are –47's or –42's, a 22½ volt B battery is used to provide the required bias. This biasing battery is inserted by connecting the wire with the clip to the minus terminal of the battery, and the positive terminal of the battery to the ground binding post of the receiver or the metal chassis.

Adapters can be made to fit any type of power tube whether of the 4, 5, 6 or 7-prong variety. The adapters are assembled from the male and female sections.

The circuits of Figure 2 are only for class A amplifiers. In class B amplifiers the two grids are connected together.

In receivers that use only one power tube, only one adapter is required. The circuits, Figure 2 show the wiring for both a single and a double adapter Phone Receptor.

FIGURE 2

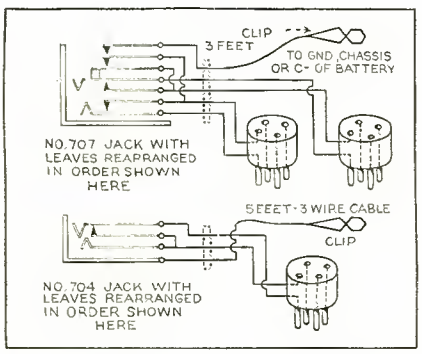
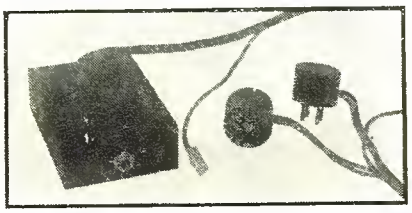
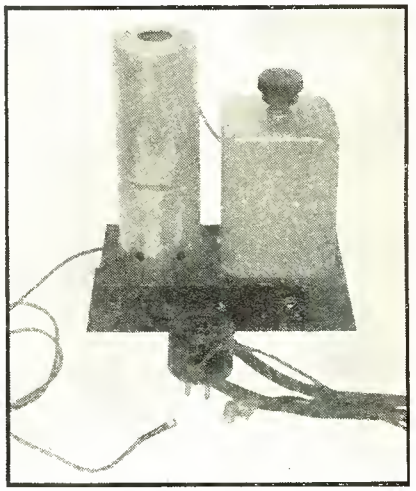


FIGURE 1. HEADPHONE ATTACHMENT FOR STANDARD RECEIVERS





BEAT NOTE OSCILLATOR

Figure 3. This compact oscillator is easily attached to any superheterodyne receiver to permit c.w. reception and easy DX tuning

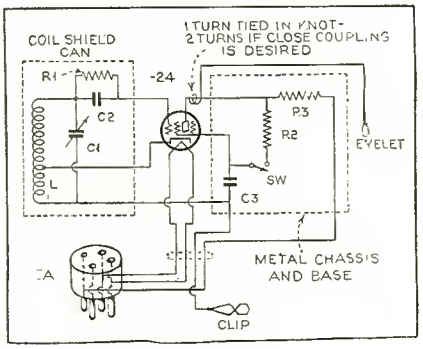


FIGURE 4

List of Parts

Special reconstructed jack (Yaxley No. 707 for Figure 2a; Yaxley No. 704 for Figure 2b)
Metal box 3" x 4½" x 1¼"
3 foot of flexible wire
5 foot color coded battery cable, 5 wire for Figure 2a or 3 wire for Figure 2b
Spring clip
Suitable Eby adapter sections for 4, 5, 6 or 7 prong tubes
½ inch rubber grommet
Wire and hardware

In the chain of events that take place in a superheterodyne receiver, all signals are converted to a single frequency—and at this frequency (the intermediate frequency) are greatly amplified.

If an external oscillator is coupled to the intermediate-frequency amplifier and is tuned slightly off this frequency an audible note, equal to this frequency difference, will be heard whenever any signal is tuned in one the receiver. This "beat (*Continued on page* 633)

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safe landings during fog or other conditions of low or zero visibility.

Amplification Factor of High-Mu Tubes, by Otto H. A. Schmitt. The Review of Scientific Instruments, December, 1933. This article shows how it is possible by the use of a dummy tube in the plate circuit to obtain the high resistance characteristic necessary to attain the full amplification of 1500-2500 per stage for the –57 tube using only 300-600 volts plate supply.

Methods for Measuring Antennas and Other Impedances, by C. E. Worthen. The General Radio Experimenter, December, 1933. This article describes a new model of a radio-frequency bridge in which careful elimination or compensation of parasitic capacitance and inductance makes the bridge direct reading over a wide range.

Insulated Wires Used in Radio Set Production, by Raymond G. Zender. Electronics, January, 1934. This article describes the effects of various types of insulation and insulation treatment on voltage breakdown and insulation resistance of the hook-up wires used in radio set production.

Transmission Lines for the Doublet Antenna, by E. F. Johnson and Ralph P. Glover. QST, January, 1934. This article describes a different solution of the impedance-matching problem to provide a transmission line, between antenna and transmitter, the function of which is purely to transfer power without forming a portion of the radiating system of the transmitter.

How to Get a Class C License, by K. B. Warner. QST, January, 1934. Hints for operators anxious to obtain a Class C license, a license which can be applied for by men located more than 125 miles airline distance from all the 32 examining cities.

Diode Detection in Old Receivers, by G. S. Granger. Service, January, 1934. This article describes a number of diode detection circuits by means of which old tuned-radio-frequency and superheterodyne receivers can be improved.

How to Get Copies of Articles Abstracted in This Department

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

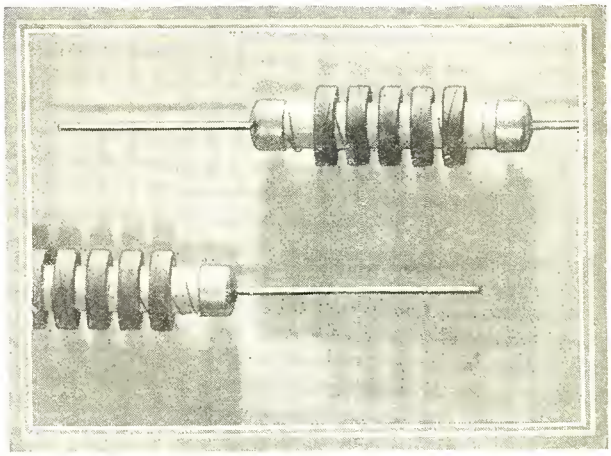
RADIO NEWS *cannot undertake to supply copies of these articles. They are NOT included in the* RADIO NEWS *Free Technical Booklet Service.*

Review of Technical Booklets Available

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

4. *A 15- to 200-Meter Superheterodyne.* A description of the outstanding features of the Hammarlund-Roberts high-frequency superheterodyne, designed especially

(*Continued on page* 628)



Aristocrats of the CHOKE FAMILY

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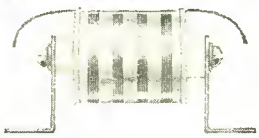
MIDGET R. F. CHOKES

(*Above Illustration Actual Size*)

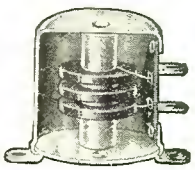
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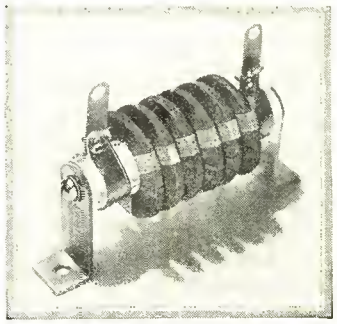
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THE SERVICE BENCH

ZEH BOUCK

AUTOMOBILE RADIO AND THE SERVICE-MAN

AUTOMOTIVE radio is among the most profitable fields of specialization for the serviceman. However, it is a business that must be promoted and built up before its potentialities can be fully realized. Carl Burns, of Amsterdam, N. Y., drums up trade as described in the following letter:

"A funny thing about owners of automobile radio sets. If anything goes haywire with them, they go to their garage or auto service station rather than to a radio serviceman! They figure that it is part of the car—the psychology works and they act accordingly! Of course this is somewhat 'wet,' because an automobile installation is something that should not be handled with a monkey wrench or a hydraulic jack. At the same time, it *is* hooked up with a very vital part of the automobile mechanism—*i.e.*, the ignition system.

"The way I take advantage of the car owner's attitude, and at the same time reconcile these technical differences, is by having a local printer make me up some twelve-by-twenty-inch signs which I have distributed among every garage and gas station within one mile of my service shop. These signs read:

AUTOMOBILE
RADIO
EXPERT
INSTALLATION AND SERVICE

"I have given out close to fifty of these placards, promising the garages and service stations *ten cents on the dollar commission on every job turned in to me!* The auto folks have co-operated 100 percent so far, figuring that, aside from a possible commission, the sign identifies them as up-to-the-minute, and may attract automotive trade aside from radio business. When a car drives in with radio trouble, they call me on the 'phone, and I either hop over to the auto place or the owner drives to my shop. In any case, it is never more than a five-minute trip. Of course, if the trouble is in the set proper, rather than a mere matter of faulty installation or ignition racket, the receiver is removed for repair in the shop. By this sort of a hook-up I have the co-operation of a whole corps of automobile experts, whose advice and assistance make it posible for me to do the finest kind of a radio job while at the same time maintaining the efficiency of the car itself at peak. That's the way an auto-radio installation should be made—the *auto mechanic and radio man working hand in hand!*

"With this arrangement I average better than one auto job per day—which, of course, is aside from my regular service business. My profits on auto-radio *service* alone amounted to slightly more than $600 in 1933. Installation ran up another $400. The best part of it is, the auto-radio business booms in the summer when the regular sales and service work slumps. Incidentally, the contacts made on auto service jobs have been *additionally profitable.* The recommendation of a satisfactory auto-radio repair often nets me a client for home-radio service. As a matter of fact, I make it a point to get into conversation with the customer, and working up to the point of what sort of a radio he has in his home, how long he's had it, and how it is perking."

Increasing Used Car Values

Automotive contacts of the type mentioned by Mr. Burns should be profitable in several ways. Many service stations, and the majority of garages, deal in used cars, the resale prices of which can be jacked up considerably by the installation of radio receivers. The increased value invariably exceeds the cost of installation, and the psychological element usually results in a quicker turn-over. Approach your local garages with the proposition of installing radios in their used cars—and in new cars when they are also authorized dealers.

The editor of RADIO NEWS pointed out an additional automotive radio possibility in his Editorial, for February, which described the attractions offered by taxi-cabs so equipped.

Taxis featuring radio entertainment, and announcing the fact by a well-placed sign, have an all-time customer "pull" comparable to that enjoyed in the winter by cabs advertising themselves as "heated". Many new cabs are coming through with factory installed sets. Inevitably these will require servicing and *the early service bird will make exclusive arrangements for the servicing of entire fleets!*

Cabs not so equipped *need radio to compete*—another job for the serviceman. And even, in smaller communities, where radio competition is small, it can be pointed out that radio will make *customers* of *pedestrians.*

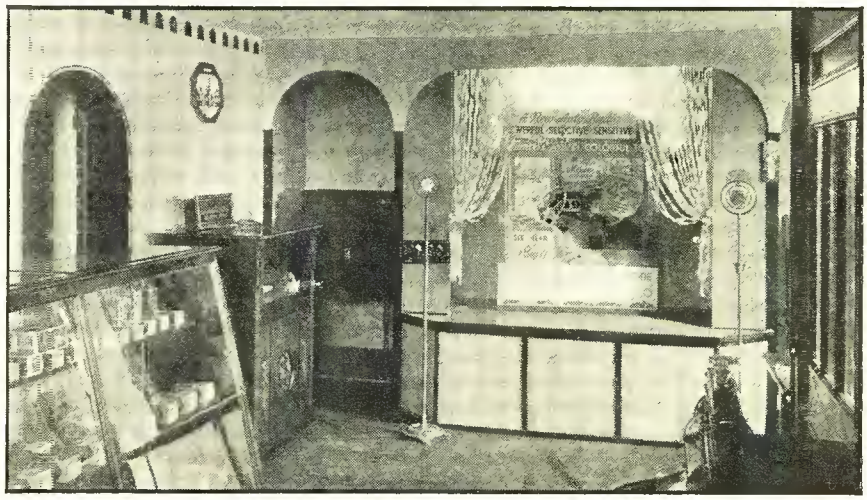
A reasonable amount of common sense should be used in the installation and operation of auto radios—particularly taxi sets. Operation control, of course, is out of the serviceman's province, but the car and cab owner should be warned against too much volume and bad quality. When the latter exists, a serviceman should be called in immediately.

Trouble Shooting on the Majestic 66 Automobile Radio

An engineer, associated with maintenance work on this receiver, contributes the following data to this month's digest of auto radio and the serviceman:

"All auto sets are subject to noise interference from the vibrator system of its "B" supply, and each particular set has its own methods of attack on such noise prevention, depending upon the particular design of the power supply system. The Majestic 66 is no exception to this rule and some of the common cures are herewith detailed. Providing all of the filter condensers and chokes are in order, one

Two views of the Groveland Radio Laboratory, Groveland, N. Y. Figure 1 at head of page, Figure 2 below



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common source of such noise is the opening of the bypass condenser connected from the side of the 'B' supply input fuse to the ground. This condenser, which is of the cartridge type having a capacity of .3 mfd., is merely held by its connector leads, and in the course of vibration to which the set is normally subjected, often breaks off at one of these leads or else opens up inside. When replacing, it is good policy to see that it is fastened down tightly to the chassis so that vibrations will not be transmitted to the leads. Some of these sets generate vibrator noises in spite of the fact that all components are of the right value and okay. When this condition was first noticed in the field, it led to feverish work on the part of the factory engineers to determine its causes and cure. As a result, all of the later sets came equipped with 60-ohm, carbon resistors, in series with the small bypass condensers connected across the vibrator primary circuit, which thoroughly eliminated these spurious oscillations. These resistors are not shown in the circuit diagram of the 66 given in the official service manual of this set, as the trouble developed after the issuance of the manual. However, in the later publication of the Majestic parts catalogue, which shows all circuit diagrams of Majestic receivers from the first model 70 to the 66, these resistors are to be included. The inclusion of these resistors dampen the spurious oscillations set up by the sparking of the vibrator armature, which, although properly bypassed by condensers, nevertheless found a resonant circuit which radiated into the r.f. portion of the receiver and was thus passed on into the speaker. A new set would not show any signs of such vibration pickup until after it had aged somewhat.

"There are three outstanding parts failures which occur in this receiver when subject to wetting by water—which occurs due to carelessness on the part of the owner who fails to shut his cowl ventilators during rainy weather or when the car is being washed. The water finds its ways into the interior of the set through the ribbed opening in the cover, causing damage in three places. The most frequent to fail of the three components is the 10,000-ohm screen-grid resistor, in series with the screens of the r.f., oscillator and i.f. tubes. This is a wire-wound resistor located directly above the oscillator socket on the underside of the set, and riveted to the side wall of the chassis. When the set ceases to function after it has become wet, one can tell immediately if the screen grids are at fault by trying to get a clicking sound when making intermittent contact on the control grid of the i.f. tube.

"The second source of trouble is a peculiar electrolyic action which takes place always on the red-colored lead, going into the 'B' choke. This 'opens' the soldered joint inside of the choke where the lead connects to the fine wire of the choke winding. The symptom of this is a high voltage on the control grid of the 89 ouput tube. By placing the fingers across the control grid and chassis of the set, one can feel a slight shock which is due to this condition. The choke need not be replaced, for the winding itself is not open. Just cut into the first layer of insulating paper around the choke until the two leads are exposed. The choke winding going to the red lead will then be found disconnected and *resoldering* will repair it.

"The third component failure is the breakdown of the rectifier socket, which, when it becomes even slightly wet, permits the high voltage terminals to 'arc over' to the chassis and carbonize it so

(*Continued on page 625*)

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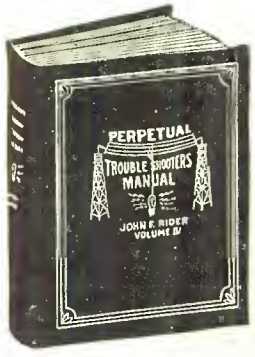
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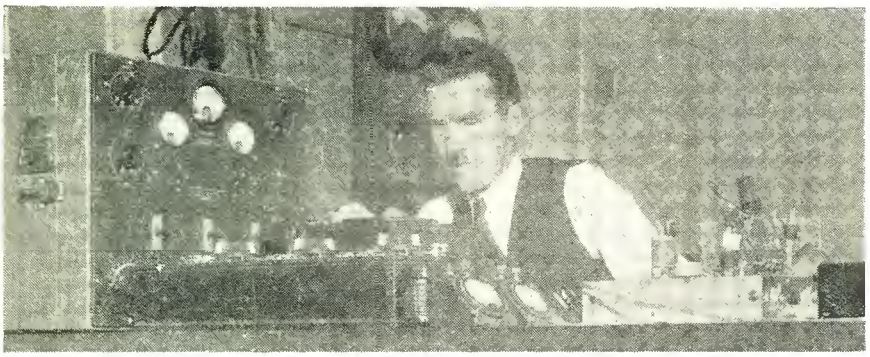
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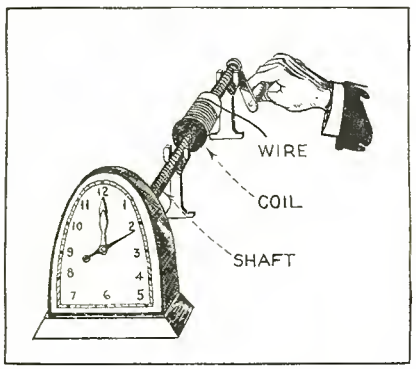
WITH THE EXPERIMENTERS

S. GORDON TAYLOR

Novel Counter for Coil Winder

I find that a good substitute for a turn counter in winding multi-turn coils is an electric clock. The one I use is of the dollar variety. The starter handle on the rear of the clock is coupled directly to the coil-winder shaft, and for each revolution of the coil the clock will register one second by the second hand. Sixty turns is registered as one minute, and 3600 turns register one hour.

This makes an easy-reading automatic counter. A flexible cable such as used in automobile remote-control cables could be

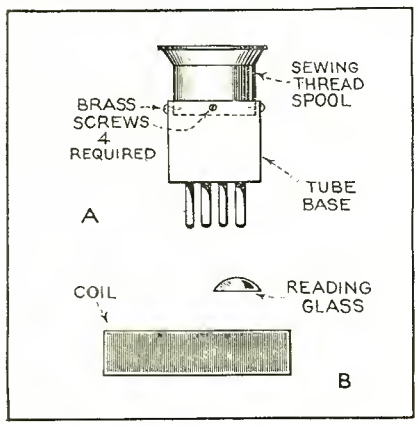


used for mounting the coil winder in front of the clock, or a mirror could be so placed that the face of the clock can be watched while winding.

STEVEN S. ERICKSON,
Evanston, Ill.

S.W. Coil Kinks

Short-wave experimenters should find this coil handle very useful. Simply cut an ordinary large-size sewing thread spool



in half, as shown in drawing "A," and fasten it inside the tube base by means of four small brass screws or tacks.

This type of plug-in form with handle also makes an ideal connector plug for short-wave adapters, etc., the cable being brought out through the hole in the end of the spool. It might be a good idea to give the handle a coat of varnish to improve the appearance and to make it non-absorbent.

Drawing "B" shows how the number of turns on r.f. chokes, broadcast coils, etc., can be easily counted, if the windings are magnified by means of a fairly high-power reading glass.

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

Handy Tube Puller

Removing tubes from some compact and motor-car receivers is not always an easy matter, but a remedy is suggested in the following information from the Philco

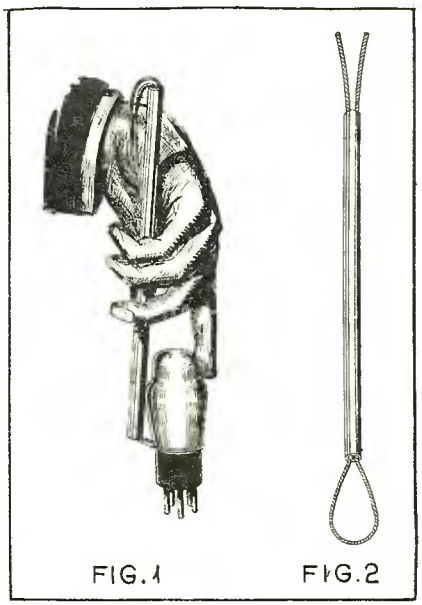


FIG. 1 FIG. 2

Transitone Service Bulletin on a convenient, inexpensive vacuum-tube puller.

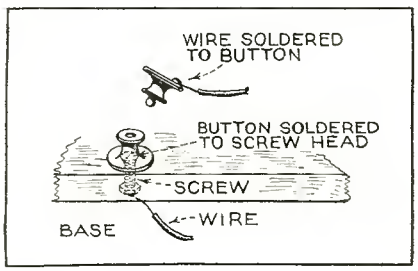
A wire cable or strong cord, about 36 inches long, is looped through a metal tube. The loop should be large enough to pass over the tube and the metal tube so placed that the end is almost even with that part of the tube where the glass envelope joins the base. The excess cable is then pulled back over the end of the metal tube.

It is now only necessary to pull on the tubing. The index finger of the hand should be placed on the other side of the tube to aid in guiding it out. If this is not done there is a tendency to pull the tube out at an angle, causing it to bind.

Some servicemen may want to try it another way. Instead of looping the cable through the tubing, just thread one end of the cable through and make a slip-knot on the end of the cable. The rest of the operation is the same as that described in the drawing.

Connecting Clips Made from Snap Buttons

The experimenter trying different circuits finds binding posts an inconvenience when making frequent changes of connections. The device herewith illustrated provides a simple solution to the problem. An old pair of snap type cuff or glove buttons or the snap buttons employed on women's dresses are employed for the purpose, with



one-half of the button fastened to the equipment while the other half is connected to the battery lead. By snapping the two halves together, a good electrical connection is made. To fasten the button to the base-board, one half of the button is soldered to the head of a mounting screw as shown in the drawing.

Leakage Measurements of Electrolytic Condensers

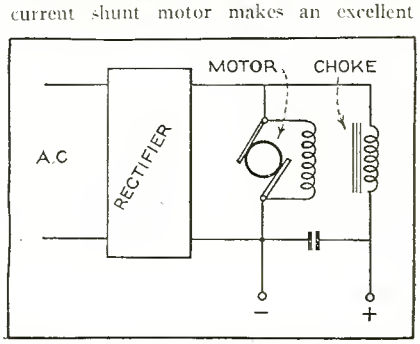
In the item, "Testing Electrolytic Condensers," which appeared in the Experimenters Department of the September, 1933, issue of RADIO NEWS, the 0-250 milliammeter will not give accurate leakage measurements and where an accurate reading is required, a lower range 0-10 or 0-25 milliammeter should be substituted for the higher range instrument as soon as the leakage drops sufficiently to permit the use of the lower range instrument.

To avoid damage to the low range meter, care should be taken not use this instrument when a.c. is connected across the circuit.

WILLIAM RAZIM,
Jamaica, N. Y.

A Filter for Heavy Currents

The conventional method of filtering rectified a.c. current is by means of chokes and condensers. This method becomes somewhat expensive and difficult with currents greater than one or two amperes. The writer has found that a small direct-current shunt motor makes an excellent



filter for certain applications. When such a motor is connected, without load, across the rectifier, the inertia of the armature will keep the speed virtually constant

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throughout the cycle, and therefore the voltage across the brushes is practically constant. Running as a motor during that part of the cycle when the voltage from the rectifier is above the average value, the machine returns power to the circuit as a generator when the voltage drops below average. A small filter of the choke-condenser type is required to eliminate commutator ripple.

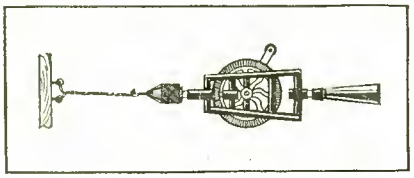
The use of a motor-filter of this type will raise the output voltage by as much as 73% (with half-wave rectification and no load) and in this respect the motor-filter is analogous to the input condenser of an ordinary two-stage filter, with the energy stored in a rotating armature instead of a dielectric or magnetic field. The voltage regulation of the filter will improve as the size of the motor is increased, but larger losses will then result.

This idea has proved of value in such applications as lighting mercury-vapor lamps from a half-wave source, operating electromagnets, dynamic speaker fields, etc.

CHARLES D. SAVAGE,
Portland, Ore.

Simple Way to Twist Leads

Many experimenters find it necessary to make their own twisted pair and they find it difficult to twist the wires uni-

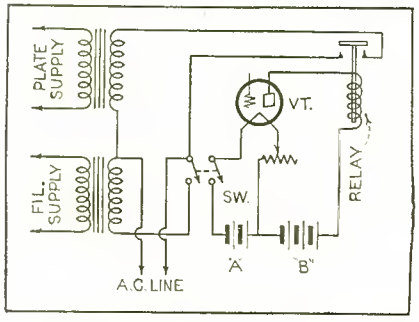


formly. This problem is easily solved by using an ordinary hand-drill. First, take a piece of hook-up wire with a length slightly greater than twice that of the desired twisted pair, and fasten its ends to two nails placed about one inch apart in the wall. Now take a hand-drill, insert a hook in the chuck in place of a drill, loop the wire over the hook and crank the drill. In this way uniformly twisted wire may be made in a few minutes' time.

Vacuum Tube Delay Switch

In the accompanying diagram, a vacuum tube is used to serve as a delay switch. As all of the parts used in it are standard, it may be hooked up and timed in a short time.

L1 and L2 are any loads such as plate and filament transformers, which are to be turned on a few seconds apart. Of course they need not always be operated from a common source as shown. When the d.p.s.t. switch is closed, current will flow through the load L1 and the filament or heater of VT. When this filament or heater has reached a sufficiently high



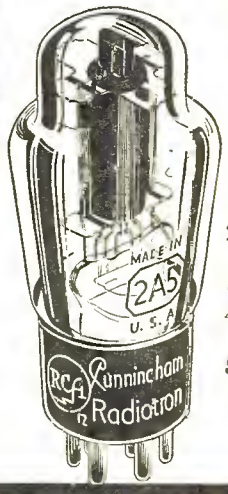
temperature, the tube will pass enough current to operate the relay and cause current to flow through the circuit L2. The time lag will be governed by the type of tube chosen for VT and by varying R1.

(*Continued on page 625*)

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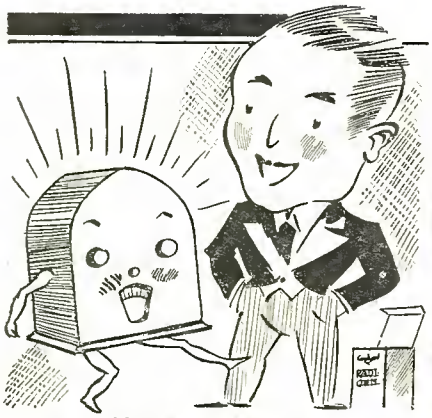
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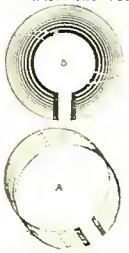
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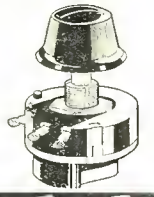
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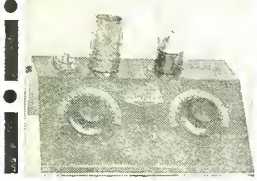


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What's New in Radio

(*Continued from page* 609)

Fifth Ave., New York City.

Dual Buttonhole Microphones

Description—The photograph shows two Universal double-button lapel microphones corded together, an arrangement which allows the speaker complete freedom to move around the platform and address his

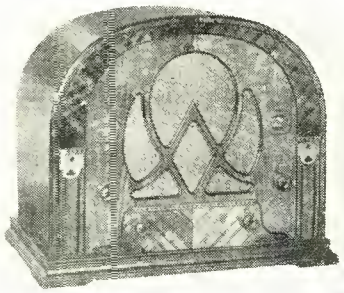


audience in a natural manner and still maintain constant volume level. The microphone is sturdily constructed and the cord terminals are securely held by screws in metal anchors imbedded in the polished bakelite housing.

Maker—Universal Microphone Co., Ltd., Inglewood, Calif.

Midget Receiver

Description—An attractive seven-tube superheterodyne set featuring tone control, automatic volume control and an improved eight-inch dynamic type speaker. In addition to broadcast reception, the set

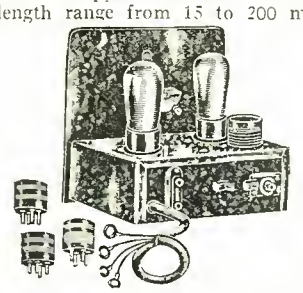


provides police, airplane and amateur signals. The following type tubes are utilized: three –58's, one –55, one –56, one 2A5 and one –80 type rectifier.

Maker—Atwater Kent Mfg. Co., Philadelphia.

Short-Wave Receivers for the Beginner

Description—This company offers complete construction kits on a two-tube battery-operated and a three-tube a.c.-operated short-wave receivers. The illustration covers the battery job, which employs two type –30 two-volt tubes. The kit includes all the parts, a drilled crystal finish metal chassis and panel and a set of building instructions. The a.c. receiver employs two –56 type tubes and an –80 type for rectification. The receiver chassis measures 7 inches long by 5 inches wide by 2½ inches deep. The measurements of the power pack, a separate unit for the a.c. receiver, are 7½ inches long by 3¾ inches wide by 2¾ inches high. The plug-in coils supplied with the kit cover a wavelength range from 15 to 200 meters.

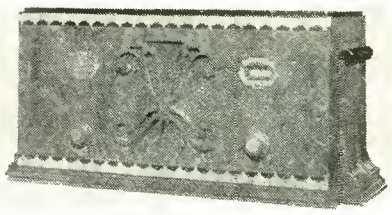


Additional coils can be had up to 625 meters. For those who do not care to build their own, the receivers are available completely wired, ready for operation.

Maker—Harrison Radio Co., 142 Liberty St., New York City.

An Attractive Mantle Type Reeeiver

Description—This artistic "book-end" midget cabinet houses the new Zenith Challenger model 707 six-tube superheterodyne receiver. It measures 17 inches long by 2 inches high by 6½ inches deep. The receiver is equipped with

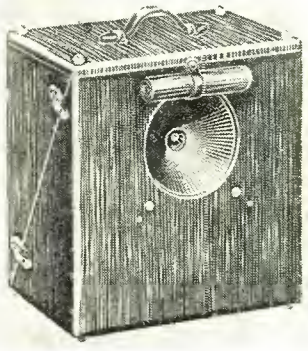


automatic volume control, a six-inch dynamic type speaker and it employs the following type tubes; one –56, one –57, one –58, one –59, one 2A6 and one –80 type rectifier.

Maker—Zenith Radio Co., 3620 Iron St., Chicago, Ill.

Portable Public Address System

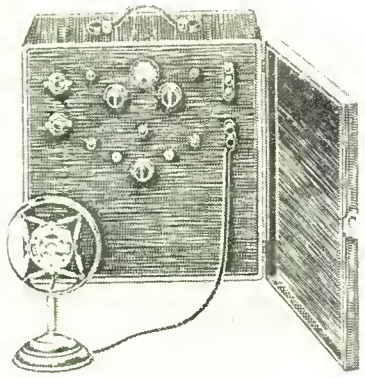
Description—This new Lafayette dual-speaker portable public-address system should have unusual interest for the radio dealer and serviceman as a profitable item for rental or permanent installation in schools, restaurants, auditoriums, window demonstrating, etc. The complete system is self-contained in two handy carrying



cases. The two 12-inch-size dynamic type speakers together, conveniently form one case measuring 18¼ inches wide by 18¼ inches high by 13¼ inches deep. The amplifier case is the same as the speaker case in height and width, and its depth is 11¼

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inches. This unit contains a built-in mixing panel which is equipped with a master switch and control, tone control and a phono-mike changeover switch. The four-tube amplifying system employs the 2A3 type tube in the push-pull power stage to deliver 10 watts output. A –57 type tube is used in the first stage and a type –56 is

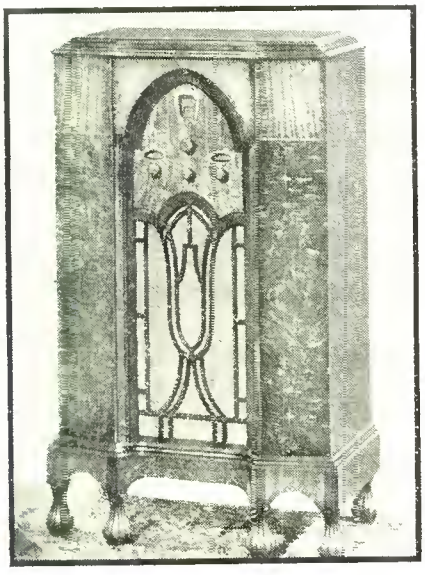


used for rectification. Each speaker is provided with a 50-foot extension cable. The microphone used is the standard Lafayette model 25.

Maker—Wholesale Radio Service, 100 Sixth Ave., New York City.

Console Receiver

Description—This new fourteen tube superheterodyne console receiver, with dual wavelength range of 540 to 1675 kc. and 1675 to 4300 kc., covering the regular broadcast programs and the police, amateur and aviation signals, was recently introduced by the Crosley Radio Corporation. The manufacturer points out the following refinements with which the set is equipped: meter tuning, static control, continuous tone control, large auditorium type dynamic speaker and a Class A parallel push-pull power stage. Its tube equipment consists of five –58's for the r.f. amplifier, oscillator, modulator, two-stage i.f.



amplifier and the a.v.c. amplifier, one –55 diode and meter tube, three –56's for the audio amplifier, q.a.v.c. circuit, and as an audio phase shifter, four –45 output tubes and one 5Z3 type rectifier. The cabinet measures 41¼ inches high, 26 inches wide and 15 inches deep.

Maker—Crosley Radio Corp., Cincinnati, Ohio.

Portable P. A.

(*Continued from page 603*)

in the circuit with the exception of the aforementioned speaker coupling unit.

By referring to the circuit diagram Figure 2, it will be seen that a 53 type tube is used as a triode in the first stage and its output is resistance coupled to a type 53 tube which is employed as a phase inverter and a resistance coupled amplifier. The push-pull resistance coupled power stage is of the Class A type, using the 2A3 type tubes.

In the second stage, the two triode sections of the 53 are used individually. The input from the first stage is fed to the grid G1 and the ouput of the plate P1 is not only resistance-capacity coupled to one of the 2A3 type tubes but part of this output is fed through a capacity-resistance network to the second grid G2. Very little power is taken from plate P1 to drive G2 as the resistance network has a total of 1,060,000 ohms to ground and the values are so chosen that both plates impress the same voltages upon the corresponding grids of the output tubes, and as these two voltages are exactly out of phase, true push-pull resistance coupling is obtained.

The 2A3 type power tubes, Class A, with semi-fixed bias are capable of delivering an undistorted output of 12 watts. The semi-fixed bias is obtained partially by the speaker field being used as a bias resistor and partially by a stabilizing voltage obtained through a 10,000 ohm 10-watt resistor connected to the end of the first filter choke. From this same point the power supply voltage is taken to the output tubes, all other tubes being separately filtered. Note that the second 53 tube has a large cathode by-pass condenser of 50 mfd. 25 volt rating, to prevent regeneration or oscillation.

The secondary winding of the speaker transformer is tapped at 8, 4 and 2 ohms. Two of these taps are brought out to the speaker socket so as to permit the ready connection of one or two speaker coils. The 600 ohm speaker field may be replaced by two 1200 ohm speaker fields, provided they are so designed as to obtain full excitation at 62 volts.

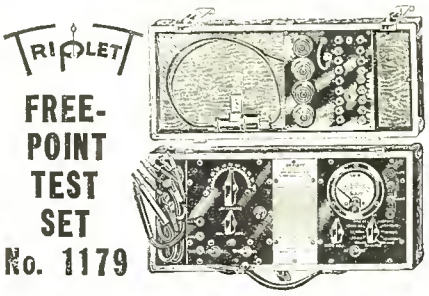
The value of all the condensers and the resistors are shown in the schematic circuit diagram. The following is a list of the remaining parts and accessories. The complete equipment is made available to RADIO NEWS readers by Coast to Coast Radio Corporation.

List of Parts

Ch1, Ch2—Type 6167 filter choke, 200 ohms, 125 ma. 30 henry.
DP1, DP2—Type E6516A double potentiometer, 500,000 ohms.
SW1, SW2—s.p.d.t. toggle switch.
SW3—s.p.s.t. toggle switch.
T1—Type 6164 2-button microphone
T2—Type D 2376 output transformer.
T3—Type D2020E power transformer.
TC—Type D1280 tone control.
VT1—6-prong socket.
VT2—5-prong socket.
VT3, VT4—7-prong socket.
VT5, VT6, VT7—4-prong socket.
Utah type D1166E dynamic speaker.
Astatic crystal microphone, type D-104, or Universal carbon microphone.
Astatic crystal phonograph pick-up, type S-8.
4½ volt C battery.
Phonograph motor turntable.
Type E690 carrying case, 21 inches long by 15½ inches wide by 14½ inches high.
Control board, speaker extension cable, miscellaneous wire and hardware.



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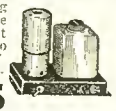
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Lesson 28

Self-Inductance

WHENEVER an electric current flows through a wire, there is a magnetic field produced around the wire, the direction and intensity of the field depending upon the direction and strength of the current flowing. If the current is varied in any way, the magnetic field also varies correspondingly. This varying field sets up in the wire itself a counter or self-induced e.m.f. which always opposes the change which produced it. (Lenz's law.)

The effect of the self-induced e.m.f. in a wire may be illustrated by the following experiment. Connect up the solenoid of 100 feet of wire used in Art. 101, a switch, a voltmeter and a battery as shown at (A) of Figure 1. The voltmeter connected across the coil should have a suitable range for the particular battery voltage employed. When the switch K is closed, the voltmeter assumes a steady deflection, since the current flows in the direction shown by the solid arrows. Upon opening switch K, a very large deflection of the voltmeter occurs. The deflection is always in a direction opposite to the steady deflection caused by the battery current. This shows that after the main circuit containing the battery has been opened, and while the current is dropping to zero or the magnetic field is vanishing, a *momentary e.m.f.* is induced in the coil in such a direction as momentarily to maintain the current flowing in the coil. The current would therefore tend to flow from C to D in the coil and would thus have to flow into the meter in the direction shown by the dotted arrows. The meter therefore deflects in a direction which is opposite to the direction in which it previously deflected.

An electromotive force which is induced in a circuit by reason of a variation in the value of the current in the circuit is called an *electromotive force of self-induction.*

Since the self-induced e.m.f. opposes any change whatever in the current flow, it is evident that the result is that it takes a longer time to build up the current to its final value when e.m.f. is applied, and a longer time for the current to fall to zero when the e.m.f. is removed, where this effect is present to any great extent in a circuit. The effect is somewhat similar to that of *inertia* in mechanical devices, the inertia tending to oppose either an increase or a decrease in speed of motion.

The effects of self-induction are very marked in circuits having the form of a helix, for in these circuits the added effect of the various turns creates a considerable magnetic field within the coil; the magnetic field of every turn cuts many adjacent turns, and the counter-e.m.f. is increased. The magnetic effect of a great length of wire is thus concentrated into a small space. Whenever strong self-induction is desired, the conductor is wound up into the form of a solenoid having a large number of turns as shown at (B) of Figure 1. This greatly increases the magnetic field produced by the current flowing through the coil, and so increases the self-induction effect.

Since the effect of self-induction is due to the generation of a counter-e.m.f. in the circuit due to the action of its own magnetic field, we should expect that its effect would be proportional to the rate at which the lines of force link or unlink with the circuit, just as in the case of the generation of e.m.f. in an electric generator.

The self-induction effect of a coil or wire, by which it tends to prevent any change in the current flowing through it (whether the current is starting and then increasing, or decreasing and coming to a stop, or changing its direction of flow), is called its *inductance.* The unit of *inductance* is called the *henry* (h), named after Joseph Henry, the famous experimenter who independently discovered the effects of electromagnetic induction only a few months after Faraday.

When a current change of one ampere per second in a circuit produces in it an induced e.m.f. of one volt, the circuit is said to have an inductance of one henry.

The symbol for inductance is L. The definition of the henry may be stated in algebraic form as follows:

$$L = \frac{E}{I't}$$

in which L is the inductance in henries, E is the induced e.m.f. in volts and I't is the change in current in amperes per second.

Except for the larger sizes of iron-core coils, the *henry* (h) is a larger unit of inductance than it is convenient to use. Therefore, most air-core radio inductances are measured in millihenries (mh.) and microhenries (μh). One millihenry is equal to one-thousandth of a henry. One microhenry is one-millionth of a henry.

Inductance is sometimes found as an inseparable part of some electrical device or circuit. Thus, in a transformer, both the primary and secondary windings possess inductance. The inductance of the secondary winding of tuning transformers or coils used in radio receivers is an important factor which determines the frequency or wavelength range to which they may be "tuned" with a given tuning condenser. In some cases, inductance is purposely added to a circuit, as in the case of antenna loading coils, choke coils, etc. Devices which are purposely added to introduce the element of inductance to a circuit are called *inductors.* However, it has become a practice in radio and electrical work to call such devices by the names of choke coil, impedance coil, inductance coil, inductance, reactance coil, etc. Thus it is common to hear of radio-frequency choke

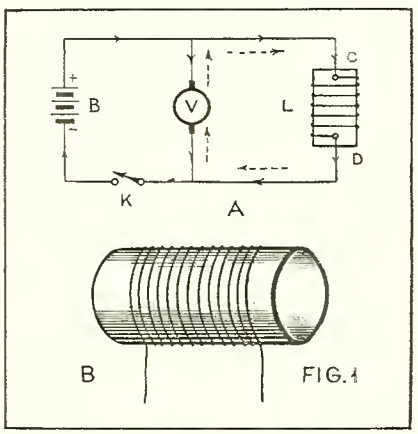


Figure 1. (A) Circuit for showing self-inductive effects. Forms of inductors used in radio work. (B) Air-core inductor of 200 microhenries or so

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

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coils, filter chokes, etc. In this series an attempt will be made to use both the standard term *inductor* and the terms in common usage, in a way which will enable the student to become thoroughly familiar with all of them.

It is evident that the cause of self-induction is due to the property possessed by the wire or coil by reason of its *physical* arrangement, such as number of turns, shape of coil, permeability of magnetic path of core, etc. This should be kept in mind. A coil or wire possesses the property of inductance whether a current is passing through it or not (although the inductance of an iron-core inductor may be decreased by magnetic saturation of the core due to too much current flowing in the winding). Of course, the exact inductance value depends on the many factors mentioned above.

The self-inductance of an *air-core* solenoid is approximately

$$L = .0251\ d^2\ n^2\ l\ K \times 10^{-9} \text{ henries}$$

where L = inductance in henries
d = mean diameter of solenoid in inches
n = number of turns per inch
l = the length of the solenoid (when wound) in inches
K is the form-factor (Nagoaka's correction factor) which depends for its value on the ratio of the diameter to the length of the winding

If L is to be expressed in *microhenries*, this formula becomes

$$L = .0251\ d^2\ n^2\ l\ K$$

Inductors of various shapes, numbers of layers, etc., can be calculated by special formulas which have been developed. The student will find these in Bulletin 74 of the United States Bureau of Standards. If iron is introduced in the magnetic circuit, the inductive effect is of course increased greatly, depending upon the permeability of the iron employed. The permeability of air is 1; that of iron may be as high as 25,000 to 100,000 or more. This means that the inductance of a given coil may be increased 25,000 times or more by winding it on a core of high permeability iron or special alloy. Of course the iron must form the *complete* path for the magnetic lines of force, or the increase in inductances will be less than these values.

In some cases iron cannot be used for the core, on account of the excessive eddy current and hysteresis losses which occur if the current and flux are changing rapidly. This is particularly true in radio-frequency inductor or choke coils used in radio equipment. The induced voltage across an inductor depends upon the *rate* at which the current is changing, and the inductance of the coil. If the current changes rapidly, the induced voltage will be very much greater than if it changes slowly.

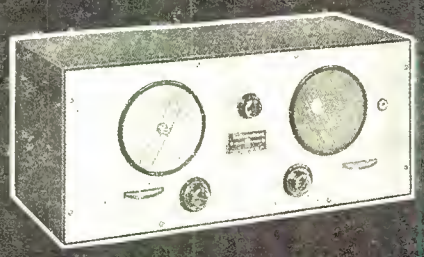
"Hams" to the Rescue

(*Continued from page 586*)

sending message after message, in freezing weather, to turn to the amateurs in the United States and Canada to help him. While it was luck that we were the ones to receive it (any 'Ham' anywhere would have done the same and felt it his duty to deliver the message, Lymburner displayed both courage and perseverance in staying at the key till his message was delivered.

"When it was over, Art and I could relax, and we both decided it was a thrilling experience and were very glad to have been of help to someone relying on radio to effect the rescue from an extremely perilous situation."

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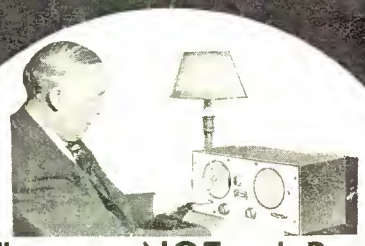
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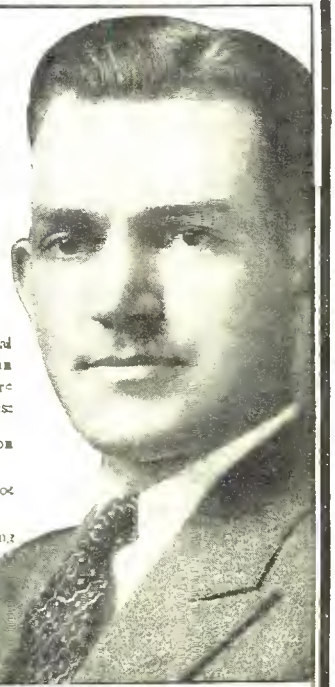
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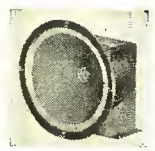
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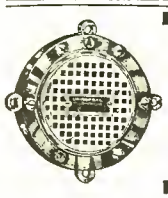
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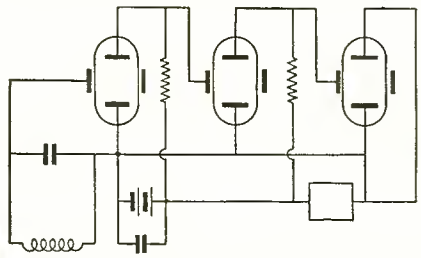
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LATEST RADIO PATENTS

BEN J. CHROMY*

1,901,558. CASCADE AMPLIFIER. AUGUST HUND, West Orange, N. J., assignor to Wired Radio, Inc., New York, N. Y., a Corporation of Delaware. Filed July 22, 1930, Serial No. 469,805. 3 Claims.

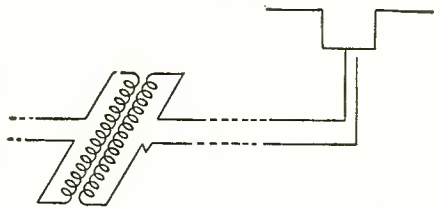
1. An amplifier system comprising, an input circuit, a plurality of photoelectric cells, each of which includes an interior



anode, an interior cathode, and an exterior grid; and an output circuit, said photoelectric cells being directly connected in tandem from plate to grid.

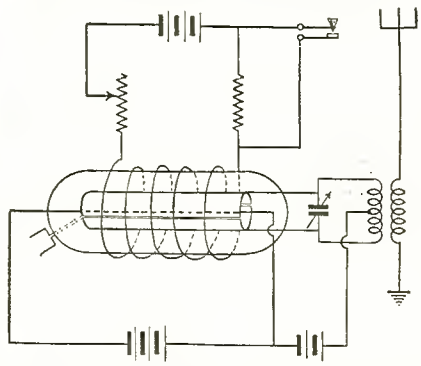
1,905,792. TRANSMISSION SYSTEM. EDMOND BRUCE, Red Bank, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a Corporation of New York. Filed Mar. 20, 1929. Serial No. 348,435. 6 Claims.

1. In combination with a transmission line, a second transmission line, means



comprising an antenna for causing high-frequency current to flow in the first-mentioned line, and means comprising a reflector for causing high-frequency current to flow in the second line, said currents being of relatively opposite phase and the spacing of said lines being small as compared with the wavelength of the said current.

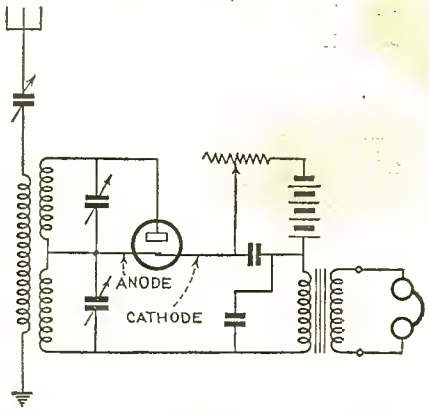
1,901,112. SIGNAL TRANSMITTING MEANS. ELMER D. MCARTHUR, Schenectady, N. Y., assignor to General Elec-



tric Company, a Corporation of New York. Filed Nov. 20, 1928, Serial No. 320,709. Renewed Oct. 15, 1932. 6 Claims.

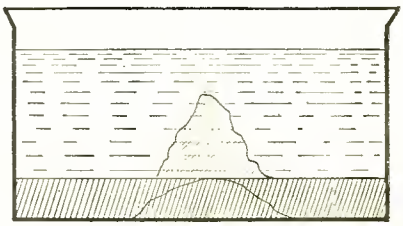
1. The combination, in a high frequency transmitter, of an electron discharge device, having a cathode and a plurality of anodes, said anodes being symmetrically arranged with respect to the cathode and adjacent thereto, an oscillatory circuit connected between said anodes, means for producing a unidirectional magnetic field between said anodes, said magnetic field being independent of current in said oscillating circuit, and means for varying said magnetic field in accordance with the signal to be transmitted thereby to vary the intensity of the oscillations produced in said oscillatory circuit.

1,905,873. DETECTOR CIRCUIT FOR THREE-ELEMENT GASEOUS DISCHARGE TUBES. AUGUST HUND, West Orange, N. J., assignor to Wired Radio, Inc., New York, N. Y., a Corporation of Delaware. Filed Oct. 30, 1931. Serial No. 571,989. 9 Claims.



1. A radio-frequency detector comprising a gaseous discharge device having an anode, a cold cathode and a control electrode, a tuning device connected to said gaseous discharge device having a high-frequency primary inductance and two secondary inductances, said secondary inductances forming respectively branches of two independent resonant circuits, one of which includes the control electrode and one of the other electrodes of said gaseous discharge device and the other of said resonant circuits being in circuit with the anode and cathode of said gaseous discharge device, and means to demodulate signaling energy through the effect of ionization in said device.

1,906,758. CRYSTAL AND METHOD OF PRODUCING THE SAME. BENGT KJELLGREN, Cleveland, Ohio, assignor to The Brush Development Company,



Cleveland, Ohio, a Corporation of Ohio. Filed Apr. 27, 1929. Serial No. 358,629. 14 Claims.

1. The method of producing crystals, which consists in cutting a seed crystal from a crystalline mass in pre-determined relationship to the crystalline axes of said mass, planting said seed in a depression

* Patent Attorney, Washington, D. C.

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in the bottom of a vessel containing a solution of the salt to be crystallized so that the salt solution will crystallize on the exposed surface of the seed, and causing said solution to crystallize on said seed.

11. The method of producing crystals long in length and narrow in width, which consists in determining the crystalline axes of a crystalline mass, cutting a seed portion from said mass parallel to the major longitudinal axis of the mass, planting said seed in a solution of the salt to be crystallized and causing said solution to crystallize on said seed.

With the Experimenters

(*Continued from page* 619)

A lag of from a fraction of a second to several seconds may be obtained with this hook-up. The grid of the tube may be left unconnected as shown. The relay must be of the type which will operate at a few milliamperes, and sufficient B battery voltage employed to pass this required current through the tube plate circuit.

John W. Deely,
Springfield, Mass.

Poor Notes

(*Continued from page* 600)

supply filters show the effects of both complete and incomplete filtering. The latter causes the signal's wave to become modulated, which, of course, is objectional, for it produces interference quality; i.e., new frequencies appear above and below the carrier frequency. Accordingly, the importance of the plate supply and plate voltage regulation is plainly seen.

The Service Bench

(*Continued from page* 617)

that a new socket has to be put in. These failures due to water in the set may cause all three breakdowns at the same time, so that when one occurs it is a good idea to check up on the rest."

In further reference to vibrator noise, Louis Warren of the United Radio Service, Sioux Falls, S. D., recommends a check on the lead-in. He points out that it is important that it be shielded all the way to the first r.f. coil and that the shield be properly grounded to the chassis. Mr. Warren continues in reference to the—

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(*Continued on page* 636)

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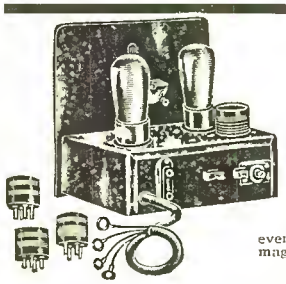


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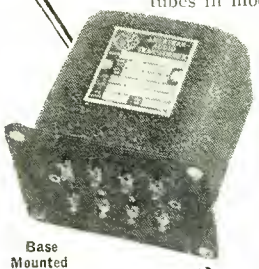
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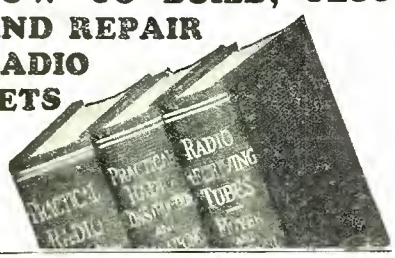


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QRD? QRD? QRD?

CONDUCTED BY GY

ALTHOUGH man-made inventions have alleviated much of the fear of the triple threat of fire, water and winds to seagoing men, there are still ships listed in Lloyd's Register as "missing" or "unaccounted for." Ships which left some port for a fixed destination and never heard from again. No trace of wreckage, lifeboats or seamen to give mute testimony to another sea disaster. Such was the fate of the USS Cyclops, a collier, which theoretically vanished into thin air and such would have been the fate of the SS Nevada but for the alertness of her operator and the cooperation of the operator on the Oregon Maru. The vessel, broken in three clean parts, drifted slowly apart until the providential shifting tides carried one of them to the low-lying reef upon which were cast the three only survivors, who gave an account of what had happened. The operator gave his life by sticking to his key until the generators died.

As one radio operator stated, "Mrs. Lindbergh is one darn good brass pounder, and when one operator compliments another, especially a woman, that is news." From the moment their long flight, which is now history, started, she was in continuous communication with some radio station en route and only once requested information as to her position. Their 20-watt job held up perfectly and at one period of their flight signals were received at Pan-American Airways, in Miami, so clearly that they were redirected through a telephone directly to the New York office in the Chrysler Building. The signals not only traveled 4,000 miles to the Miami station but continued 1,200 miles more over an ordinary telephone line. During their 1,800-mile jump from Bathurst, Africa, to Natal, Brazil, direction finding, weather reports and emergency storm warnings were picked up by Mrs. Lindbergh, without fail. The radio equipment on the plane were a standard short wave Xmtr and receiver and an emergency outfit.

Harold D. Hayes, radio inspector for the FRC at Chicago, recently recalled a radio experiment in which he was a principal actor. He went up in a captive balloon to a height of 2,000 feet from the bright lights of the city of Los Angeles and was able to copy the position message of the SS Siberia which was then two days west from Honolulu. This was considered to be a great achievement but later on proved it possible to transmit from this same height and be able to do this without any ground connections whatsoever. In those days it was believed absolutely necessary to have a wire trailing on the ground or through the water. But this was 20 years ago.

Now that most of the New Year's resolutions have been broken, we wonder if just one has been kept. We refer to that resolution which every operator makes, "I will study my job *better* so as to be ready for the *next rung on the ladder*. I will get some *course of study* so that I might be a power in this art and not just another operator." Ye Ed has always been an advocate of bettering one's position by the persistent study of advanced methods and latest developments in radio which are appearing every day. Experiments are being conducted continuously for the purpose of bettering radio reception, gaining greater and yet greater distances for transmission, making it more practical and safer for ships at sea through *facsimile* work, television, new tubes, etc. and etc. These new developments demand *study of the proper type* before one can grasp their intricate assemblies or their methods of operation. It cannot be picked up over-night by the average operator nor can it be absorbed by looking over its complicated mechanism with just a faint knowledge of basic principles.

A course of programmed study is absolutely necessary and for this purpose we have schools, either residential or correspondence, which through years of practical experience have developed methods of study proven to be successful. Ninety percent of those operators who have reached the fourth or fifth or even sixth rung on the ladder of success invariably give credit to some school study course which gave them the necessary equipment for that job up ahead. The Capitol Radio Engineering Institute, by special arrangement with Ye Ed, have outlined a course of study for those who have had a few years of practical experience in radio. Study, study and then study some more, is the formula to get out of the rut, me hearties.

Among some of the later operators who have made good through this method of study are Wally Hamilton, formerly of the SS Starr, and now with the International Fisheries Commission . . . . Frank King who was transferred recently to be Assistant in Charge of the 5,000 watt WKBW Station . . . . Tony Pastrana was promoted from studio operator, after an examination, to Chief Operator of the plant which placed him in charge of the 10kw. Xmtr and power equipment . . . . H. C. Kern who was formerly stationed at WSEN as operator is now back at that station but with the tag of Chief Engineer attached to him . . . . and so on and on. Which only goes to prove that *the chain attached to the goal* is only as strong as *the will to study*. Catch on?

Well, the boys went and did it! Yep, they went on strike for the rights of an American radio operator to earn a livable wage. As the ARTA puts it, "The rising discontent of commercial wireless operators against the endless chiseling of their wages aboard American ships, with some vessels now paying as low as $45.00 per month, has crystallized in open strike action against the American Merchant Lines, a subsidiary of the powerful International Mercantile Marine. The action was precipitated by a reduction of 25 percent in wages on four ships of their fleet. Every possible form of peaceful protest and attempts at negotiations was undertaken by the ARTA in an effort to restore or compromise the cut, but to no avail, they state. Although a meeting was held with Mr. W. A. Davis, Deputy Administrator of the Marine Code under the NRA, he was unable to do anything to alleviate the situation. The regional Labor Board at New York City has also interceded in the controversy and warned that Washington would *not* look with favor upon this drastic cut, when every other industry has increased their payrolls and production costs to meet the NRA program.

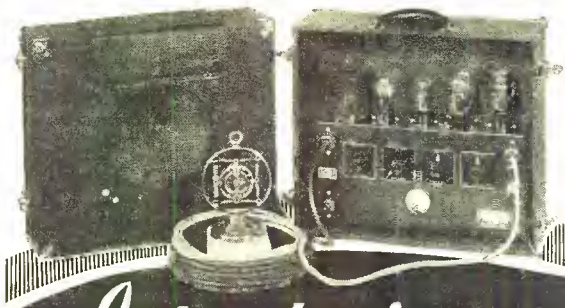
Furthermore, the American Merchant Lines have been drawing a lucrative mail contract from the government to the tune of about one and a half millions of dollars

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annually which, because of the attention this difficulty has drawn from the Administration, might lead to the cancellation of this subsidy. They would most certainly look with disfavor on wage cuts at the present time, which is in total contradiction with the desires of the Administration. The International Radio Telegraphers Association, in which virtually every commercial wireless operator of Great Britain and Europe is organized, has cabled pledging full support and promising to take effective action against non-union operators who sailed on the affected vessels.

Viva los ops, sez we! We are happy that this crisis has come at this time due to it either making or breaking the whole organization of the ARTA. If they win, they will have a 100 percent roster of every operator in the United States, but if they lose . . . . Although there would be no doubt in any mind as to the outcome of this action if the ARTA were affiliated with the American Federation of Labor, it is to be hoped that the Administration will deem it wise to intercede in the operators behalf if for no other reason than to give those men in this profession a New Deal. This column has repeatedly advocated the alliance with an organization which could give to it the help it must have to make successful any fight it may have on its hands by the cooperation of their officials in Washington, their affiliated organizations in the shipping industry and by wise counsel. All of this the ARTA lacks! But for the help the Administration in Washington must give them to carry out their own program of the NRA, this fight would have been hopeless at the start. As it is there is a faint glimmer of hope that there may be a compromise until some future date when the American Lines will again cut wages of operators. The ARTA states, "The American Lines derisively stated that they could get as many operators as they wanted at $50.00 per month." And so would a grown man laugh at a child's threats or demands. But if the child were backed up by a full grown brother the grown man would listen with respect to its demands. He might even hem and haw but in the final would compromise and accede in great measure to the child's wishes. This simile can well be applied to the present situation except that the child is backed up by a distant relation (the NRA Administration) who, although he would like to help the child, remains in the background and argues diplomatically. The American Federation of Labor would have been able to throw its weight into the matter not only through its representatives in Washington but, also, through its affiliated organizations.

Not to be outdone for predicting the trend for the New Year, Mr. E. H. Rietzke of the CREI states that from recent inspections he has found radio factories on excellent schedules of production. The broadcast code requiring ops to be worked not more than 48 hours a week is making jobs for others at broadcast stations. The minimum pay scale, while not ideal, is doing away with many of the serious evils existing at some stations. Increased foreign trade is making more jobs for ops on ships. Many servicemen throughout the country are telling us that they have all the business they can handle. The radio business is gradually pulling itself out of the hole of depression. Keep up the old courage and start the New Year with a feeling of confidence, increase the time devoted to study and prepare to really profit from the improvement that is on its way. And so sez GY, with plenty of 73 for good cheer for the future.



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110v. A.C.-D.C. S.W. (15 to 200 Meters) 3 Tubes—6F7—43—25Z5

Absolutely quiet Built-in Power Supply

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Complete, incl. 4 coils (15-200 m.) less tubes.....$16.95
Set Arcturus Tubes.....3.95
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Verified World-Wide Reception

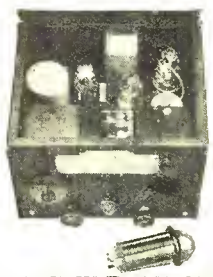
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Complete, less tubes, in rich crackle-finish cabinet. Assembled, wired, tested, ready to plug in, including four coils.$12.95
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110v. A.C.-D.C. S.W. 15-200 meters. 4 tubes: 2-78's, 1-43 and 1-25Z5. Built-in power supply; pair of plug-in coils. Other specifications same as Alan Ace. Complete including 4 pairs of coils, 15-200 m.....$24.95
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ACE and INTERNATIONAL also available for straight A.C. or D.C. 110 or 220, 2 and 6v. battery operation.

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BRING YOUR TESTER UP-TO-DATE

Blue prints, construction and operating instructions by Jack Grand, makes it simple. These blue prints, etc., are for the WESTON 547 and may be used for the *Jewell 409* and *408; the Weston 565*, and the *Supreme 400 series.*

Complete set of prints, construction, and operating instructions. $1.60 Postpaid

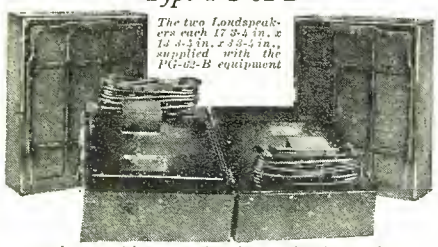
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RCA VICTOR Portable Public Address System

Type PG-62-B



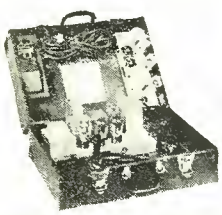
The two Loudspeakers each 17 3-4 in. x 14 3-4 in. x 8 3-4 in., supplied with the PG-62-B equipment

22 in. x 15 1-4 in. x 11 1-8 in. (closed). PG-62-B Carrying Case (open) containing Two Loudspeakers and Cables

Type PG-62-B complete portable public address system, including the famous *Velocity Microphone*, a high grade Class B 20 watt amplifier and two modern dynamic loudspeakers with extension cords—all self-contained in two carrying cases. Operates on 110 volts AC, and is designed to reenforce speech and music. Provision for electrical phonograph input.

Type PG-63 is a less expensive model, employing one loudspeaker and carbon type microphone, and is self-contained in one carrying case.

Write for descriptive folders. Portable electric phonograph units of single and double turn-table types available for either of the above equipments.



22 in. x 15 1-4 in. x 9 in. (closed). PG-62-B Amplifier Carrying Case, opened



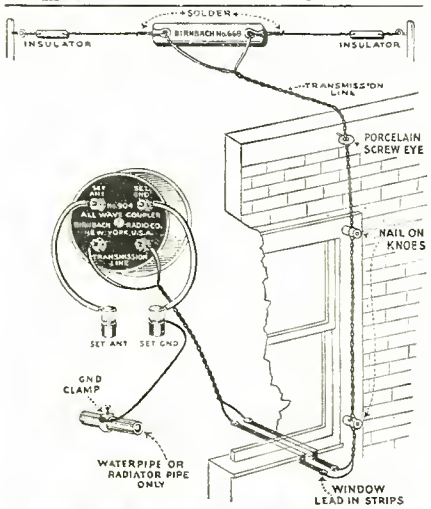
Velocity Microphone and Stand

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All-Wave ANTENNA

ALL-WAVE receivers need this dual antenna system for best results. Increases signal strength and clarity—reduces noises.

Kit includes doublet antenna with transmission line to an all-wave coupler. Ideal system for the reception of broadcast and short waves.

Easily erected. List price $3.75, complete with all parts and instructions. *Write Dept. RN-4 for Complete Data on Birnbach Products.*

BIRNBACH RADIO CO., Inc.

145 Hudson St., New York City

Technical Review

(*Continued from page 615*)

for commercial operators for laboratory, newspaper, police, airport and steamship use.

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

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

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

16. *R.M.A. Standard Resistor Color-Code Chart.* A handy postcard-size color-code chart designed by the Lynch Mfg. Co. to simplify the job of identifying the resistance values of resistors used in most of the standard receivers.

25. *Noise-Reducing Antenna Systems.* Two types of noise-reducing systems perfected by the Lynch Mfg. Co. for both broadcast and short-wave reception.

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

41. *How to Build the "Economy Eight."* A folder prepared by Wholesale Radio Service Co. giving complete constructional information, diagrams, list of parts, etc., of an efficient 8-tube receiver which can be built from a kit which sells for $13.75.

42. *How to Build Useful Servicing and Testing Instruments with Simple, Standard Meters.* How any meter—preferably a low-range milliammeter—can be used to measure amperes, volts and ohms over any desired range through the use of proper shunt and series resistors. The bulletin has been prepared by the Lynch Mfg. Co. and gives both the theoretical and practical data required to make all the calculations to convert or change the range of function of a given meter.

52. *The Servicer.* A monthly house organ published by the International Resistance Co. It contains information designed to help the serviceman do better work and make more money doing it.

Free Technical Booklet Service

THROUGH the courtesy of a group of manufacturers, RADIO NEWS offers to its readers this Free Technical Booklet Service. By means of this service, readers of RADIO NEWS are able to obtain quickly and absolutely free of charge many interesting, instructive and valuable booklets and other literature which formerly required considerable time, effort and postage to collect. To obtain any of the booklets listed in the section herewith, simply write the numbers of the books you desire on the coupon which appears farther down in this column. Be sure to print your name and address plainly, in pencil, and mail the coupon to the RADIO NEWS Free Technical Booklet Service. Stocks of these booklets are kept on hand and will be sent to you promptly as long as the supply lasts. To avoid delay, please use the coupon provided for the purpose and inclose it in an envelope, by itself, or paste it on the back of a penny postcard. The use of a letter asking for other information will delay the filling of your request for booklets and catalogs.

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

APRIL, 1934
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  - ☐ Jobber
  - ☐ Dealer
  - ☐ Servicing Organization
- ☐ Dealer
- ☐ Jobber
- ☐ Radio Engineer
- ☐ Experimenter
- ☐ Laboratory Technician
- ☐ Professional or Amateur Set Builder
- ☐ Licensed Amateur
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I am a ☐ subscriber ☐ newsstand reader.

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

Name.....

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

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59. *The I.R.C. Volt-Ohmmeter.* Characteristics and uses of the International Re-

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sistance Co. volt-ohmmeter, a combination voltmeter and ohmmeter specially designed for the point-to-point method of trouble-shooting.

60. *Audio and Power Transformers and Choke Coils for Use in Public-Address Amplifiers and Radio Receivers.* Complete information on the characteristics of a wide variety of Amer-Tran de luxe and Silcor (popular-priced line) audio and power transformers and chokes.

61. *Replacement Parts for Dealers and Servicemen.* A book, prepared by Wholesale Radio Service Co., listing manufacturer's name and model number of a large number of current model and old type receivers with the recommended replacement power transformers, condenser blocks, volume controls, voltage dividers and audio transformers required for such sets. This catalog is a list-price catalog which servicemen can show their customers when quoting prices for replacement parts.

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

PLEASE NOTE: To avoid disappointment, please make your selection of booklets from the latest issue of RADIO NEWS, since our supply of booklets not listed in the current issue is exhausted. The list and coupon contained in this (April) issue should not be used after April 30, 1934.

Tuning B.-B. DX

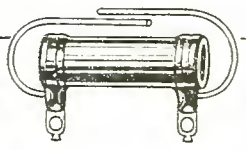
(*Continued from page* 611)

this is especially true of westerly stations but applies with some reservations to others also. During the evening hours distant stations to the north and south can be heard provided local interference conditions permit. The Japanese stations are heard in Australia and New Zealand during these hours. Occasionally powerful South American stations, especially those on split frequencies, can be heard here in the United States at this time.

Hearing European Stations

Later in the night, depending of course on the distance, some stations to the east may be heard with early morning programs. New Zealand listeners hear American stations beginning about 10:30 p. m. local time. Here in America some European stations can be heard, principally German, around midnight and shortly thereafter.

After midnight conditions for the reception of westerly stations steadily improve as a rule and are also good for the reception of stations located to the north or south. The latter stations can sometimes be heard very satisfactorily on special DX programs at these hours. Conditions for the reception of western stations usually continue to improve until daybreak, or as long as the station remains on the air. Thus, in general, the hours just before sunrise are the best for the reception of the Australian, Japanese, and Far Eastern stations here in America, and a similar time is best for the reception of European and African stations in Australia and New Zealand and for the reception of North American stations in Europe.



You'll Praise This New **TEN-WATTER**

COMPACT, wire-wound, vitreous-enameled—a low-priced, efficient, moisture-proof ten-watter that will be welcomed wherever quality with economy is a factor.

Positive, low-resistance contacts through non-oxidizing Monel metal bands and lugs—plus pigtails for convenience. Will withstand high temperature, give long usage and permanent resistance value.

Same type made in three sizes, three ratings and 67 resistance values.

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POWERTONE *Means* "THE BEST IN SHORT WAVES"



FOUR TUBE A.C. *ShortWave Receiver*

With **Built-In Speaker**

15 to 550 Meters

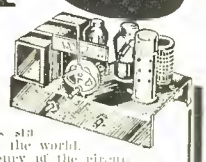
Up-to-the-minute in short wave design. The dynamic speaker and the power supply are both built into the chassis, making the entire receiver one unit.

Thorough tests and confirmations from customers show stations logged from all parts of the world on the hand speaker. Tubes: 2-'58's, 1-'80 and 1-2A5.

A beautiful, modernistic cabinet available to house the entire receiver.

Model R4A-K. Kit of Parts with 4 Bruno Coils.$11.50
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Set of Sylvania Tubes..... 2.25
Modernistic Cabinet 1.50
Bruno Broadcast coil (200 to 550 meters) .89

UNIVERSAL A.C.-D.C. *Short Wave Receiver*



15 to 200 Meters

One of the most popular Powertone receivers. Tunes stations from every corner of the world. Latest tubes increase efficiency of the circuit—1-'75, 1-2A7's and 1-'43.

Three oversized filter chokes assure quiet, humless reception. Smooth regeneration. Simple tuning on the full-vision, slow motion vernier dial.

Cabinet is all-metal, finished in black crystal. Cabinet serves as shield against hand or body capacity. Incorporates the finest parts.

Model U3-K Kit of parts with Cabinet and 4 Bruno Coils $8.95
Model U3-W Wired and Tested, including Cabinet 2.00
Extra Set of Sylvania tubes ... 3.25

Handy Serviceman's MANUAL

An indispensable servicing guide and short wave reference, including many late short wave circuits. FREE with every Powertone receiver purchased.

The Handy SERVICEMAN'S MANUAL

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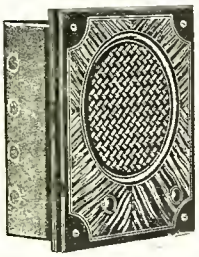
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(*Continued from page* 608)

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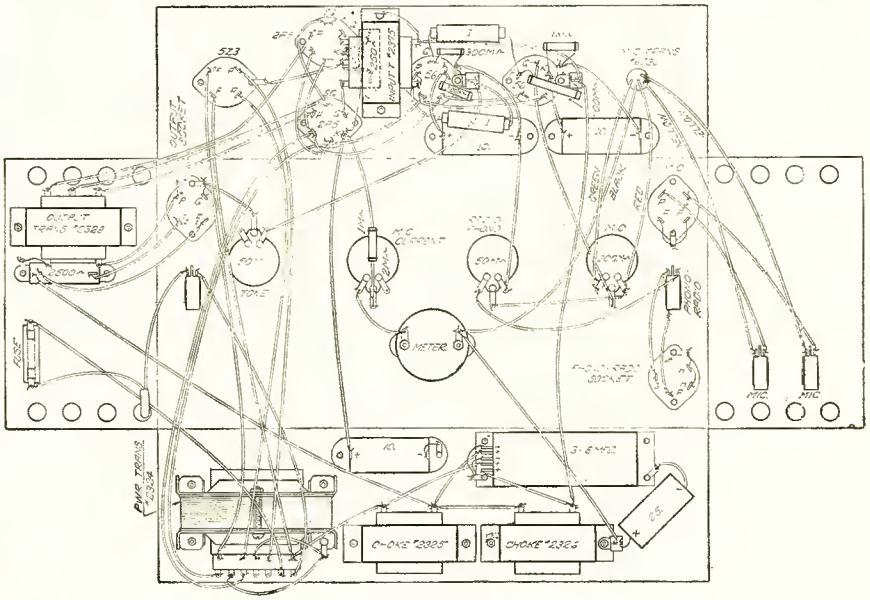


FIGURE 3

The gain of the amplifier is about 90 DB. The microphone input impedance is 400 ohms. Any high impedance phonograph pickup may be used. The input impedance from a radio receiver source should also be high but is not critical; a suitable insulating condenser may be connected from any plate in the audio system of the radio receiver. The output impedance is 500 ohms. The power consumption is slightly under 100 watts, the power supply being suitably fused.

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Two New Tubes

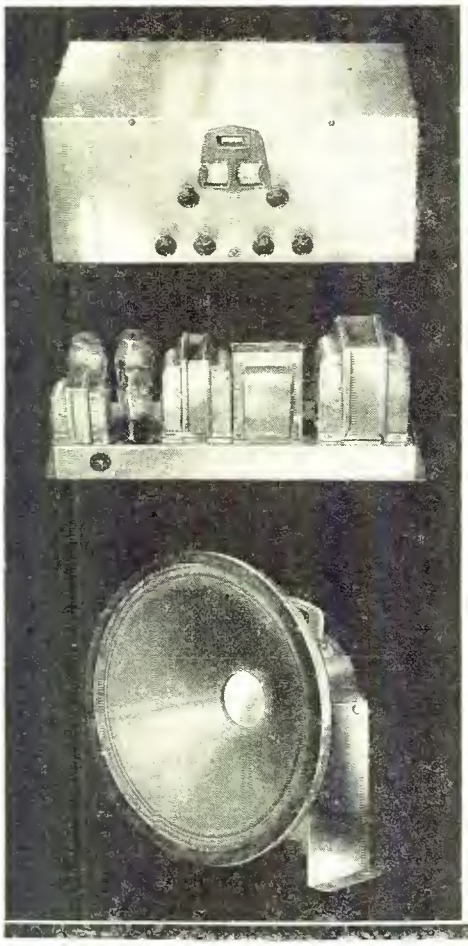
(*Continued from page* 605)

the plate loads and bypass condensers must be selected carefully in order to insure the separation of i.f. and a.f. signals. As the audio signal varies the grid bias over a considerable range, the i.f. amplification varies during the cycle and a distortion is produced. This distortion results in either increasing or decreasing the modulation percentage. If the correct phase relations are employed the system will be stable (the a.f. signal reduces the modulation percentage) but if the a.f. signal on the grid were reversed it would result in motorboating. The right values of voltages and the gain obtainable are shown in the curves of Figure 10.

Figure 11 illustrates a similar circuit, with the addition of a.v.c. and manual volume control. The latter works on the detector as well as the a.f. stage. This system makes use of a transformer with three windings. Coil III and coil II are coupled 100 percent. Coil I and coil II are loosely coupled. The upper section of the potentiometer is across the 5000 ohm resistor and this varies the total resistance in the circuit consisting of winding II, condenser C, and the 5000 ohm resistor—this series circuit is tuned to the intermediate frequency. The volume control then, cuts down the input to the diode. At the same time, the lower half of the potentiometer is a part of the a.f. load and by cutting down this load the a.f. input to the next tube is controlled.

The technical data given here was furnished by engineers of RCA and Cunningham.

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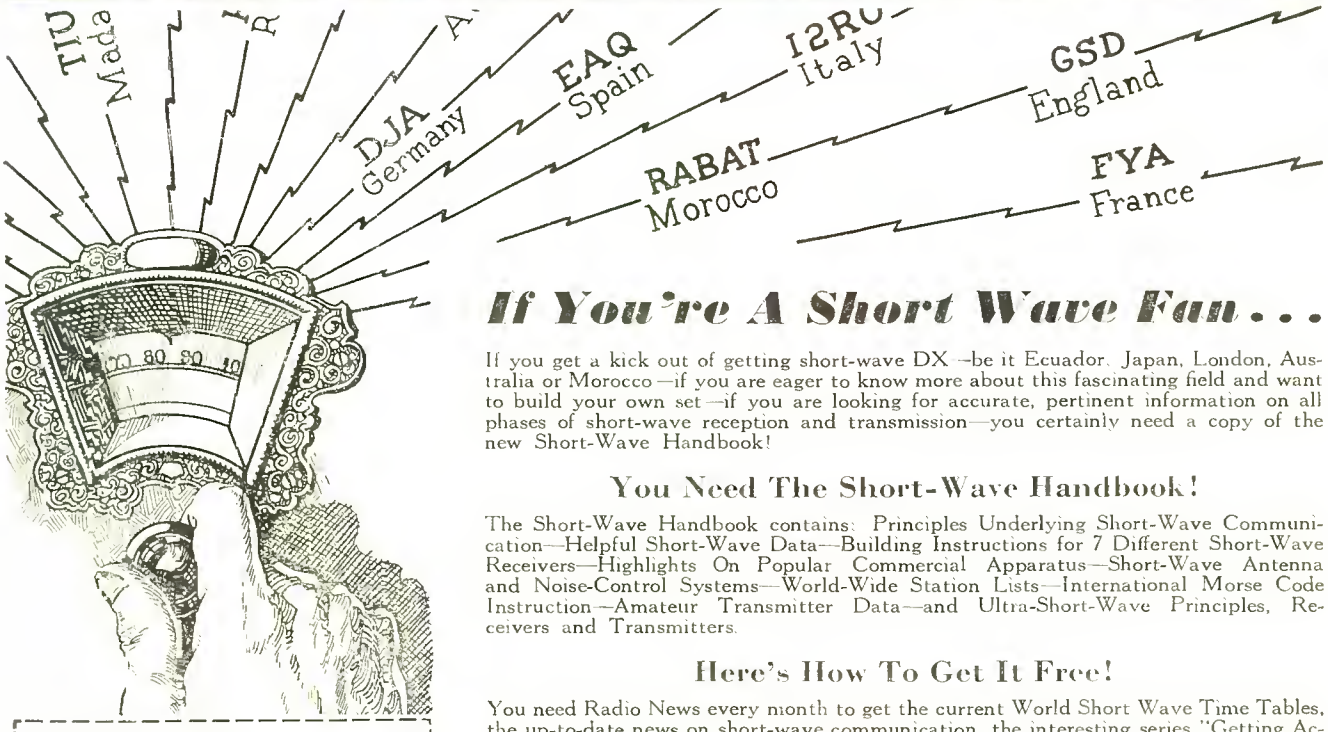
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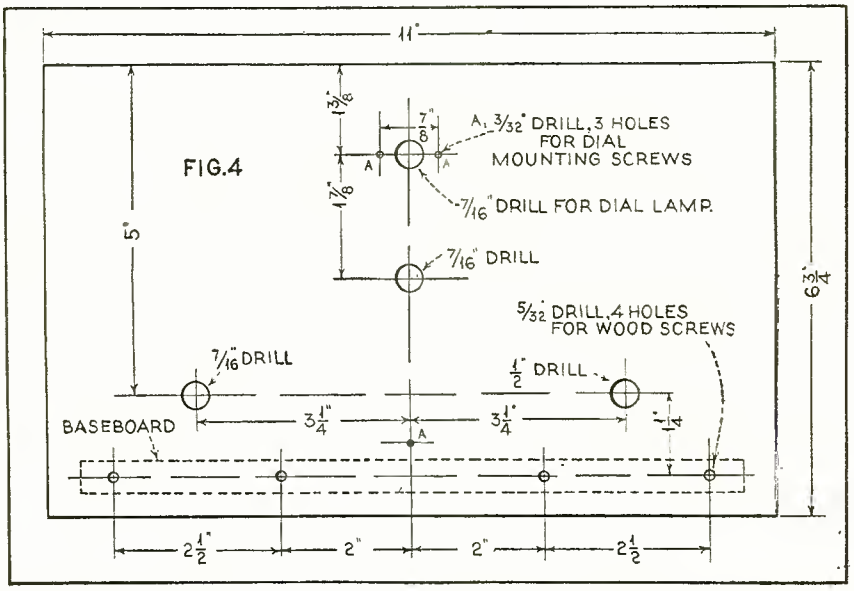
Getting Acquainted With Short Waves

(*Continued from page 595*)

The following parts will be used in the a.c.-operated receiver:

Parts List

One aluminum panel, size 7" x 11"
One base-board, about 10" x 7– deep
C1—National 100 mmfd. variable tuning condenser, type SE100
C2—Fixed-variable 70 mmfd. variable condenser (screw-driver adjustment)
R1—50,000-ohm potentiometer
R2—Lynch 2-watt 5000-ohm pigtail resistor
R5—Lynch 2-watt 2000-ohm pigtail resistor
R3—Lynch 2-watt, 10,000-ohm pigtail resistor
R4—Lynch 5-megohm pigtail grid leak
RFC—National radio-frequency choke coils, type 100
Two National 5-prong sockets (for tubes)
One National 6-prong socket (for plug-in coil)
One National 4-conductor power cable



J—Telephone receiver jack
Three binding posts
One National VBC dial
Trans.—National amplifying transformer, type S101
C3—Mica grid condenser, .0001 mfd.
C4—By-pass condenser, .01 mfd.
C5, C7—By-pass condensers, .5 mfd.
C6—Mica by-pass condenser, .00025 mfd.
L1, L2, L3—National plug-in coils for the wave ranges desired
One bakelite strip for mounting binding posts
Miscellaneous screws, hardware, etc.
One coil flexible hook-up wire
One package bus-bar wire
One National grid grip, type 24 (for connection to top of tube)

In addition to the above parts used in the actual construction of the short-wave set, the following accessories should be acquired:

Accessory List

One type –24 tube for the detector
One type –27 for the amplifier
One type –80 tube for the power supply
One National complete power supply, type 5880-AB, for 110 volts, 60 cycles, or type 5880-AB-25 for 25 to 40 cycles
One telephone receiver head-set—2000 to 4000 ohms (with plug)

If the battery set is constructed, the following parts and accessories will be eliminated: C4, R2, R3, R4, 2 six-prong sockets (for the tubes), the type –24 tube, the type –27 tube, the type –80 tube, the telephone jack (J), the 'phone plug, the power supply plug and the power supply.

Taking the place of these a.c. parts in the battery set are:

Extra Parts List

Two National 4-prong sockets (for the tubes)
Seven additional binding posts
S—Double-pole, single-throw toggle or jack switch
R5 (Figure 3)—Lynch 10-megohm grid leak
One type –34 tube
One type –30 tube
One Eveready air-cell battery
Three 45-volt, center-tapped B batteries
One 9-volt C battery

The same coils are used in both the a.c. and d.c. models, and the following is a list of those in which the beginner will be most interested. The colors refer to the stripe on the face of the rim by which they are readily identified.

Coil Types and Ranges

No. 11—black—13.5 to 25 meters—daytime, long-distance reception
No. 12—red—23 to 41 meters—miscellaneous broadcasting
No. 13—white—40 to 70 meters—long-distance night broadcasting
No. 14—green—65 to 115 meters—amateurs, airplane
No. 15—blue—115 to 200 meters—police broadcasts

The tuning curves of four of the most popular coils are illustrated in Figure 5. Do not try to buy these parts directly from the manufacturer. If you live in the city, you will have little difficulty in locating a convenient source of supply. Any radio serviceman can direct you to a store handling parts—and in most cases he will be glad to get them for you himself. If you prefer to purchase direct by mail, look through the advertising section of this magazine. You will find several radio parts houses who will send you their catalogs. These firms are reliable and their prices are cheap as possible for the designated parts.

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DX Accessories

(*Continued from page* 612)

note" whistle is therefore the indication of the presence of a station.

The "beat note" oscillator described here functions as such an external oscillator, drawing its plate and filament supply voltages from one of the power tubes of the receiver through the medium of an adapter. Several models are available for use with different types of superheterodynes. If the reader makes his own, it will be necessary, of course, to make the coil and condenser combination suitable to tune to the intermediate frequency employed in his receiver.

This oscillator, as shown in Figures 3 and 4, is simple to install and operate. The adapter, placed under one of the audio

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power tubes, supplies filament and plate voltage. The adapter shown in Figure 4 is for use with a receiver employing a 4-prong power tube. A wire with a spring clip grounds the oscillator to the receiver. A wire with an eyelet feeds the signal to the receiver. The eyelet is slipped over the plate pin of the last i.f. tube. All this takes about one minute to do. A station is tuned to peak signal on the receiver and the knob on the oscillator is adjusted to "zero beat" the signal. The setting of the knob is permanent after the preliminary adjustment has been made. Once installed, the oscillator is turned on and off at will by means of its toggle switch.

In constructing the oscillator, the tuned circuit (L and C1) is mounted in the shield can, with the condenser knob projecting on top. The voltage-supply circuits and switch are mounted in the base. The oscillator is of the electron-coupled type, the signal coupling to the plate circuit being obtained by the capacity between the plate terminal and a single turn of the insulated output wire about it. Note that there is no metallic connection between the insulated wire and the plate terminal of the oscillator tube. Three of the four wires of the cable are connected to the plate and the filament (heater) terminals of the Eby adapter The fourth wire has a 3-foot extension with a spring clip on the end for the ground return.

List of Parts

A—Shield can of suitable size
C1—Hammarlund midget type, 25 mmfd. variable condenser
C2—Polymet small .00025 mfd. mica condenser
C3—Polymet tubular .1 mfd., 300-volt condenser
L—Universal or scramble-wound coil, tapped at ⅓ of winding for cathode connection (coil to be selected for proper i.f.)
R1—Lynch 25,000-ohm, 1-watt resistor
R2—Lynch 100,000-ohm, 1-watt resistor
R3—Lynch 250,000-ohm, 1-watt resistor
SW—Toggle "off-on" switch
Grip cap
Knob for condenser C1
Tube shield
24A tube
Lug for eyelet
5 feet of 4-wire color-coded cable
Eby male and female sections of a 4-, 5-, 6- or 7-prong adapter, depending on type of power tube employed in receiver
Spring clip
Metal sub-base, 6½ inches by 3 inches by 1¼ inches
½-inch rubber grommet
Wire and hardware

Philco Model 16-X

(*Continued from page* 592)

is the single tuning control. Its operation is effortless and smooth, and of sufficiently high ratio to avoid being unduly critical in adjustment when tuning for short-wave stations. Nevertheless the ratio is not so high as to make the tuning of the broadcast band burdensome. This seemingly contradictory condition is explained by the fact that for the short-wave ranges a smaller tuning capacity is employed, providing a band-spread tuning effect.

Immediately below this knob is the band-selector knob. This control is another which requires little physical effort to manipulate. It has five positions, one for each tuning range, and as it is tuned from one position to another a shutter moves behind the tuning dial, allowing the tuning lamp to illuminate only the portion of the dial carrying the calibration of the tuning range for which the band-selector switch is set. By this means the operator can tell at a glance which range the receiver is set for, and the calibration of that range is thrown into bold relief.

At the right is the bass compensating knob. This controls a four-point switch. In the first position the bass notes are somewhat suppressed, with relative accentuation of the higher audio frequencies. In the last position the opposite is true, the bass notes being brought up to relatively high level. The two intermediate positions provide in-between degrees of tonal balance and the four positions therefore offer a sufficiently wide variation in tone color to meet any individual taste or requirements.

The fourth knob, at the lower left, is the combination on-off switch and audio volume control.

The console employs the well-known sloping speaker panel. To just what extent this feature contributes to the excellence of reproduction it is difficult to determine because there are numerous other factors each of which contributes its share. The entire console has obviously been carefully designed with thorough attention to accoustic details, for instance; and both the circuit design and the loudspeaker are such as to result in a highly satisfactory overall frequency characteristic.

The actual operating tests of this receiver have not been completed at the time of

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this writing, having been carried only as far as the laboratory tests on broadcast-band reception, which involves a study of the functioning of the various features of a receiver. The balance of the operating tests will be concluded in one of the Radio News Listening posts in time to permit the inclusion of a report in the next issue.

For the benefit of servicemen who lack data on this receiver, the circuit diagram given in the present article has been made to include much useful information.



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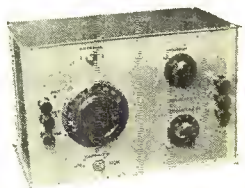


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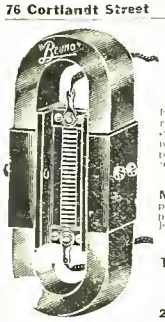
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20 W. 22nd St. New York

"Ay-Vee-See Applications

(*Continued from page* 607)

action by decreasing the voltage across the cathode resister. Since the resultant bias on the tube is the sum of the cathode bias and the a.v.c. bias, the a.v.c. action has been slowed up. The obvious solution is to have the cathode bias more or less fixed, which may be done by using a bleeder resister from the B-plus terminal to the cathode. Another method of attack is to use an amplifier after the a.v.c. tube to amplify the a.v.c. bias before it is fed back to the controlled tubes, which means that small variations in input will result in efficient a.v.c. bias production. Separate tubes may be used for this or the very valuable composite tubes—duo-diode, etc., combinations can perform the whole works in one tube.

These tubes are almost exclusively used in commercial sets. There are three types in each voltage class—6B7, –75 and –85 in 6-volt heater class, and the 2B7, 2A6 and –55 in the 2½-volt class. The characteristics of the corresponding types are identical. Each tube has two diode plates surrounding a common cathode which extends further up the tube and is part of a set of separate tube elements.

In the 2B7 and 6B7 the separate elements form a screen-grid tube; in the other tubes the elements form a triode.

The discussion on a.v.c. has considered duplex diode tubes with each diode performing separate functions. Figure 9 shows the diodes connected together to perform the simultaneous functions of a.v.c. voltage production and audio detection. This method employs fewer units than those we have been discussing and is therefore becoming more popular. The first circuit has the merit of separating the time constant values from the audio detection circuits. The –75 is the most popular tube in view of its cost and efficiency, and in view of the tendency toward elimination of the 2½-volt tubes, may become exclusively used.

S-W First Aids

(*Continued from page* 596)

N	United States of America. (Government stations)
OAA-OBZ, OCA-OCZ	Peru
OFA-OGZ, OHA-OHZ	Finland
OKA-OKZ	Czechoslovakia
ONA-OTZ	Belgium and colonies
OUA-OZZ	Denmark
PAA-PIZ	Netherlands
PJA-PJZ	Curacao
PKA-POZ	Dutch East Indies
PPA-PYZ	Brazil
PZA-PZZ	Surinam
Q	(abbreviations)
RAA-RQZ	Union of Soviet Socialist Republics (U. S. S. R.)
RVA-RVZ	Persia
RXA-RXZ	Republic of Panama
RYA-RYZ	Lithuania
SAA-SMZ	Sweden
SPA-SRZ	Poland
STA-STZ, SUA-SUZ	Egypt
SVA-SZZ	Greece
TAA-TCZ	Turkey
TFA-TFZ	Iceland
TGA-TGZ	Guatemala
TIA-TIZ	Costa Rica
TSA-TSZ	Territory of the Saar
UHA-UHZ	Hedjaz
UIA-UKZ	Dutch East Indies
ULA-ULZ	Luxemburg
UNA-UNZ	Kingdom of Serbs, Croats and Slovenes (Yugoslavia)
UOA-UOZ	Austria
UWA-UZZ, VAA-VGZ	Canada
VHA-VMZ	Australia
VOA-VOZ	Newfoundland
VPA-VSZ	British colonies and protectorates
VTA-VWZ	British India
W	United States of America
XAA-XFZ	Mexico
XGA-XUZ	China
YAA-YAZ	Afghanistan
YHA-YHZ	New Hebrides
YIA-YIZ	Iraq
YLA-YLZ	Latvia
YMA-YMZ	Free City of Danzig
YNA-YNZ	Nicaragua
YSA-YSZ	Republic of El Salvador
YVA-YVZ	Venezuela
ZAA-ZAZ	Albania
ZBA-ZHZ	British colonies and protectorates
ZKA-ZMZ	New Zealand
ZPA-ZPZ	Paraguay
ZSA-ZUZ	Union of South Africa

Morse Code and the S.W. Listener

Many short-wave broadcast listeners are intrigued by the code transmissions of commercial stations and amateur stations encountered in tuning the short waves. To read code at the speeds

INTERNATIONAL MORSE CODE

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

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

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

normally transmitted is, of course, out of the question unless one has had long practice at it. However, slow-speed sending is often heard when stations are testing or when one is calling another. In either case, the test signal or the call letters of the station called, together with the call letters of the transmitting station, are repeated over and over again, in many cases so slowly that the rankest novice can catch these calls and interpret them with the aid of the code printed herewith.

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The DX Corner (Broadcast Band)

(*Continued from page* 610)

Every now and then a record of phenomenal reception with a crystal receiver bobs up. Perhaps this is the reason that there seems to be a widespread interest in crystal sets, even among owners of multi-tube receivers. Perhaps some other DX'ers occasionally revert to the use of a crystal outfit by way of diversion, and have some outstanding records to show for it. Let's hear about them.

DX in England

I was very interested in your December issue of The DX Corner for Broadcast Waves. The best heard stations in my locality are the Argentine stations, which can be received all the year round any time after midnight, G.M.T.

The best heard North Americans are: WCAU, WPG, WBZ, WTAM, WIOD, WABC; the best time to hear them is between 12 midnight and 5 a.m., G.M.T. I have occasionally picked up WCAU as early as 10:40 p.m., G.M.T., while European stations are still on the air.

I have received verifications from the following stations during the last six months: WPG, WCAU, WBZ, WIOD, WABC, WJZ, WTAM, WNAC, WBT, WCCO, WLAC, WOW, WTIC, WGY, KSL, KGO, XEAW, LR5, VAS.

Such stations as WOW, KSL, XEAW and KGO are considered fine catches, as they are stations very seldom heard in England. F. R. Crowder, Leeds 3, Yorkshire, England.

500,000-Watt Crosley Station

Reports received from listeners indicate that the new WLW transmitter is getting out in excellent fashion in its experimental tests carried on under the call W8XO, daily from 1-6 a.m. At the present writing, after a test period of about thirty days, listeners as far off as Australia report excellent reception. Mexican and South American listeners report that test signals are sufficiently strong to override their tropical (and summertime) static. The tests to date are taken to indicate a consistent DX range of approximately 5000 miles or more for the new transmitter.

G. E. Model K-80

(*Continued from page* 602)

There was very little difference between these two, except that reception of distant stations was markedly better on the broadcast band with the outside antenna. Some European short-wave stations were received without any aerial. The ground connection was a cold-water pipe about 6 feet from the set.

During the week-ends of January 20th-27th, short-wave reception was favorable. This was especially evidenced by the fact that such stations as GSD, GSB, GSA, DJD, DJC, EAQ, I2RO and the Pontoise stations were received loud and clear, often rivalling locals. This was especially true of the British and German stations.

When the DX Corner for this month was made up, the log of stations received was of course used to be compared with other reports. This month several new stations appear in the short-wave time-table, some of which were received during these tests.

The 50-meter band yielded especially good results. For instance, there are W4XB, GSA, W8XAL, W9XAA, VE9GW, all close together, yet each could be received clearly. Even when VE9GW and W9XF were on at the same time, they could be separated sufficiently; these stations are but 5 kc. apart. Other stations received on the same band during the first week-end were RV59, HIX, VE9DN, W3XAU, CP5, YV1BC, W8XK, YV3BC, HI1A, W3XL and HC2RL. There were more, but these were not identified at the time.

Amateurs, as usual, provide a diversion even in the middle of the night when little else can be received on the short waves. There were also several commercial transmissions where the conversation of engineers could be followed.

Police stations all over the United States came in for their part of the entertainment, and those in Canada gave opportunity to brush up on our French.

The broadcast band, at 6 p.m., brought in such stations as WCCO, WHAS, and sometimes Fort Worth, WBAP on 800 kc., but the West Coast is not good until later. However, at this time (6 p.m.), three Canadian stations are well received, giving a welcome variation to the New York broadcast fare. The quality is good and, in fact, many short-wave stations such as GSA and DJC come in with very good quality.

Calibration of the dial is so accurate that stations can be found on any of the four bands with equal facility. The maximum variation that was noted was about one percent.

RADIO NEWS SERVICE TO YOU

If you desire manufacturer's literature on the equipment described in this article, address a request for same to RADIO NEWS, Department GS, 222 West 39th Street, New York City. If you are a radio serviceman and desire complete service data, address your request for same on your service letterhead or inclose your business card.

"Scoutmaster"

(*Continued from page* 599)

One 4-wire battery cable
Wire, hardware, etc.
One type -30 tube
Two No. 6 dry-cell batteries
One 45-volt B battery
Headphones

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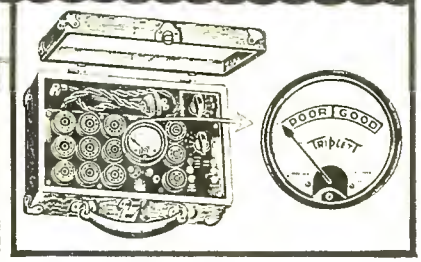
"Backstage"

(*Continued from page* 613)

the Buick Motor Company twice weekly over CBS. The Monday and Thursday programs also bring to the microphone Howard Marsh, tenor, and Andre Kostelanetz's orchestra and chorus. This is Benchley's first radio series although he has had an extensive stage and screen career. Marsh returns on this series after a half-year absence from the studios. Kostelanetz has carved a unique niche in the broadcasting world for himself through his novel instrumental and vocal arrangements.



New Direct Reading Tube Tester *Simplifies Tube Testing*



NO longer need you reassure a skeptical customer as to the worth of a tube. The position of the meter needle on the shaded 2-color scale, indicates to what degree a tube is either poor or good. When you use the Readrite 419 tester, you can see this for yourself.

This newer and better instrument is used by both dealers and service men to check new and old tubes . . . on the counter or out in the field. It makes tube testing so simple, so easy, so quick . . . that anyone can operate it. Selling tubes is made easy! Has only two selector switches—one for heater volts and the other for the type of tube. No confusion. No multiplicity of operations.

A push button provides two plate current readings for determining the conductance and worth of a tube. The correct tube filament voltages applied are: 1½, 2, 2½, 3.3, 5, 6.3, 7.5, 12.6 and 25. (Comes in Oak case.)

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The Editor to You

(*Continued from page 583*)

short-wave development he will lose a large amount of future trade. He must "know" the short waves. He must be able to "sell" the short waves. He must be able to *keep short-wave receivers well serviced!* He must know about short-wave antenna types. He must understand noise-reducing equipment, etc.

Of course, there are some servicemen and dealers who today are already giving service and realizing excellent profits from their short-wave work. They have found a new way for getting customers and creating a new interest in radio. They have found that they can keep their customers *interested* in short waves. They have found that they have had to *instruct new users* in the operation of short-wave sets.

And here is the best point of all. They have found in RADIO NEWS their greatest ally, in creating and holding new short-wave enthusiasts as satisfied customers. They have found that with the RADIO NEWS World Short-Wave Time Schedule in the hands of their customers, they eliminate many complaints, from new and old users of short-wave sets, that they cannot get all the foreign stations. Of course, it is true that you *must know when and where to tune in these stations* to be able to get them. That is just what our time schedule tells you—at a glance.

The present issue is devoted in considerable part to the short waves. It contains *all of the information necessary for a beginner on the short waves to immediately cash in on the money he has spent for a new all-wave receiver.* It contains Time Schedules of the world's leading short-wave stations. It contains a Distance Chart and a Time Conversion Chart to let you know the time in any other part of the world as compared to local time. It has a Department devoted exclusively to short-wave information. It has one article of a series on "Getting Acquainted wtih the Short Waves." It contains two articles for the beginner telling them "How to Build" a simple short-wave set, with picture wiring diagrams, so that the set can be built on a kitchen table with ordinary tools by an average individual. It contains descriptions of a number of the latest commercial all-wave receivers. At the same time the issue does not slight our regular readers, be they servicemen, engineers or all other groups of readers.

So here, Mr. Dealer and Mr. Serviceman, you have a publication that will *help you get started* on a new and well worth-while channel of endeavor. You can take it along with you right into your customer's home and can show him the advantages he will get from the short-wave apparatus, properly used.

The Service Bench

(*Continued from page 625*)

squarer, and square it with a few blows of a hammer. Next clamp the squarer and cable in a vise, and saw carefully with a hacksaw. The result is a factory job! Occasionally the control cable works hard —particularly on the Ford-Majestic model III). If the control turns easily from 0 to 100, but stiff in the reverse direction, the chances are there is a loop or sharp bend in the cable—probably where it turns up the steering column from the rear of the car. If this loop is not carefully rounded, it will 'kink' when force is applied to the control wire. One way of curing this is to tape it securely, but a better method is to slip a piece of copper tubing over the cable and shape it into a gradual curve. About eighteen inches of ⅜ inch tubing are required."

Auto Service Manual

The serviceman going seriously into the auto radio field is advised to obtain a copy of the "Specialized Auto Radio Manual" by John F. Rider. In addition to general details on installation or servicing, this comprehensive volume contains circuit diagrams, resistance data, individual installation, operating and service notes on practically every automobile radio receiver in use today. It has the recommendation of *The Service Bench.*

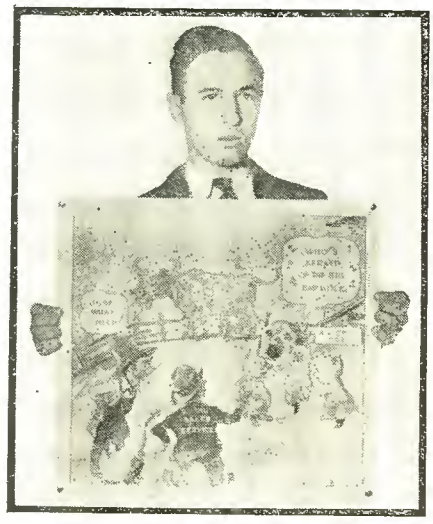
THIS MONTH'S SERVICE SHOP

Two views of the Groveland Radio Laboratory are shown in Figures 1 and 2, presenting a most excellent example of what can be done in the way of progressive sales and service. The Groveland Radio Laboratory specializes in Sparton, Majestic, General Electric, Fada and Crosley radios—and the attractive sales room shown in Figure 1 does a lot towards putting them over. It will be observed that an auto-radio set—the Majestic—is featured on the *eye compelling* stage. As we have pointed out elsewhere, auto radio is a live bet for the serviceman. The tube display is also particularly attractive. Their service shop in Figure 2 is complete in every detail. The instruments are Weston and Jewell. All conventional voltages and currents are available—25 and 60 cycle—32, 110 and 350 volts d.c.

All of which doubtless contributes to the comment of the manager, David Vialet, who writes anent the new deal—"We have been in the radio business eight years, and can truthfully say that 1933 was the best year since we have been in business—*especially during the last two months!*"

You May Have One of These Cartoons

Readers will remember this cartoon as being the symbol adopted in our campaign for the Air-Cell receiver, as a solution to the problems of farm or rural radio. The National Carbon Company has made large reproductions of this cartoon of a



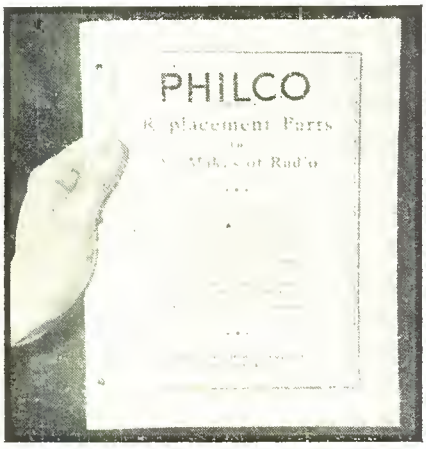
size two feet square. A number of the visitors to our offices, seeing them, asked if they could have one. As a result we have made arrangements with the National Carbon Company to have them furnish one of these cartoons to *any* RADIO NEWS *reader interested in farm radio and in mod-*

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ern battery-operated receivers. The cartoon is an excellent reproduction and suitable for framing and hanging on the wall, or for mounting on stiff cardboard in the dealer's or serviceman's window. It is sure to be an attraction for anyone interested in rural radio. So sit down this minute and drop a card to RADIO NEWS, Department N, 222 W. 39th Street, New York City, requesting such a cartoon, and it will be sent to you gratis. Send in your request promptly, as there is a limited supply of them available.

Replacement Parts Catalog

Radio dealers and servicemen will find this new Philco 32-page catalog of replacement parts for all makes of radio receivers extremely helpful in their work. The folder contains a complete list of service and repair parts to cover all the serviceman's requirements, a full line of tool and testing equipment and a list of re-



placement parts used in all Philco home receivers and Transitone auto radio receivers.

Through a special arrangement with Philco Radio and Television Corporation, these catalogs are made available to RADIO NEWS *servicemen and dealer readers.* The only requirement is that all requests be written on letterheads indicating that the reader is a bona fide radio serviceman or dealer. Address requests to Dept. P., RADIO NEWS, 222 West 39th St., New York City.

The DX Corner (Short Waves)

(*Continued from page* 590)

LCL, EAQ. Mr. Kruger reports that CR7AA is an experimental station operating every Monday, Tuesday and Saturday evenings at 8:30 p.m. till 10:30 p.m., South African time. They use only 150 watts. Have any hams in America received this little station? Their address is Colonia De Mocambique, Lourenco Marques, Africa.

Best Bets in Brazil

Señor W. W. Enete of Rio de Janeiro, Brazil, sends in the following Best Bets in his location: GSG, GSF, HVJ, W3XL, W3XAL, GSA, W8XK, GSC, DJA, W2XAF, W8XK, W2XE, W8XAL, W3XL. Señor Enete has been using a National converter with an RE45 Victor and a Philco 16B receiver.

Best Bets from Bombay

Mr. D. R. D. Wadia reports following Best Bets from Bombay, India: BLV, PCK, PMC, GSG, PHI, FYA, DJB, GSF, HVJ, RAU, SUZ, GSE, I2RO, GSD, EAQ, VK2ME, GSC, DJA, VK3ME, VE2ME, GSB, ZGE, VUC, VQ7LO, GSA, DJC, RV59, HVJ, G6RX, RV15, LSX. He says he finds American receivers best. He has used Zenith, Patterson, National, Pilot, Scott, Lincoln and Philco receivers. He is a member of the India Short Wave Club.

Readers Who Helped Log Stations for This Month's Report

We are indebted to the following readers of RADIO NEWS who sent in reports of reception this month: D. Smith, Woburn, Mass.; H. Adams, Jr., Baltimore, Md.; H. K. Miller, Northampton, Mass.; J. E. Brooks, Montgomery, Ala.; D. H. Townsend, Fallon, Nev.; E. C. Lips, Pittsburgh, Pa.; E. Black, Glenside, Pa.; Dr. J. P. Watson, Hazlehurst, Miss.; W. F. Buhl, Newark, N. J.; A. J. Mannix, Portsmouth, N. H.; E. S. Allen, Reedley, Calif.; J. Hull, Berkeley, Calif.; H. Johnson, Big Spring, Tex.; C. J. Grece, Jr., Jersey City, N. J.; W. E. Taylor, Brush, Colo.; J. C. Meillon, Jr., Paris, France; J. C. Kelley, Ashland, N. H.; L. R. Cadwell, Jr., Benton Harbor, Mich.; J. White, New York City; A. B. Baadsgaard, Ponoka, Alta.,

(*Continued on page* 640)

Television

(*Continued from page* 585)

the grid of the cathode ray tube to control the intensity of the spot of light on its screen. The two sweep circuits cause the spot to scan the whole picture area in a series of horizontal lines. This scanning is to be in step with the scanning of are original object at the sending station. This synchronization is provided by controlling the sweep circuit frequencies by means of the frequencies present in the modulation of the signal, due to the borders of the picture. When the frequencies are identical, the picture remains stationary but may be "out of frame." This is corrected by shifting the phase of the synchronizing voltage.

In the complete circuit of Figure 5, the apparatus is operated much like two individual sweep circuits of the type shown in the December, 1933, issue. The fact that the frequency is kept constant changes the manipulation required, however. The grid bias on the mercury vapor discharge tubes T is kept well negative, and a large

(*Continued on page* 638)

APRIL, 1934

Technical Information Coupon
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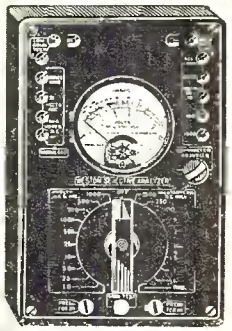
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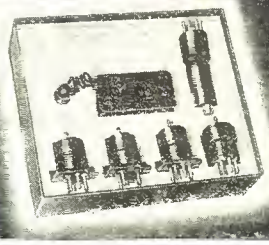
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WESTON *Radio Instruments*

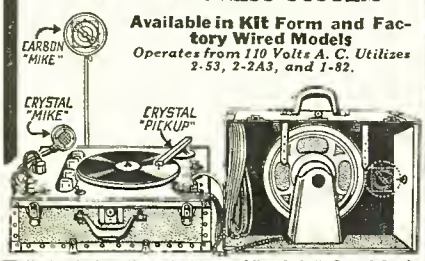
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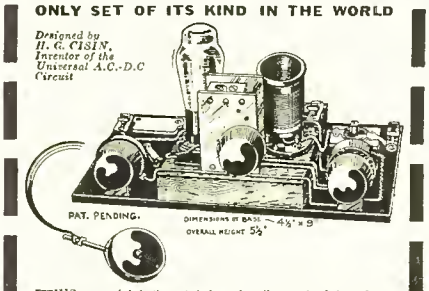
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locking voltage is applied to insure good frequency locking. The strength of the locking voltage is regulated by potentiometer P1, and increasing it makes it easier for the discharge tube to discharge, and therefore reduces the amplitude of the sweep across the screen. Potentiometer P2 regulates the phase of the locking voltage and permits accurate framing of the picture. Potentiometer P3 regulates the uncontrolled sweep frequency and is used to make the frequency close enough to the correct value to permit locking in step with 20 or 1200 cycles. Potentiometer P4 is a positioning control which allows approximate centering of the picture on the screen. It moves the picture diagonally, because it applies an equal voltage to both sets of deflecting plates. Potentiometer P5 controls the average spot brilliancy of the screen, and will give a bright picture with good contrast if adjusted for half the maximum brilliancy and the receiver output is run up enough to make parts of the picture black. On weak outputs, good contrast can be obtained by reducing the brilliancy. Potentiometer P5 should be well insulated from the operator, because it is at high potential. Potentiometer P6 is used to focus the spot. The taps on the 50,000 ohm voltage divider of the low voltage power supply are set to give about 200 volts across P4 and about 100 volts between cathode and screen grid of the '58 constant current tubes. The proper values of condensers C are to be found by experiment, being different for different transformers, and the values that give maximum locking voltage at 20 and 1200 cycles should be used. The purpose of the '56 tubes is to give coupling to the audio transformers without by-passing the high frequency output of the receiver, which would happen if the tubes were omitted. The tuned transformers serve as filters.

The sweep circuits of Figure 3 were built up in separate units by the authors to provide greater flexibility during development work. However, anyone desiring to do so could construct this entire circuit on a single chassis.

In regard to the discharge tubes, those used were the General Radio mercury vapor discharge tubes, type 506-P1. It

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should be possible to use the R.C.A. Victor type 885 if the negative bias is increased to 45 volts or so and more locking voltage is applied. As for the cathode-ray tube, (see list of parts) a type was used that required focusing voltage equal to one half the anode voltage, heater voltage of 2.5 volts, and socket connections as shown in Figure 3. If a different made of tube is used, the socket connections, the heater voltage, and the voltage divider arrangement for the focusing voltage will have to be changed in accordance with the manufacturer's data. The battery for the negative bias on the modulating gril may also have to be changed.

It is to be hoped that this series of articles has given the readers some knowledge of the uses of cathode-ray tubes and practical information on some of its many applications.

List of Parts

C Two condensers, about 1 and .01 microfarad, 400 volts, exact capacity required to be found by experiment.
C1 Eleven Aerovox type P5 electrolytic condensers, 8 microfarad, 500 volts.
C2 Aerovox cartridge condenser, .2 microfarad, 1000 volts.
C3 Aerovox mica condenser, .003 microfarad, 1000 volts.
C4 Aerovox cartridge condenser, .15 microfarad, 600 volts.
C5 Aerovox type 1450 mica condenser, .0025 microfarad.
C6 Two Aerovox type 1450 mica condensers, .01 microfarad.
C7 Aerovox filter condenser, 1 microfarad, 400 volts.
C8 Morrill type 3014 condenser, 1 microfarad, 3000 volts.
L1 Two Kenyon BC350 filter chokes.
P1 Two Clarostat potentiometers, .1 megohm.
P2 Two Clarostat potentiometers, .1 megohm.
P3 Two Clarostat potentiometers, .1 megohm.
P4 One Clarostat wirewound potentiometer, 50,000 ohms.
P5 One Clarostat potentiometer, .1 megohm.
P6 One Clarostat wirewound potentiometer, 50,000 ohms.
R1 I.R.C. metallized resistor, 100,000 ohms, 2 watt.
R2 Two Aerovox cement-coate wirewound resistors 100,000 ohms, 20 watt.
R3 Rheostat, 1 ohm, 3 amp.
R4 I.R.C. metallized resistor, 2 megohms, 2 watt.
R5 Aerovox adjustable wirewound resistor 50,000 ohms, 75 watt.
R6 Two I.R.C. metallized resistors, 3000 ohms, 2 watt.
T Two General Radio 506-P1 mercury-vapor discharge tubes.
T1 Kenyon B250PT, power transformer.
T2 Kenyon B59PT, power transformer.
T3 Kenyon B25FT, filament transformer.
T4 Two Kenyon B12 Audio transformer, 1 plate to push-pull grids.
Five Eby isolantite sockets; one 7 prong medium; two 6 prong and two 5 prong.
Five Eby No. 12 bakelite sockets; on 7 prong medium; two 5 prong and two 4 prong.
One dozen plain Eby binding posts.
One on-off toggle switch for 110 volts, a.c.
Nine 1½ inch bakelite knobs, 1 inch shaft.
One 7 wire cable and medium 7 pin plug.
Two 4½-volt C-batteries.
One 67½-volt B-battery.
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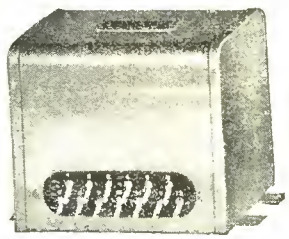
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T3–Kenyon Filament Transformer Type B25FT	5.75
T4–2 Kenyon Audio Transformers Type B12, 1 plate to push-pull grids, for pair	11.50
L1–2 Kenyon Filter Chokes, Type BC350	8.00
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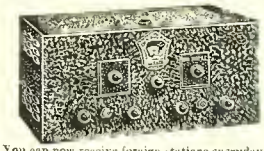
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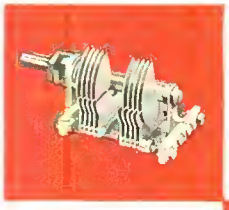
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2-SE Midget Condenser
Isolated rotors, electrically independent, prevent interstage coupling through common rotor and frame circuits. Isolantite insulation. 270° SFL plates. 100 mmf. per sec. Air gap .026. List price **$5.00.**





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



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



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

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



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



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





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



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



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

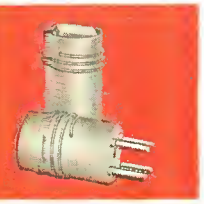
Type 90 RF Choke
For by-passing work on screen grid or plate circuits of screen grid tubes or between detector and first audio. DC res. 350 ohms. Ind. 90 m.h. List price without mount, **$1.25.**



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



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





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



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



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

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



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



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



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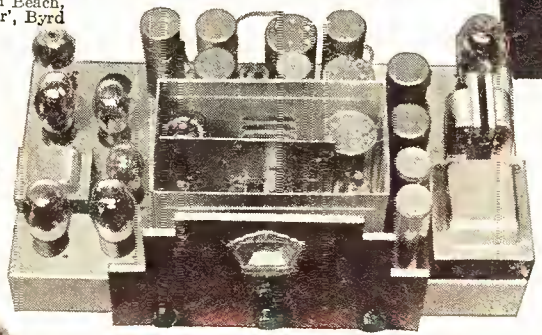


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