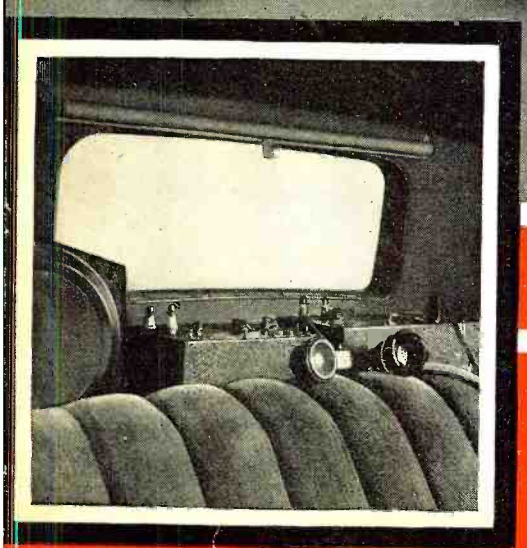
THE RADIO SERVICING AUTHORITY

RADIO NEWS AND SHORT WAVE RADIO

MARCH
25¢
U. S. AND CANADA

5 Meter Car Radio

SHORT WAVE TIME TABLE



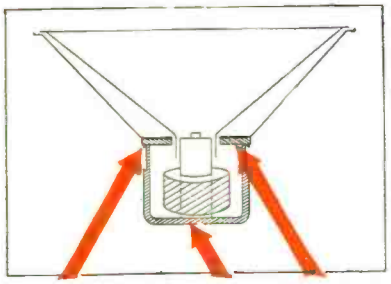
THE RADIO WORKSHOP

A Publication Devoted to Progress in Radio

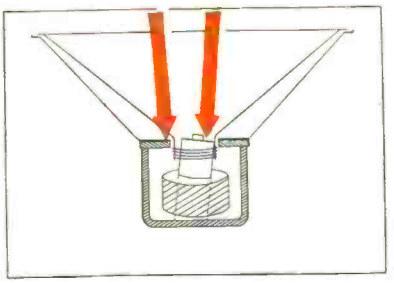
Service Work
Experiments
DX Reception
Broadcasting
Amateur Activity
Set Building
Electronics
Engineering
Short Waves
Television
Applications
Measurements

EXPRESSLY DESIGNED FOR

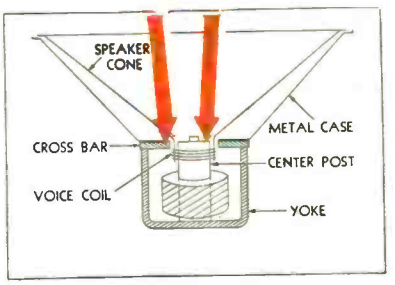
STABILIZED PERFORMANCE



A new G-E process — projection welding — results in a permanent and perfect magnetic path.



Projection welding also prevents misalignment of center post — a source of many speaker noises.



A perfect magnetic path and permanent alignment give crystal-clear tone and stabilized performance.

MODEL A-82
8 metal tubes, four reception bands 140-410 k.c. and 540-19,500 k.c.

$94.60 (Eastern List Price)

The Stabilized Dynamic Speaker is but one of five major features which contribute to stability in the life and performance of General Electric receivers.

ADDITIONAL FEATURES ARE:

Metal Tubes—Strong and clear in signal. Supremely quiet—especially on short-wave broadcasts.

Sentry Box — Controls as many as five separate broadcast bands — permitting only one radio wave to pass.

Permaliners — Maintain the original factory adjustment of the set. Sealed against moisture and dirt.

Sliding-rule Tuning Scale—Shows only one tuning scale at a time—lists all stations in a straight line. As easy to read as a ruler.

GENERAL ELECTRIC

The Original Metal-tube Radio

APPLIANCE AND MERCHANDISE DEPARTMENT, GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONN.

J. E. Smith, President National Radio Institute

I WILL HELP YOU START A SPARE TIME OR FULL TIME RADIO SERVICE BUSINESS WITHOUT CAPITAL

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

Now Has Fine Business

"I have a fine business servicing sets. I am making a good living—seldom have a week under $40. If it wasn't for N. R. I., I would probably be tramping the streets."

Glenn C. King,
46 Division Ave., S.,
Grand Rapids, Mich.

$15 a Week in Spare Time

"My spare time earnings average $15 a week. Since studying with you I have earned about $7.000 to $8.000 in Radio. I owe my success to the good method of the N. R. I."

C. N. Heffelfinger,
R. F. D. No. 1,
Temple, Penna.

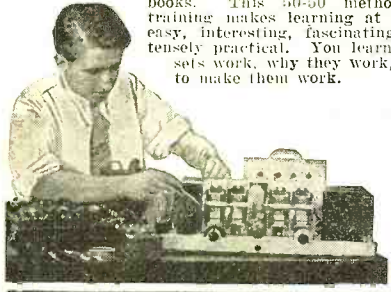
Best Equipped Shop in Town

"In the last year, we have moved our Radio shop and we now have the best equipped Radio Repair Shop in East Toledo. We also have a shop at 624 Milton Street. We have three fellows working for us."

W. R. Brown,
309 Main St.,
Toledo, Ohio.

You Get PRACTICAL EXPERIENCE with Radio Equipment I Give You

I'll show you how to use my special Radio equipment for conducting experiments and building circuits which illustrate important principles used in such well-known sets as Westinghouse, General Electric, Philco, R.C.A., Victor, Atwater-Kent, and others. You work out with your own hands many of the things you read in our lesson books. This 50-50 method of training makes learning at home easy, interesting, fascinating, intensely practical. You learn how sets work, why they work, how to make them work.



Free Book Tells How Mail Coupon!

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

Many N. R. I. Men Make $5, $10, $15 a Week Extra in Spare Time While Learning

Many of the twenty million sets now in use are less than 50% efficient. I will show you how to cash in on this condition. I will show you the plans and ideas that have enabled many others to make $5, $10, $15 a week in spare time while learning. George W. Honert, 248 Water St., Ligonier, Ind., made over $500 from the start of the Course to its completion.

Get Ready Now for a Radio Business of Your Own and for Jobs Like These

Broadcasting stations use engineers, operators, station managers, and pay up to $5,000 a year. Radio manufacturers use testers, inspectors, foremen, engineers, servicemen and buyers, and pay up to $6.000 a year. Radio dealers and jobbers employ hundreds of servicemen, salesmen, managers, and pay up to $75 a week. Television promises many good jobs soon. Television is leaving the laboratory in an impressive way. One million dollars is being spent on two stations. Receiving sets are being designed and built. New opportunities—many of them—are right ahead. My book tells you of the opportunities in these fields, also in Aviation Radio, Police Radio, Short Wave Radio, Automobile Radio and other new branches of this fast growing industry. Get it.

I Train You at Home in Your Spare Time

Hold your job until you're ready for another. Give me only part of your spare time. You do not need a high school or college education. Hundreds with only a common school education have won bigger pay through N. R. I. Graduate J. A. Vaughn jumped from $35 to $100 a week. Fred Dubuque doubled his earnings in one year. The National Radio Institute is the Pioneer and World's Largest organization devoted exclusively to training men by Home Study for good jobs in the Radio industry.

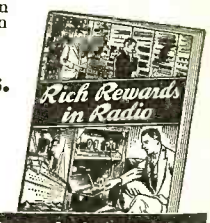
You Must Be Satisfied

I will give you an agreement to refund every penny of your money if you are not satisfied with my Lesson and Instruction Service when you complete my Training. And I'll not only give you thorough training in Radio principles, practical experience in building and servicing sets, but also Advanced Specialized Training in the type of Radio work you choose.

Get My Free Book of Facts

Mail the coupon for "Rich Rewards in Radio." It's free to any ambitious fellow over 15 years old. It tells you about Radio's spare time and full time opportunities; about my training; what others who have taken it are doing and making. Mail coupon now in an envelope, or paste it on a 1c post card.

J. E. SMITH, Pres.
Dept. 6CR
National Radio Institute
Washington, D. C.



Get my *FREE LESSON* on Radio Servicing Tips

I'll prove that my Training gives practical, money-making information, that it is easy to understand—that it is just *what you need* to master Radio. My sample lesson text, "Radio Receiving Troubles—the Cause and Remedy" covers a long list of Radio receiver troubles in A.C., D.C., battery, universal, auto, T. R. F., super-heterodyne, all-wave, and other types of sets. And a cross reference system gives you the probable cause and a quick way to locate and remedy these set troubles. A special section is devoted to receiver check-up, alignment, balancing, neutralizing and testing. Get this lesson *Free*. No obligation. *Just mail coupon.*

MAIL COUPON NOW

This Coupon is Good for One FREE COPY OF MY NEW BOOK

J. E. SMITH, *President*,
National Radio Institute,
Dept. 6CR,
Washington, D. C.

Dear Mr. Smith: Without obligation, send me the Sample Lesson and your free book about spare time and full time Radio opportunities, and how I can train for them at home in spare time. (Please print plainly.)

Name.....*Age*.....

Address.....

City.....*State*.....14x1

Find out about the World Famous Course that Pays for Itself

RADIO NEWS

Edited by LAURENCE MARSHAM COCKADAY

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Vol. XVII March, 1936 No. 9

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Coming—

Among the articles for servicemen next month will be one continuing the discussion of output meters which begins in the present issue; also one on adapting standard radio receivers to the needs of the hard-of-hearing through the addition of a microphone and headphone jack. This field is a lucrative one which servicemen can profitably cultivate. For the 5-meter enthusiast there will be several distinctly worth-while articles. Readers with other interests including constructors and experimenters will likewise be amply taken care of in a variety of articles by well-known authors.

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Clay Bailey, Chief Radio Opera or Second Byrd Antarctic Expedition,

. . . gives high praise to great performance of MASTERPIECE receivers at "bottom of world"!

Above: *Chief operator Bailey, in his furs at Little America.*

Left: *Chief Operator Bailey, with Waite, John Dyer and Guy Hutchinson at KFZ in Little America. Under Mr. Bailey's right arm is one of the Byrd Expedition's four MASTERPIECE II receivers.*

Lower Left: *Chief Operator Bailey's report of MASTERPIECE performance.*

● It is a well known fact that the Byrd Expedition selected four MASTERPIECE II receivers and took them to Little America. Now, the story of their really triumphant performance is told by Clay Bailey, Chief Radio Operator of the expedition.

For a receiver to perform satisfactorily under IDEAL conditions is ONE thing. But for a receiver to stand up and give brilliant, trouble-free performance under the MOST DIFFICULT CONDITIONS possible to imagine—with little opportunity for service or repairs—is an achievement which we believe is unequalled by any other all-wave radio.

Mr. Bailey's letter is reproduced here, exactly as it came to us. Need we offer more convincing proof of MASTERPIECE quality of design and workmanship?... or more significant assurance of what you may expect of the even greater MASTERPIECE IV of today? The coupon will bring you a free copy of the 32-page "Blue Book," with complete description of "the finest radio of all time," new low prices, easy payment plan, and 30-day home trial offer. Mail it today... there's no obligation.

3981 Falcon Street,
San Diego, California,
November 13, 1935.

Mr. McMurdo Silver,
3354 North Paulina Street,
Chicago, Illinois.

Dear Mr. Silver:

As Chief Operator of the Second Byrd Antarctic Expedition I feel that a word of praise and thanks is due you and your Corporation in regard to the satisfactory performance of the four MASTERPIECE II receivers which were the official all-wave receivers of the Expedition, one of which remained on the "Bear of Oakland" and one on the "Jacob Rupert", providing the entire expedition with regular home entertainment as well as a choice selection of foreign programs during their 30,000 or so miles voyage to and from the bottom of the world.

On the departure of our two vessels from the Bay of Whales for one long year, possibly two, contact with the outside world depended solely upon radio to that body of men who faced the cycle of Antarctic seasons. One can readily realize to what extent the broadcasts from home and the outside world contributed to the contentment and morale of the ice party. How comforting and consoling, snug in our little city, listening to the voices of our loved ones, thousands of miles away, as though seperated only by a few feet.

The familiar clang of "Big Ben" from London, in addition to other choice programs from Europe, were regular morning features. From noon until early evening we were naturally more interested in broadcasts from home of which the volume and clarity was no question. For evening entertainment one's choice was of programs from South America, New Zealand, Australia, and Japan as well as other Asiatic countries.

The care and maintenance of these receivers was of little or no consequence. Little things like a few drops and rough handling by the transportation department and drifting snow on the trail between Little America and the ships are barely worth mentioning.

As these were the only all-wave broadcast receivers on the expedition I am sure the crews of both ships, while wintering in New Zealand, in addition to the ice party, join me in expressing appreciation to you and your Corporation for providing us with this means of world-wide broadcast entertainment.

Sincerely yours,
Clay Bailey
Clay Bailey,
Chief Radio Operator,
Byrd's Second Antarctic
Expedition.

LOW PRICES!

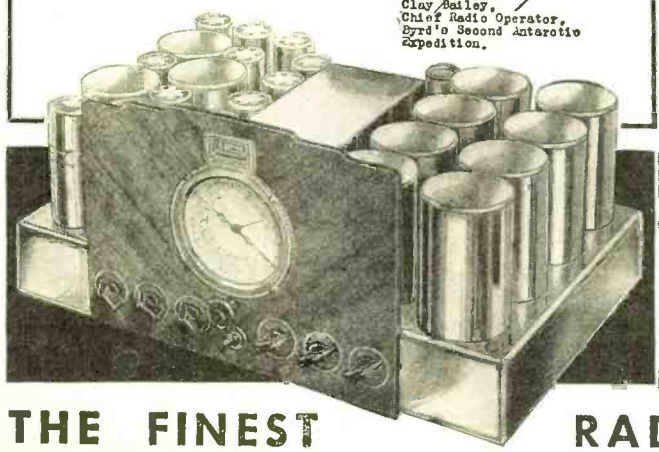
The new perfected MASTERPIECE IV is now offered at the lowest price in its history, under a positive guarantee of satisfaction or your money back.

EASY TERMS!

New, liberal time-payment plan enables you to enjoy the thrilling performance of this superfine receiver NOW ... and pay for it out of income. Check and mail the coupon for details.

30-DAY TRIAL

Try the new MASTERPIECE IV in your own home or laboratory. If it fails to outperform any other receiver, at any price, return it to our laboratory undamaged and get your money back.



HIGH-FIDELITY
WORLD-WIDE
ALL-WAVE

Custom Built
SILVER MASTERPIECE IV

McMURDO SILVER CORPORATION, Div. G. P. H. Inc.
3352 N. Paulina Street, Chicago, U. S. A.

☐ Send Free "Blue Book" giving complete specifications of MASTERPIECE IV with details of 30-DAY TRIAL.

☐ Send details of new Budget Plan of Easy Payments.

Name.....

Address.....

City..... State..... 3-RN

THE FINEST RADIO OF ALL TIME!

Pages From A Serviceman's DIARY

TUESDAY—Stayed in this morning to take care of some shop jobs. The first one, an International midget, was weak (simply due to improper adjustment of the magnetic speaker). Took only a moment to fix. Found a blown filter condenser in the next one, also an International. The rectifier tube, as is usually the case, was ruined when the condenser blew. Checked the volume control with the ohmmeter. Also doubtful. Phone customer, recommending the set be traded in. Will let us know.

NEXT—Stewart-Warner all-wave. Replaced volume control and spent some time on the rubber-roller drive which slipped occasionally. Had no replacement rubber belt so removed the worn drive, built up the grove by winding a rubber band around it, then replaced the worn belt. Now O.K.!

Meanwhile one of the fellows dropped in to tell about the new speaker design being tried out in the new Rockefeller church. Uses two dynamic cones, one in a large compartment enclosed with pipes arranged to resonate with and reinforce certain frequencies, the other in a shallower compartment alongside. Both compartments were inverted over a pool of water. An opening at one end allowed the sound waves to emerge only after being literally "baptized" in the water. Which seems a peculiarly appropriate design for use in a Baptist church. Either because of or in spite of its design, the apparatus apparently proved a complete success in diffusing the sound evenly throughout the cathedral. After all, the more conventional designs did not prove satisfactory.

Off for lunch, then out on calls. NUMBER ONE—Large, beautifully furnished house. The estate of a man who, when living, was a banker of national prominence. Was ushered in to the presence of a charming widow, who asked me first to fix her son's set, then to go over the other three sets in the house. Told me the boy would let no one go near his radio and that he got a great deal of pleasure tinkering with it. Went upstairs and knocked on a bedroom door. Was admitted by a young fellow, about 18, who promptly locked the door after I entered. Told me he liked to play with the set, which was a Radiola 86, but that he had the wires all balled up now and couldn't get a sound out of it.

A Hidden Cache

Turned the set around and found the cabinet contained not only the set and power unit but also an additional high-voltage supply, consisting of two quarts of 16-year-old rye and one large bottle of Scotch. In between the power transformer and choke was plugged a large batch of perfumed letters wrapped in ribbon. All of which I removed and reverently placed along the floor. Found the voice-coil, link-circuit open and the wires off. Repaired and replaced wires on link, remembering that the mike works only with the red and black wire on the right-hand side. Carefully replaced the bottles and letters, suggesting that he really should have a larger and more modern radio to meet his present requirements. He agreed, and asked me how much the biggest set we had would cost. Told him we had a Cape-heart at $1200 that had plenty of space in back. Said he would have it sent up. (No chance, however, since the managers of trust funds generally take even better care of other people's money than they do of their own.) Meanwhile took his order to install a better mike for home recording. Went downstairs and checked over a Zenith combination, adjusting the push-buttons on the station selectors, picked up another Zenith midget to replace the volume control, then tackled the sweet job of making a Stromberg record-changer run properly after the youngster had jammed the mechanism. Phoned the shop that I wouldn't be able to hold to the schedule so our emergency man could "fill in" for a couple of hours. (Customers can let a set remain inoperative for a week, but if a serviceman is half an hour late they feel sadly neglected.)

JAMMED FULL OF BOTTLES, LOVE LETTERS, NICKNACKS

The young owner suddenly remembered the precious letters he had hidden away and grabbed wildly for them. Was his face Red?

THESE records from an anonymous serviceman's diary should be of decided interest to veteran servicemen, as well as to those whose experience in the service field is more limited. Written by a man who "knows his stuff," and shot with an occasional outcropping of humor, these items provide many hints not found in text books. More of these pages will appear from time to time.

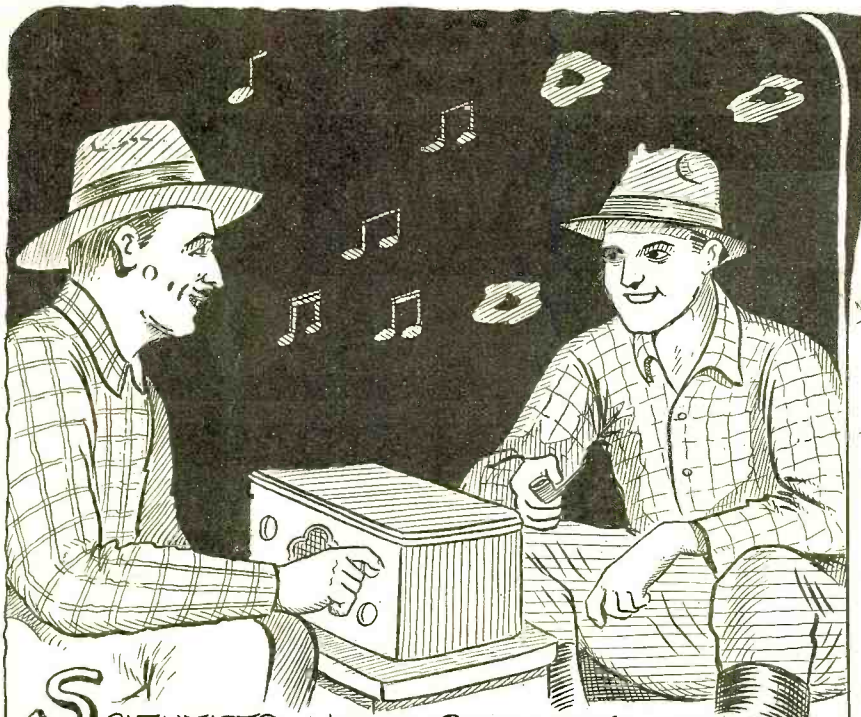
Got the record-changer operating normally again, discarded all the warped records and picked up the schedule again at 4 p.m., reporting my location at the office. Pulled a Radiola 143 chassis, which gave distorted reproduction due to a defective volume control. Struck a miserable buzzing noise, blanketing reception completely, at the next stop. Checked over the household appliances and made sure that no one was using an electric heating pad. All O.K. Looked out the window and saw a tropical fish aquarium in the next house. Went over and asked permission to test the aquarium heater. Sure enough—arcing badly! Explained that the neighbors were being subjected to interference from it. They were nice about it and promised to buy a better one. (Substituted an ordinary electric bulb temporarily.) All O.K. now. Bye-bye until tomorrow.

Noise Causes Deafness

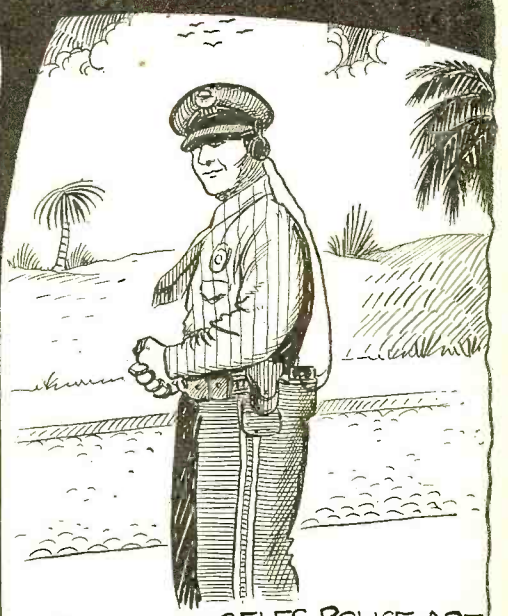
CINCINNATI, OHIO—Believe it or not, continuous exposure to loud noises will cause deafness, due to damage to the nerves. This was the conclusion of Dr. M. H. Lurie of Harvard University. Dr. Lurie has been experimenting with the ears of cats; he was able to connect a special kind of radio hook-up to the hearing apparatus of cats' ears. In such a way it was possible to gain valuable information about the causes of different kinds of deafness. It seems that cats have all the varieties of deafness which occur in human beings. Among the causes of deafness Dr. Lurie lists unregulated noise over long periods which may seriously injure the nerves by which we hear. Explosions can dislocate the special hearing cells, throwing them off the vibrating membrane on which they rest.

RADIO FACTS and ODDITIES ....

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

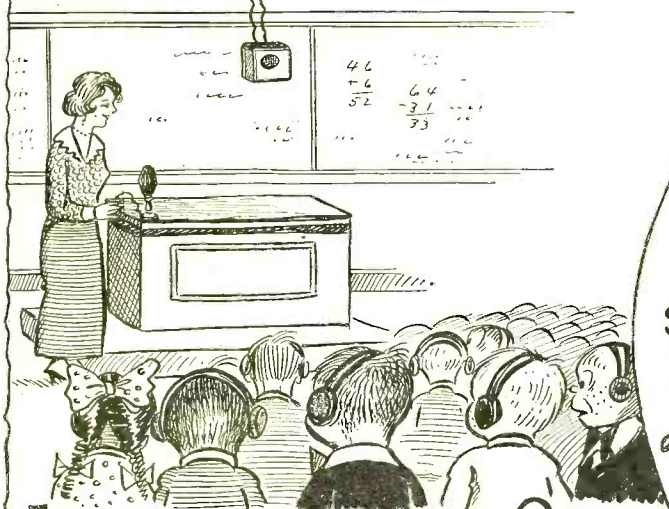


SCIENTISTS HAVE GONE INTO THE DEPTHS OF MAMMOTH CAVE, KENTUCKY AND PICKED UP RADIO PROGRAMS THAT PENETRATED MORE THAN 400 FT. OF SOLID ROCK!

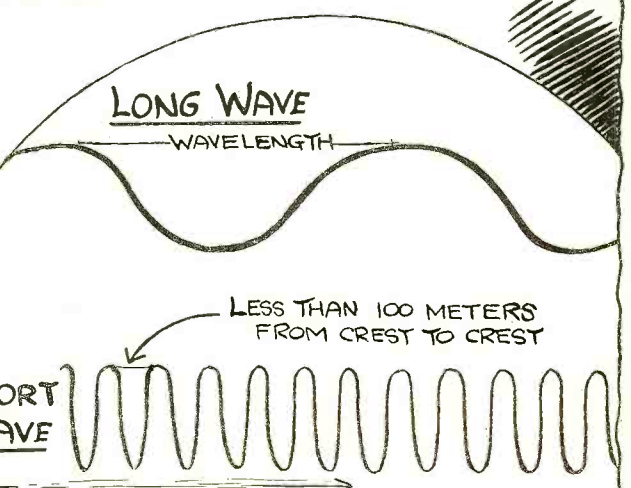


THE LOS ANGELES POLICE ARE EQUIPPED WITH TINY 44oz. RADIO RECEIVERS, WHICH THEY CARRY IN THEIR POCKETS, AS AN AID IN CATCHING CRIMINALS!!!

=HF Elmo



IN MANY ENGLISH SCHOOLS, RADIO SOUND EQUIPMENT, WITH SPECIAL LOUD SPEAKERS AND HEAD SETS ARE INSTALLED FOR TEACHING CHILDREN WHO ARE HARD OF HEARING!!!



THE TERM "LONG" WAVES AND "SHORT" WAVES HAVE NO BEARING ON THE DISTANCE THEY MAY TRAVEL NOR ON THEIR POWER!! THE WAVE LENGTH IS MEASURED FROM THE CREST OF ONE WAVE TO THE CREST OF THE FOLLOWING ONE!! THIS IS EQUIVALENT TO PITCH IN MUSIC!!!

For the First Time— Universal Application!

Mallory Condensers are manufactured under U. S. Patents 1710073,1714191, et al.

Now...69 MALLORY REPLACEMENT CONDENSERS

service 100% of all *radio sets

*radio sets using electrolytic condensers

For the first time, the service man is offered a practical universal mounting feature for carton type condensers.

For the first time, the service man has available a practical universal mounting feature for round can condensers.

For the first time, the necessity for splicing leads has been eliminated.

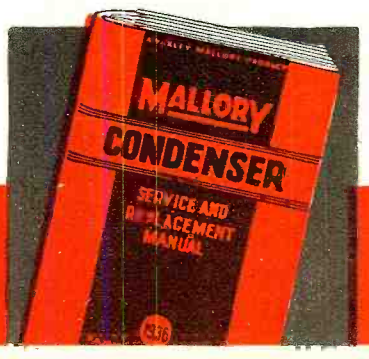
For the first time, absolute protection against humidity is afforded.

Here are but four of many constructional features of the new Mallory line. ***But,*** over and above constructional features, is a fifth feature — for the first time — the New Mallory Condenser Service and Replacement Manual, which gives in detail the universal application of these condensers in every day service work. It is the most valuable condenser help a service man can have—the detailed analysis of problems submitted by over 29,000 service men. Have you received your copy? If not, write us today, on your business letterhead.

Cellophane separators —
Etched anodes —
Stitched anode leads —

— of course, all important improvements pioneered or developed by Mallory are incorporated in Mallory Condensers wherever they add to quality.

P. R. MALLORY & CO., Inc.
INDIANAPOLIS INDIANA
Cable Address—Pelmallo



Radio News

March, 1936

Five-Meter CAR RADIO

(Talk While You Ride!)

Many American amateurs have been having a lot of fun and gaining experience in the operation of portable-mobile radio installations by building and operating a 5-meter radio telephone transmitter and receiver for their cars. The activities on the 5-meter band have increased to such an extent, recently, that no matter where you drive there are always a number of stations you can contact along the path of travel. This article gives the details of construction of such a transmitter

By **Laurence M. Cockaday**

"HELLO! W2JCY. This is W2IRT. I am speeding along the Hutchinson River Parkway from White Plains at about 35 miles per hour while I am talking to you. I am using my new 5-meter portable-mobile phone transmitter. Are you receiving me all right?"

That was the first transmission your editor picked up from "Tony" Landry's tiny radio-telephone installation in his coupe, while talking to amateurs on the 5-meter band. These conversations with Tony have continued for about a month, from many points in Westchester County, while Mr. Landry contacted my station direct from his car. These interesting talks over the air from a moving automobile to my own home prompted this article, as many people whom we had told of the incidents asked how such a set could be built and installed.

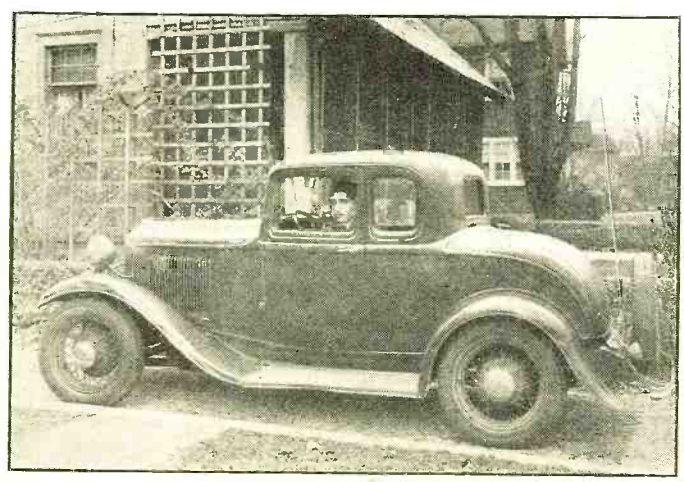
Guided by Radio

One night, about a month ago, I picked Mr. Landry's (W2IRT) signals up while he was about to start down Fort George Hill in New York City and asked him whether he would like to give me the constructional data on his transmitter and receiver for publication in RADIO NEWS. He said he would like to talk to me about it and I invited him up, although it was then 1 o'clock in the morning. He started out to come to my home station (W2JCY) and we had an interesting duplex conversation on the way as I pointed out to him, by radio, the proper turns in the road to take until he finally arrived right at my door. Thus, the plans for this article were really made over the air.

The complete car-radio installation is made in two small metal cabinets installed in a shelf under the back window, as illustrated. One of these contains a complete transmitter and the other a superheterodyne receiver. Other photographs and a diagram accompanying this article shows clearly the constructional details so that anyone with a working knowledge of radio can build one.

ARRIVING AT THE AUTHOR'S HOME

This is how "Tony" Landry drove up into the editor's driveway after a 12-mile drive throughout which he had been "steered" by a 5-meter radio telephone conversation between the car and the home station.

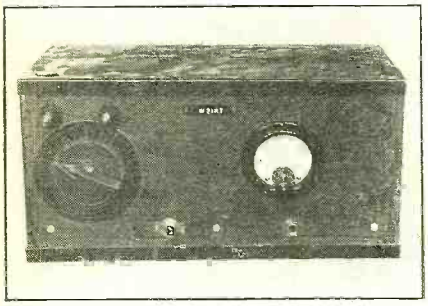


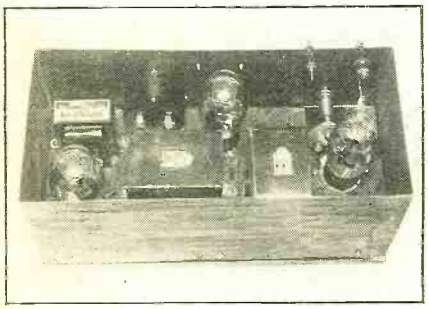
The Transmitter

The transmitter itself consists of one 6A6 oscillator tube using a T.N.T. circuit, with another 6A6 tube as a Class B modulator, and a third 6A6 tube as a Class A driver. The transmitting equipment is enclosed in a

THE COMPLETE INSTALLATION

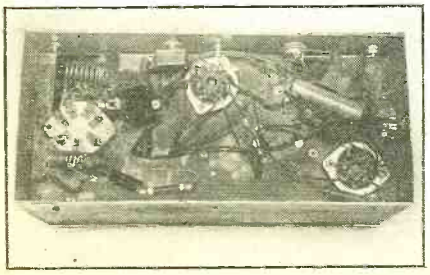
Above: Looking through the car window at the compact 5-meter transmitter and receiver with the microphone and loudspeaker in evidence. Below: The details of the transmitter equipment.





THE CONSTRUCTION DETAILS

The photograph, above, shows the top view looking into the cabinet, with the tubes mounted in place. Below is the bottom view of the transmitter, showing the plate and grid coils, the switches, jacks, resistors, condensers and tube sockets.



metal cabinet 5½ inches by 6 inches by 12 inches. On the front panel are: the tuning dial (at the left) with the two antenna terminals directly above; a s.p.s.t. switch to cut on and off the B-plus supply for transmission-reception, a microphone jack and a 0-100 milliammeter for checking operation. At the right-hand side of this cabinet is a 5-pronged socket for connecting a plug running to the power supply. B batteries are employed for furnishing the plate energy and the transmitter operates very well with B voltages as low as 100 volts and develops full power with 275 volts on the plate. At the present time B batteries are used and the oscillator is biased so that it draws about 60 milliamperes at 275 volts. The transmitter has worked very successfully with ranges from 10 to 20 miles, with reports of R8 to R9 reception. Both the transmitter and the receiver are suitable for duplex operation so that the car can be moving along while the transmitter is in operation and signals can be received and transmitted at the same time, as in a regular telephone conversation.

Details of the coils for the transmitter are as follows: The oscillator plate-tank coil consists of nine turns of No. 12 or No. 14 wire, wound in a spiral 5/8ths of an inch in diameter and spaced a distance of the diameter of one wire. This tank circuit is tuned by a three-plate 35 mmfd. condenser. The grid-tank may have 14 to 15 turns of No. 14 wire, wound in a spiral ½ inch in diameter and spaced a distance of the diameter of one wire.

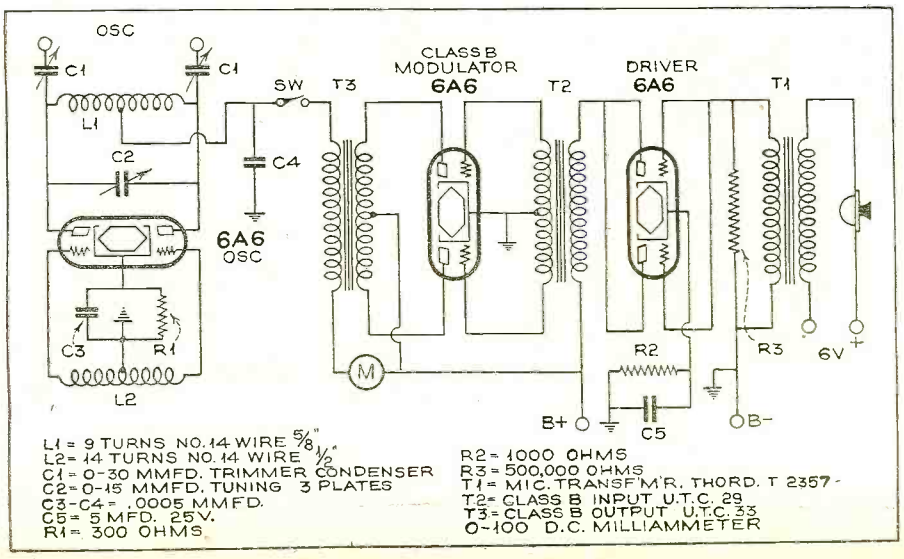
The circuit for this transmitter is shown herewith and the various parts are noted on the diagarm, together with their circuit constants, so that with the photographs and the diagram anyone handy with tools can build the transmitter in a few hours' time. It will be noted that there is a compartment above and one below the chassis "shelf" so that the tubes and transformer are mounted above this, while the rest of the parts and most of the wiring are in the lower compartment. This construction tends to add to the stability of the transmitter and to eliminate feed-back effects which might otherwise become a hazard in the case of duplex operation.

The Rod Antenna

A single-button carbon microphone is used with the transmitter and good quality reproduction is assured with a regular telephone hand set.

The antenna itself is mounted directly on the license plate rack, bolted and grounded in this way onto the frame. A single-wire feeder is tapped off this rod direct to the antenna post on the transmitter. The rod is 52 inches long and the tap is made 35½ inches from the top end. This point is very critical in adjustment and should be carefully checked, for a difference of only ¾ of an inch up (or down) in this adjustment will cause the signal to drop from an R9 to an R5. Final adjustment of this tap is made while contacting a distant station duplex so that the receiving station can report at which point the transmitter is operating most efficiently.

The receiver employed is a superheterodyne using four tubes for headphone operation and to which may be added an output tube for operation of the loudspeaker. (*Turn to page* 537)



WHAT'S *NEW in* RADIO

Yes, there is something new in radio! On this and the following pages you will find important inside information on newest radio and electronic developments

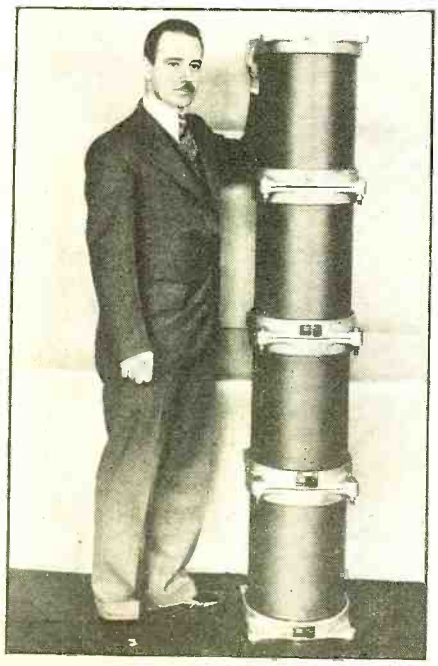
By W. C. Dorf

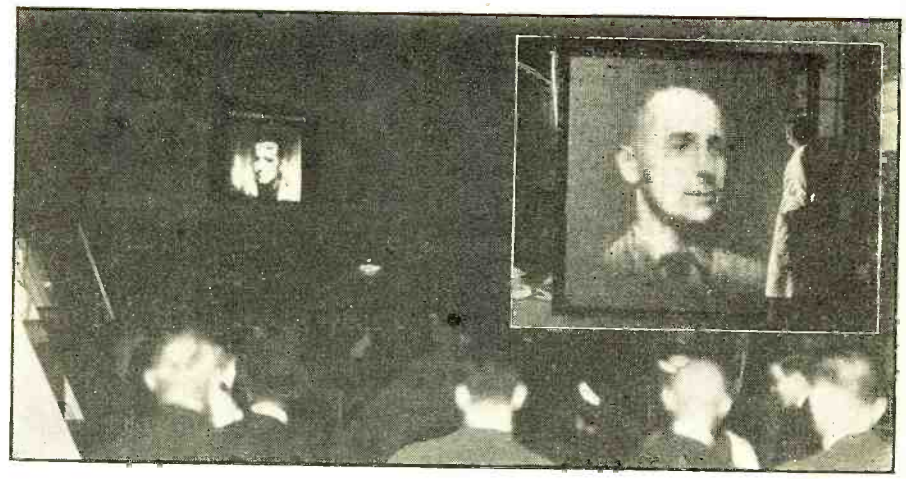
Super-Sensitive Photronic Cell

A new photo-cell of the "dry-plate" type, to provide high current output is now made available by the Weston Electrical Instrument Corporation. Known as the type 2 photronic cell, it is intended primarily for use at levels of illumination so low that the regular photronic cell can not provide sufficient output for the purposes intended.

A Man-Sized Condenser

Mr. William M. Bailey, Chief Engineer of the Cornell-Dubilier Company, is shown in the accompanying photograph standing beside a special oil filled paper condenser as developed by the above company for X-Ray power purposes. It has a capacity of 0.06 mfd. and is designed to stand up under a potential of 250,000 volts.





TELEVISION IS SURELY COMING—AND SOON!

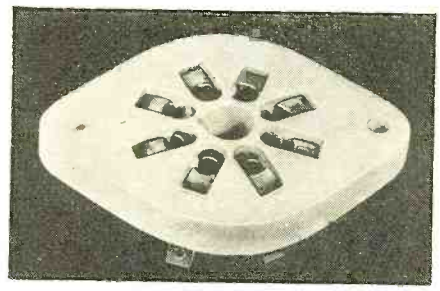
Here is a demonstration of large-scale television reception recently made in Germany utilizing the Karolus television-plate method. Insert shows relative size of the picture compared to a human

Aerial Kit

To facilitate installation, the new Atwater Kent doublet-antenna comes completely assembled. The parallel-pair transmission line is soldered to the antenna and the center insulator and porcelain spreaders are attached to the antenna and lead-in.

Low-Loss Socket for Metal Tubes

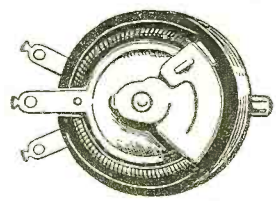
The National Company introduces six new sockets with Isolantite insulation which include the JX100 wafer type socket for the new RK28 and RCA803 power pentodes, a unique socket for the RCA954 acorn pentode tube, two sockets for the RCA955 acorn triode, a 50-watt metal shell socket and the new Isolantite wafer



socket shown in the illustration for the octal-base metal tubes.

The Newest in Power Rheostats

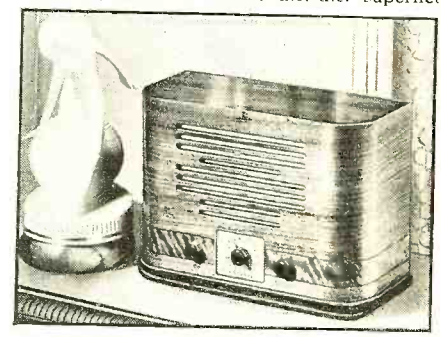
The Electrad vitreous enameled power rheostats are ruggedly constructed for long life at rated current loads. The contact shoe of special metal graphite composition contacts the wire-wound element on the outside surface to insure smooth noiseless action. They can be used as speed con-



trols for small motors, temperature controls for vacuum tube filaments and as a general voltage or current regulator in the laboratory. The type 2X shown, is available in standard values from 1 to 2000 ohms in 25 watt rating. Other units are made in 50, 100 and 150 watt ratings.

An Attractive Table-Type Set

The International "Kadette" model 60 receiver, offers a 6-tube a.c.-d.c. superhet

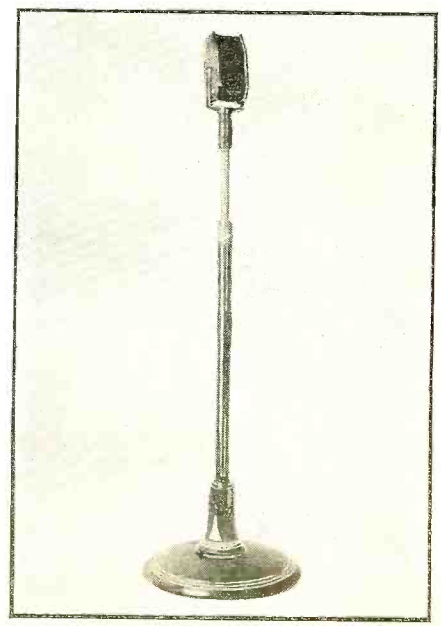


in a striking modernistic design with dual-wave band coverage from 70 to 545 meters.

The Latest in Microphone Stands

The new Amperite microphone stand with non-sliding, ball-bearing clutch requires only ⅛ turn for a positive stop, meaning that the stand level "stays put." The microphone moves up or down with smooth pneumatic action. The stand can be rotated without loosening the clutch, a very desirable feature when it is necessary to rotate the microphone in a hurry.

(*Turn to page* 568)



HOW RADIO

Radio progress is not something which slowly
sult of hundreds, if not thousands, of funda
industry's leaders, both technical and indus
will undoubtedly affect radio

Short Waves as Regular Listeners' Fare

By Larry E. Gubb

I fully expect that for a great majority of radio listeners foreign short-wave programs will constitute a regular and important part of their daily listening schedules in 1936. The attention of American listeners has been focussed on the short-wave band by recent improvements in reception through such features as the all-wave aerial, and the built-in aerial tuning system, which make it possible to tune in more stations in all parts of the world than ever before; and from the other side by improved short-wave programs, more broadcasts in English, and the installation of better broadcasting equipment by foreign stations.

Radio Tubes Blazing Trail in 1936

By F. J. Wessner

Radio tubes again demonstrate themselves to be the keystone of the radio industry in the selling story provided by new glass-metal and all-metal types. No other single development during the past year could have acted as the basis for such a powerful merchandising campaign, such a potent reason why to buy a new receiver. That radio tubes will continue to blaze new trails seems assured. New tube types and improvements on present types will be definitely in the picture during the coming year. Where the science involved in radio tube research can lead remains curtained by time. Strides which will open up new wonders of radio are expected and if the past is any criterion, will surely be made.

Acorn Tubes for the Ultra-High Frequencies

By James Millen

The growing importance of the ultra-short waves for both commercial and amateur use has greatly speeded the development of suitable equipment. Television, facsimile, and high-fidelity transmitters for the ultra-high frequency spectrum are receiving great attention from the commercials and leading amateurs are operating successfully on wavelengths of one meter and below. Necessity is the mother of invention, and equipment has kept pace. Typical among important developments are acorn tubes, which have helped make feasible the design by National of a practical receiver for the range from 1 to 10 meters.

High Fidelity on Ultra-Short Waves

By J. M. McNeill

With the advent of so-called high-fidelity receivers appearing upon the market in the last two or three years, it has become evident that in the present broadcast band there are definite obstacles in the path of higher fidelity reproduction. The long distances covered by transmitters operating in the normal broadcast band with only 10 kilocycles separation causes intolerable interference to receivers which have been "opened up" for reproduction of higher audio frequencies. Higher fidelity reproduction, however, is a sound basis of development and will, therefore, not be denied. Recognizing that the assignments in the broadcast band are too firmly entrenched to be unscrambled and re-assigned, some other avenue of escape must be employed. The answer lies in the utilization of short waves.

Fortunately, short waves on the order of 7 meters have a transmission characteristic such that they do not carry great distances. This means that broadcasting may be done in two nearby cities on the same wavelengths without danger of interference. Consequently, it is not necessary to hold this assigned wavelength down to a 10-kilocycle band width. This will permit high-fidelity transmission to the extremities of the audible range. While only experimental work has been done with broadcasting of this type at this time, there is no doubt that in a short time high-fidelity stations will be established in the near future providing a source for a higher quality of reproduction.

Perfection of Short-Wave Transmission

By E. F. McDonald, Jr.

The perfection of short-wave transmission has put within the reach of every radio owner the means of becoming a cosmopolite. Eventually interchange of information between nations will become a tremendous factor in preserving world peace. Because of these things among others, Zenith this season has devoted a large proportion of its efforts toward giving the public highly important improvements in the short-wave features of its receivers.

Radio as an Educational Medium

By E. H. Rietzke

I believe radio is a greater factor in education than most people realize. The average person today has a better appreciation of music and a wider knowledge of world affairs than was possible before the advent of radio broadcasting. The stratosphere broadcast, the March of Time, outstanding musical programs, etc., brought into the home, take the listener out of the everyday routine and into a world with which he would otherwise have little contact. It seems to me that the future of radio in education lies along such lines rather than toward education of a more academic nature and that along such lines radio has a distinct function which cannot be duplicated by any other means.

Amplification of "Millions" in One Tube

By V. K. Zworykin

A type of tube has recently been developed which depends for its operation upon directing an initial electron current by means of an appropriate electron optical system onto a succession of sensitized targets having a high secondary emission ratio. In such a tube an initial current may be amplified several million times without instability. Multiplier photocells based on this principle have been built to have an output of 5 to 10 amperes per lumen and may some day replace the conventional photocell and associated amplifier system. In addition to their extreme simplicity and excellent frequency response, they have the even more important feature that the "noise" output is extremely low, allowing, at small light intensities, a gain of from 50 to 100 or more in signal-to-noise ratio.

Big Opportunities for the Trained Serviceman

By Albert A. Ghirardi

The fact that the circuits of the new receivers this year are more complicated than ever before, and that they have even more "gadgets" to get out of order than the models of previous years, ought to make the real live-wire type of servicemen —the kind who make it their business to keep up to date on all new equipment—just shout for joy! Now, more than ever before, the "screwdriver and plier" type of serviceman will be forced out of the servicing picture to make way for the type of man who is "up on his business fundamentals" and "knows his circuits."

Advanced Training Needed in 1936

By A. Pietman

The appearance on the market of complicated multi-tube receivers, using as many as twenty-four tubes, and the impending advent of television, means that servicemen must study hard and keep themselves thoroughly informed on technical developments. If they do not, they will find themselves unable to diagnose trouble in customers' receivers, and they will quickly lose their business. They must also keep their test equipment up-to-date, to take care of new types of tubes, new circuits and new accessories.

Short-Wave Reception Greatly Improved

By Tobe Deutschmann

With almost dramatic abruptness the short-waves have jumped our required tuning range from 950 to approximately 23,000 kilocycles! Many compromises were necessary in receiver design to quickly bridge this tremendous technical gap. Obviously a new order of precision in radio manufacturing is necessary and the coming year will see short-wave reception greatly improved through perfection of detail in receiving equipment. With many years of experience in precision radio production behind us, the Tobe Deutschmann Corporation feels that it is in a particularly fortunate position to meet these new conditions.

Metal Tubes Here to Stay

By Alvin Zinkan

What does the future hold for metal tubes? Radio prophets have had many sad experiences in this fast-moving and changing business. But two things seem certain; metal tubes are here to stay and glass tubes will still be in demand both for replacement and original equipment for many years to come. About half a hundred radio set manufacturers are producing receivers equipped with metal tubes; wholesalers and dealers are stocking them for replacement sales. 1936 should show a continuance of present conditions. Raytheon's position, as a tube manufacturer, is to supply what is demanded rather than to attempt to dictate requirements.

ADVANCES!

forges ahead as people watch. It is the re- mental ideas originating in the brains of the trial. Here are some of those ideas which trends during the present year

Public-Address Work Increasing in 1936

By C. B Scott

It is our feeling that the coming year will show progress in the field of sound reproduction along the lines of higher fidelity, extended uses for public-address equipment and more standard public-address units. Special engineering will still be necessary for some installations, but the public-address field is one which is adapting itself well to standardization. This will be very important as the uses for public-address systems increase.

Research Develops Service Field

By H W. Sams

P. R. Mallory & Co., Inc., of Indianapolis, Indiana, announce two new developments of unusual interest to servicemen. One is the Service and Replacement Condenser Manual described as the first complete books of its kind. It rounds out the series of servicemen's manuals which we have been compiling. The other is a new universal line of replacement condensers that offer many amazing engineering features, such as universal application, smaller sizes, and great efficiency.

Both manual and line resulted from research and development activities that followed the study of thousands of questionnaires in which servicemen presented their condenser problems.

A Real Future in Radio

By F. L. Sprayberry

Radio educational standards are gradually being brought to a higher level. The young man choosing radio as his profession can no longer take general radio training and expect it to qualify him for *any* position in radio. Minimum educational requirements are at least two years of high school—more high school or college training simply means that a young man's chances for advancement are greater. Radio has many fields of opportunity. Select the one you like best and *specialize* in it—that is your best assurance for a real future in radio.

A Specialist Is Entitled to His Fee

By Charles Golenpaul

Skilled Specialist—that's the deeper significance of the title, "Radio Serviceman." And tomorrow that specialist will have learned how to charge for specialized skill, for it is in a keener business sense rather than further technical capability that progress must be scored. Future radio servicing must be profitable as well as fascinating. Remember, specialists are paid for brains rather than hands. Meanwhile, set and parts manufacturers fully appreciate the recent transition from tinker to technician. They are catering as never before to recognized servicemen, notably with endless literature, regional meetings, test equipment and even factory training. Radio periodicals are bringing timely and practical data to those who must solve the thousand-and-one problems in servicing intricate sets of today. Radio parts are made available in widest variety to meet every requirement, even to precisely matched duplicate replacements. But I for one still insist that radio servicemen as a group have not as yet cashed in on their enviable situation. The IRSM and National Technician movements, among others, cannot be too highly commended for bringing business methods to servicemen. After all, a specialist is entitled to his fee.

Short Waves Bring Japan and Russia

By A. G. Hoffman

Just as the automobile came before good roads were developed, just so radio sets are ahead of the airways, but these are being paved with powerful stations which override static both day and night, winter and summer. Dependable short-wave broadcasting is here. Receivers as far inland as Missouri and Arkansas are consistently receiving Japan from one direction and Russia from the other, while South American stations boom through day and night.

Trained Servicemen to Go Far

By V. E. Jenkins

The days of guesswork, haphazard methods, hit-and-miss attempts to remedy troubles are forever past in servicing. Skilful servicing has become an established and recognized part of the radio field.

Public demand for the best in receivers has brought about many changes in the design and improvement of vacuum tubes and radio receivers. To keep abreast of this advancement has necessitated alertness on the part of the serviceman. A vast number of new service problems always follows in the wake of progress affording unlimited opportunity for the serviceman. Those who fit themselves, who make use of resources made available, are bound to go far in this permanently established branch of the radio field.

The Future of Radio in Education

By J. E. Smith

Radio broadcasting is a new vehicle for the dissemination of educational information. Being a new medium, those who wish to use radio for purposes of educating the public must adapt the method to the means. Education by radio must attract the public because attendance is not compulsory. Broadcasts like American Town Meeting, War Against War, Radio Forum, Plays with a Purpose, fortunately, are the high signs that radio in education is coming of age

Even such abstract subjects as "pronunciation" and "correct use of words" can be broadcast, if appeal and incentive are included. Washington boasts of such a program.

NEXT MONTH

We are asking further questions on other subjects of interest to our readers and the ideas of another group of experts will be given in the April Issue.

Two New

ELECTRON TUBES

By S. Kaufman

AT separate demonstrations before the Institute of Radio Engineers, two new electronic tubes were recently revealed by Dr. V. K. Zworykin and Philo T. Farnsworth, well known television inventors. Considerable attention of the radio industry was accorded the two products. The RCA development was described before a New York I.R.E. assembly while the Farnsworth product was explained to the Washington Chapter of the same scientific body.

Dr. Zworykin, Mr. Louis Malter and Dr. George A. Morton, of RCA, described their firm's new device termed an "electron multiplier" at the New York session. The tube was said to hold definite advantages in the further development of television. But its possibilities in other branches of radio were also declared to be enormous. Experiments indicate application of the valve to any task of electrical amplification requiring exceedingly high gain at noise levels far below the present types of amplifier tubes. The tube is suitable for amplifying either d.c. or a.c. of any frequency.

According to RCA spokesmen, the tube marks an advance in the utilization of what laboratory men call "secondary emission." This is a principle by which the impact of electrons emitted by a cathode release other electrons, from a series of succeeding electrodes, in ever increasing volume. The valve may be provided with a photo-electric cathode or the customary thermionic cathode of the type used in tubes of average receiving sets. A photo-electric cathode was used in the tube demonstrated by RCA.

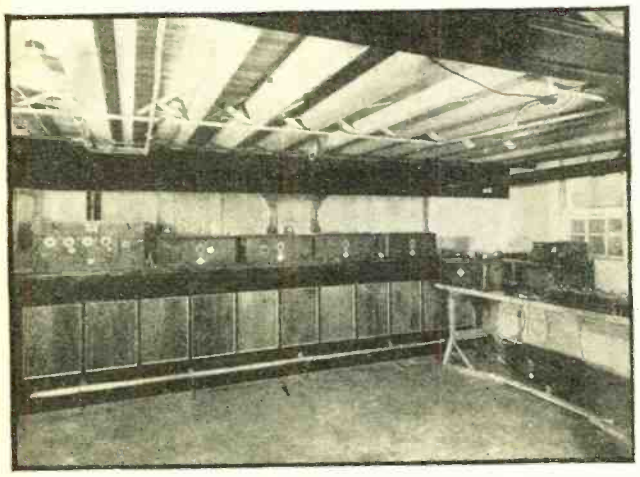
A neon glow tube connected to the

(*Turn to page* 557)

FREQUENCY MODULATION

ARMSTRONG'S

(For the Reduction



AN AMATEUR SET-UP

A complete installation embodying the principles of the Armstrong receiver system at the home of Harry Sadenwater of Haddonfield, N. J.

In the first of these articles covering mizing disturbances in radio communication RADIO NEWS—the principles of frequency mitter was described. In the present discussed, as well as the means by which range of ultra-short-wave communication

By Dale

Part

THE transmission distance for very high-frequency signals has been limited by the fact that these waves are not reflected by the Kennelly-Heaviside layer. Consequently, very high-frequency signalling is carried on (except under freak circumstances) by the direct sky wave, which travels in nearly a straight line from the antenna. Regular communication has been limited to transmission between stations in view of each other, the maximum distance over which communication could be accomplished being dictated by the curvature of the earth. Some recent studies of the properties of the ionosphere indicate that the direct wave is diffracted in the upper atmosphere, and, consequently, this conclusion must be modified, but, by and large, reliable communication at ultra-high frequencies—until the frequency-modulation development—had been limited to short distances. To maintain communication over larger distances, directive antennas or high-power transmitters had to be constructed. Armstrong's contribution in suppressing receiver noise, and thus increasing the effective sensitivity of receivers, has increased the distance over which reliable communication is feasible.

More Distance—Less Noise

The results that Professor Armstrong has obtained by the use of the wide-band frequency modulated system have been highly successful. Consistent high-quality transmission has been maintained over a distance of some 85 miles over an extended period of time on a frequency of 41 megacycles with a 2-kilowatt station located at the top of the Empire State Building. It should be pointed out that, with the transmitter at a height of 1000 feet, 85 miles is about twice the ordinary "line-of-sight" distance over the surface of the earth. These signals have been transmitted flawlessly in the midst of heavy lightning storms, when reception from a 50-kilowatt broadcast station only 20 miles distant was severely marred by the static crashes. Such reception with the ordinary amplitude-modulated system, even at high frequencies, is only obtained under exceptional circumstances. It should also be pointed out that the results obtained with the Armstrong method were all with the use of a simple dipole antenna, with no intentional directional characteristic.

2½-Meter Demonstration

At the meeting of the Institute of Radio Engineers, on November 6th, 1935, at which the frequency-modulated system was disclosed, a demonstration transmitter located about 20 miles from the Engineering Societies Building in New York, where the paper was read, operated successfully with an antenna power of only 100 watts. The Engineering Societies Building is located in midtown Manhattan—hardly a favorable situation for a demonstration broadcast—but excellent reception was obtained. The system was operated at a wavelength of 2.5 meters. This is an example of the improvement in service area and economies in power that could result. A new medium-power transmitter making use of the frequency-modulated system is now being constructed. It is believed that tests will reveal still greater improvement in performance over the present systems.

The apparent disadvantage of the new signalling method, which may prevent its adoption for a time, is its complexity. Undoubtedly simplification will take place, but for the present it appears that it can be applied only for point-to-point service by commercial communication concerns. Whether it will be widely used for broadcast reception in the future is as yet a matter for conjecture.

The Receiving System

The simplified circuit diagram of the receiver which is employed is shown in Figure 5. While this receiver makes use of a multiplicity of tubes (there are twenty-seven in one model), most of these are part of the sensitive superheterodyne receiver which precedes the frequency-modulation detection scheme and which is shown in the first box in the diagram. This receiver, of advanced design, makes use of 2 intermediate frequencies, the first at about 6 megacycles, and the second at 400 kilocycles. The output of the last intermediate-

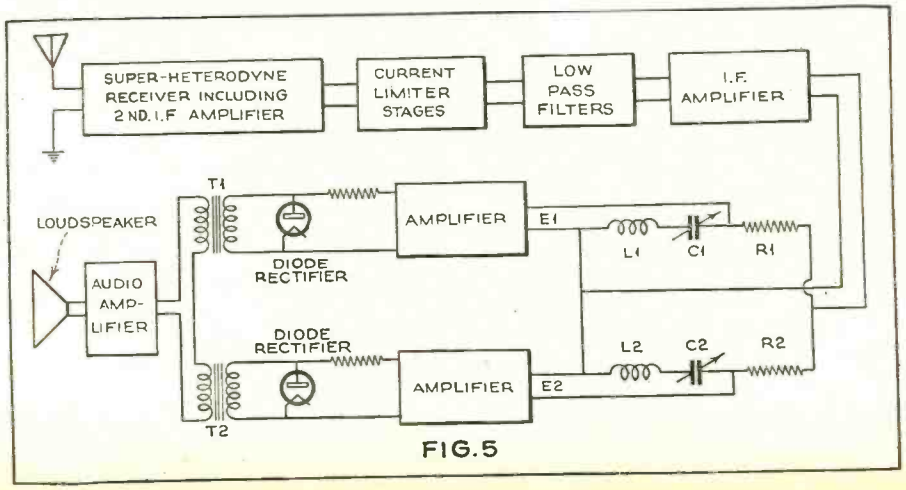


FIG.5

ON ULTRA SHORT WAVES

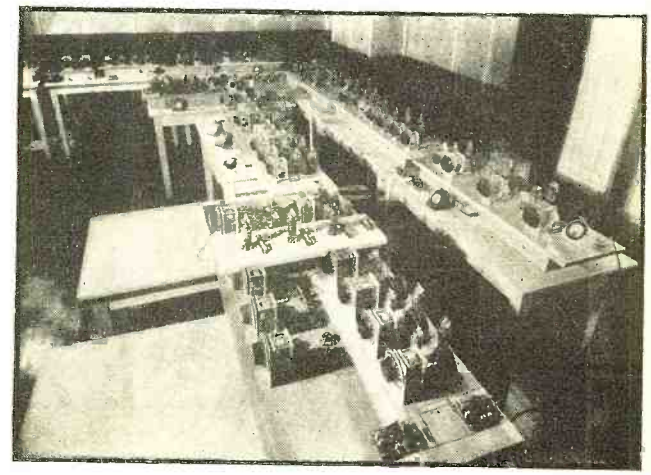
INVENTION

of Radio Disturbances)

Edwin H. Armstrong's invention for mini—which appeared in the February issue of modulation were outlined and the trans- article, the operation of the receiver is disturbances are avoided, thus increasing the beyond the limitations of present systems

Pollack

Two



A REVISED TRANSMITTER

A view of the second transmitter modulating equipment, mounted on tables, at the Empire State Building, showing the various multiplexing circuits of the Armstrong system.

frequency amplifier is passed to the current limiter stages, each of which is similar to that employed in the transmitter. The current limiters (saturated vacuum tubes), whose action is similar to that of a fast a.v.c. circuit as incorporated in the receiver, have a dual function. In the first place, they eliminate any amplitude variation which may have been introduced into the signal between the transmitter and the i.f. amplifier output. Such amplitude modulation can result from noise or fading. The second function of the current limiters is to produce a mirror image for each disturbing frequency, on the opposite side of the carrier. This will be described later.

The Detector

After being amplified the signal voltage passes to two resonant circuits, each consisting of a resistor, a condenser, and an inductor in series. One of these circuits, say L1, C1, R1, is tuned to the lowest frequency of the frequency-modulated signal, the other, L2, C2, R2, is tuned to the highest frequency. Thus, if the intermediate frequency for the carrier is 400 kilocycles, which is swinging between 350 kilocycles and 450 kilocycles due to the presence of the frequency-modulated signal (these figures are illustrative; several combinations have been used in practice), one of the circuits is tuned to 350 kilocycles, the other to 450 kilocycles. Note that the intermediate amplifier must be designed to have a 100-kilocycle bandwidth.

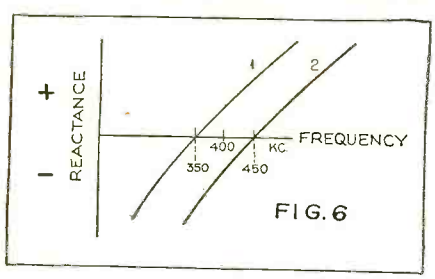
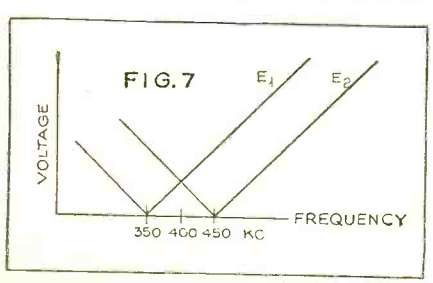


FIG. 6



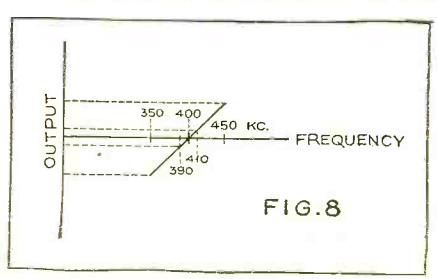


FIG. 8

How It Works

Figure 6 shows the variation in reactance of each of the tuned circuits; in the range within which the detector operates the variations are nearly linear. The voltage for the two amplifiers is taken across the condenser and inductance in each branch. Figure 7 illustrates the variation in E1 and E2 (which are the voltages admitted to each of the amplifiers) with frequency. After being amplified, each of these voltages is fed to the linear diode rectifiers, whose outputs are combined by the transformers, T1 and T2. The transformers are so poled that frequency variations produce a cumulative voltage in the output, as shown in Figure 8. It has been found that the relation between frequency and output voltage (Figure 8) can be made linear, and thus an excellent means for detecting a frequency-modulated wave has been devised, for, as the transmitter frequency swings under the influence of the frequency modulation, the voltage across the output varies accordingly. The transformers, T1 and T2, are followed by a high-quality audio amplifier and loudspeaker.

There remains the explanation of the means by which this communication method reduces disturbances. It has been pointed out that until the development of the frequency-modulation method, the only available way to extend the range of communication at very short wavelengths had been to increase the power of the transmitted wave by the use of directional antennas, or by high-power transmitter apparatus. If, on the other hand, attempts were made to increase the range by increasing the sensitivity of the receivers, it had been found impossible to do so without simultaneously increasing the noise level. To be effective, an increase in receiver sensitivity must be accompanied by an improvement in the signal-to-noise ratio. This is what the wide-band, frequency-modulation method accomplishes.

Why It Reduces Noise

Noise inherent to the receiver results from electronic effects in the early amplifier tubes, and from thermal agitation noise in the first tuned circuits. That part of the noise which is due to amplitude fluctuations is eliminated directly by the stages of current limiting in the receiver. When no carrier is being received, the noise is distributed throughout the band over which the amplifier operates, in the case illustrated in Figure 6, over the 100-kilocycle band from 350 to 450 kilocycles. When a carrier is superimposed upon the noise, the situation changes because the components of noise, in the band-pass of the amplifier, beat with the carrier and greatly increase the noise appearing at the output. This effect can be noticed with any receiver; there is always a large increase in the noise level when an unmodulated carrier is tuned in. (In addition, the detector sensitivity is increased by the (*Turn to page* 573)

The "HAM" Shack

Conducted by
Everett M. Walker
Editor for Amateur Activities

FAMOUS CHICAGO STATION
This is the "Ham" Shack of Alice R. Bourke, W9DXX of Chicago, Illinois. Notice the fine array of receivers at the back of the operating table with the transmitters on the left.

Ten METERS "Lively"

DURING the last two months the 10-meter amateur band has become tremendously active. It has opened up, and there is DX galore to be had with the proper transmitting and receiving equipment. As a matter of fact, for the last year there have been an ever-increasing number of stations on the band, and when conditions have been "right" contacts over several thousands of miles with small amounts of power have not been uncommon. With the increasing number of stations operating on it, more and more is being learned about the necessary types of transmitters, receivers and antennas.

JUST how reliable the 10-meter band is for DX is still a moot question. The writer has a theory that the tremendous distances that are being obtained today may not last, but this is only a question that can be answered by the extended use of the channel. It might be recalled that just about eight years ago the 10-meter band was "hot." There were several Eastern amateurs operating extensively on it and accomplishing phenomenal distance work. One station in New Jersey as early as 1928 established regular scheduled communication with a station in South Africa. Then the band seemed to go dead. Then, about a year ago several of the pioneers who were still active on the band reported that they again were establishing distant contacts.

It may have been that the band appeared to go dead during this period because of insufficient activity. But, this is not likely. It is the writer's theory that these DX periods, so-called, appear in cycles—cycles that in some way are related to sun-spot activity. It has been known for some time that there is some relation between the ionosphere (sometimes called Heaviside layer) magnetic storms and sun-spots. The relation of "skip distance" to high-frequency radio signals is quite generally known. The latest theories indicate there are three layers in the ionosphere, each giving a different refraction angle and varying in reflections properties according to the frequency utilized. Now, on the 10-meter band, the ionosphere necessarily has to be reasonably low (it varies in height between fifty and 400 miles) in order that it might reflect these ultra-high frequencies back to earth at an angle that will fall tangent with the earth's surface, or less. If the angle is too great, of course the signals will go off into space, leaving only the ground wave effective.

L.P.O. WITH A TRANSMITTER
Jose Perez of Santiago, Dominican Republic is shown at the microphone of his station, HI4V.

Now, if the writer's observations are correct, it would seem that these usable skip periods follow in more or less the same cycle as sun-spot activity. The sun-spots occur in periods of eleven years, waxing and waning during such a period to peak and minimum. Right now we are approaching a period of maximum activity. The cycle is now tending toward greater sun-spot activity. It might be pointed out that in 1928, when a number of amateurs were obtaining real DX on 10 meters, we were passing through a phase of the cycle that was similar to that we are now having.

Will the Band Last?

Therefore, the question is: Is the 10-meter band good during a period of small sun-spot activity? That is something the amateur will be able to determine by the increased activity on the channel. It will be interesting to see if it is true. But, in any event, it does not mean the band is useless, nor that it will be usable during several year periods. In periods of "poor skip" it is a desirable local band. During these poor periods, it is somewhat like 5 meters; it is quasi-optical, but to a lesser degree than the latter band, and it covers the valleys better than the higher frequencies.

With more activity on the band, the chances for obtaining this information are increased. More and more stations are taking a fling at 10 meters. They are finding it interesting. Some have worked better distances than possible with the same equipment on 14,000 kilocycles, and have received better reports. The band, as far as DX is concerned, is a daytime band. The largest number of stations are to be found on it on Sundays and international holidays. It generally follows when there is a short skip on 14,000 kilocycles, the 10-meter band is "good."

Increased activity also has resulted in valuable information on necessary antennas, transmitters and receivers. Newcomers to the band have found it difficult to get a transmitter to work effectively. To begin with, antenna is far more important than power, and even more so than on 20 meters.

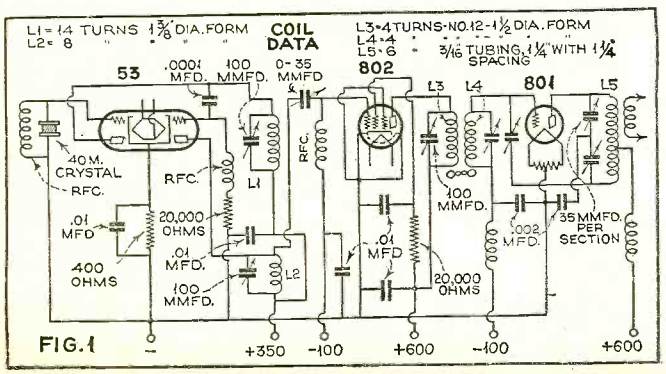


FIG. 1

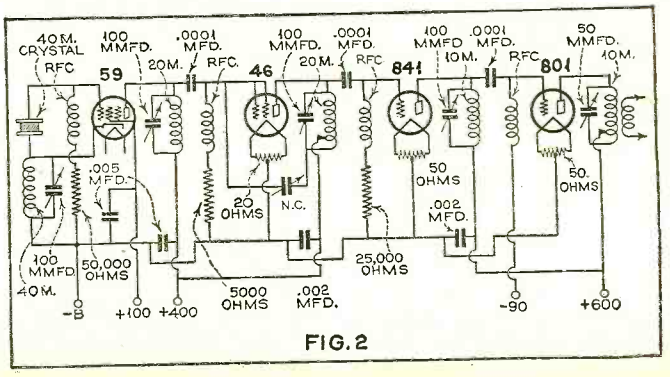


FIG. 2

¶ A Department for the amateur operator to help him keep up-to-date

In general, it has been found that a half-wave doublet is about as effective as any antenna that can be erected for 10 meters. A majority of the stations are using variations of this system. It would appear, judging from the results obtained by most stations on the band, that a horizontal antenna is the most effective. This may be due to the fact most receiving antennas are horizontal, and naturally are more effective in receiving horizontally polarized waves. The radiation pattern from a half-wave antenna, of course, provides the greatest amounts of radiation in the two directions at right angles to the axis of the antenna. Therefore, its erection direction is important.

The Johnson "Q"

As for feeding the horizontal doublet, any of the accepted methods may be used. These are three: matched impedance voltage fed; twisted-paid matched impedance and the transformer or Johnson "Q" method. All three are effective. It might be pointed out that a station on the West Coast has done considerable experimentation with different types of antenna, including beams, diamonds, etc., and was heard to say recently that he has always returned to his Johnson "Q" for the best results.

Another type of antenna which should give excellent results but on which complete data is not usually available, is two half-wavelength antennas operating in phase. This type of aerial is less directional than the half-wave type. It merely consists of two half-wave Zeppelin antennas strung end-to-end and fed in the middle with a common pair of feeder wires. It might be called a current-fed 20-meter antennas. This type antenna provides good radiation in four directions at about forty degrees to the axis of the aerial wire.

Height Above Ground

The height above ground also is important. It is something that should be experimented with until the best results are obtained. One station in the East has found that it is desirable to tilt the antenna in the direction it is desired to "spray" the signals. Between 30 and 45 degrees will give the most marked directional characteristic. The station in question tilts the antenna toward Europe in the morning and toward the West Coast in the afternoon.

It is impossible to predict when the 10-meter band will "open" up during any one day, but observation over an extended period seems to indicate that stations from Europe begin coming through at about 8 a.m. on Sunday morning and other days when these stations are free to operate. Sometimes it is as late as 9 o'clock before they begin to filter through. Stations to the West begin coming through shortly after noon (on the East Coast) and seem to arrive at a peak at about 4 p.m. The times given here are Eastern Standard Time, and of course, conditions will vary in the different time zones, but should follow about the same trend in other sections

Furthermore, there is no means of forecasting when the 10-meter band will be good. Some Sundays it will be excellent, and on others no distant signals may be heard at all. Some study of sun-spot phenomena might give some clue as to what may be expected for a given time, but this would not always follow. In general, it seems that with a sudden increase in the sun-spot curve, short-wave radio improves. Sun-spots, in addition to following the general eleven-year cycle from time to time, show increase for a few days at a time. At such intervals it has been found that instead of improving high-frequency transmission, they have the contrary effect and have been known to cause complete dead spots. Also, another factor enters into the problem of forecasting conditions. That is magnetic storms. These, too, are generally accepted as being related to sun-spot activity. But, unlike the effect the spots have on the ionosphere, which appears to follow in step with the sun-spot cycles, the magnetic storms seem to be further removed from the cause. That is, they do not seem to follow immediately

(Turn to page 572)

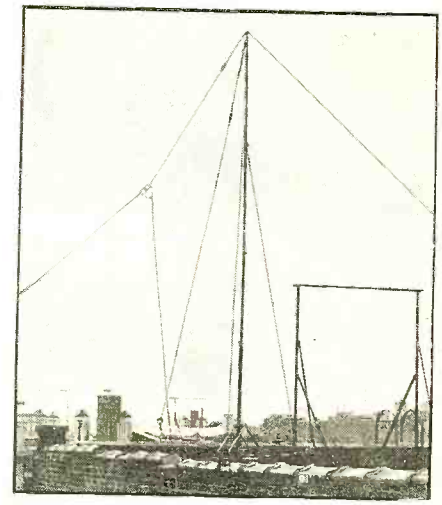
Steel Antenna MAST

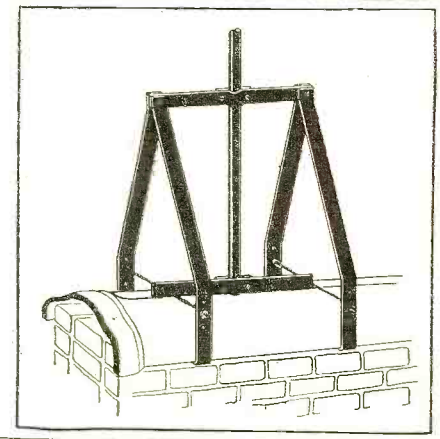
By G. Frazer

OCCASION was recently found to install a new antenna mast at one of the New York Listening Posts. The type selected proved so eminently satisfactory that it is being brought to the attention of readers who may be faced with the problem of erecting a suitable antenna.

THE type antenna mast selected for our new antenna installation was the Premax Telescope Mast. This consists of four tubular steel sections of graduated diameters, finished in dark-green enamel. Normally the mast is mounted on any type of roof, whether flat or sloping, by means of a pair of adjustable steel flanges attached to the bottom end of the base section. For apartment-house installations, such as that at the Listening Post mentioned, there is a special Premax parapet support which permits the mast to be mounted at any convenient point atop the parapet as shown in Figure 1. This four-section mast has an overall length, extended, of 13 feet and a closed length of approximately 3½ feet.

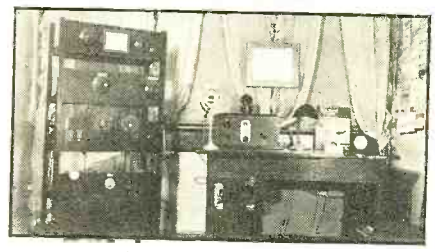
(Turn to page 565)





WORKS ALL BANDS

Here is a rig in the "Ham" Shack of G. G. Peterson (W9JVJ). His transmitter operates on all wavebands from his home town of Carbondale, Illinois.



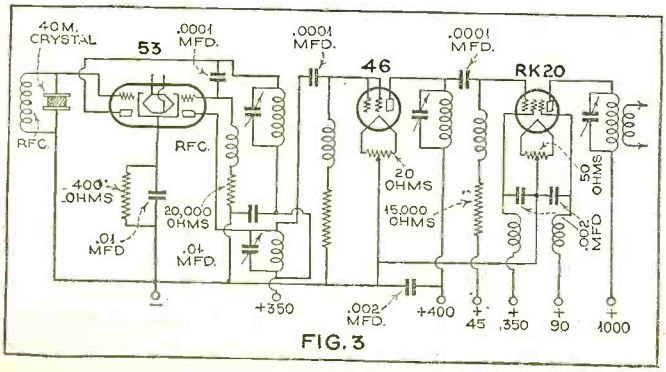


FIG. 3

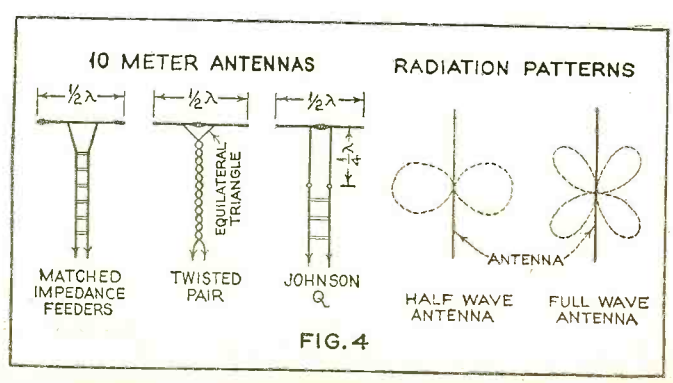


FIG. 4

The Five-Meter GET

By S. Gordon Taylor

The ultra-high-frequency ranges below 2.5 and 10 meters, are due to become nels, especially for television. Now is est himself in order to follow, or perhaps

TESTING 5-METER RECEIVERS

Here the author is shown with some of the 5-meter equipment to be described in the articles to follow. Left to right, the equipment shown is: Peak "X-4" transmitter, Peak superheterodyne, Lafayette superheterodyne, Acratest super-regenerator (below) and the R-T-L super-regenerator.

THE purpose of this series of articles is to provide some general information on ultra-high frequency radio, with special attention to the 5-meter amateur band, for the benefit of experimenters who are unfamiliar with this field; also to present specific information on available 5-meter receiving and transmitting equipment for experienced 5-meter enthusiasts.

For the uninitiated it will be interesting to know that 5-meter amateur radio (and commercial experimental radio) is enjoying a tremendous growth in popularity. It is estimated that in the New York metropolitan district alone there are over 1000 active 5-meter "ham" stations on the air and every large city boasts numerous experimenters in this field. Not only that, but the suburban and even rural sections boast numerous 5-meter signals.

The popularity of 5-meters is explained in 3 ways. First the equipment necessary for transmission and reception is extremely inexpensive as compared with the equipment required for operation on the other amateur bands. Second, for local contacts the 5-meter transmitter will provide dependable communication with very low power as is demonstrated by the fact that a number of New York "hams" have worked 400 or more 5-meter stations in this area. The great majority of the 5-meter transmitters around New York City put considerably less than 10 watts into the antenna and many of them put out only a fraction of a watt. The majority of such transmitters employ receiving tubes exclusively. In fact the 5-meter transmitter that uses one or more regular transmitting tubes is the exception rather than the rule. The third reason for the popularity is found in the fact that this ultra-high-frequency band provides a tremendous field for the experimentally inclined. While 5-meter radio dates back several years it is still in a constant process of development. Every month produces appreciable advances in the art. During these past years a great deal has been learned but the field has not as yet advanced sufficiently far to be "over the head" of the novice who has perhaps tired of the more conventional frequency ranges and is looking for new worlds to conquer.

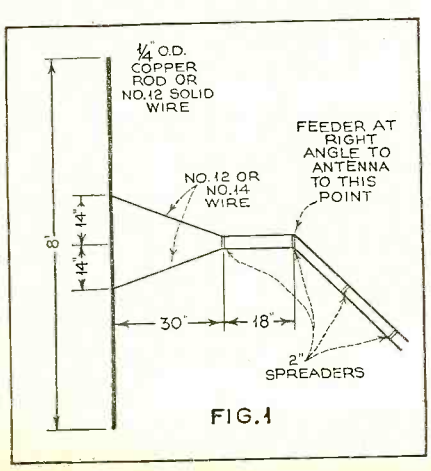


FIG.1

Receiving Equipment

The requirements of receiver equipment for 5-meter operation in some respects differ radically from those encountered in the lower-frequency amateur bands and the short and long-wave broadcast ranges. This is essentially a "local" band. Under ordinary conditions reception of signals over range greater than 25 or 30 miles constitutes real DX. On the other hand, good stable communication, with good signal intensity can be expected even from low-powered stations within a radius of 20 to 25 miles. The ranges will be expanded in time through the use of directional transmitting and receiving antennas and through other developments which overcome the tendency of 5-meter signals to travel in straight lines rather than following the curvature of the earth.

5-meter receivers need not have anything like the degree of selectivity or sensitivity required in receivers operating on the regular short-wave or broadcast ranges. In fact extreme sensitivity or high selectivity seem to be undesirable at the present state of development. The average 5-meter transmitter does not maintain constant frequency and for that reason a receiver having extreme selectivity would not be able to hold a signal from such a transmitter. Transmitter frequency shifts of 50 to 100 kilocycles or even more are not at all uncommon on 5-meters. Until such time as transmitters are developed to the point of employing crystal control, M.O. P.A. or other means for stabilizing frequency, high selectivity will continue to constitute a distinct disadvantage.

Super-regenerative Receivers

Too much sensitivity is likewise a disadvantage in the average noisy location or at least is unnecessary because of the interference from automobile ignition systems and certain other types of "man-made static." Most of the noise interference familiar on other wavelengths, including atmospheric static, is not present on 5 meters but unfortunately ignition noise *is* present in exaggerated form as are some other forms of interference such as from high-frequency diathermy equipment, some oil burners, etc. Definite values of required sensitivity and selectivity have probably not been worked out but it is estimated that receiver sensitivity better than 5 microvolts is superfluous.

At the present time there are two

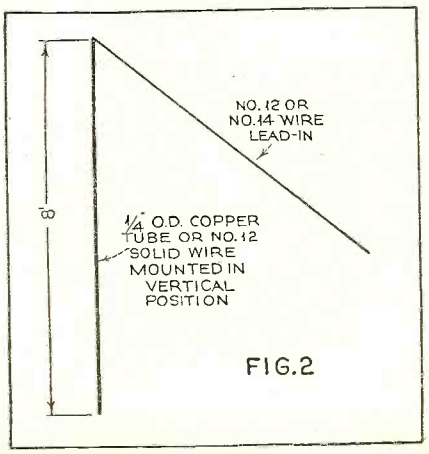


FIG.2

Range Beckons GOING!

10 meters, particularly those between some of the most important radio chan- the time for the experimenter to inter- participate in, the development to come

Results of Tests on 5-Meter Equipment

A NUMBER of 5-meter receivers are now under test in the RADIO NEWS Listening Post (shown on the opposite page), where they have been employed in regular two-way amateur contacts under the author's call, W2JCR. These receivers will be described next month in Part Two of this series. Part Three will review 5-meter transmitting equipment now available on the market, which within the next few days will be added to the present transmitter at W2JCR for tests.

types of receivers in general use. These are the super-regenerative and the superheterodyne types. Each type has its staunch supporters and each type has its definite advantages as well as disadvantages. The super-regenerative receiver has the advantage that it is particularly effective on 5-meters. When properly designed and operated it shows good sensitivity. Perhaps its outstanding characteristic is its peculiar tendency to reject external noise. Even when used in sections where the automobile traffic is continuous, the super-regenerative receiver is not particularly susceptible to ignition disturbance. Such a receiver is likewise simple to operate.

As against these conditions, adherents of the superheterodyne type will point out 3 basic drawbacks to this type of receivers. The super-regenerative detector is inherently unselective. Furthermore, when connected direct to the receiving antenna it radiates badly. Third, the operation of the super-regenerative detector is characterized by a "rushing" sound. On strong signals this rush disappears completely but, on the other hand, it is very much in evidence on weak signals. The amplitude of this rushing sound varies considerably in different super-regenerative receivers, depending upon the care put into the design and adjustment. Claims are made that if a receiver is properly designed, the rush (with no signal tuned in) can be reduced to a point close to inaudibility. However, there are few 5-meter experimenters that have ever been able to reach this ideal condition without greatly decreasing the inherent sensitivity of this type of circuit.

The Superheterodyne

Recently super-regenerative detectors have been improved greatly through the use of a preselector stage. Such an amplifier stage provides increased selectivity and, being connected between the detector and the antenna, effectively eliminates radiation. It also, in many instances, reduces the "rush" when receiving weak signals. This is not true in the case of all receivers having a preselector stage, however, because it is a rather difficult matter to obtain any appreciable gain in a t.r.f. stage at this ultra-high frequency unless one resorts to the use of the "Acorn" pentode tube (954) and even then extremely high gain is not to be expected.

The superheterodyne receiver has the advantage of providing almost unlimited sensitivity and selectivity. Strange as it may seem, it has been necessary, in designing 5-meter superheterodynes, to intentionally reduce the selectivity and to purposely avoid building in too much sensitivity. This has usually been accomplished by avoiding the use of the usual double-tuned i.f. transformers and substituting resistance-coupled i.f. stages with the resistance and coupling condensers values so selected as to broadly tune each stage to the desired frequency. These intermediate amplifiers will usually pass a band (*Turn to page* 565)

Meter Switching *for the "Ham"*

By L. E. Grant, W1AHC

ALL of us are interested in getting the most from any radio equipment we may purchase. This applies especially to meters. The big advantage of having separate meters for different circuits is that one glance at the panel accurately checks the operating condition of the transmitter. However, it is not necessary to have an array of meters unless desired. Two meters, two switches, and you have a complete, practical, and highly versatile method of checking up on the operation of every circuit of your transmitter.

The voltmeter, in conjunction with the four tap voltmeter switch, SW1, will read the voltage on the plate of any respective tube simply by turning the knob to the desired position. The first tap is left open. The diagram of Figure 1 is self explanatory.

The milliammeter and its associated switch, SW2, makes it possible to take a reading of the current in the plate circuit of any desired tube. As shown in Figure 1, the first tap is open. The second tap applies plate voltage to all tubes, assuming that two or three tubes are being used. Taps three, four, and five, put the meter in the plate circuit of tube number one, two, and three, respectively. Taps six, seven, and eight, remove the plate voltage from tubes one, two, and three, respectively. This means the plate voltage of any one tube can be removed without affecting the rest of the set in any way. Neutralizing becomes a simple matter—no fussing with wires or behind-panel switches to cut off (*Turn to page* 543)

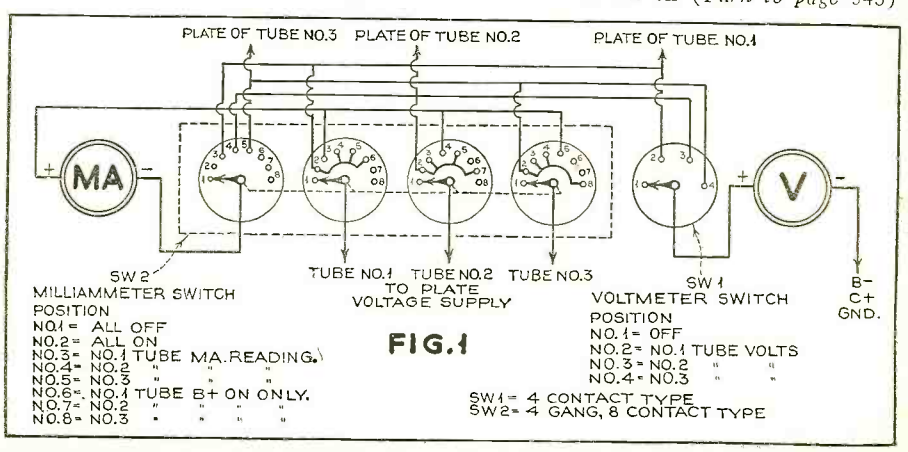
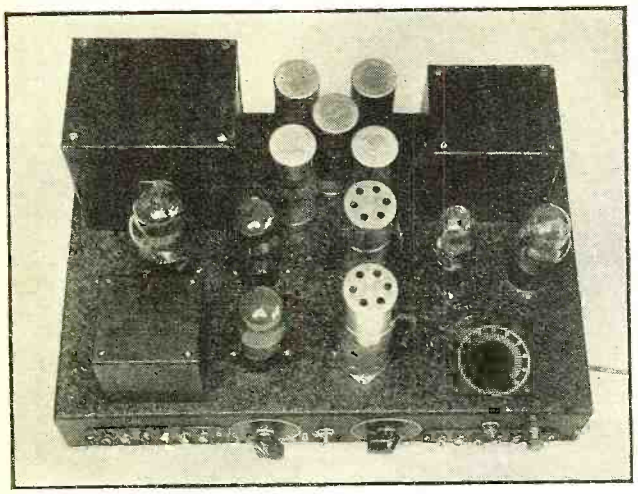


FIG. 1



TOP VIEW OF THE COMPLETED AMPLIFIER

Illustrating the compact and workmanlike design for the new "phase-inversion" amplifier, designed, built and tested in the RADIO NEWS *Laboratory especially for amateur and servicemen's use.*

Servicemen!

How To 20-Watt *for Phone*

Constructional data on the new Class last month. The unit employs an is ideal for amateur modulation as

By J. H. Potts

Part

THE complete schematic circuit of this new 20-watt P.A. amplifier for amateurs or servicemen to build themselves is shown in Figure 2 and indicates the simplicity of the design. Three individual input channels are provided, two of which may be used for microphones and the third for a phonograph pick-up or pre-amplifier. Convenience and ease of connection are assured through the use of a 6-contact input terminal strip. Each alternate terminal is grounded so that the difficulty of having to fasten three lugs or phone tips under a single ground terminal is avoided. In addition, a separate binding post is provided for an external ground.

Flexible Input Circuits

Since the 6A6 is composed of two similar high-mu triodes, provision has been made to connect channels A and B simultaneously, to each input section. As the output plates of this tube are wired in parallel, sounds picked up by microphones connected to these channels are amplified and mixed in the plate circuit before passing on to the phase-inverter tube. Separate gain controls are provided for both channels A and B to facilitate proper mixing. In addition, for phonograph pick-up amplification, where the increased gain of the 6A6 is not required, channel B and its associated volume control may be transferred directly to the phase-inverter tube by simply throwing switch 2 to point b.

Channel C connects directly to the phase inverter circuit and is intended for use with an external pre-amplifier, but may likewise be used for pick-up work when the turntable is already fitted with a volume control. Switch 2 must be on point a when using this channel.

High Stability

The tone control is connected from the plate to cathode of the phase-inverter tube and is therefore effective, regardless of which channel is used.

Freedom from motor-boating and other forms of instability is obtained through the liberal use of resistance-capacity filtering. In all circuits, except the screen supply to the 6C6 tubes, considerable capacity has been used. The screen filter circuit, consisting of a 1-megohm resistor and a .1 mfd. condenser, has a time constant of 1/10th second which is sufficiently fast to eliminate motor-boating under these design conditions, without affecting the fidelity characteristic over the useful range. It is important that no larger capacity be used at this point.

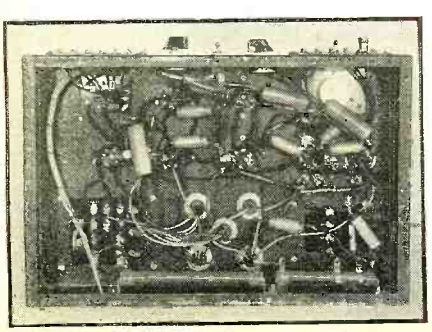
The chassis employed is of standard size, using heavy No. 16-gauge steel, and is fitted with a bottom cover. Drilling is done in accordance with the layout shown in Figure 2. The two gain controls are located in the front of the amplifier, with the power switch S1 in the center. Above the input terminal strip is located the channel switch S2 and the ground binding post. The tone control is on the top portion of the chassis. Provision is made for five output channels. The output transformer is designed to match 15-, 7.5-, 5-, 3.75- and 1.25-ohm loads in addition to a standard 500-ohm transmission line.

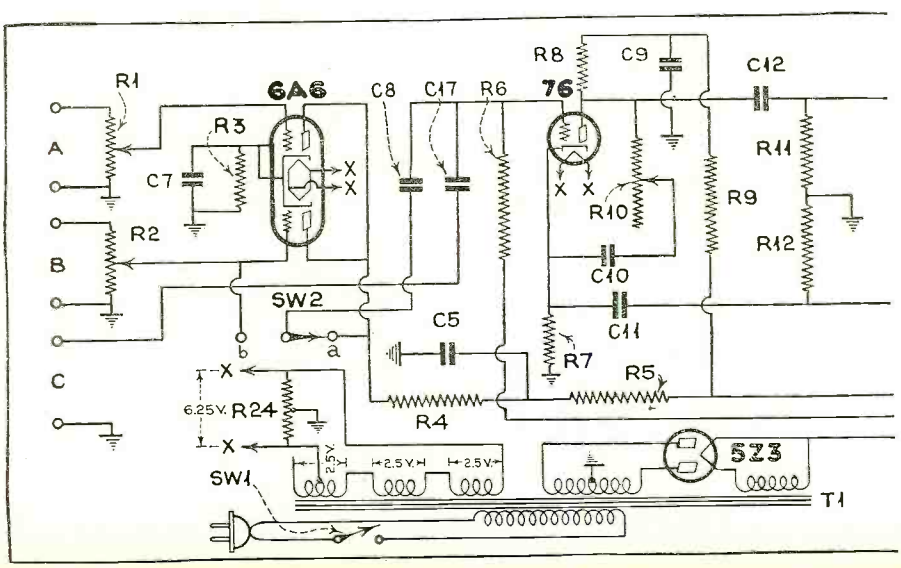
Wiring Suggestions

In wiring, the leads in the input circuits should be kept well separated to reduce stray coupling. The filament circuits should be wired in first. The filter circuit wiring may then be completed. Finally, the resistors and by-pass condensers are wired in, using

UNDER CHASSIS VIEW

This view of the amplifier taken from below shows the general idea of assembly and wiring.



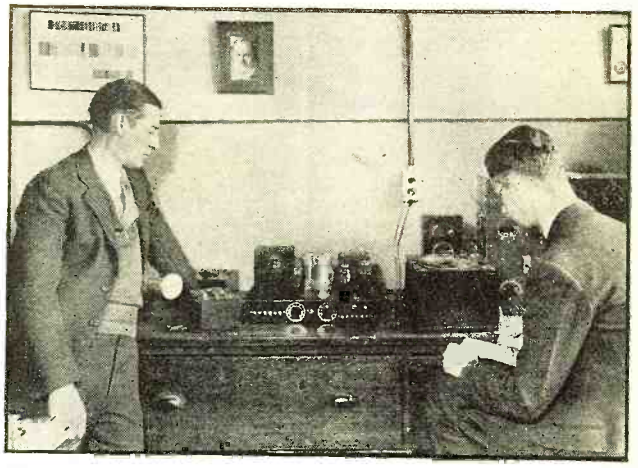


Amateurs! BUILD THE Amplifier *and P. A. WORK*

A RADIO NEWS Amplifier described
outstanding type of circuit which
well as for service applications

and **J. M. Borst**

Two



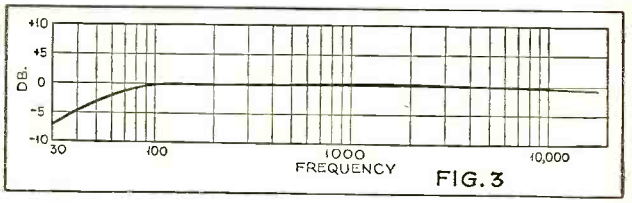


FIG. 3

TESTING THE UNIT FOR FREQUENCY RESPONSE

The view above was taken in the RADIO NEWS *Laboratory while the authors were running their tests for audio response. The curve indicates the high-quality reproduction that the amplifier is capable of delivering.*

small terminal strips located close to the sockets. After the wiring is completed, the voltage adjustment of the phase-inverter tube may be undertaken. The slide on R22 should be adjusted until the voltage between point C and ground is approximately 26 volts. Next, put a milliammeter in the plate circuit of the 76 and readjust the slide until the meter reads 1.4 ma., approximately. Point D, for the screen voltage, is taken at 250 volts.

Measured Characteristics

If the amplifier is to be operated over long periods, longer tube life, particularly of the 6B5's, may be obtained by using less than the maximum plate voltage of 400 volts. A reduction to approximately 350 volts is accomplished by simply omitting C1. The power output will, of course, drop slightly but will be sufficient for practically all purposes.

The amplifier's performance was measured in the RADIO NEWS Laboratory in the usual way. Since it appears from many letters that some readers have difficulty in interpreting the meaning of the usual engineering graphs, a little more light on the subject seems desirable. The gain of the amplifier was 102 db. This was measured with the volume control "full-on" and the amplifier delivering 20 watts to a 500-ohm load, at 400 cycles. In practical language, this means that it takes .025 volt at the input terminals to deliver full output. The circuit used for the purpose of this measurement and the frequency characteristic is shown in Figure 4. The resistance, R, of 150,000 ohms, was placed there to simulate the internal impedance of any signal source one would employ. One hundred and fifty thousand ohms was chosen as the average secondary impedance of line-to-grid transformers.

The frequency characteristic was measured with the same set-up, shown in Figure 4. This was taken also at full gain and with the amplifier delivering 20 watts to a 500-ohm load. The vacuum-tube voltmeter and the rectifier-type meter were checked against each other and corrections were made for the characteristics of the rectifier-type meter. The frequency characteristic is shown in Figure 3. It is essentially flat throughout the audible range. At 18,000 cycles it was .7 db. down, at 10,000 cycles .4 db. down. On low notes good response is obtained; at 80 cycles it is .9 db. down, at 50 cycles 3 db. down and at 30 cycles 6.7 db. down. When the first stage is cut out, the voltage gain is reduced 10 times, so the total gain of the amplifier is then 82 db.; it takes .25 volt at the input terminals for full 20-watt output. This arrangement will generally be preferred with the average phonograph pick-up.

Hum Level

The hum level is 40 db. below maximum output—or 1 volt across the 500-ohm load. One should be careful to shield input wires and to ground the shields of input transformers, etc., to eliminate any possibility of hum pick-up by induction.

Finally, some cathode-ray tests were made. The first one was a test for harmonic distortion. It was made by applying the input signal to one set of deflecting plates (*Turn to page 536*)

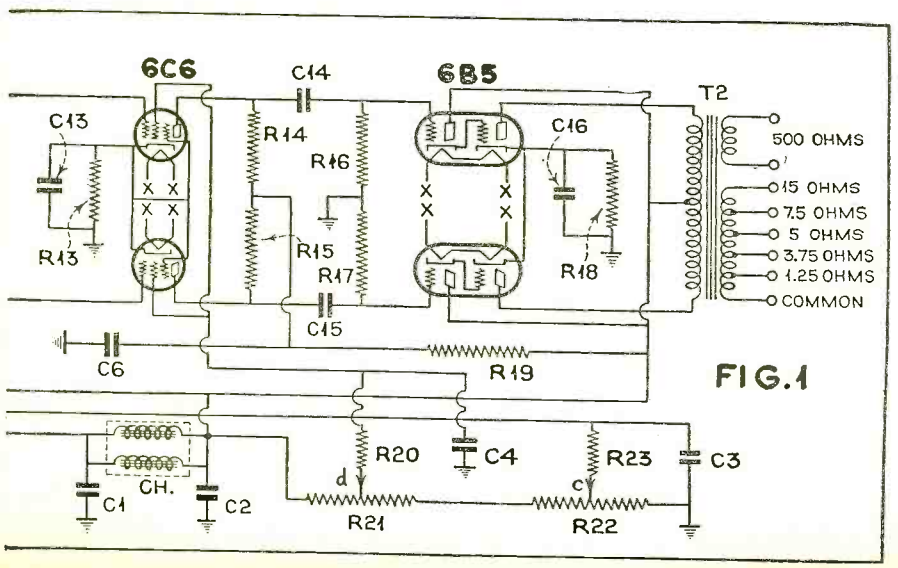


FIG. 1

THE TEST CIRCUIT USED

This is the general layout of the test method employed for checking the amplifier's frequency characteristics.

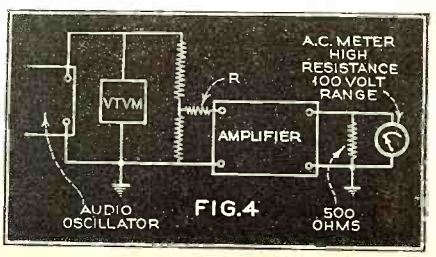


FIG. 4

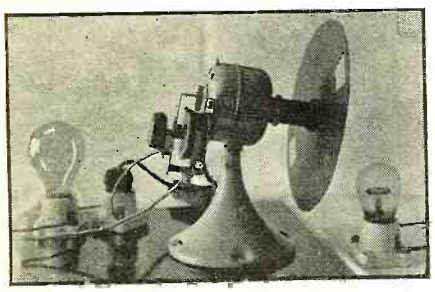
The RADIO WORKSHOP

¶ Items of interest for beginners, experimenters and radio constructors.

Conducted by The Associate Editor

Simple Stroboscope Shows Rectifier Action

Many forms of motion, too fast for the unaided eye to follow, can be "slowed down" and analyzed with a high-speed movie camera. In similar fashion you can use this little gadget to get a slow-motion picture of the rectification process in mercury-vapor tubes, and to find just what fraction of the cycle is being used. An

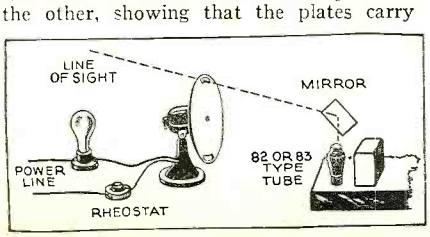


investigation of this kind would ordinarily require the use of an oscillograph

The device consists of a heavy cardboard disc mounted on the shaft of a fan motor from which the guard has been removed. The disc may be eight or more inches in diameter, with two slots about an inch square located near opposite edges. A tight-fitting spool makes a convenient hub for mounting the disc. For speed control, a lamp socket and a heavy-duty rheostat of at least 30 ohms are wired in series with the motor

Employ a lamp of the right size to bring the motor speed to approximately 1800 r.p.m. An easy way to find this speed is to examine, through the rotating disc, a neon lamp lighted from the 110-volt a.c. line. As the speed approaches synchronism (1800 r.p.m.) the glow will flicker slowly, shifting from one plate to the other. When the disc is in step the glow will remain on one plate or the other.

Now, with the disc slightly off synchronism, examine an operating mercury-vapor tube of the 82 or 83 type. The blue glow will be seen to shift from one plate to the other, showing that the plates carry current in alternation. With the disc in step, the glow will appear on one plate only, while if the tube be viewed from a point 180 degrees around the circumference of the disc, the glow will appear on the other plate. Still other portions of the cycle can be selected by shifting your viewpoint.



Amateurs using 866 type rectifiers will find the device useful, because when the disc is in step the angle over which the glow is visible indicates how much of the cycle is being used by the tube. For example, if the filter is of the condenser-input type and the first condenser is too large, the glow will be seen through a narrow angle only. This indicates that the tube is carrying current in brief spurts of possibly dangerous peak value. Higher audio frequencies can be observed in like manner by using discs with more holes.

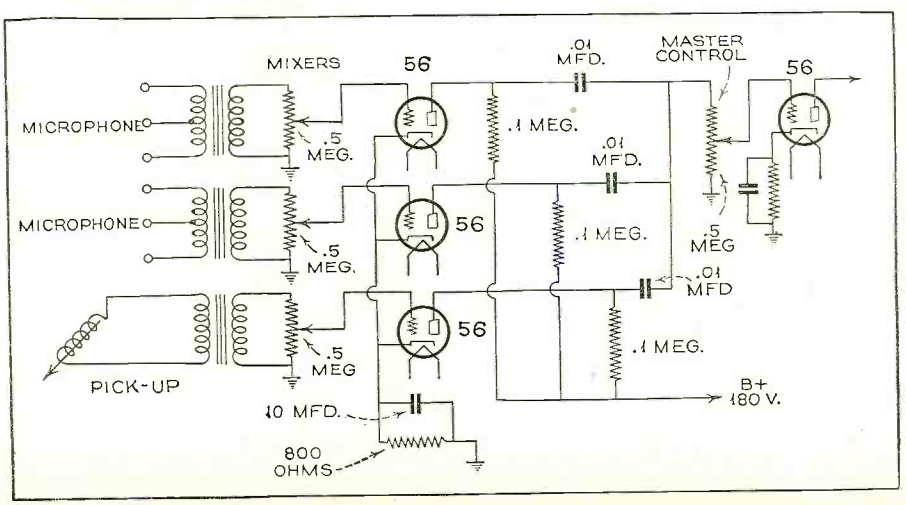
Of course, the stroboscope can be used to study many other forms of high-speed motion, such as motors, alternators, engines, etc.

C. D. SAVAGE,
Portland, Ore.

Mixing Panel

Here is a circuit that fellow-experimenters might be interested in. It is a method for mixing several input sources such as two microphones and a pick-up, without the use of expensive constant-impedance volume controls ordinarily required for each source. Standard 500,000-ohm potentiometers are used in each grid circuit and the variation of any one control has no noticeable effect on volume or frequency characteristics of the other sources, regardless of their setting. I believe the additional tubes and sockets are less expensive than the constant-impedance type controls otherwise necessary. Any number of channels and any suitable type tubes can be used.

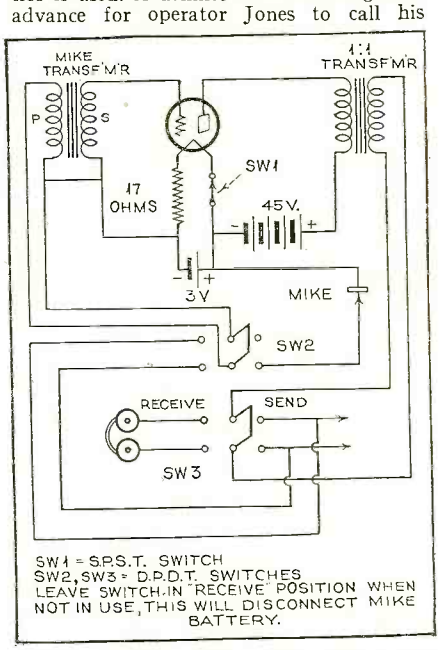
CHARLES M. DIBRELL,
Ardmore, Okla.



How to Build a Two-Way Phone System

For the "out-of-the-way" places where there are no telephone lines, the simple communication system shown below can be used for establishing a two-way phone channel over short distances.

For the complete channel two outfits are required, one at each end of the line. Regular amateur phone communicating practice is used. A definite time is arranged in advance for operator Jones to call his

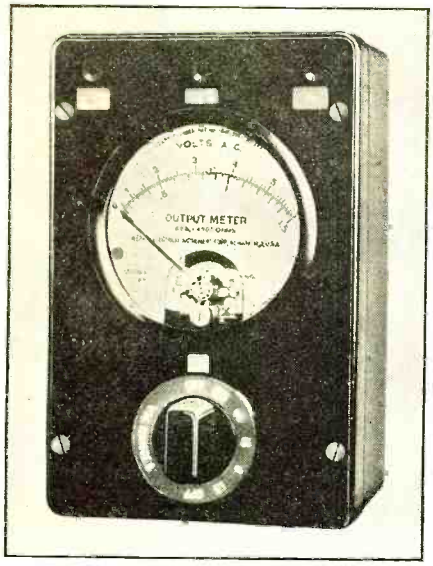


friend operator Smith, who listens and when Jones is finished calling, both operators throw the switches to the sending or receiving end, whichever the case may be and then Smith does the talking.

One of the connecting lines can be a continuous fence wire well insulated or a No. 18 or 20 insulated wire. The ground serves as the other conductor. If the distance of the channel is not too long a bell-ringing call-arrangement could be installed.

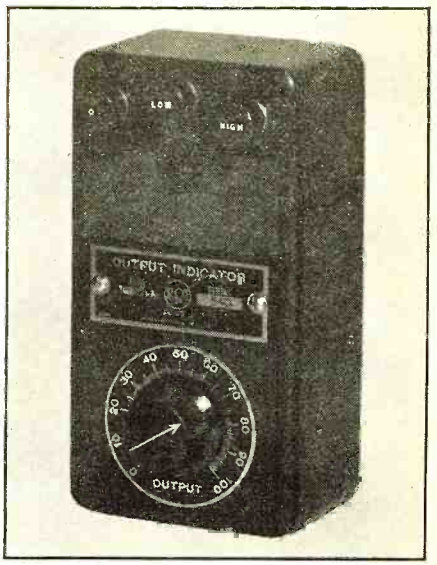
Instead of the 2-d.p.d.t. switches to change the outfit from "send" to "receive" a 4-p.d.t. switch could be used. Another suggestion for this switching arrangement

(*Turn to page* 570)



THE WESTON
RECTIFIER-METER TYPE

A Serviceman's STUDY *of* Output Meters



THE R. C. A. NEON-TYPE
OUTPUT METER

MANY servicemen do not appreciate the importance of the output meter as an aid to proper receiver alignment. Some of the more experienced, who have become proficient in adjusting by ear the simpler circuits of former years, continue to apply this method to present-day receivers. Others have not acquired sufficient familiarity with the various meters available to employ them effectively.

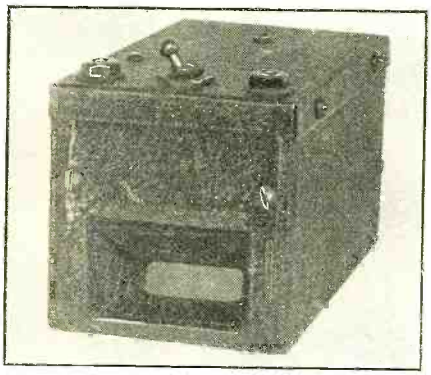
By John Strong

NO modern high-grade superheterodyne receiver can be precisely aligned by ear. Small differences in sound intensity, readily apparent with an output meter, are not perceptible even to trained listeners. When only one or two circuits are badly out of adjustment in a simple receiver, considerable improvement can of course be obtained even without an output meter. But in more complex sets, when several circuits require aligning, the unavoidable slight inaccuracies which are bound to occur in each circuit adjusted by ear become cumulative, with the result that maximum sensitivity and selectivity are not obtained. Furthermore, the fidelity of reproduction of some superheterodynes is largely dependent upon the proper adjustment of the intermediate-frequency amplifier circuits. Correct alignment of such circuits is impossible without proper equipment and knowledge of the required characteristic.

Visual Devices

Any device which will give a visual indication of slight changes in signal voltage reaching the detector circuit of a receiver may be used for alignment purposes as an output meter. The variety of instruments which will do the job ranges from a flashlight bulb to a cathode-ray oscilloscope. While the copper-oxide rectifier combined with a sensitive milliammeter as supplied with most analyzers is ideal for most purposes, less expensive apparatus is suitable when properly used. Several simple, inexpensive devices are shown in the accompanying photographs. The more elaborate ones have a wider range of adaptability which makes for greater speed and convenience in handling a quantity of work. For those who prefer to build their own, a simple tube voltmeter type, which can be constructed at negligible cost if a spare 1-ma. meter is on hand, will be described next month.

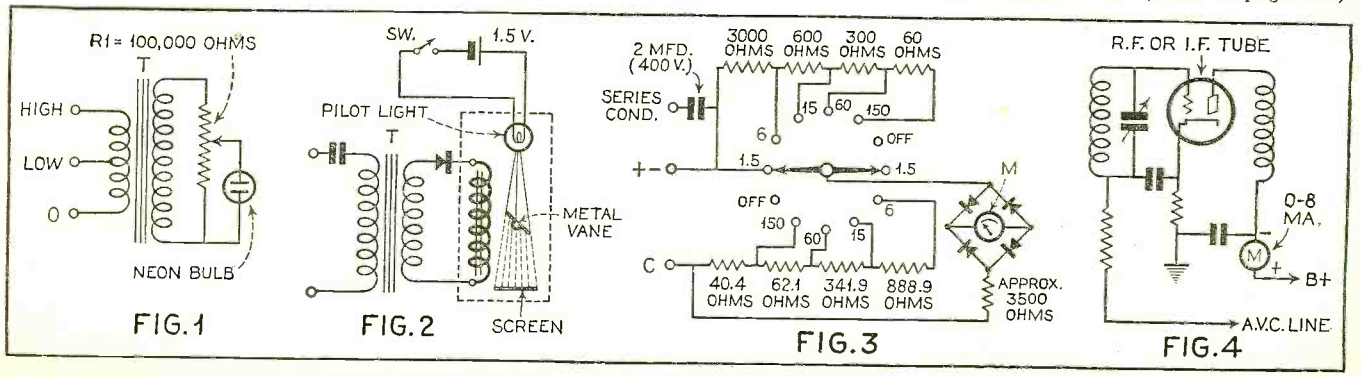
PHILCO EMPLOYS
THE "SHADOWGRAPH"



The neon tube is used as an indicator in some manufactured instruments. Figure 1 shows the circuit employed in the R.C.A. output meter. This apparatus may be used across a speaker voice coil. Since the maximum voltage in this portion of the circuit is not sufficient to cause a neon bulb to light, an impedance-matching transformer is used to raise the voltage to the proper level. A bulb of low power consumption is employed to obtain high sensitivity. Various ratios are available to adapt it to differing output circuit impedances. Signal level adjustment is regulated by varying R1.

"Shadowgraph" Output Meter

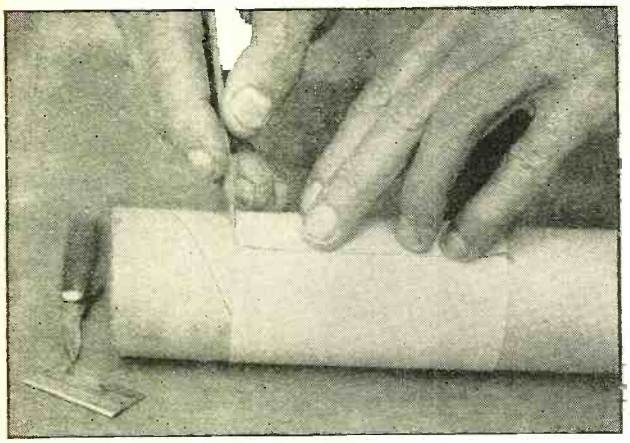
Figure 2 shows how Philco has adapted the familiar "shadowgraph" tuning meter for use as an output meter. This instrument is designed to be used on the primary side of the output transformer rather than in the secondary circuit. A condenser is used to isolate the steady plate voltage from the output meter. The higher signal voltage present in this portion of the circuit is stepped down, rectified and applied to a metal vane type d.c. meter. With no signal voltage, the vane intercepts light from a battery-operated pilot bulb, causing a dark area to appear on the rectangular screen. As increasing signal voltage is applied, the vane swings correspondingly until at maximum it is at right angles to the (*Turn to page* 555)



The SERVICE

Sometimes its just an idea, sometimes making the difference between "red ink" In this issue the Service Editor gives you valuable to you,

Conducted by Zeh



CUTTING TUBING STRAIGHT

Figure 2. How many times have you used a hacksaw on a cardboard tube with "Tower of Pisa" results?

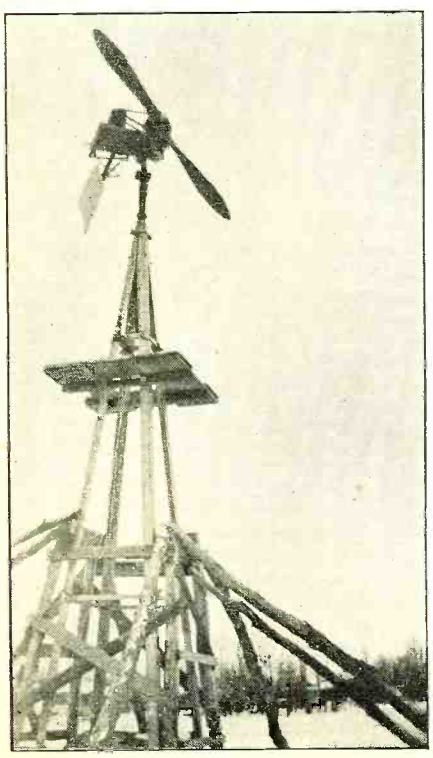
WITH several manufacturers putting out Wind-Mill Power Plants and receivers designed especially for use with them (see this month's Service Prize Contest), both the farmer and the rural serviceman are getting a new "break." Some servicemen are jacking up their profits by constructing the windmill and charging unit themselves.

Windmill Power

Considerable interest was evinced by rural servicemen in the windmill-power system described by Ronald A. McNeil, in this department some two years ago. Mr. McNeil sends us the accompanying photograph (Figure 1) of his improved power plant. The present model is mounted on a standard steel windmill tower. A 6-foot airplane-type propeller is mounted on the front-wheel assembly of a Model T Ford,

"IT'S AN ILL WIND
THAT BLOWS NOBODY GOOD"

Figure 1. Windmill power has opened up a new fount of income for the rural serviceman.



and drives a 6-volt automobile generator at a 3-1 ratio by means of the conventional V-shaped fan belt. Sliding contacts on the platform permit it to turn with the wind. The propeller is offset 3½ inches from the turntable pivot, providing a tendency to turn away from a strong wind, with the effect of a governor. Mr. McNeil is good enough to answer letters personally in reference to this unique power plant. His address is Atwater, Sask., Canada.

McCalla Brothers, of Mercer, Pa., send along the following pointers on windmill installations:

"Obviously, as high a position as possible, within reasonable distance from the receiver location, should be chosen for the windmill. The charger should be positioned at least 10 feet above the ground, and be sure that no obstructions, such as trees, silos and large buildings, are close enough to obstruct the wind. In almost every location there is a prevailing wind, and the tower should be erected in such a spot as to take full advantage of it.

"All connections must be well soldered—excepting, of course, such as are made to posts. These latter should be made with soldered lugs. Be sure the ammeter, relay and battery connections are tight. In other words, watch out for high-resistance contacts. In running the wire from the wind charger to the battery, number 12 B. & S. gauge copper wire can be used on distances up to 50 feet. From 50 to 75 feet, number 8 is in order. From 75 to 200 feet, number 6 or 4 B. & S. must be employed. In cases where the receiver draws less current than the average charging rate, it will be more economical to house the battery as close to the windmill as possible—rather than alongside the set, which, however, is usually the more convenient location. (Many farmers, though in the habit of milking at 4 a.m., balk at the idea of trudging through sub-zero snow to put electrolyte in the battery!)"

THE DAY'S WORK

A couple of kinks with which to start, and, perhaps, save the day: Frank W. Bentley, Jr., of Missouri Valley, Iowa, sends us the idea illustrated in the photograph of Figure 2. Every serviceman has repeated occasion to cut cardboard tubing to a desired length—the problem always being to cut the ends in parallel planes The illustration is almost self-explanatory of how this can be accomplished easily and quickly. Take an envelope, the longer the better, and wrap it tightly around the tubing so that the edges coincide where they overlap. Mark this edge, with a pencil, clear around the tubing. Then move the envelope away from the mark the length of the desired tube and rule another circle. The pencil lines form perfect guides for the knife or razor blade. Obviously, if one end of the tube is perfectly cut—in a plane at right angles to the axis of the tube—only one line will have to be drawn—at the desired distance from the end.

When impregnated with wax, such tubing may be efficiently used in oscillator coils, wave-traps, etc.

Another Soldering Iron Kink

As long as soldering irons are used, so long will the serviceman devise new ways to heat them and new gadgets to hold them!

"Having had several soldering irons (the type with the small diameter, fine point) burn out at the critical moment, I determined to heat them in a modernized version of the good old-fashioned external method. I clipped off the leads, and mounted a heater unit, taken from a parabolic electric heater, on a Masonite base, covering it with a guard of wire screening, as shown in Figure 3. The iron is heated by placing the copper inside the heater unit—which will take care of even a large iron. A small copper will be overheated if left in the center of the unit. You will quickly learn from experience just how far out to place it to maintain the correct working temperature, and will certainly appreciate the freedom from the cord. This unit is really an effective little electric furnace, and small bars of steel can be heated red hot for tempering, forging and other work."—H. H. Parker, Los Gatos, California.

The effectiveness of this device as a furnace would be increased manyfold if the coil were covered with a refractory compound, such as an oxychloride cement. Mix two parts of magnesium oxide with one part of powdered asbestos (by weight). Dissolve one pound of magnesium chloride in a pint of water. Use this solution to mix up a thick paste—about the consistency of mud pies. Apply this to the outside of the unit, after first wrapping it in at least six thicknesses of asbestos paper. Moisten the asbestos paper before applying the cement so that it will not absorb moisture from the mixture. Build up a protective wall three to four inches thick. This cement will harden in about 12 hours, but the unit should not be used for several days.

The protective material will practically eliminate loss of heat by radiation, allowing

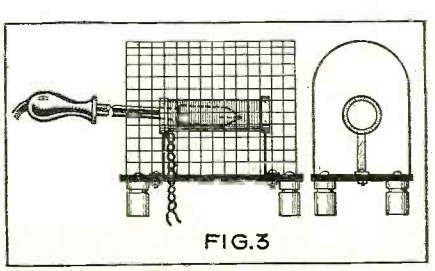


FIG.3

BENCH

its the smaller things that count, in and "black," in the serviceman's ledger. both ideas and kinks that may prove immediately!

Bouck, *Service Editor*

much higher temperatures to be attained. The oven now should be used with a rheostat for temperature control—or, better yet, a transformer. As a matter of fact, we'd suggest the use of the rheostat or transformer even with the open unit, as considerable economy of operation will result, and, with the temperature adjusted correctly, the iron can be placed completely in the unit at all times. Full voltage should be used to bring the unit up to the desired temperature, after which it should be dropped until the temperature is maintained. The oven—with the refractory covering—will be much more economical to operate than the open heater, and the transformer always more so than the rheostat.

Neon Lamp Condenser Tester

Like soldering iron kinks, these devices seem to be legion. Every once in a while one comes through that is a little different—and it pops up in the *Service Bench*. Marion Wade, of the Lyon Maytag Company, Leavenworth, Kansas, sends us the circuit shown in Figure 4, which he uses for testing condensers, resistors and grounds.

"By using the one test lead on the hot side of the line, the light will glow on both sides of the plate to show a ground. By adjusting the resistor so that only a very small portion of the lamp is glowing, it will give an accurate test every time on a condenser or resistor."

We don't quite see the necessity for the shunt resistor across the filament, and Mr. Wade gives no value for it. The interested reader is referred to the following 1935 issues of RADIO NEWS for further details regarding neon lamp test arrangements—January, April and August.

Replacing a Dial Bulb

Mr. H. Sparks, whose name is as well suited to radio as it is to residence in Loveland, Ohio, sends along the following: "Here's a time saver in replacing the dial bulb in a Majestic Model 50. Remove the metal dial escutcheon which is held with

(*Turn to page* 553)

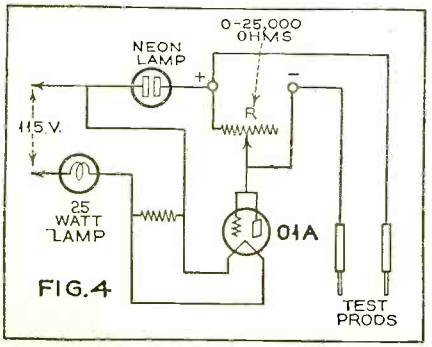


FIG. 4

¶ Tell Us Your Problems

Cathode-Ray Oscilloscope Contest

RADIO NEWS is offering monthly prizes of $10.00, $5.00, $4.00, $3.00 and $2.00 for new and novel uses of the Cathode-Ray Oscilloscope in radio servicing. What our readers want to know is how the oscilloscope is now helping servicemen make more money, by—1. Reducing the time necessary for specific service jobs, and—2. Increased effectiveness and customer satisfaction. New, associated oscilloscopic circuits and apparatus may well contribute to this end, and are therefore good contest material. Photographs of servicemen at work with the oscilloscope will add merit of prize-winning caliber, as will oscillographs (drawings made from observations on the oscilloscope) and oscillograms (actual photographs of the images on the screen). These last are easily taken with any good camera, with panchromatic film or plates. Address contributions to, yours for better servicing—

The Service Contest Editor

New CRYSTAL *Oscillator*

By F. Siemens

AS a result of the increasing popularity of all-wave receivers, there has been an insistent demand for a low-priced instrument to enable their more accurate calibration over a wide frequency range. The new R.C.A. crystal oscillator, which has just been announced, is designed to provide a degree of accuracy and range of application far beyond that obtained by other means. This new instrument utilizes a 955 acorn type tube as an oscillator. It is crystal-controlled to an accuracy of 2 parts in one million. It is difficult to conceive such a degree of precision. We might compare this to a watch so marvelously constructed that it would not lose or gain more than one second in six days.

Two fundamental test frequencies are supplied, 100 and 1000 kc., plus or minus .05 of one percent. Since the output is rich in harmonics, calibration points may be obtained from 100 to 20,000 kc. in 100 kc. steps and 1000 to 50,000 kc. in 1000 kc. steps. In addition, individual calibration of the crystal used is supplied with each instrument, with the temperature at which the calibration is made and the correction factor necessary to obtain the extreme precision of 2 parts in a million.

The schematic circuit is shown in Figure 1. As shown, the instrument operates from the usual 110-120 volt, 50-60 cycle line supply and normally supplies a 60-cycle modulated signal. An unmodulated signal may be obtained by using a 90-135 volt battery supply.

The apparatus as illustrated is very compact and simple in operation. Complete instructions for its use are furnished with each instrument. Its use provides servicemen, for the first time, with a low-cost test instrument of highest precision. For laboratories and amateurs it is indispensable. For experimenters and DX fans it will prove a welcome and long-sought-for aid to greater radio enjoyment.

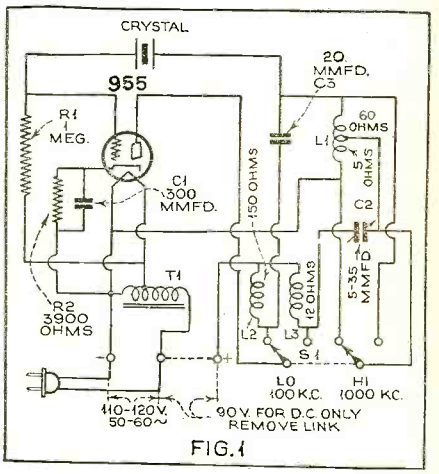


FIG. 1

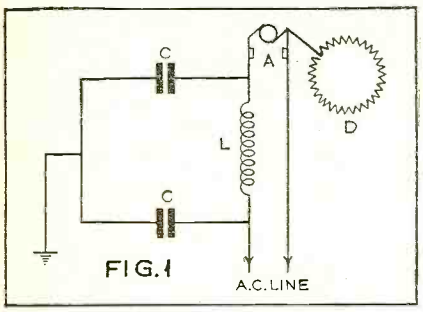


FIG. 1

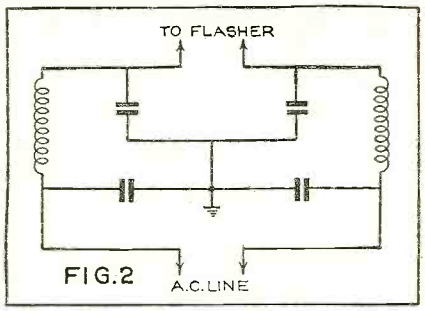


FIG. 2

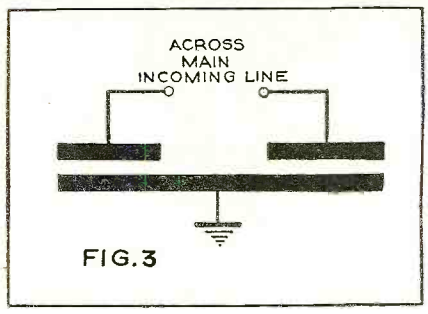


FIG. 3

Eliminating Traffic Signal Noise

By J. R. Steen

RADIO interference from traffic signals is a common cause of disturbance on both home and automobile radio receivers. Generally, however, nothing is done about it largely because people who are bothered with this type of interference either do not know where it comes from, or, if they do, they assume that it cannot be eliminated.

EVEN servicemen have hesitated to approach the problem for lack of a definite plan for going after this business.

My own personal experience as a serviceman has convinced me that there is a profitable and logical field in eliminating signal interference for the fellows who will go after it. Just as they did in my town, many city officials will be glad to cooperate if you go to the trouble of explaining the matter carefully and even demonstrating how much radio interference an innocent-looking traffic light can actually cause. With the number of lights now used in the average town or city, I hardly have to point out what a juicy slice of business can be had if you get the job of eliminating interference from them.

Complaints regarding traffic-light interference should be made to the local police commissioner, public-works commissioner, city electrician or contractor—whoever is in charge according to your local set-up. This information can easily be obtained at city headquarters.

The yellow caution light or blinker (flasher) is usually the worst offender. Such lights are generally installed at minor traffic intersections in residential districts where many radio receivers are in use. The red and green lights operating at regular 10 or 30 second intervals do not cause such really serious interference.

Figure 1 shows one type of contactor. D is a saw-toothed disc operated by a small motor. A represents the contacts in series with the flasher lights. Choke L consists of approximately a ½ pound roll of No. 18 bell wire (up to a 5 amp. circuit), wound on a core of about 1½ inch diameter. Condensers C are from 1 to 1.5 mfd. 220 volt AC ratings.

More obstinate cases of traffic-light interference will require the filter shown in Figure 2. If interference still persists after using such a filter, add circuit of Figure 3. The combination of either circuits 1-3 or 2-3 will eliminate radio noises from this source in just about every case. The values of condensers and chokes in Figures 2 & 3 are the same as those for Figure 1.

As is well known, much of this interference elimination work is experimental up to a certain point. It means working by the method of "cut and try." However, if the serviceman has the filter parts shown in each of the three diagrams he will be well equipped to go out and show real results. In my own work along these lines, I have dispensed with the "cut and try" method in favor of the Sprague interference analyzer. This is the last word in noise elimination work—one as valuable in ordinary home interference jobs as it is when approaching traffic light problems. Simply by cutting this analyzer into the circuit and then applying various filter banks by turning the dial you are enabled to find, in short order, the exact filter combination to produce best results.

After the correct filter combination has been determined these units can be installed directly in the signal box if there is room or in a metal container fastened outside of the box. The traffic light maintenance crew will often dig up a container and attach it to the signal box for you. Westinghouse makes a good weatherproof marine box which is ideal for the purpose.

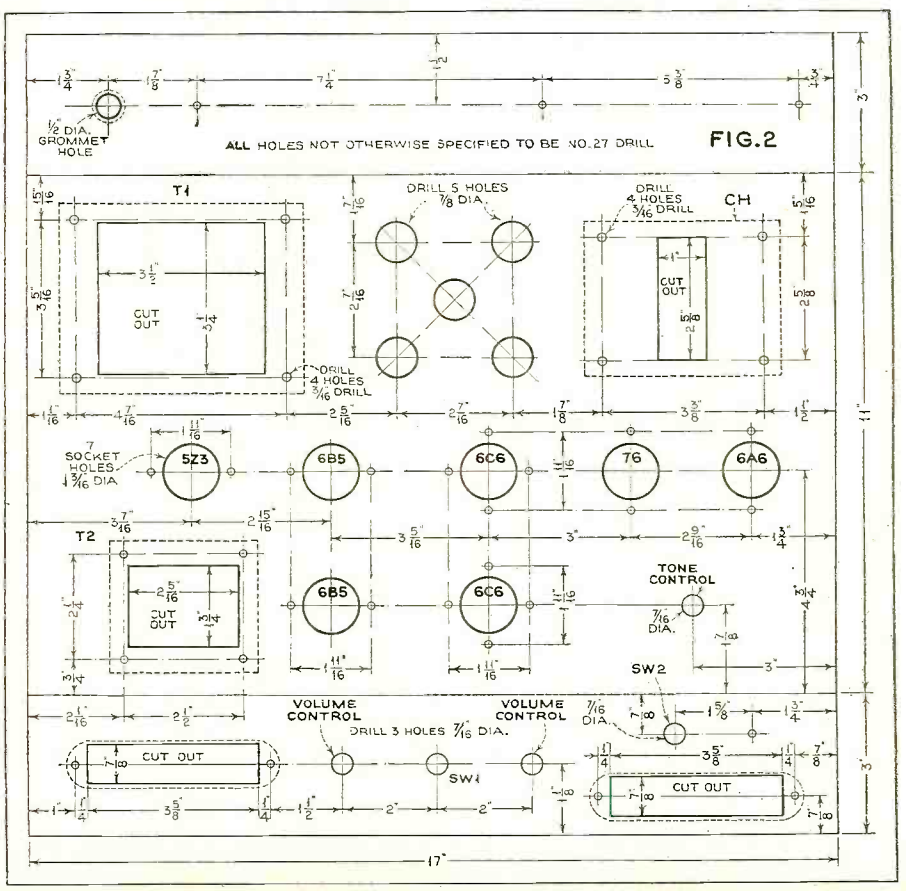
A car radio, close to the control box, is a great help while working on the job; by listening to the radio you can tell at once when you have hit upon the proper filter combination to eliminate the interference.

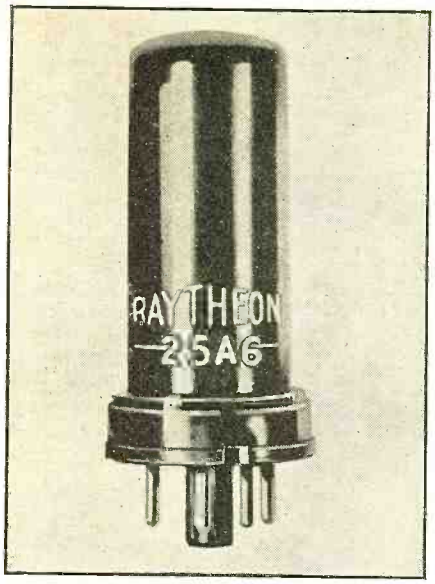
20-Watt Amplifier

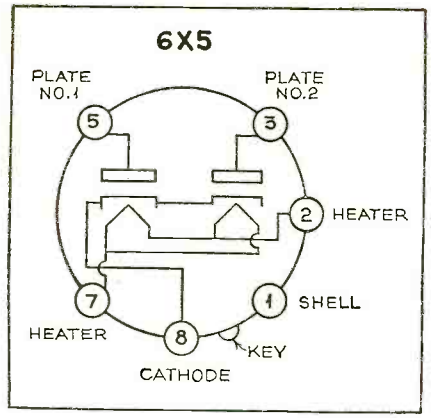
(*Continued from page* 531)

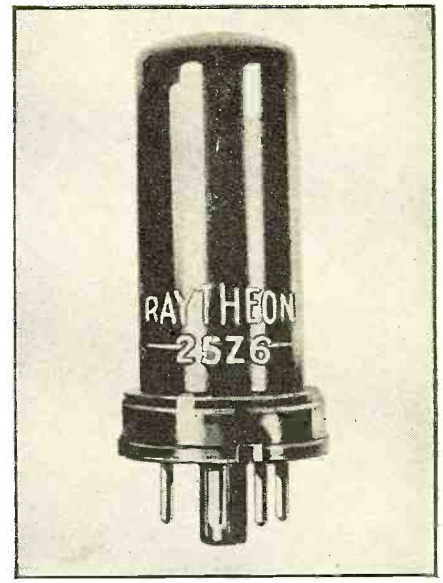
and the output signal to the other set of deflecting plates. When proper phase relations exist, the trace should be a straight line. If it curves at the ends, third harmonic distortion is present. While there was a slight curvature at the ends at full output, the line was perfectly straight at slightly reduced levels. Another cathode-ray test was made to establish the action of the inverter tube. After measuring the voltage across resistors, R11 and R17 with a vacuum tube voltmeter, to be sure that they were equal, the deflecting plates were connected so that one side of the signal sweeps horizontally, the other vertically. The resultant trace must be a straight line and at 45 degrees to the axis—nearly, because the two sets of plates are not equally sensitive. The experiment proved that this was the case. Reversing the connections to the input grids of the 6C6's did not change the trace. This was a proof that the inverter delivers a symmetrical signal to the push-pull circuit.

(*Continued on next page*)





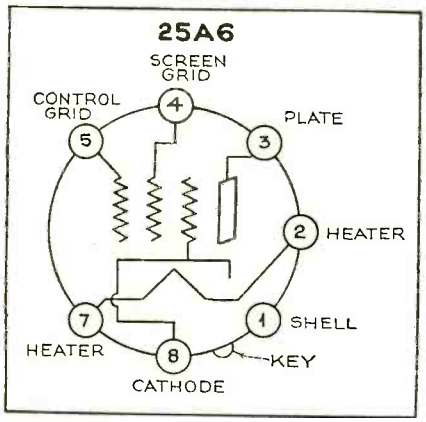




Three New

METAL TUBES

By Richard Purinton



THREE new metal tubes have been announced which complete the series of tubes for a.c.-d.c. receivers and provide a rectifier for automobile receivers.

These tubes, manufactured by Raytheon, are: the 25A6, an output power-pentode similar to type 43; the 25Z6, a full-wave high-vacuum rectifier and voltage doubler similar to type 25Z5; and the 6X5, a full-wave rectifier for automobile use. Characteristics and socket layouts of the three tubes are shown below. All three tubes have the same dimensions and are mounted in a steel shell of the same size as that of the 6F6.

TYPE 25A6

Power Amplifier Pentode

Voltage	25.0 volts
Current	0.3 ampere
Maximum overall length	3¼"
Maximum Diameter	1 5/16"
Base	Small Octal 7-pin

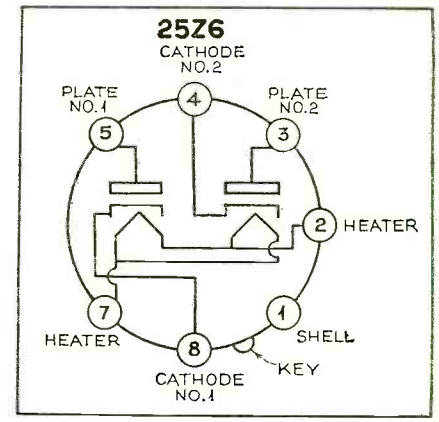
Class A Amplifier, Operating Conditions and Characteristics

Heater	25.0	25.0	25.0 volts
Plate	95	135	180 max.vlts.
Screen	95	135	135 volts
Grid	-15	-20	-20 volts
Amplification Factor	90	99	96
Plate Resis.	45000	42000	40000 ohms
Mutual Cond.	2000	2350	2400 umhos.
Plate Current	20	39	40 M.A.
Screen Current	4	8.5	8.0 M.A.
Load Res.	4500	4000	5000 Ohms
P.O.	0.9	2.0	2.75 watts
Dist.	11%	9%	10%

25Z6

Rectifier Doubler

Heater:	
Voltage	25.0 volts
Current	0.3 ampere
Maximum over-all length	3¼"
Maximum Diameter	1 5/16"



A. C. Voltage per Plate	125 V. Max.
D. C. Load Current as Voltage Doubler	85 M.A. Max.
D. C. Load Current as Rectifier	85 M.A. Max.
Peak Plate Current	500 M.A.per plate

6X5

Full-Wave Rectifier (Heater Type)

Heater	
Voltage	6.3 volts
Current	0.6 ampere
Maximum Over-all Length	3¼"
Maximum Over-all Diameter	1 5/16"
Base	Small Octal 6-Pin
A. C. Voltage per Plate	350 volts max.
Peak Inverse Voltage	1250 volts max.
D. C. Load Current	75 M.A. max.
Peak Plate Current	375 M.A. max.

20-Watt Amplifier

(*Continued from previous page*)

Parts List

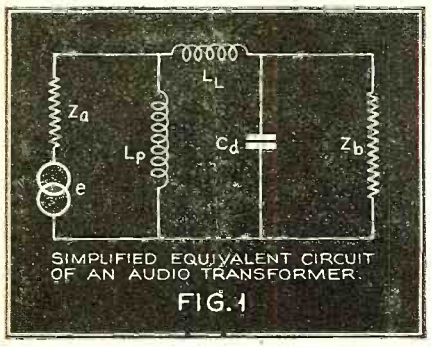
C1—Cornell-Dubilier PE-B6808 paper filter condenser, replacement for 8 mfd. 800 volts peak
C2—Two, Cornell-Dubilier EB8800 dual electrolytic condensers 8-8 mfd. each, 525 peak
C3—Cornell-Dubilier electrolytic condenser 25 mfd. 50 volts
C4, C10, C11, C12, C14, C15, C17—Cornell-Dubilier tubular paper condenser, .1 mfd., 400 v. type DT-4P1
C5, C6—Cornell-Dubilier dual electrolytic condenser 8-8 mfd., 525 volt peak
C7, C13, C16—Cornell-Dubilier electrolytic condenser 25 mfd., 25 v. ED-2250
C8—Cornell-Dubilier tubular paper condenser type DT-4P1, .1 400 volt
C9—Cornell-Dubilier electrolytic condenser 8-8 mfd., 525 volts peak
Ch—Amertran filter choke, Z-913, dual sections in parallel, 8 henries, 200 ma.
R1, R2, R10—Electrad potentiometers, 500,000 ohms
R3—IRC carbon resistor, 1250 ohms, 1 watt
R4—IRC carbon resistor, 50,000 ohms, 1 watt
R5, R9, R19—IRC carbon resistor, 100,000 ohms, 1 watt
R6, R11, R12, R16, R17—IRC carbon resistor, .5 meg., ½ watt
R7, R8—IRC carbon resistor, 25,000 ohms, ½ watt
R13—IRC carbon resistor, 1500 ohms, 1 watt
R14, R15—IRC carbon resistor, ¼ meg., 1 watt
R18—IRC wire wound resistor, 150 ohms, 10 watts
R20—IRC carbon resistor, 1 meg., 1 watt
R21—Electrad Truvolt resistor, 50,000 ohms, 25 watts
R22—Electrad Truvolt resistor, 25,000 ohms, 50 watts
R23—IRC carbon resistor, 75,000 ohms, 1 watt
R24—Trutest, center-tapped resistor, 20 ohms
SW1—SPST toggle switch
SW2—SPDT toggle switch
T1—Amertran Power transformer, type U981, primary, 115 volts; secondaries, 425-0-425 volts, 160 ma.; 5 volt, 3A; 2½ volts, 5A; 2½ volts, 10A; 2½ volts CT, 5-A.
T2—Amertran output transformer, type J874, primary 10,000 ohms CT, secondaries, 500 ohms and universal voice coil
1 4-prong wafer socket
1 5-prong wafer socket
1 large 7-prong wafer socket
4 6-prong wafer socket
1 chassis 17x11x3 with bottom cover
2 terminal strips, 6 terminals each
2 tube shields
3 V. C. pointer knobs
2 indicator dials marked "Volume"
1 indicator dial marked "Tone"
4 terminal lug strips—2 terminals
1 line cord and plug
1 rubber grommet
1 binding post
2 grid clips
2 6B5 tubes Triad or Sylvania
2 6C6
1 5Z3
1 76
1 6A6

5 Meter Car Radio

(*Continued from page* 520)

Next month this receiver and its circuit and construction will be described for the benefit of those readers who would like to build a complete installation.

Mr. Landry has made many trips up into Connecticut and down through New York and Jersey and even as far as Washington using this rig. He has made many friends among the amateurs he has contacted, visiting their homes and seeing their transmitting and receiving apparatus. On his last trip to Washington he contacted W3BAI, at Boling Field, from a distance of 16 miles and got specific road information from the operator to bring him direct to that station. He also worked W3DBC and a number of other amateurs en route. On his Connecticut trip he contacted W1EER of Noroton Heights and visited this outstanding 5-meter station. Everywhere in his travels great interest has been shown in his tiny 5-meter car-radio.



SIMPLIFIED EQUIVALENT CIRCUIT OF AN AUDIO TRANSFORMER.
FIG. 1

Theory and Practice for Correct

IMPEDANCE MATCH

By C. A. Johnson

Part Six

IN Part V, we described a method of measuring the frequency response of an audio transformer. This is a direct means of determining how well a given transformer will effect a match between two specific values of impedance. Careful measurement, under operating conditions, should always be employed to confirm (or dis-prove) theoretical performance. On the other hand, a large amount of unnecessary measurement can be avoided; if it is preceded by intelligent circuit analysis. In this installment, we will try to point out some of the factors to be considered in such an analysis of an audio transformer. Such a discussion, at this point, must necessarily be general. Some of the more important exceptions will be discussed in detail later.

THE ideal transformer (described in Part IV) neither stores nor dissipates energy within itself. Any physical transformer does both to a certain extent, depending upon conditions. If it didn't, it would obviously have zero insertion loss, and would have a uniform response for all frequencies. Our problem, then, is to discover what causes this storage and dissipation of energy, and how it varies with frequency.

Limitations in Design

These causes may be subdivided in great detail, but all are a result of one or more of the following fundamental limitations:

1. The inductance of a winding cannot be made infinitely large.
2. All of the magnetic energy generated by the primary is not reproduced in the secondary.
3. Each winding has resistance and distributed self-capacity.
4. There is a mutual capacity between the windings.

We have already pointed out (Part V) that limited primary inductance causes the primary to act as a shunt across the source, at low frequencies. This fact indicates the desirability of making the primary inductance very high. However, there is a definite upper limit, particularly in the case of a step-up transformer. Whatever the value of L_p, L_s must be equal to N^2L_p. (See Formula 4, Part IV; N = turns ratio.) The physical limitations to the size of L_s, therefore, automatically fix the size of L_p.

A part of the primary energy is consumed in magnetizing the core, and in losses due to eddy currents and hysteresis. With the core materials in use today, this is a relatively small loss, except in the case of output transformers.

There is a further loss between primary and secondary due to flux leakage between the two. A part of the primary flux, for example, generates no power in the secondary load, because it does not link with the secondary. However, it still appears in the primary circuit as a parasitic inductance. The inductive reactance produced in the circuit from this effect is called "leakage" reactance. The same analysis applies to the secondary and its associated circuit. The total leakage reactance is divided between the two circuits in proportion to the turns ratio.

Any inherent resistance in either winding dissipates energy in the form of I^2R losses. In a well-designed transformer the winding resistance is relatively small. Hence, it can usually be disregarded in a circuit analysis that is devoted to studies of frequency response.

The various distributed capacities in a physical transformer may either produce resonance (or by-pass the signal). Both of these effects will obviously vary with frequency.

The Equivalent Network

The exact equivalent circuit of an audio-frequency transformer is a rather complicated network. In such a circuit, elements of resistance, inductance and capacity are used to represent effects similar to those described above. The transmission characteristic of such a circuit can be calculated, exactly, for any frequency. However, the process is long and tedious and we often do not have sufficiently accurate data on all of the transformer constants. In practice, we can simplify the problem by using approximate networks. These contain only the elements of importance for the particular problem under consideration.

Three of the most important effects generally encountered in audio-frequency transformers are illustrated in Figure 1. The symbols used have the following meaning:

e = e.m.f. generated by source.
Z_a = internal impedance of source.
L_p = Primary inductance.
L_L = Leakage inductance.
C_d = Distributed and mutual capacity lumped together.
Z_b = Load impedance.

The ratio of the transformer shown in Figure 1 is unity. Any other ratio, N, may be reduced to unity ratio by dividing all impedances in the secondary circuit by N^2. Note that this procedure follows logically from the basic fact that the ratio of a transformer merely acts a a multiplier. (Formula 4, Part IV.)

Frequency Response

Now, let us see how this network affects the transfer of power from Z_a to Z_b. We can tell by inspection that L_p will have the greatest shunting effect at low frequencies. Similarly, L_L will present the greatest series reactance at the highest frequencies. The same is true for the shunting effect of C_d. The question as to which is the more important depends upon their relative magnitudes.

For studies in the low-frequency region, we may limit our equivalent circuit to the effects L_p as shown in Figure 2. The transmission loss in decibels for this circuit is given by Formula (1).

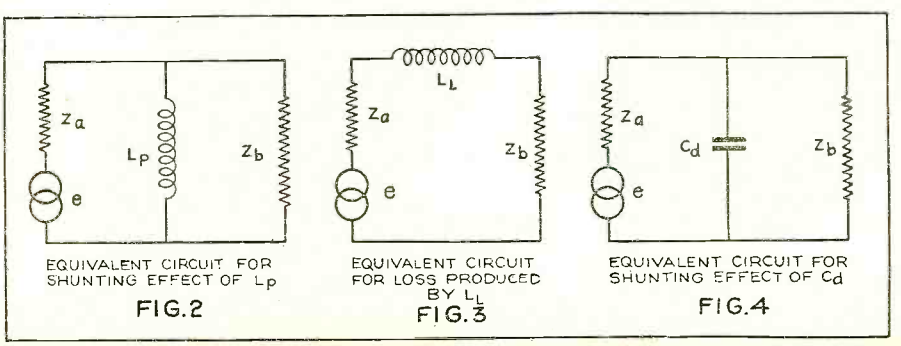
$$\left.\begin{array}{c}\text{Decibels loss due only}\\ \text{to shunting effect of } L_p\end{array}\right\} = 10 \log \left[1 + \left(\frac{Z_a Z_b}{(Z_a + Z_b)\omega L_p}\right)^2\right] \quad (1)$$

Now, if the primary inductance is known for a given transformer, the loss due to its shunting effect may be calculated for various frequencies. Suppose we have given a transformer with the following constants:

L_p = .5 henry.

Impedance ratio = 200 ohms to 200 ohms.

How far will this transformer be "down" at 30 cycles? (*Turn to page* 566)



EQUIVALENT CIRCUIT FOR SHUNTING EFFECT OF L_p
FIG. 2
EQUIVALENT CIRCUIT FOR LOSS PRODUCED BY L_L
FIG. 3
EQUIVALENT CIRCUIT FOR SHUNTING EFFECT OF C_d
FIG. 4

Analysis and Test Report on

24-TUBE All-Wave Super

By L. M. Cockaday *and* S. G. Taylor

A NEW 24-tube receiver just placed on the market and submitted to the *Radio News Laboratory* for test is extremely interesting in itself because of the numerous refinements and modern developments incorporated in its circuits. Beyond this, it is interesting as an expression of confidence, on the part of the manufacturer, that prosperity is returning sufficiently to warrant the production of a laboratory-built receiver which is built to an ideal, without regard for price limitation. Actually, for a custom-built receiver the price is not particularly high but it is, of course, high enough to carry this receiver out of the "garden variety" of commercial production receivers.

Hi-Fidelity Featured

The receiver, as illustrated on this page, is the new "Royale" model, produced by Royale Radio Crafters, a subsidiary of Midwest. It consists of three units—the 13-tube chassis, an 11-tube power supply and power amplifier, and a speaker assembly which incorporates three speakers. Three different consoles are available to house the equipment, each of which is unusual in conception and execution—getting away from the conventional form to a decided degree.

Outstanding among the features offered in this receiver are its real beauty of musical reproduction, its wide tuning range (from 4½ meters to 2400 meters divided into six ranges) and the combination of simplicity and flexibility in operation.

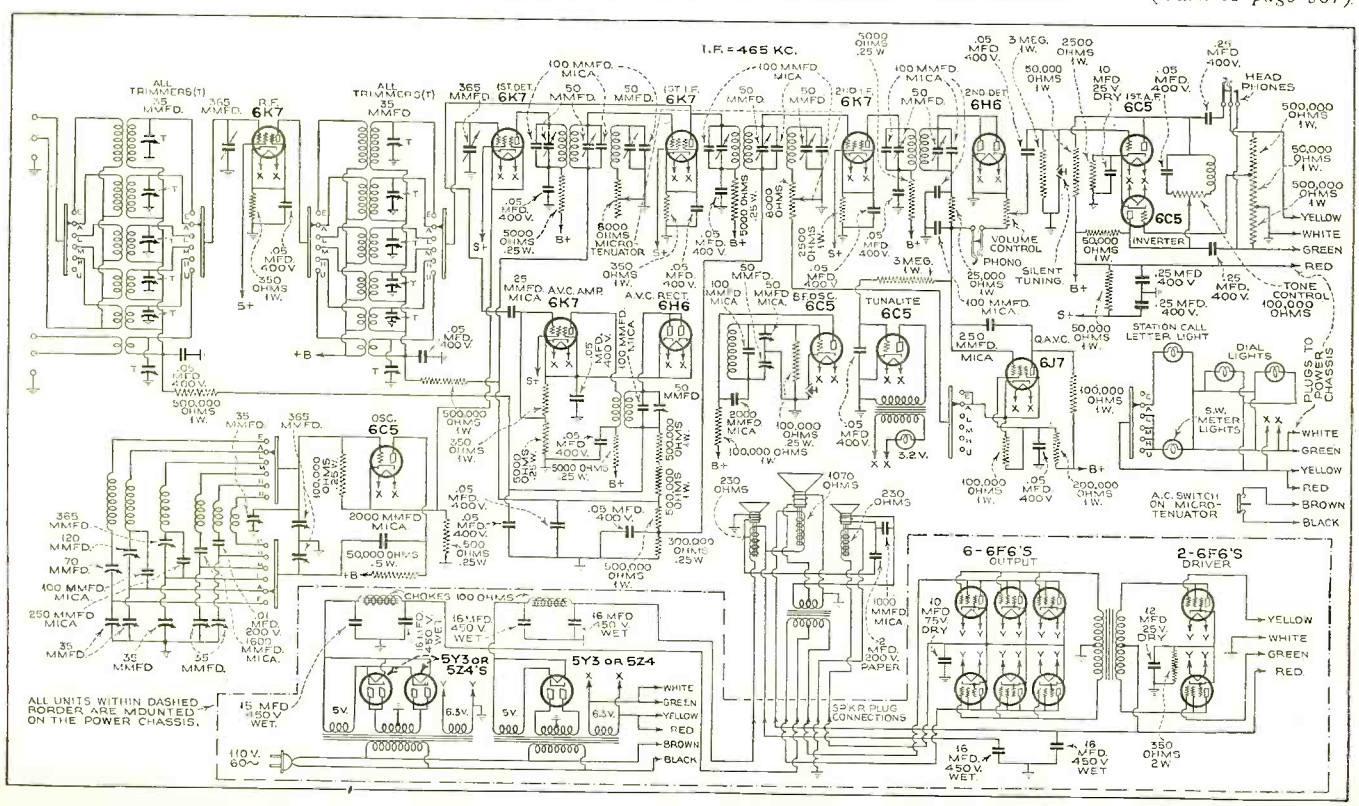
The complete chassis has been received at the *Radio News Lab.* for "on the air" tests. While sufficient time has not elapsed to permit completion of the tests, results during the preliminaries have been extremely satisfactory. Next month a report on the completed tests will be given. In the meantime the following description of the circuit (shown below) will be of interest to many technical-minded readers.

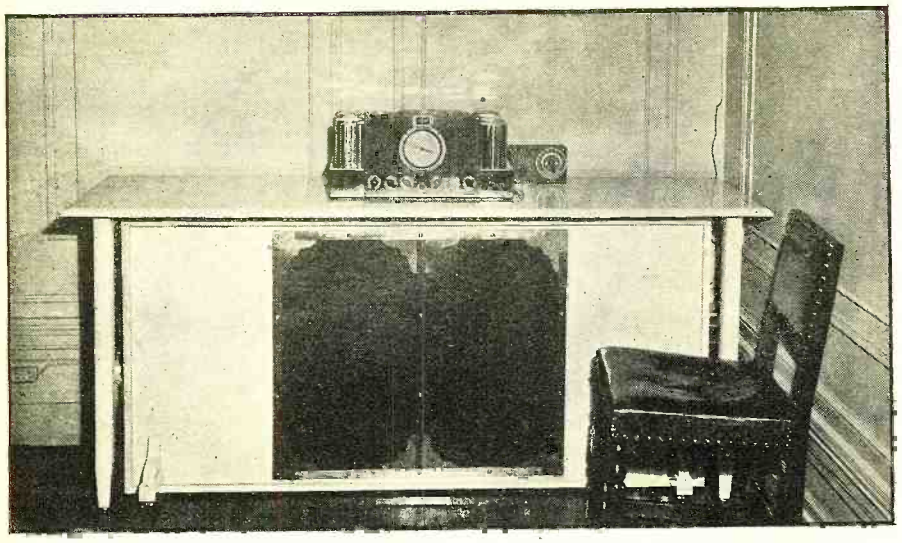
The "Royale" employs 24 tubes which can be either metal tubes or a glass equivalent, the so-called "G" tubes, the choice being left to the purchaser. The average reader will wonder why 24 tubes are necessary and what they are used for. This can be answered by following the action of the receiver beginning at the antenna and ending up at the loudspeakers.

The Circuit

The first tube is a 6K7 radio-frequency amplifier. One tuned radio-frequency stage is employed on all five wave-bands utilizing this 6K7 tube which is approximately equivalent to the 6D6. The first detector is also a 6K7 and the oscillator circuit employs a 6C5 triode. The intermediate-frequency amplifier consists of two stages, again with 6K7 tubes and working into a 6H6 second detector. The intermediate-frequency amplifier employs triple-tuned transformers with a variable resistance in one circuit of each. The two variable

(*Turn to page* 567)





AN UNUSUAL RADIO SET-UP

A radio table, designed by the editor of this department and installed in his city apartment. It will accommodate three or more receivers at one time, and will have connections to three different antenna systems. The baffle is faced with a reddish-gold silk screen in a natural mahogany frame, to break the severity of the large baffle surface and conceal the speakers.

THE DX CORNER

S. GORDON TAYLOR

(For Broadcast Waves)

THE list of Observers appearing elsewhere in this department includes the names of all those whose 1936 applications have been approved to date. A number of applications are on hand awaiting action. As soon as they have been favorably acted upon they will be added to the list of Official Observers for 1936. If you were an Observer in 1935 and have not sent in your application for reappointment, now is the time to do it. Applications will also be welcome from other readers who desire appointment. In making such application, please include a description of the receiving equipment you are using and also a brief summary of your DX accomplishments to date.

F.C.C. Monitor Schedule

The monthly frequency checks have been entirely changed with the result that hereafter these checks will take place during the second week of each month instead of the first week. Also the days and hours have undergone a wholesale shift. Unfortunately the new schedule reached RADIO NEWS too late to be included here this month but an effort will be made to include it in full in the next issue.

DX CALENDAR

Below are given lists of special and periodic DX broadcasts which are scheduled up to March fifteenth. The initials following an item indicate the organization to which the program is dedicated and where a RADIO NEWS special has been arranged for by an Observer, his name is given in the schedule.

Don't fail to tune in the RADIO NEWS specials on this list and as many others as possible—and above all, don't fail to report to each station tuned in, giving them as much information as you can concerning their signal strength, fading, quality, etc. Practically all of these stations verify reports and where verifications are desired it is always desirable to enclose return postage. If a large number of RADIO NEWS readers send reports to the stations who dedicate programs to us, these stations will feel well repaid for the time and effort required to put on these early morning programs.

Hours shown are Eastern Standard Time and are all a.m. unless otherwise indicated.

SPECIALS

Day	Hour	Kc.	Call	State	Kw.	Club
			February			
1	3-4	640	WOI	Iowa	5	CDXR
	3-4	1200	CHAB	Sask.	.1	CDXR
	4:30-5:30	1200	CKNX	Ont.	.05	CDXR
	5-6	1370	WMFO	Ala.	.1	NNRC
	7-8	1210	WSBC	Ill.	.1	NNRC
2	2-3	1300	CJLS	N. S.	.1	NNRC
	2-4	1200	CHAB	Sask.	.1	NNRC
	3-4	1120	CHSJ	N. B.	.5	NRC
	3-4	1150	XEFL	Tijuana	.25	URDX C
	4-4:30	630	CKOV	B. C.	.1	
3	3-4	1440	XEFI	Chih. Mex.	.25	CDXR
	5 on	570	WSYR	N. Y.	.25	URDXC
5	2-2:30	1310	WEBR	N. Y.	.1	CDXR
	3-5:10	**1400**	**WIRE**	**Ind.**	**.5**	**R. News Kalmbach**
7	2-3	1290	KDYL	Utah	1	CDXR
8	**4:40-5**	**1420**	**KCMC**	**Ark.**	**.1**	**R. News Halsey**
	5-6	1130	WOV	N. Y.	1	CDXR
	5-6	1370	WMFO	Ala.	.1	NNRC
	7-8	1210	WSBC	Ill.	.1	NNRC
9	1-2	1250	CMKC	Cuba	.15	UDXC
	1-2	**1420**	**KGGC**	**Calif.**	**.1**	**R. News Covert**
	2:30-4:30	1320	KID	Idaho	.25	NNRC
	3:01-3:30	630	CKOV	B. C.	.1	CDXR
	3-4	1370	KFRO	Texas	.1	NNRC
	3-5	**830**	**WEEU**	**Pa.**	**1**	**All Clubs**
	3-5	1450	CFCT	B. C.	.075	CDXR
	4-4:30	630	CKOV	B. C.	.1	
	4-6	**1310**	**WTRC**	**Ind.**	**.1**	**R. News Smith**
10	2-2:20	1420	WJBO	La.	.1	R. News Golson
11	2-2:20	1370	WSVS	N. Y.	.05	R. News Kalmbach
	3-4	1370	KRE	Calif.	.1	NNRC
12	2:01	1210	KIUL	Kansas	.1	
	2:30-3	1370	WHBQ	Tenn.	.1	NNRC
	6-6:30	1270	WOOD	Mich.	.5	CDXR
13	2-5	1320	CMOX	Cuba	.25	
15	2:30-4	1050	CX26	Uruguay	2	NNRC
	2:30-4	1050	CX26	Uruguay	2	IDA
	5-6	1370	WMFO	Ala.	.1	NNRC
	7-8	1210	WSBC	Ill.	.1	NNRC
16	1-1:30	600	WICC	Ct.	.5	CDXR
	1-2	1300	WHAZ	N. Y.	.5	UDXC
	2-3	1370	WPFB	Miss.	.1	NNRC
	3-4	620	KGW	Oregon	1	CDXR
	3:30-4:30	1370	KFRO	Texas	.1	CDXR
	4-5	630	WGBF	Ind.	.5	CDXR
	4-5	1010	CHML	Ont.	.05	CDXR
	4-6	1310	WTRC	Ind.	.1	CDXR
18	1-4	940	WDAY	N. D.	1	
19	2:01	1210	KIUL	Kansas	.1	
	2:30-3	1370	WHBQ	Tenn.	.1	CDXR
	3-4	1420	WAZL	Pa.	.1	NRC
	3-6	1500	WOPI	Tenn.	.1	CDXR
20	2-3	830	WRUF	Florida	5	CDXR & GCDXR

A PENNSYLVANIA DX'ER

Stanley Brus, No. Braddock, Pa., has set out to collect veri's from every state with his Midwest 10-tuber, 1935 model, and now lacks only four states.

Official RADIO NEWS Broadcast Band Listening Post Observers

United States

Alabama: Ray Wood
Arkansas: James Halsey
California: Frank D. Andrews, Roy Covert, Bill Ellis, Henry Evansmith, Randolph Hunt, Walter B. McMenamy, Radio Fellowship, Warren E. Winkley
Connecticut: Fred Burleigh, James A. Dunigan, Stanley Grabowski, Joseph J. Mazel
Illinois: Herbert H. Diedrich, H. E. Rebensdorf, D. Floyd Smith, Donald C. Truax
Kansas: Dudley Atkins III, T. R. Grosvenor, Vernon Rimer
Louisiana: Wilbur T. Golson, Aubrey V. Deterly
Maine: Danford Adams, Floyd L. Hammond, Roger Williams
Maryland: William L. Bauer, Louis J. McVey, William Rank, Frank Zelinka
Massachusetts: William W. Beal Jr., Walter C. Birch, Russell Foss, Warren C. Reichardt, Evan B. Roberts
Missouri: M. F. Meade
Minnesota: Floyd Biss, Walter F. Johnson
Montana: R. W. Schofield
Nebraska: Bud Crawford
New Jersey: Robert F. Gaiser, Morton Meehan
New York: Jacob Altner, Murray Buitekant, Ray Geller, John C. Kalmbach Jr., Harry E. Kentzel, Maynard J. Lonis, Harold Mendler, Robert C. Schmarder, R. H. Tomlinson, William Wheatley
North Dakota: O. Ingmar Oleson
Ohio: Stan Elcheshen, Donald W. Shields
Oregon: David Hunter
Pennsylvania: Robert W. Botzum, Robert H. Cleaver, Harry M. Gordon, Edward Kocsan, Francis Schmidt, Joseph Stokes, Paul V. Trice
Rhode Island: Spencer E. Lawton
South Dakota: Mrs. A. C. Johnson
Texas: Isaac L. Davis, E. L. Kimmons
Vermont: Henry T. Tyndall Jr.
Virginia: A. J. Parfitt, C. C. Wilson
West Virginia: Clifford Drain

Foreign

Alaska: S. A. Tucker
Australia: Albert E. Faull, Aubrey R. Jurd
Canada: Bernard J. Clancy, John W. Ker, Ernest W. Law, Philip H. Robinson
England: R. T. Coales, F. R. Crowder, Charles E. Pellatt
Japan: A. T. Yamamoto
New Zealand: Alexander N. Chalmers, L. W. Mathie, Eric W. Watson
Philippine Islands: George Illenberger
Puerto Rico: Ralph Justo Prats
Switzerland: Dr. Max Hausdorff
Turkey: A. K. Önder

DETAILS OF THE TABLE

The 5½-foot baffle, rolled out to show the provision for four speakers and the power-pack shelves under the table. The baffle, made of heavily reinforced 1¼-inch lumber, aids materially in obtaining fine quality of reproduction. The general design of the whole table unit is such as to permit the utmost flexibility of installation and operation of receivers for "on the air" tests.

	3-4	1160	CMHJ	Cuba	.1	UDXC
22	3-4	1220	KYA	Calif.	1	CDXR
	3:30-4	1310	WEXL	Mich.	.05	NRC
	4-5	620	WHJB	Pa.	.25	CDXR
	5-6	1370	WMFO	Ala.	.1	NNRC
	7-8	1210	WSBC	Ill.	.1	NNRC
23	12:01-3	1420	WPAR	W. Va.	.1	CDXR
	2-3	1270	CMKC	Cuba	.15	NRC
	2-3	1040	CP4	Bolivia	10	NNRC
	3:01-3:30	630	CKOV	B. C.	.1	CDXR
	3-4	**1150**	**XEFL**	**Calif.**	**.5**	**R. News Johnson**
	3:30-4	**630**	**CKOV**	**B. C.**	**.1**	**R. News Gordon**
	4-4:30	630	CKOV	B. C.	.1	
25	2:30-4	1200	KADA	Okla.	.1	
26	2:01	1210	KIUL	Kansas	.1	
	2-3	1370	WOC	Iowa	.1	NNRC
	3-4	1530	W1XBS	Conn.	1	NRC & CDXR
	6-6:30	1270	WOOD	Mich.	.5	CDXR
27	5:30-6	1310	WRAW	Pa.	.1	GCDXC
29	2 on	1430	WHP	Pa.	.5	CDXR
	2:30-3:30	1450	WTFI	Ga.	.5	CDXR
	5-6	1370	WMFO	Ala.	.1	NNRC
	7-8	1210	WSBC	Ill.	.1	NNRC

March

1	2-3	1310	CJLS	N. S.	.1	NNRC
	3:01-3:30	630	CKOV	B. C.	.1	CDXR
	3-4	1150	XEFL	Tijuana	.25	URDXC
	3-4	1200	CHAB	Sask.	.1	CDXR
	3-4	1220	KWSC	Wash.	1	CDXR
	4-4:30	630	CKOV	B. C.	.1	
	4-5	1220	KWSC	Wash.	.1	NNRC
	5-5:30	1240	KGKO	Texas	.25	NNRC
4	3-5:10	1400	WIRE	Ind.	.5	CDXR
5	4:30-5:30	1200	CKNX	Ont.	.05	CDXR
6	2-3	1290	KDYL	Utah	1	CDXR
7	5-6	1370	WMFO	Ala.	.1	NNRC
	7-8	1210	WSBC	Ill.	.1	NNRC
8	2-4	1420	WJBO	La.	.1	CBXR
	4-4:30	630	CKOV	B. C.	.1	
9	**12:45-1:45**	**1130**	**KSL**	**Utah**	**50**	**R.News Jensen**
	2-2:20	**1420**	**WJBO**	**La.**	**.1**	**R. News**
	2-3	1250	CMKC	Cuba	.15	CDXR
	2:30-4:30	1320	KID	Idaho	.25	NNRC
	3-4	1370	KFRO	Texas	.1	NNRC
10	2-3	1530	W1XBS	Conn.	1	NRC & CDXR
11	2:30-3	1370	WHBQ	Tenn.	.1	NNRC
	6-6:30	1270	WOOD	Mich.	.5	CDXR
14	**4:40-5**	**1420**	**KCMC**	**Ark.**	**.1**	**R. News Halsey**
	5-6	1370	WMFO	Ala.	.1	NNRC
	7-8	1210	WSBC	Ill.	.1	NNRC
15	3:01-3:30	630	CKOV	B. C.	.1	CDXR
	3:30-4:30	1370	KFRO	Texas	.1	CDXR
	4-4:30	630	CKOV	B. C.	.1	
	4-5	1300	WHAZ	N. Y.	.5	CDXR
	4-6	1310	WTRC	Ind.	.1	NNRC
	4-6	1310	WTRC	Ind.	.1	NNRC

PERIODIC

The times shown for the following stations are, so far as could be determined, correct at the time of preparation. However, the hours of these periodic broadcasts are shifted frequently and it will probably be found that some of them will have changed hours by the time this appears in print.

Daily—

7:30 a.m. 1050 kc., KFBI, Abilene, Kansas, 5 kw (tips)

8:30 p.m. 1310 kc., WTRC, Elkhart, Ind., .1 kw (tips) (exc. Sunday)

Tuesdays—

2:30-3 a.m. 900 kc., KSEI, Pocatello, Idaho, 25 kw

Thursdays—

12:30-1:15 a.m. 1390 kc., KLRA, Little Rock, Ark., 1 kw. (MCDXB)

2-2:15 a.m. 1300 kc., KFAC, Los Angeles, 1 kw. (tips)

8:45-9 p.m. 1420 kc., KCMC, Texarkana, Ark. 1 kw. (Radio News) (tips)

11-11:15 p.m. 1010 kc., CKCK, Regina, Sask., .5 kw. (tips)

Fridays—

8 p.m. 1320 kc., WORK, York, Pa., 1 kw. (NRC) (tips)

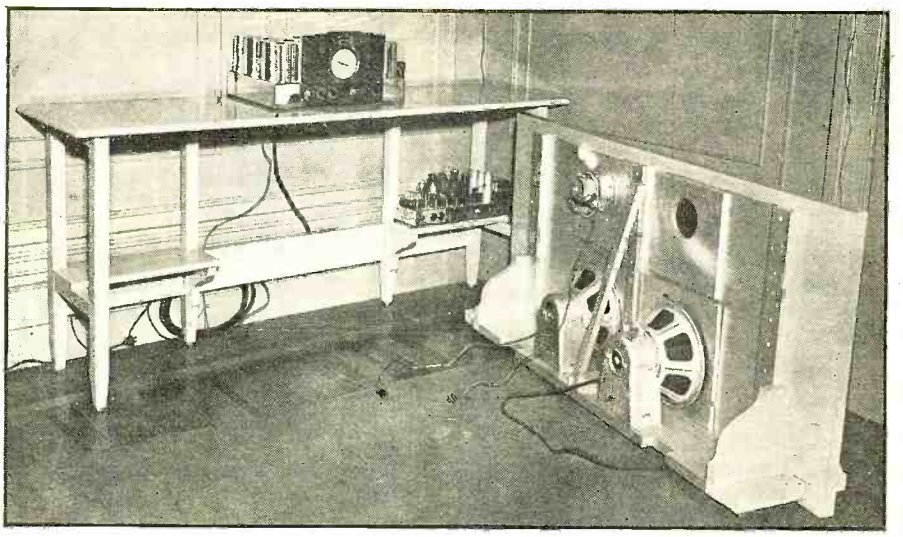
8:45-9 p.m. 1530 kc., W9XBY, Kansas City, Mo. 1 kw. (tips)

Saturdays—

12:01-12:30 a.m. 980 kc., KDKA, Pittsburgh, Pa., 50 kw., (tips)

10-10:15 a.m. 830 kc., WEEU, Reading, Pa., 1 kw. (tips)

3:30 p.m. 1360 kc., WQBC, Vicksburg, Miss., 1 kw. (tips)



Sundays—

12:30-12:45 a.m. 1420 kc., KGGC, San Francisco, Calif., 1.kw. (Radio News) (tips)

12:45-1 a.m. 640 kc., KFI, Los Angeles, Calif., 50 kw. (tips)

12:45-1 a.m. 1250 kc., WTCN, Minneapolis., Minn., 1 kw. (tips)

12:45-1 a.m. 1400 kc., WIRE, Indianapolis, Ind. .5 kw. (tips)

12:45-1 a.m. 1470 kc., WLAC, Nashville, Tenn., 5 kw. (tips)

1-5 a.m. 1210 kc., TGW, Guatemala, Gua., 10 kw.

2 a.m. 730 kc., CJCA, Edmonton, Alberta, 1 kw.

2-5 a.m. 1380 kc., CMBX, Havana, Cuba, .25 kw.

Consolidated Foreign "Best Bets"

Following is a list of the foreign stations being heard by Official Observers in different sections of the U. S. and Canada. Wherever either an asterisk (*) or a number appears in a column it indicates that the station has been heard in the section represented by that column. The numbers represent the approximate *local* time when the station is heard. Heavy numbers represent p.m. and light numbers a.m.

This list is made up from observers' reports as follows: Column 1 (New England)—Observers Birch, Tyndall, Foss, Hammond, Reichardt, Roberts; Column 2 (New York, New Jersey)—Observers Meehan, Maynard, Gaiser, Tomlinson, Kalmbach Jr.; Column 3 (Pennsylvania, Maryland, Virginia)—Observers Gordon, Kocsan, Marshall, McVey, Wilson, Brus; Column 4 (Illinois, Indiana, Minnesota, Nebraska, North Dakota)—Observers Truax, Johnson, Smith, Oleson, Diedrich, Crawford, Biss; Column 5 (Texas, Alabama, Louisiana, Arkansas)—Observers Kimmons, Wood, Deterly, Halsey; Column 6 (California)—Observer Hunt.

The location and power of the European stations listed will be found in the European Call List in the December issue; of the TP's, in the Asiatic Call List in the November issue.

(Note: Official Observers and other readers are invited to send in a listing of foreign stations heard each month. In doing so it will facilitate matters if stations are reported in the form of a list with the frequency, call, location and hour [your own local time] when best heard.)

Kc.	*Call*	*1*	*2*	*3*	*4*	*5*	*6*
546	HAL	–	*	–	–	–	–
556	Beromunster	*	–	–	–	–	–
565	Athlone	2	–	–	–	–	–
570	2YA	–	–	–	*	–	–
574	Stuttgart	7	*	–	–	–	–
580	3WV	5	–	–	–	–	–
583	Grenoble PTT	3	–	–	–	–	–
583	YLZ	*	–	–	–	–	–
592	Vienna	3	–	–	–	–	–
601	SBD	*	–	–	–	–	–
601	CNR	3	–	2	–	–	–
610	I1FI	2	–	–	–	–	–
620	Brussels I	2	–	–	–	–	–
625	TIPG	–	–	10	–	*	–
638	Prague	1	*	–	–	–	–
640	5CK	–	–	–	*	–	–
648	Lyon-la-Doua	5	*	–	–	–	–
650	CX6	9	–	–	–	–	–
658	Cologne	2	*	–	–	–	–
650	1YA	5	–	3	5	5	*
660	XGOA	–	–	–	5	4	*
668	North Regional	6	–	–	–	–	–
670	LS4	9	–	–	–	–	–
670	2CO	–	–	–	*	–	–
670	JFAK	–	–	–	–	*	–
677	Sottens	5	–	–	–	–	–
695	PTT	5	–	–	–	–	–
710	LS1	9	–	–	–	–	–
713	I1RO	5	*	–	–	–	–
720	3YA	–	–	–	*	–	–
731	EAJ-5	5	–	–	–	–	–
731	Tallinn	*	–	–	–	–	–
740	Munich	1	*	–	–	–	–
740	2BL	–	–	–	5	–	–
749	Marseille	6	–	–	–	–	–
750	LR7	8	–	–	–	–	–
750	KGU	5	*	3	2	3	–
750	7NT	–	–	–	5	–	–
750	JOBK-1	–	–	–	–	–	*
758	Katowice	1	–	–	–	–	–
767	South Regional	6	–	–	–	–	–
770	CX12	9	–	–	–	–	–
770	3LO	5	–	–	–	–	–
776	Toulouse	5	*	3	–	–	–
776	LKF	*	–	–	–	–	–
785	Leipsig	3	*	*	–	–	–
790	4YA	5	–	–	5	–	–
795	EAJ-1	6	–	–	–	–	–
795	Lwow	*	–	–	–	–	–
800	HIX	8	–	–	–	–	–
800	4QG	5	–	–	5	–	–
804	West Regional	6	–	–	–	–	–
810	CX14	9	–	–	–	–	–
814	Milan	5	*	2	–	–	–
815	PRA-6	8	–	–	–	–	–
823	Bucharest	*	–	–	–	–	–
830	LR5	8	*	2	7	–	–
830	3GI	4	–	–	5	–	–
841	Berlin	1	–	–	–	–	–
850	CX16	9	–	–	–	–	–
850	LKB	*	–	–	–	–	–
859	Strasbourg	6	*	–	–	–	–
868	Paris AGEN	5	–	–	–	–	–
868	Poznan	*	–	–	–	–	–
870	LR6	9	*	10	7	–	–
877	London Regional	7	–	–	–	–	–
886	Graz	*	–	–	–	–	–
895	Limoges	*	–	–	–	–	–
895	Helsinki	*	–	–	–	–	–
900	PRF3	7	–	–	–	–	–
904	Hamburg	6	–	–	–	–	–
910	LR2	8	–	–	–	–	–
913	Toulouse	4	*	4	–	–	–
920	HHK	8	–	–	–	–	–
922	OKB	1	–	–	–	–	–
923	PRF4	8	*	–	–	–	–
932	Brussels II	2	–	–	–	–	–
941	SBB	1	–	–	–	–	–
941	Algiers	2	–	–	–	–	–
950	LR3	9	–	–	7	–	–
950	Breslau	1	–	–	–	–	–

A NEW ZEALAND OBSERVER

L.P.O. Mathie, Hawkes Bay, N. Z., in addition to being an ardent DX'er is also a member of the Advisory Board of the N.Z. DX Club.

Kc.	Call	1	2	3	4	5	6
950	2UE	–	–	–	5	–	–
959	Poste Parisien	5	5	2	–	–	–
960	YV1RC	8	6	*	–	–	–
960	PRB4	–	–	–	–	*	–
960	JOOK	–	–	–	*	–	–
980	6AM	5	–	–	–	–	–
986	I1GE	2	–	–	–	–	–
986	Torun	2	–	–	–	–	–
990	LR4	2	–	2	7	–	–
990	2GZ	5	–	–	5	–	–
995	PFBI	3	–	–	–	–	–
1005	HJ3ABH	–	–	–	–	*	–
1010	CX24	9	–	–	–	–	–
1010	3HA	–	–	–	*	–	–
1013	Midland Regional	6	–	–	–	–	–
1017	PRB9	8	–	–	7	–	–
1020	2KY	–	–	–	5	–	–
1022	EAJ-15	5	–	–	–	–	–
1030	LR9	9	–	–	–	–	–
1031	CT1GL	*	–	–	–	–	–
1031	Konigsberg	2	–	–	–	*	–
1040	CP4	2	–	–	–	*	–
1040	Rennes	5	2	2	*	–	–
1050	CX26	–	*	–	–	–	–
1050	South National	5	–	–	–	–	–
1050	JOHG	–	–	–	–	–	*
1059	I1BA	5	–	–	–	–	–
1068	Paris-Cite	*	–	–	–	–	–
1070	LR1	8	–	*	7	–	–
1077	Bordeaux	5	2	2	–	–	–
1090	CX28	9	–	–	–	–	–
1090	XGOB	–	–	–	–	*	–
1095	EAJ7	6	–	2	–	–	–
1104	Madona	2	–	–	–	–	–
1110	2UW	–	–	–	5	–	–
1113	Radio-Normandie	7	2	3	*	–	–
1113	OKK	1	–	–	–	–	–
1120	4BC	6	–	–	*	–	–
1130	CX30	9	–	–	–	–	–
1131	SBH	*	–	–	–	–	–
1132	PRD8	8	–	–	–	–	–
1140	I1TO	5	–	1	–	–	–
1149	West National	5	–	–	–	–	–
1149	North National	5	–	–	–	–	–
1150	LR8	9	–	–	7	–	–
1160	4MK	–	–	–	5	–	–
1170	4TO	–	–	–	5	–	–
1176	Copenhagen	1	–	–	–	–	–
1180	3KZ	–	–	–	5	–	–
1185	Nice-Corse	6	–	–	–	–	–
1190	LS2	8	*	2	10	–	–
1195	Frankfurt	1	*	*	–	–	–
1200	YV3RC	–	–	–	–	*	–
1204	Prague II	*	–	–	–	–	–
1210	TGW	3	*	5	*	5	–
1213	Lille	2	*	–	–	–	–
1222	I1TR	2	–	*	–	–	–
1230	LS8	9	8	7	–	–	–
1231	Gleiwitz	2	–	–	–	–	–
1240	WKAQ	7	*	*	–	*	–
1240	Relay Station, Sweden	*	–	–	–	–	–
1249	Juan-les-Pins	*	–	–	–	–	–
1258	Kuldiga	*	–	–	–	–	–
1267	Nurnburg	1	–	–	–	–	–
1276	Kristianssand	*	–	–	–	–	–
1280	3AW	–	–	–	5	–	–
1282	PRG3	8	–	–	–	–	–
1290	WNEL	7	*	–	–	*	–
1294	Linz	2	–	–	–	–	–
1295	PRA5	1	–	–	–	–	–
1312	SBC	*	–	–	–	–	–
1320	KGMB	5	–	–	*	*	–
1330	HJ1ABA	3	–	–	–	–	–
1330	Bremen	1	–	–	–	–	–
1339	Montpellier	*	–	–	–	–	–
1348	2RN	*	–	–	–	–	–
1348	Paris-Ile de France	2	–	–	–	–	–
1348	Milan II	*	–	–	–	–	–
1348	Konigsberg	3	–	–	–	–	–
1366	SCF	*	–	–	–	–	–
1370	CX42	9	–	–	–	–	–
1384	Warsaw II	*	–	–	–	–	–
1385	SCG	*	–	–	–	–	–
1393	Lyon	6	–	–	–	–	–
1402	SCE	*	–	–	–	–	–
1410	2KO	–	–	–	5	–	–
1411	SCW	*	–	–	–	–	–
1438	SCJ	*	–	–	–	–	–
1438	HAE-3	*	–	–	–	–	–
1447	SCA	*	–	–	–	–	–
1456	Eiffel Tower	*	–	–	–	–	–
1483	SCD	*	–	–	–	–	–

Those S.A.'s on 810, 890, Etc.

In the "Reports from Readers" section last month Observer Gordon (Pennsylvania) had a bone to pick with DX'ers who report South American stations on 810, 890, 913, 1050, 750, and 690 kc. He had checked these frequencies constantly and was certain they were occupied by Cuban, Mexican, and French Canadian stations only.

Observer Tomlinson (New York) doesn't check with Observer Gordon and has the following to say: "There are several things Observer Gordon should do. First, he should distinguish between the "Spanish" used by the Cuban stations and that used throughout South America. Second, study just how the letters from A to Z and the numbers of 1 to 10 sound, when spoken in Spanish. Third, learn approximately what sound split frequencies make when they hetrodyne against another channnel 1000 to 5000 cycles away. Fourth, inspect some dozens of QSL's scattered on the East Coast. Nights when western stations are not coming through, usually the South Americans do. Several times during the past three months this has happened on 810 kc. and either CX14 or the Chile station can be heard. I have a report out now on CX14. On 913, the South American reported there for some time was LR2, he never stays at one place, I have found him ranging from 895 to 917. Right now he's staying on 910 even. 895 to 898 brings in ZP9 quite often. 1050 is one of the best SA's, CX26. He may be heard behind CRCK many nights straight. CX8 has been heard here and also by others on 690, while 695 is HJN. 750 is a jumble, LR7 several nights has pushed through and can be heard when WJR talks. Also on 750 are a couple in Brazil, one in Peru and a Cuban. It's up to the listener to determine which language is pushing through each night. Either Observer Gordon is in a poor location, or he can't distinguish between the three, Portuguese, Spanish and Cuban. Referring to 913, as a French speaking Canadian, I presume he means our reports on Toulouse. Lord, the way this station has been tearing in all fall and winter, I don't see how anyone, especially with a Scott, can mistake him, he's often better than the Canadian on 910."

A SWISS L.P.O.

Dr. Max Hausdorff, Lugano, Viganello, Switzerland, who serves as an official observer for both the broadcast band and short waves, is shown here in his "DX Corner" before his 18-tube Midwest. Below is shown a view of Lake Lugano as viewed from his home.

International 6000-12,500-Mile DX Short-Wave Club

The membership rules of this club have been altered to include Broadcast Band DX'ers who have logged and verified stations over 3500 miles distant. Anyone desiring further information should address an inquiry as follows: Oliver Amlie, President, 56th and City Line Avenue, Overbrook, Philadelphia, Pennsylvania.

Our Readers Report—

Observer Birch (Massachusetts): Verification from LR1, 1070 kc., states that this station is now in regular operation and desires reports, return postage not necessary. Nice-Cote d'Azur, 1185 kc., is also anxious for reports.

Observer Foss (Massachusetts) reports hearing Paris on 182 kc. This will be interesting knowledge to owners of the newer receivers that include a long-wave band.

Observer Hammond (Maine): CMQ, now heard on 880 kc. Some of the all night stations are KFAC, KROW, WNEW, WSMK, WHN and KPCB.

Observer Roberts (Massachusetts): Christmas time brought the best T. A. reception that I have ever heard. On the morning of the 24th heard 49 T.A.'s between midnight and 3:30 a.m. On the 25th heard 9 new Swedish stations. This brings my total of T.A. broadcast-band stations to 118.

Observer Meehan (New Jersey): WJBW has joined the ranks of 24-hour stations. WNBX is now heard as late as 9 p.m. EST. WHBL changed to 1300 kc. January 21st. WKAR changed to 850 kc. January 14th. WEHC is changing its call to WCHV. Chalked up 578 BCB stations during 1935 and verified 244.

Observer Gaiser (New Jersey): KGU operates daily from 11:45 p.m. to 4:15 a.m. EST and offers a swell veri. The address is: M. A. Mulrony & Advertiser Pub. Co., Ltd., Honolulu, Hawaii.

Observer Tomlinson (New York): CE-62, 625 kc. has changed the call to CB-62 and will have a program on the air from 1-2 a.m., EST, Feb. 10th dedicated to IDA. LR3, LS4, PRF4, Toulouse-Muret (Radio Lyons 1393 kc.), CE-26 and OKR have verified my reception so far this season and I have 50 other reports out.

Observer Kalmbach (New York): Bordeaux, 1077 kc.; Radio Normandie, 1113 kc.; and Rennes, 1040 kc., were all heard R7 with little fading, 2-3:15 a.m from Jan. 1st to 4th. CMBY is operating on 1035 kc., not 1030. Found reception around Xmas was excellent. On Dec. 26 heard LS2, LR4 and LR5 with signals running as high as R9 and very little fading.

Observer Kocsan (Pennsylvania) also reports LR4, LR5 and LS2 coming in R4-R9, Dec. 26th.

Observer McVey (Maryland): Radio Paris, 182 kc. has been heard with good volume, 5-7 p.m. Droitwich, Great Britain, 200 kc., also heard, 6-7 p.m. with good volume.

Observer Wilson (Virginia) reports reception right up to the end of 1935 considerably below par, and that the numerous Cubans and Mexicans now on the air have not helped to improve DX conditions by any means.

Stanley Brus (Pennsylvania): Up to December 1st I have received 134 veries. Am attempting to verify every state and now lack only four.

Observer Truax (Illinois) reports his 1935 log wound up with 436 stations received, 105 verified. He would like to correspond with DX'ers in foreign countries, especially those in France and Japan. The name Truax was derived from the original French De Trieux and he would particularly like to correspond with anyone by that name in France. Letters may be addressed to: Donald C. Truax, 539 Woodlawn Avenue, Aurora, Illinois.

Observer Johnson (Minnesota): HRN, Tegucigalpa, has shifted frequency to 1350 kc. A Mexican announcing only in Spanish, with the call XES or XEF, Tampico, has been heard irregularly Sunday mornings until 2 a.m., EST on 990 kc. The Canadian Radio Commission gives interesting talks on aerials, receivers, etc. every Tuesday from 10:30 to 10:45, EST. Eastern Canadian frequency checks take place on the 20th of each month and sometimes on the 19th. These occur between 1 and 3:30 a.m., EST, each station being on for an 8-minute period. This month's frequency checks brought my log up to 765.

Observer Floyd Smith (Illinois): Have recently experienced my first T.A. reception after trying for 4 years. The stations heard were Fecamp and Rennes with R5-R6 signals. Have just completed a 650 foot antenna, running west to east with the lead in at the east end and with an average height of 40 feet. It has proved highly directional for eastern stations.

Observer Oleson (North Dakota): CKPR has moved to 910 kc. Would like reports from users of the new McMurdo Silver "R9" antenna system and the GE "V" doublet—especially as to their effectiveness on the broadcast band. Anyone able to give the desired information may address him as follows: O. Ingmar Oleson, Ambrose, North Dakota.

Observer Crawford (Nebraska) desires to register a complaint against stations which put their unmodulated carriers on the air for periods of up to a half hour or more before starting to modulate. He feels that any warming up necessary should be accomplished without putting the carrier on the air.

Observer Deterly (Louisiana) reports that Santa Claus left a Philco 116B, 11-tube receiver in his stocking.

Observer Halsey (Arkansas): W6XAI, 1550 kc., Bakersfield, Calif., puts a really good signal in here from 6 to 10 p.m. with its peak occurring from 7 to 7:30 p.m.

Observer Hunt (California): The DX Season to date has not been comparable with the 1934-

(*Turn to page* 566)

AMERICAN STATION LIST

NORTH AMERICA *and the* WEST INDIES

(Exclusive of the United States)

Compiled by John M. Borst

NORTH AMERICA

CANADA

Call	Location	kc.	kw.
CJKL	Kirkland Lake, Ont.	550	1.0
CJRM	Moose Jaw, Sask.	540	1.0
CFNB	Fredericton, N. B.	550	0.5—1.0
CFPR	Prince Rupert, B. C.	580	0.05
CKUA	South Edmonton, Alta.	580	0.5
CHRC	Quebec, Que.	580	0.1
CKCL	Toronto, Ont.	580	0.1
CJOR	Vancouver, B. C.	600	0.5
CFCF	Montreal, Que.	600	0.4
CRCW	Windsor, Ont.	600	0.5—1.0
CKOV	Kelowna, B. C.	630	0.1
CJGX	Winnipeg, Sask.	630	0.5—1.0
CFCO	Chatham, Ont.	630	0.1
CFCY	Charlottetown, P. E. I.	630	1.0
CJCJ	Calgary, Alta.	690	0.1
CFRB	Toronto, Ont.	690	10.0
CJCA	Edmonton, Alta.	730	1.0
CFPL	London, Ont.	730	0.1
CKAC	Montreal, Que.	730	5.0
CHWK	Chilliwack, B. C.	780	0.1
CKSO	Sudbury, Ont.	780	1.0
CFQC	Saskatoon, Sask.	840	1.0
CRCT	Toronto, Ont.	840	5.0
CFJC	Kamloops, B. C.	880	0.1
CRCO	Ottawa, Ont.	880	1.0
CJAT	Trail, B. C.	910	0.25
CRCM	Montreal, Que.	910	5.0
CFAC	Calgary, Alta.	930	0.1
CKPR	Fort William, Ont.	930	0.1
CFCH	North Bay, Ont.	930	0.1
CKPC	Brantford, Ont.	930	0.1
CFLC	Prescott, Ont.	930	0.1
CHNS	Halifax, N. S.	930	1.0
CRCS	Chicoutimi, Que.	950	0.1
CKY	Winnipeg, Man.	960	15.0
CKCD	Vancouver, B. C.	1010	0.1
CKWX	Vancouver, B. C.	1010	0.1
CHWC	Regina, Sask.	1010	0.5
CKCK	Regina, Sask.	1010	0.5
CHML	Hamilton, Ont.	1010	0.1
CKCO	Ottawa, Que.	1010	0 1
CKJC	Wolfville, N. S.	1010	0.05
CFCN	Calgary, Alta.	1030	10.0
CKLW	Windsor, Ont.	1030	5.0
CRCK	Quebec, Que.	1050	1.0
CRCV	Vancouver, B. C.	1100	1.0
CKOC	Hamilton, Ont.	1120	0.5—1.0
CHLP	Montreal, Que.	1120	0.1
CHSJ	Saint John, N. B.	1120	0.5—1.0
CKX	Brandon, Man.	1120	0.1
CHAB	Moose Jaw, Sask.	1200	0.1
CKNX	Wingham, Ont.	1200	0.05
CKTB	St. Catharines, Ont.	1200	0.1
CJCS	Stratford, Ont.	1210	0.05
CJCU	Aklavik, N.W.T.	1210	0.05
CKBI	Prince Albert, Sask.	1210	0.1
CKMC	Cobalt, Ont.	1210	0.05
CKCH	Hull, Que.	1210	0.1
CJOC	Lethbridge, Alta.	1230	0.1
CJCB	Sydney, N. S.	1240	1.0
CFRN	Edmonton, Alta.	1260	0.1
CKCV	Quebec, Que.	1310	0.1
CJLS	Yarmouth, N. S.	1310	0.1
CHCK	Charlottetown, P.E.I.	1310	0.05
CKCW	Moncton, N. B.	1370	0.1
CJRC	Winnipeg, Man.	1390	0.1
CHNC	New Carlisle, Que.	1410	0.5—1.0
CKFC	Vancouver, B. C.	1410	0.05
CKMO	Vancouver, B. C.	1410	0.1
CKGB	Timmins, Ont.	1420	0.1
CKNC	Toronto, Ont.	1420	0.1
CFCT	Victoria, B. C.	1450	0.05
CHGS	Summerside, P.E.I.	1450	0.05
CJIC	Sault St. Marie, Ont.	1500	0.1
CKCR	Waterloo, Ont.	1510	0.1
CFRC	Kingston, Ont.	1510	0.1

Note: Where two powers are given, the larger one is used during daylight, the smaller one at night.

MEXICO

Call	Location	kc.	kw.
XEFC	Merida, Yuc.	550	0.1
XEAO	Mexicali, B. C.	560	0.25
XEPN	Piedras Negras, Coah. at present using	590	100.0 50.0
XEX	Mexico, D. F.	610	0.5
XEZ	Merida, Yuc.	630	0.5
XEOX	Saltillo, Coah.	640	0.25
XEAL	Mexico, D. F. (temp. suspended)	660	1.0
XET	Monterrey, N.L.	690	0.5
XEN	Mexico. D. F.	710	1.0
XEBC	Aguacaliente, B. C. (temp. suspended)	730	5.0
XEAM	Nuevo Laredo, Tams.	750	0.025
XFC	Aguascalientes, Ags. (temp. suspended)	810	0.35
XERA	Villa Acuna	840	250.0
XEFE	N. Laredo, Tams.	850	0.25
XEMO	Tijuana, B. C.	860	2.0
XEW	Mexico, D. F.	890	50.0
XENT	Nuevo Laredo, Tams.	910	150.0
XEAA	Mexicali, B. C.	920	0.2
XEFO	Mexico, D. F.	940	5.0
XFO	Mexico, D. F.	940	5.0
XEAW	Reynosa, Tams.	960	50.0
XEAE	Tijuana, B. C. (temp. suspended)	980	0.25
XEK	Mexico, D. F.	990	0.1
XES	Tampico, Tams.	990	0.25
XEAF	Nogales, Son.	990	0.75
XEBK	Neuvo Laredo, Tams.	1000	0.1
XEBH	Hermosillo, Son.	1000	0.1
XEY	Merida, Yucatan	1000	0.01
XEOK	Tijuana, B. C. at present using	760	2.5 0.2
XEJ	Ciudad Juarez, Chih.	1020	1.0
XEB	Mexico, D. F.	1030	10.0
XEA	Guadalajara, Jalisco	1060	0.125
XEBA	Ciudad Cuzman, Jal.	1080	0.02
XEAS	Saltillo, Coah.	1160	0.05
XEL	Mexico, D. F.	1100	0.25
XELO	Piedras Negras, Coah. (temp. susp.)	1110	10.0
XEFL	Tijuana, B. C.	1150	0.25
XEWZ	Mexico, D. F.	1150	0.1
XEH	Monterrey, N. L.	1150	0.25
XEC	Tijuana, B. C.	1160	0.03
XED	Guadalajara, Jalisco	1160	2.5
XEU	Veracruz, Ver.	1160	0.25
XETH	Puebla, Pue.	1210	0.1
XEMZ	Tijuana, B. C.	1210	0.25
XEFV	Ciudad Juarez, Chih.	1210	0.1
XEAT	Hidalgo del Parral, Chih.	1210	0.05
XEE	Durango, Durango	1210	0.05
XETF	Veracruz, Ver.	1220	0.012
XEFJ	Monterrey, N. L.	1230	0.1
XELA	Saltillo, Coah.	1240	0.05
XEME	Merida, Yuc.	1240	0.015
XEKL	Leon, Gto.	1240	0.5
XEAI	Mexico, D. F.	1240	0.1
XEG	Ensenada, B. C. (temp. suspended)	1270	0.2
XFB	Jalapa, Ver.	1270	0.25
XEMX	Mexico, D. F.	1280	0.012
XEX	Monterrey, N. L.	1310	0.125
XEAG	Cordoba, Ver.	1310	0.01
XEFW	Tampico, Tams.	1310	0.25
XETB	Torreon, Coah.	1310	0.125
XECW	Mexico, D. F.	1310	0.01
XFD	Jalapa, Ver	1340	0.35
XEI	Morelia, Mich.	1370	0.125
XEFZ	Mexico, D. F.	1370	0.1
XEZZ	San Luis Potosi, S.L.P.	1370	0.1
XEAZ	Guanajuato, Gto.	1420	0.007
XEFB	Monterrey, N. L.	1420	0.1
XEFI	Chihuahua, Chih.	1440	0.25
XEFA	Tacuba, D. F.	....	0.5

MIQUELON

FQN	St. Pierre	609	0.25

NEWFOUNDLAND

VOWR	St. John's	681	0.5
VOGY	St. John's	840	0.4
VOAS	St. John's	940	0.1
VOAC	St. John's	1065	0.04
VONF	St. John's	1195	0.5

WEST INDIES

CUBA

Call	Location	kc.	kw.
CMW	Havana	600	1.4
CMBY	Havana	640	0. 2
CMCQ	Havana	680	0.25
CMK	Havana	730	3.0
CMCW	Havana	750	0.15
CMBS	Havana	770	0.15
CMJK	Camaguey	780	0.15
CMHW	Cienfuegos	810	0.1
CMCF	Havana	815	0.25
CMQ	Havana	840	0.5
CMBN	Havana	880	0.15
CMX	Havana	920	1.0
CMBC	Havana	940	0.15
CMCD	Havana	960	0.25
CMBZ	Havana	1000	0.15
CMJA	Camaguey	1010	0.05
CMCV	Havana	1030	1.0
CMKD	Santiago de Cuba	1050	0.25
CMHA	S. la Grande	1070	0.05
CMCO	Havana	1110	0.15
CMGF	Matanzas	1120	0.15
CMKM	Manzanilla	1120	0.15
CMJI	C. de Avila	1130	0.05
CMBG	Havana	1140	0.225
CMJF	Camaguey	1150	0.2
CMHJ	Cienfuegos	1160	0.1
CMBD	Havana	1170	0.15
CMJO	C. de Avila	1180	0.05
CMCJ	Havana	1200	0.5
CMHI	Sta. Clara	1210	0.15
CMJE	Camaguey	1220	0.05
CMCB	Havana	1230	0.15
CMHB	Sancti Spiritus	1240	0.05
CMKC	Santiago de Cuba	1250	0.15
CMCG	Havana	1255	0.15
CMHD	Caibarien	1270	0.25
CMCU	Havana	1280	0.15
CMOX	Havana	1320	0.2
CMHK	Cruces	1330	0.25
CMJL	Camaguey	1340	0.075
CMCA	Havana	1350	0.25
CMJH	C. de Avila	1360	0.05
CMGE	Cardenas	1370	0.15
CMBX	Havana	1380	0.2
CMJC	Camaguey	1390	0.15
CMGC	Matanzas	1400	0.1
CMKR	Santiago de Cuba	1400	0.1
CMCR	Havana	1410	0.15
CMJP	Moron	1430	0.075
CMOA	Havana	1440	0.25
CMKF	Holguin	1460	0.05
CMOK	Havana	1470	0.15
CMCN	Marianao	1500	0.15
CMCX	Havana	1500	0.15

DOMINICAN REPUBLIC

HIX	Santo Domingo	800	1.0
HIG	Santo Domingo	900	0.05
HI4D	Santo Domingo	1010	0.025
HIT	Santo Domingo	1050	0.1
HIL	Santo Domingo	1111	0.02
HI4M	Santo Domingo	1150	0.02
HIJ	Santo Domingo	1190	0.01
HIN	Santo Domingo	1220	0.04
HI7P	Santo Domingo	1300	0.025
HIZ	Santo Domingo	1350	0.1
HIH	San Pedro de Macoris	1391	0.075
HI1A	Santiago de los Caballeros	1410	0.05
HI5N	Santiago de los Caballeros	1440	0.1
HI8Q	Santo Domingo	1475	0.025

HAITI

HHK	Port-au Prince	920	1.0

Meter Switching

(Continued from page 529)

the plate supply.

A word about the meters; use a milliammeter large enough to accommodate the tube drawing the highest current. Likewise, the voltmeter must be capable of reading, at least, the maximum voltage on any tube used. If your voltmeter will not do this you can apply a suitable multiplier, whose value can be found from the following formula, will work satisfactory.

$$Rm = \left(\frac{V2}{V1} - 1 \right) \times Rv$$

Where;

RM = Resistance of multiplier, in ohms.

V2 = Desired new maximum reading in volts.

V1 = Original maximum reading in volts.

Rv = Resistance of meter in ohms, or, if ohms per volt is given, then, Rv = ohms per volt × maximum reading in volts.

These switches and meters take up very little space, and make a neat appearance on any panel. This system has been in use at W1AHC for over two years with good results. Although it is questionable as to the breakdown point between switch points, 800 volts with about 150 ma. have been fed to the transmitter without any signs of trouble.

The DX for the

Conducted by Laurence

A PALESTINE DX CORNER

Introducing W. E. Frost, L.P.O. for Palestine. He uses an 11-tube Philco, a 6-tube RCA and a 1-tube, home-built, short-wave set. His antennas are a doublet and a "spider".

THE thirty-sixth installment of the DX Corner for Short Waves contains the World Short-Wave Time-Table for 24-hour use all over the world.

Affiliated DX Clubs

We are hereby placing a standing invitation to reliable DX Clubs to become affiliated with the DX Corner as Associate Members, acting as advisers on short-wave activities, in promoting short-wave popularity and reception efficiency. A list of associate organizations follows: **International DX'ers Alliance**, President, Charles A. Morrison; **Newark News Radio Club**, A. W. Oppel, Executive Secretary; **Society of Wirelesss Pioneers**, M. Mickelson, Vice-President; **U. S. Radio DX Club**, Geo. E. Deering, Jr., President; the **Radio Club Venezolano**, Venezuela, President, R. V. Ortega; **The World-wide Dial Club**, President, Howard A. Olson; **International 6000- to 12,500-Mile Short-Wave Club**, Oliver Amlie, President, Joseph H. Miller, Vice-President; **Globe Circlers DX Club**, W. H. Wheatley, President; **Radio Fellowship**, M. H. Ryder, Chairman; **Short Wave Club of New York**, H. C. Lange, President.

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

"Legal" Wavelength Calculations

In accordance with the vote taken a month ago as to whether we should adopt the "legal" basis for calculating wavelengths from the frequency of short-wave broadcasting stations, as adopted by international convention, or retain the more accurate calculation based on the latest findings of the speed of electromagnetic radiation, the Time-Table this month will be found to have a revised wavelength listing. Our Listening Post Observers and other readers voted almost unanimously in favor of the "legal" wavelengths.

Your DX Logs Welcome

Please keep on sending in your information on any S.W. stations that you hear during the coming month, getting them in to the short-wave DX Editor by the 20th of the month. In this way you share your "Best Catches" with other readers and they, in turn, share with you, making for improved knowledge on short-wave reception. Also send in any corrections or additions that you can make to the short-wave identification charts, including station addresses, station slogans, station announcements, and any identifying signals the stations may have.

A GO-GETTER ON SHORT WAVES

Gus Bartsch, Official Listening Post Observer for Illinois, at his home in Chicago sends greetings to other readers.

THE WORLD'S ORIGINAL ORGANIZATION OF S. W. PIONEERS

Official RADIO NEWS Listening Post Observers in America

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

United States of America

Alabama, J. E. Brooks, L. T. Lee, Jr., William D. Owens; **Alaska**, Thomas A. Pugh; **Arkansas**, James G. Moore, Caleb A. Wilkinson, Claude H. Dalrymple, Charles Holt; **California**, Eugene S. Allen, A. E. Berger, C. H. Canning, Earl G. DeHaven, G. C. Gallagher, Werner Howald, Wesley W. Loudon, Robert J. McMahon, Oriente I. Noda, George C. Sholin, James E. Moore, Jr., Phil E. Lockwood, Hank G. Wedel, H. H. Parker, Fred A. Pilgrim, Douglas S. Catchim, Frank Andrews, Fred M. Craft, Radio Fellowship, George C. Akins; **Colorado**, Wm. J. Vette; **Connecticut**, H. Kemp, George A. Smith, Philip Swanson, Herbert J. Hyde; **District of Columbia**, Phillip R. Belt; **Florida**, James F. Dechart, George H. Fletcher, E. M. Law; **Georgia**, C. H. Armstrong, Guy R. Bigbee, James L. Davis, John McCarley, R. W. Winfree, Owen Reeve; **Idaho**, Bernard Starr, Lawrence Swenson; **Illinois**, E. Bergeman, Larry Eisler, Robert Irving, R. O. Lamb, Charles A. Morrison, Phillip Simmons, Ray A. Walters, Floyd Waters, Robert L. Weber, J. Ira Young, Evert Anderson, Eddie Zarn, Louis Horwath, Jr., Heinie Johnson, Gus Bartsch, Arthur Evans, Leo Herz, Bruce Holmgren; **Indiana**, Freeman C. Balph, Arthur B. Coover, B. L. Cummins; **Iowa**, Clarence Norman, **Kansas**, William Schumacher; **Kentucky**, W. W. Gaunt, Jr., George Krebs, Charles Miller, William A. McAlister, James T. Spalding, J. E. Wilson; **Louisiana**, Roy W. Peyton; **Maine**, Danford L. Adams, M. Keith Libby, Vincent M. Wood, R. C. Messer; **Maryland**, Howard Adams Jr., J. F. Fritsch, Forrest W. Dodge, Lyman F. Barry, Oliver Hersowitz; **Massachusetts**, Armand A. Boussey, Walter L. Chambers, Arthur Hamilton, Sydney G. Millen, Harold K. Miller, Elmer F. Orne, Roy Sanders, Donald Smith, Robert Loring Young, James B. Robbins, George James Ellsworth, Albert Pickering, Jr., W. C. Reichardt, Francis J. Reilly; **Michigan**, Ralph B. Baldwin, Stewart R. Ruple, Jerry M. Hynek; **Minnesota**, M. Michaelson, E. M. Norris, Dr. G. W. Twomey, Walter F. Johnson, Preston C. Richardson; **Mississippi**, Mrs. L. R. Ledbetter; **Missouri**, C. H. Long, Walter A. Greiner, R. C. Ludewig, Merton T. Meade, Lewis F. Miller; **Montana**, Henry Dobrovolny; **Nebraska**, Hans Andersen, P. H. Clute, Harold Hansen, Louis T. Haws, C. W. Bourne; **Nevada**, Don H. Townsend Jr.; **New Hampshire**, Paul C. Atwood, Alfred J. Mannix; **New Jersey**, William Dixon, Morgan Foshay, George Munz, R. H. Schiller, Paul B. Silver, Earle R. Wickham. George W. Osbahr; **New Mexico**, G. K. Harrison; **New York**, Donald E. Bame, John M. Borst, H. S. Bradley, William C. Dorf, Capt. Horace L. Hall, Robert F. Kaiser, I. H. Kattell, W. B. Kinzel, William Koehnlein, T. J. Knapp, A. J. Leonhardt, Joseph M. Malast, S. Gordon Taylor, Edmore Melanson, Joseph H. Miller, R. Wright, Harry E. Kentzel, Howard T. Neupert, A. C. Doty, Jr., Thaddeus Grabek, Kenneth L. Sargent. Robert J. Flynn, George Pasquale, Frank J. Flora, James E. Lynch, Pierre A. Portmann, A. J. Umlauf; **North Carolina**, W. C. Couch. E. Payson Mallard, H. O. Murdoch, Jr.; **North Dakota**, Billie Bundlie; **Ohio**, Paul Byrns, Charles Dooley, Stan Elcheshen, Albert E. Emerson, Samuel J. Emerson, R. W. Evans, Clarence D. Hall, Donald W. Shields, C. H. Skatzes, Orval Dickes, Edward DeLaet, M. L. Gavin; **Oklahoma**, H. L. Pribble, Robert Woods, W. H. Boatman; **Oregon**, Harold H. Flick, George R. Johnson, James Haley, Ernest R. Remster, Ned Smith, Virgil C. Tramp; **Pennsylvania**, Harold W. Bower, Roy L. Christoph. John Leininger, George Lilley, Edward C. Lips, Charles Nick, Hen F. Plom, C. T. Sheaks, K. A. Staats, F. L. Stitzinger, Walter W. Winand, J. B. Canfield, Charles B. Marshall, Jr., S. G. De Marco, R. H. Graham, Thomas P. Jordan, John G. McConomy, Steve Scibal, Jr., **Puerto Rico**, Manuel E. Betances, A. N. Lightbourn; **Rhode Island**, Carl Schradieck, Joseph V. Trzuskowski, Spencer E. Lawton; **South Carolina**, Edward Bahan, Ben F. Goodlett; **South Dakota**, Paul J. Mraz; **Tennessee**, Charles D. Moss, Eugene T.

Corner SHORT WAVES

M. Cockaday

THE SKAMLEBAEK TRANSMITTER

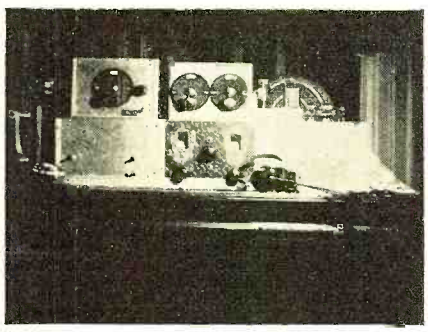
This is the transmitter hall in which the station OXY is located. This equipment takes up the whole of the extreme right side of the building.

To save a lot of wasted effort for our editors it would be best if our Observers use a standard form for their reports of new stations or station changes. We have found a system of paragraphs, in exactly the following procedure, most convenient: "W2XAF, Schenectady, N. Y., 31.4 meters, 9530 kc., daily 4 p.m. to midnight, E.S.T."

In other words, use one paragraph to an item and indicate whether data is from a veri, an announcement, or other source.

NEW JERSEY HEARD FROM

Here is the Listening Post of A Monaghan, of Glen Ridge, New Jersey, an ardent reader of RADIO NEWS *for short-wave activities.*



Also include station slogan, power, owner and address if available.

Listening Post Observers and Other Fans Please Notice

Listed in next column is this month's partial information regarding short-wave stations heard and reported by our World-Wide Listening Posts. Each item in the listing is credited with the Observer's surname. This will allow our readers to note who obtained the information given. If any of our readers can supply actual Time Schedules, actual Wavelengths, correct Frequencies, or any other Important Information regarding these items, the DX Corner Editor and its readers will be glad to get the information. There are some hard stations to pull in in these listings, but we urge our Listening Posts and other readers to try their skill in logging the stations and getting correct information about them. When you are satisfied that you have this information correct, send it in to the editor; or if you have received a "veri" from any of the hard-to-get stations, send in a copy of the "veri" so that the whole short-wave fraternity may benefit. The list containing this information follows:

Europe

Some new experimental German transmitters are reported as follows:

DJH, Zeesen, Germany, 14460 kc., 20.75 meters, reported heard. (Craft, Lawton, Libby.)

DJI, Zeesen, Germany, 9675 kc., 31.01 meters, reported heard 1-7 p.m., E.S.T., talking German and French with repeated notes from a music box. (Floyd, Berts, Baier, Hammersley, Miller, Adams, Salazar, Craft, Stayles Davis.)

DJJ, Zeesen, Germany, 10040 kc., 29.88 meters, reported heard. (Reichardt, Putnam, Craft, Lawton, Hammersley, Libby, Bower.)

DJR, Zeesen, Germany, 15340 kc., 19.5 meters, reported heard. (Bower.)

DJP, 11855 kc., 25.31 meters, reported heard, starting transmission at 2:15 a.m., E.S.T. (Bower.)

DIP, Koenigswusterhausen, Germany, 14410 kc., 20.82 meters, relaying special program to Africa at 12 noon, E.S.T. (Styles.)

DJQ, 19.63 meters, heard Sundays with same program as DJB, at 5:10 a.m., E.S.T. (N. C. Smith, Salazar, Davis.)

DIQ, Germany, 10290 kc., broad-

(*Turn to page* 548)

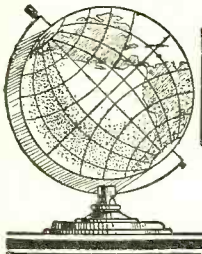
SHORT-WAVE LISTENING POST OBSERVERS

Musser, Darrell Barnes; **Territory of Hawaii**, O. F. Sternemann; **Texas**, James Brown, Carl Scherz, Bryan Scott, James W. Sheppard, John Stewart, Overton Wilson, Isaac T. Davis, Arthur Immicke; **Utah**, Earl Larson, A. D. Ross; **Vermont**, Eddie H. Davenport, Dr. Alan E. Smith, John Eagan; **Virginia**, G. Hampton Allison, L. P. Morgan, D. W. Parsons, Gordon L. Rich, Gaines Hughes, Jr., E. L. Myers, A. T. Hull, Jr., Wheeler T. Thompson, E. W. Turner; **Washington**, Glenn E. Dubbe, A. D. Golden, Charles G. Payne, J. Wendell Partner, Jack Perry; **West Virginia**, Kenneth R. Boord, R. E. Sumner, Fred C. Lowe, Jr.; **Wisconsin**, Willard M. Hardell, Walter A. Jasiorkowski, E. L. Frost; **Wyoming**, L. M. Jensen, Dr. F. C. Naegeli, Eric Butcher.

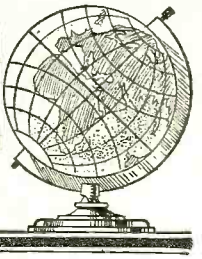
Official RADIO NEWS Listening Post Observers in Other Countries

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

Argentina, J. F. Edbrooke, Santiago E. Roulier.
Australia, Albert E. Faull, A. H. Garth, H. Arthur Matthews, C. N. H. Richardson, R. H. Tucker, Harold F. Lower, E. O. Stafford.
Belgium, Rene Arickx.
Bermuda, Thursten Clarke.
Brazil, W. W. Enete, Louis Rogers Gray, Flavio Mascarenhas.
British Guiana, E. S. Christiani, Jr.
British West Indies, D. G. Derrick, Edela Rosa, N. Hood-Daniel, Aubrey H. Forbes.
Canada, J. T. Atkinson, A. B. Baadsgaard, Jack Bews, Robert Edkins, W. H. Fraser, Fred C. Hickson, C. Holmes, John E. Moore, Charles E. Roy, Douglas Wood, Claude A. Dulmage, A. Belanger, Robert B. Hammersley, Cyril G. Clark, Fred Cox.
Canal Zone, Bertram Baker.
Canary Islands, Manuel Davin.
Chile, Jorge Izquierdo.
China, Baron Von Huene.
Colombia, J. D. Lowe, Italo Amore.
Cuba, Frank H. Kydd, Dr. Evelio Villar, Augusto Anca, Juan Manuel Salazar.
Czechoslovakia, Ferry Friedl, Joe Klar.
Denmark, Hilbert Jensen.
Dominican Republic, Jose Perez.
Dutch East Indies, E. M. O. Godee, A. den Breems, J. H. A. Hardeman.
Dutch West Indies, Rein J. G. van Ommeren.
El Salvador, Jose Rodriguez R.
England, N. C. Smith, H. O. Graham, Alan Barber, Donald Burns, Leslie H. Colburn, C. L. Davies, Frederick W. Gunn, R. S. Houghton, W. P. Kempster, R. Lawton, John J. Maling, Norman Nattall, L. H. Plunkett-Checkemian, Harold J. Self, R. Stevens, L. C. Styles, C. L. Wright, John Gordon Hampshire, J. Douglas Buckley, C. K. McConnan, Douglas Thwaites, J. Rowson, A. J. Webb, F. Crowder.
France, J. C. Meillon, Jr., Alired Quaglino.
Germany, Herbert Lennartz, Theodor B. Stark.
Holland, L. Hintzbergen, R. Groeneveld.
India, D. R. D. Wadia, A. H. Dalal, Terry A. Adams, Harry J. Dent.
Iraq, Hagop Kouyoumdjian.
Irish Free State, Ron. C. Bradley.
Italy, A. Passini, Dr. Guglielmo Tixy.
Japan, Masall Satow, Tomonobu Masuda.
Malta, Edgar J. Vassallo.
Manchukuo, Anatol Kabatoff.
Mexico, Felipe L. Saldana, Manuel Ortiz G.
New Zealand, Dr. G. Campbell Macdiarmid, Kenneth H. Moffatt, B. A. Peachey.
Newfoundland, Frank Nosworthy.
Norway, Per Torp.
Palestine, W. E. Frost.
Panama, Alberto Palacio.
Peru, Ramon Masias.
Philippine Islands, Victorino Leonen, Johnny Torres.
Portugal, Jose Fernandes Patrae, Jr.
Scotland, Duncan T. Donaldson.
South Africa, Mike Kruger, A. C. Lyell, H. Mallet-Veale, C. McCormick, H. Westman.
Spain, Jose Maria Maranges.
Straits Settelements, C. R. Devaraj.
Sweden, B. Scheierman.
Switzerland, Dr. Max Hausdorff.
Turkey, Hermann Freiss, M. Seyfeddin, A. K. Onder.
Venezuela, Francisco Fossa Anderson.



WORLD SHORT WAVE TIME-TABLE



Compiled by LAURENCE M. COCKADAY

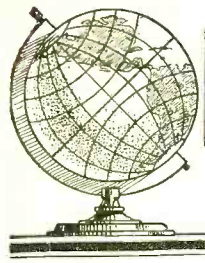
Hours of transmission for the World's Short Wave Broadcast Stations

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

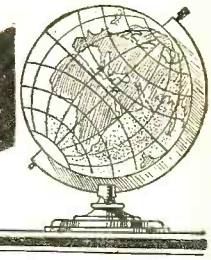
HOURS OF TRANSMISSION

Wave-length Meters	*Call Letters*	*Frequency Kc.*	*City Country*
13.93	W8XK	21540	Pittsburgh, Pa.
13.93	GSJ	21530	Daventry, England
13.94	W2XE	21520	New York, N. Y
15.93	PLE	18830	Bandoeng, Java
16.86	GSG	17790	Daventry, England
16.87	W3XAL	17780	Bound Brook, N. J
16.89	DJE	17760	Zeesen, Germany
19.52	HAS3	15370	Budapest, Hungary
19.57	W2XAD	15330	Schenectady, N. Y
19.63	DJQ	15280	Zeesen, Germany
19.65	W2XE	15270	New York, N. Y.
19.66	GSI	15260	Daventry, England
19.68	FYA	15244	Pontoise, France
19.71	PCJ	15220	Huizen, Holland
19.72	W8XK	15210	Pittsburgh, Pa.
19.74	DJB	15200	Zeesen, Germany
19.82	GSF	15140	Daventry, England
19.84	HVJ	15121	Vatican City
19.95	RKI	15040	Moscow, U. S. S. R
20.55	JVH	14600	Nazaki, Japan
21.25	HJ5ABE	14120	Cali, Colombia
22.00	SPW	13635	Warsaw, Poland
22.73	ORP	13200	Ruysselede, Belgium
22.95	VPD	13075	Suva, Fiji Islands
23.38	CNR	12830	Rabat, Morocco
24.52	TFJ	12235	Reykjavik, Iceland
24.83	CT1CT	12082	Lisbon, Portugal
25.00	RV59 (RNE)	12000	Moscow, U. S. S. R.
25.21	CT1GO	11900	Parede, Portugal
25.25	FYA	11880	Pontoise, France
25.27	W8XK	11870	Pittsburgh, Pa.
25.30	GSE	11860	Daventry, England
25.36	W2XE	11830	New York, N. Y
25.38	HJ4ABA	11820	Medellin, Col
25.40	I2RO	11810	Rome, Italy
25.44	W1XAL	11790	Boston, Mass.
25.49	DJD	11770	Zeesen, Germany
25.53	GSD	11750	Daventry, England
25.58	PHI	11730	Huizen, Holland
25.60	CJRX	11720	Winnipeg, Canada
25.60	FYA	11720	Pontoise, France
27.27	PLP	11000	Bandoeng, Java
27.93	JVM	10740	Nazaki, Japan
28.12	CEC	10670	Santiago, Chile
28.14	JVN	10660	Nazaki, Japan
29.04	ORK	10330	Ruysselede, Belgium
29.24	PMN	10260	Bandoeng, Java
30.43	EAQ	9860	Madrid, Spain
31.00	CON	9677	Macao, Asia
31.14	I2RO	9635	Rome, Italy
31.25	CT1AA	9600	Lisbon, Portugal
31.27	HBL	9595	Geneva, Switzerland
31.28	W3XAU	9590	Philadelphia, Pa.
31.28	VK2ME	9590	Sydney, Australia
31.28	HP5J	9590	Panama City, Pana.
31.32	VK3LR	9580	Lyndhurst, Australia
31.32	GSC	9580	Daventry, England
31.35	W1XK	9570	Millis, Mass.
31.36	VUY(VUB)	9565	Bombay, India
31.38	DJA	9560	Zeesen, Germany
31.45	DJN	9540	Zeesen, Germany
31.48	W2XAF	9530	Schenectady, N. Y.
31.48	LKJ1	9530	Jeloy, Norway
31.55	VK3ME	9510	Melbourne, Australia
31.55	GSB	9510	Daventry, England
31.58	PRF5	9501	Rio de Janeiro, Braz.
31.82	COCH	9428	Havana, Cuba
31.86	PLV	9415	Bandoeng, Java
32.88	HAT4	9125	Budapest, Hungary
32.89	CP6	9120	La Paz, Bolivia
33.71	HCJB	8900	Quito, Ecuador
34.29	ZCK(ZBW)	8750	Hong Kong, China
36.50	ZP10	8220	Asuncion, Paraguay
36.72	CO9JQ	8170	Camaguey, Cuba
37.34	CNR	8035	Rabat, Morocco
38.20	HC2JSB	7854	Guayaquil, Ecuador
38.48	HBP	7797	Geneva, Switzerland
40.51	HJ3ABD	7406	Bogota, Colombia
40.65	XECR	7380	Mexico City, Mex.
41.20	HJ1ABD	7281	Cartagena, Colombia
41.80	CR6AA	7177	Lobito, Angola, Afr.
42.15	HB9B	7118	Basle, Switzerland
42.36	PI1J	7082	Dordrecht, Holland
43.48	HI3C	6900	La Romana, D. R.
44.00	HIH	6818	San Pedro, D. R.
44.44	JVT	6750	Nazaki, Japan
44.71	TIEP	6710	San Jose, Costa Rica
44.95	YVQ	6672	Maracay, Venezuela
44.99	HC2RL	6668	Guayaquil, Ecuador
45.34	PRADO	6616	Riobamba, Ecuador
45.38	RV72	6611	Moscow, U. S. S. R.
45.80	TIRCC	6550	San Jose, Costa Rica
46.01	YV6RV	6520	Valencia, Venezuela
46.22	HJ5ABD	6490	Cali, Colombia

HOURS OF TRANSMISSION



WORLD SHORT WAVE TIME-TABLE



(*Continued from the Previous Page*)

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

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

HOURS OF TRANSMISSION												Wave-length Meters	Call Letters	Frequency Kc.	City Country	HOURS OF TRANSMISSION											
												46.28	HI4D	6482	Santo Domingo, D. R				XS	XS	XS			XS	XS	XS	XS
D	D	L										46.53	HJ1ABB	6447	Barranquilla, Col.				D	D	D			S	D	D	D
I	D	D	I									46.80	TIPG	6410	San Jose, Costa Rica											I	I
D	D	D	I	I	I							47.06	YV4RC	6375	Caracas, Venezuela										D	D	D
D	D										D	47.24	HRP1	6350	San Pedro Sula, D. R					D	D					D	D
I	I	Sa	Sa									47.51	HIZ	6315	Santo Domingo, D.R.					S	S	S		I	I	I	I
I	I	I										47.62	YV12RM	6300	Maracay, Venezuela												
						I	I	I				47.62	VUC	6300	Calcutta, India	I	I	D	D	Sa							
L	L	L										48.15	OAX4G	6230	Lima, Peru												L
AM												48.19	HJ1ABH	6225	Cienaga, Colombia												AM
D	D	I	I	I								48.48	HI1A	6188	Santiago de los Caballeros, D. R.				Z	Z	D	D					D
XS	XS	D										48.54	HJ3ABF	6180	Bogota, Colombia				D								XS
S	S	S	S	S	S							48.70	VPB	6160	Colombo, Ceylon	D	D	D	D	D							
D	D	XS	XS									48.70	CJRO	6160	Winnipeg, Canada												D
D	D											48.78	HJ2ABA	6150	Tunja, Colombia						D						D
D	D	D										48.78	YV3RC	6150	Caracas, Venezuela				D	D	D			D	D	D	D
XA	XA			S	S							48.78	HJ5ABC	6150	Cali, Colombia				D	S	S						XA
D	D	D		F	M	M						48.78	CO9GC	6150	Santiago, Cuba					D			D	D	D	D	D
	D	D	D	D								48.86	W8XK	6140	Pittsburgh, Pa												
												48.90	CR7AA	6135	Lourenzo Marques, Mozambique						AC	AC	AC				
										AE	AE	48.92	ZGE	6132	Kuala Lumpur, F.M.S	AE											
D	D	D	D									48.94	COCD	6130	Havana, Cuba											D	D
XY												48.94	CT1GO	6130	Parede, Portugal				S	S	S						XY
		D										49.02	W2XE	6120	New York, N. Y												
XA	XA	M	M									49.04	HJ1ABE	6115	Cartagena, Col.				XA	XA						S	XS
D	D	D	D	D								49.10	VE9HX	6110	Halifax, N. S.		D	XA	XA	XA	XA	XA	XA	D	Sa	D	D
		D										49.10	GSL	6110	Daventry, England					D	D	D	D	Th			
D	Z	I	S									49.18	HJ4ABB	6100	Manizales, Col.					XA							
			Sa									49.18	W3XAL	6100	Bound Brook, N. J.									AH			
R	R	R	R	R	AH							49.18	W9XF	6100	Chicago, Ill.												
D			XS	XS			AL	D	D	D	D	49.20	ZTJ (JB)	6098	Johannesburg, Africa	XS	XS				XS	XS	D	D	D	D	Sa
D	D	D	D									49.26	CRCX	6090	Toronto, Canada					S	S	S	S	D	D	D	D
									XA	XA		49.32	VQ7LO	6083	Nairobi, Kenya, Afr.	E	E		D	D	D	XS	Sa				
												49.34	CP5	6080	La Paz, Bolivia										I	I	I
											XS	49.34	W9XAA	6080	Chicago, Ill.	XS	XS	D	D	D	D	D	D	D	S	S	S
												49.34	ZHJ	6080	Penang, Straits Settlements	XS											
							D	I	I	I	I	49.41	OER2	6072	Vienna, Austria	I	D	D	D	D	D	D	D	D	D	Sa	
XS												49.42	HH2S	6070	Port au Prince, Haiti												
S	S	S	AG	AG	T							49.42	VE9CS	6070	Vancouver, B. C.						S	S	S	S	S	D	D
D	D	Sa	Sa	Su								49.46	HJ4ABL	6065	Manizales, Colombia				D						D	D	D
			D	D	D	Sa				XS	XS	49.50	W8XAL	6060	Cincinnati, Ohio	D	D	D	D	D	D	D	D	D	D	D	D
D	D											49.50	W3XAU	6060	Philadelphia, Pa.												D
												49.50	OXY	6060	Skamlebaek, Denmark				S	S	D	D	D	D	D	D	
	D											49.59	GSA	6050	Daventry, England											D	D
XS	XS	XS		Sa								49.63	HJ3ABI	6045	Bogota, Colombia												
E												49.65	HJ1ABG	6042	Barranquilla, Col.					XS	XS	S	S	S	S		XS
D	D	D	D									49.67	W1XAL	6040	Boston, Mass.									S	S	S	E
D											D	49.67	W4XB	6040	Miami, Fla.					D	D				D	D	D
D	D	D										49.67	PRA8	6040	Pernambuco, Brazil	D	D	D			D	D	XS	D	D	D	D
D	D	D	D	D	D	Th	Th					49.75	HP5B	6030	Panama City, Pana.					D				I			
D	D	D										49.75	VE9CA	6030	Calgary, Alberta, Can.		XS	XS	XS	D	D	D	XS		S	S	D
						I	I					49.83	DJC	6020	Zeesen, Germany					D	D	D	D	D	D	D	D
		S	S	S	S					N	N	49.83	XEUW	6020	Mexico City, Mex.											D	D
D	D	D	I									49.85	ZHI	6018	Singapore, Malaya	N											
			Sa	Sa								49.90	HJ3ABH	6012	Bogota, Colombia				D	D	D	D		S	S	D	D
D	D	D	D									49.92	COCO	6010	Havana, Cuba		D	D	D	D				D	D	D	
												49.95	HJ1ABJ	6006	Santa Marta, Colombia					D							D
				Sa								49.96	VE9DN	6005	Montreal, Canada							D					
D	D	D	D									50.00	XEBT	6000	Mexico City, Mex.				D	D	D	D	D	D	D	D	D
Z	Z	Sa	Sa									50.00	RV59	6000	Moscow, U.S.S.R.						I	I	D	D	XTh		
D	D	I										50.17	HIX	5980	Santo Domingo, D.R.					D							I
		D	D									50.20	HJ2ABC	5976	Cucuta, Colombia											D	D
	E		Th									50.21	XECW	5975	Xantocam, Mexico												
									S			50.25	XEVI	5970	Mex. City, Mexico							S		C			
D	D	D										50.26	HVJ	5969	Vatican City							D					
	AC	AC										50.42	HJN	5950	Bogota, Colombia												
												50.45	FIQA	5946	Tananarive, Mad.			D									
D	D	D										50.50	TG2X	5940	Guatemala City, Guat.												
XS												50.59	HJ4ABE	5930	Medellin, Colombia				D	D	D					D	D
D	D	S										51.02	YV8RB	5880	Barquisimeto, Ven.											XS	XS
XS	XS											51.06	HRN	5875	Tegucigalpa, Hond's					D			S	S		D	D
D	D											51.28	YV5RMO	5850	Maracaibo, Ven.				XS	XS	S	S			XS	XS	XS
D	D	Y										51.63	YV7RMO	5810	Maracay, Ven.				D	D					D	D	D
	AH	AH	AH									51.72	YV2RC	5800	Caracas, Venezuela		S	S	D	D	D	S	S	D	D	D	D
D	D	D	D									51.90	OAX4D	5780	Lima, Peru		AN	AN	AN								
						I	D	D	D	D	D	52.45	YV10RSC	5720	San Cristobal, Ven.										D	D	D
												70.21	RV15	4273	Khabarovsk, Siberia	D	D	D	I								
												79.58	HB9B	3770	Basle, Switzerland									W			

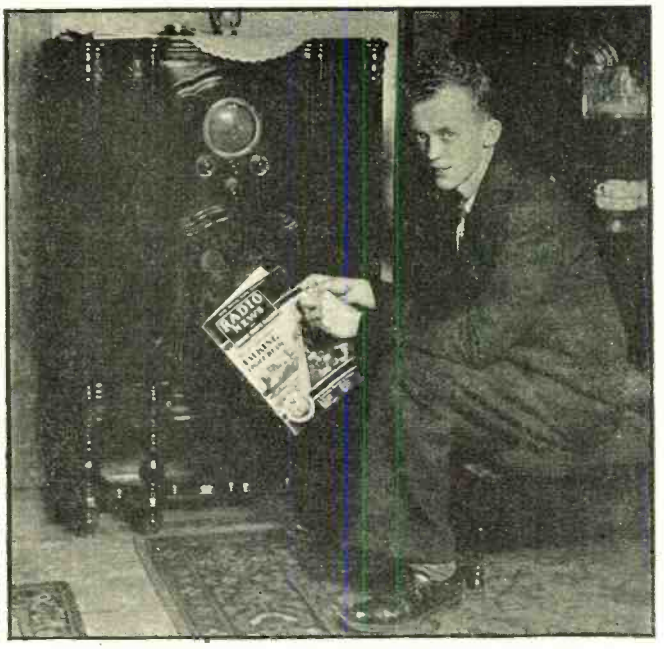
A—Thursday, Sunday
C—Monday, Wednesday, Friday
D—Daily
E—Tuesday, Thursday
F—Friday
G—Tuesday, Thursday, Saturday
I—Irregularly
K—Monday, Friday
L—Wednesday, Saturday
M—Monday
N—Monday, Wednesday, Thursday

P—Except Tuesday, Wednesday
R—Thursday, Friday, Saturday
S—Sunday
T—Tuesday
Th—Thursday
W—Wednesday
XTh—Except Thursday
Y—Sunday, Monday
Z—Tuesday, Friday
AC—Monday, Thursday, Saturday
AE—Tuesday, Friday, Sunday

AG—Tuesday, Sunday
AH—Monday, Wednesday, Saturday
AL—Except Monday, Sunday
AM—Monday, Thursday
AN—Tuesday, Saturday
Sa—Saturday
XA—Except Saturday, Sunday
XM—Except Monday
XS—Except Sunday
XX—Tuesday, Thursday, Friday
XY—Except Tuesday, Sunday

A RARE VIEW OF THE EAQ TRANSMITTER

This is the transmitter room of the famous Madrid Station EAQ, the first one we have seen and one that should be interesting to our readers the world over.



A CANADIAN LISTENER ENDORSES TIME-TABLE

Mr. James Burton, Sherbrooke, Canada, would not be without the RADIO NEWS *Short-Wave Time-Table for its help in locating short-wave stations at various times of the day. Mr. Burton is very successful in pulling in DX sations.*

The DX Corner (Short Waves)

(*Continued from page* 545)

casts news in English 8:30 p.m., E.S.T. They are heard regularly 5-7 p.m., E.S.T., and often at 12:25-1:30 p.m., E.S.T., (Torres, Barry, Miller.)

CTV, Monsante Radio. Lisbon, Portugal, testing on 26.91 meters at 2 p.m., E.S.T. (Vasallo.)

I2RO, Rome, Italy, 11810 kc., 9 a.m. to 2 p.m. Also heard on 9635 kc., 2:30 p.m. to 5 p.m. and 6-7 p.m., E.S.T. (Craft, Arickx.)

IQA, Rome, Italy, 14730 kc., heard irregularly. (Jensen, Portman.)

IDU, Asmara, Eritrea, 13380 kc., heard answering messages. (Portman.)

IRY, Rome, Italy, 16120 kc., talks to IDU in Asmara, Eritrea, 8:40 a.m. (Portman.)

RNE, Moscow, U. S. S. R., 12000 kc., heard Sundays 6-7 a.m. and 10-11 a.m., E.S.T. (Dallal.)

Asia

RIO, Baku, U. S. S. R., reported heard on 10140 kc. and 10170 kc., 6-8 a.m. and at 12:15 a.m., E.S.T. Howald, Portman, Reichardt.)

RV15, Khabarovsk, Siberia, 4273 kc., heard at 3 a.m., broadcasting music. (Butcher.) Observers Craft and Cummins reported they heard from 1-11 a.m., E.S.T.

CQN, Macao, China, 300 watts, has changed wavelength from 49 meters to 31 meters. They transmit Mondays and Fridays 3-4:30 p.m., E.S.T. (Henderson, Oliveira.)

ZCK, Hong Kong, China, may soon change frequency to 4100 or to 5100 kc. (Craft.)

JVN, Nazaki, Japan, 20 kw., 10660 kc., 28.1 meters, reported heard 12 to 1 a.m., E.S.T., and JVH on 14600 kc., heard at the same time. (N. C. Smith, Dodge, Wolf, Dalal, Parker, Torres, Kentzel, Davis, Howald, Wilkinson, Ortiz, Gallagher, Johnson, Cummins, Horwath, Pickering.)

JVU, Nazaki, Japan, 5790 kc., reported heard 3 a.m., E.S.T. (Craft.)

JIB, Taiwan, Formosa, 10350 kc., reported heard 3 a.m., E.S.T. (Craft.)

A new Japanese station has been heard on 5100 kc., approximately, but no call letters could be distinguished. This was at 3:15 a.m. to 4 a.m., E.S.T. (Craft.)

YDA, Tandjongprick, Dutch East Indies, 49.67 meters, 10 kw., heard testing at 5:50 a.m., Sundays, and at 9:30-10 p.m., E.S.T. (N. C. Smith, Craft.)

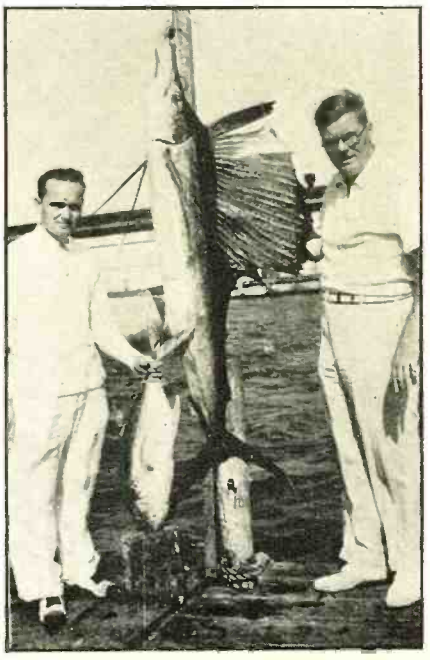
PMN, Bandoeng, Java, 10260 kc., 60 kw., reported heard 7-10 a.m., E.S.T. (Lawton, McConnan.)

Who is the station on 51 meters that can be heard speaking French every evening between 8 and 9 p.m., E.S.T.? (Canighem.)

What station around 9000 kc. calls "Muscovia" around 1 a.m., E.S.T., almost daily? (Hull.)

ANOTHER KIND OF FISHING

At the left is George Ellsworth, Listening Post Observer for Massachusetts; at right, his friend, Mr. Langfield with their prize fishing catch of the season. George also enjoys DX fishing and some of these catches he considers just as big as the sail-fish pictured.



AFRICA

ETA, Addis Ababa, Ethiopia, 18280 kc., reported heard. (Owen.) Also reported heard on 24.5 meters.

ETB, Addis Ababa, Ethiopia, reported heard on the following frequencies, 11555 kc., 11850 kc., 11980 kc. Wavelengths reported as follows: 39.7 meters, 25.15 meters. Observers says they talk in English and French at 4:45 to 5:15 p.m., E.S.T. (Reilly, Skatzes, Reichardt.)

ETC, Addis Ababa, Ethiopia, reported heard on 25.09 meters, calling New York at 4-5:15 p.m. and also 6:30-7 p.m., E.S.T. (Styles, Nosworthy.)

ETD, Addis Ababa, 11960 kc., reported heard. (Owen.)

ZE1JR is an amateur station in Salisbury, South Rhodesia, often heard working G5ML in England at 2 p.m., E.S.T. He is also on the air at 7:20 p.m., E.S.T. (Wickham.)

CR7AA, Lourenco, Marques, is on 49 meters now instead of its former 84-meter wavelength. It is heard daily 3-4 p.m. and on Sundays 10 a.m. to 1 p.m., E.S.T. (McCormick)

FIQA, Tananarive, Madagascar, reported back on the air and heard on 50.45 meters, on the 49-meter band from 10 to 11 a.m., E.S.T. (Kruger, Adams.)

NORTH AMERICA

TFJ, Reykjavik, Iceland, 12235 kc., reported heard 1:40 to 2 p.m., E.S.T. (Reichardt, Craft, McConnan.)

VE9BK, Vancouver, Canada, reported heard on 4790 kc., testing at 7:30 p.m., E.S.T. (Gallagher.)

CNHS, Halifax, N. S., reported heard at 7: p.m., E.S.T. (Adams, Jr.) Observer Foshay gives call as CHNS.

VE9DN, Drummondville, Quebec, Canada, 6005 kc., 49.5 meters, reported heard Saturdays at 11:30 p.m., E.S.T. (Dooley, Evans, Holmgren.)

W3XI, on 17310 kc., heard at 12:30 p.m., E.S.T., location unknown. (Boord.)

(*Turn to page* 562)

FROM QUAINT OLD Holland— TOMORROW'S Thrilling HEADLINES! as ONLY the NEW SCOTT BRINGS THEM

MARCH of a million soldiers breaking the untrodden sod of a new empire—peace pacts — the newest continental dances — death from the air—Olympics—history in the making! It's your world! Get some thrills out of it!

P-H-I—Huizen—sends you the news of the world direct from seething Europe! Get it—before it's canned! Broadcast in five languages — English — Dutch — French — German — Spanish. Get it direct with a SCOTT — with a regularity, a diamond clarity, a magnificent undistorted power and a more beautiful true tone than any other radio in the world!

COMPARE IT IN YOUR OWN HOME

In the privacy of your own home you surround yourself with things you come to cherish—they are an expression of your personality. So it is with your radio. When you have chucked the cares of business for a few hours and come home to relax, the astonishingly small difference in price between the SCOTT and "just another radio" vanishes—the very first night you open up the Sensitivity Control and leap through the tremendous distances of a night charged with the criss-crossing of the million fantastic miracles of radio. You flood your home with the unbelievable cultures of half a hundred nations. The wonder of radio bursts fresh upon you, and the joy of being alive becomes a new and thrilling experience.

FINEST RECEPTION GUARANTEED

Enthusiastic letters from the thousands of SCOTT owners all over the world testify that no other radio at any price goes so far to complete the enjoyment of a home as the SCOTT. Once you have felt the incomparable thrill of its power, once you have experienced the glories of symphonic music through its crystal clarity, then and only then will you know how it feels to own this magnificent instrument—unqualifiedly guaranteed to outperform any other radio. Then you will know why the internationally famous SCOTT has been the overwhelming choice of engineers, broadcasters, princes, presidents and celebrated musicians in more than 146 countries throughout the world.

More Verified World Distance Records Than Any Other Radio

Higher Strictly Class "A" Power—35 watts. For undistorted concert volume. 5 times average power.

Highest Useable Sensitivity—Clearer foreign reception. Less than 1 microvolt sensitivity.

Bullet-Direct Selectivity — continuously variable 2 to 16 KC—for foreign stations you have never heard before.

Double A. V. C.—keeps world programs at practically even volume.

Short Wave Station Locator—instantly locates foreign stations.

Tonetruth Chamber—eliminates boom.

Full Range Hi-Fidelity—twice tonal range of other high fidelity receivers. 30 to 16,000 cycles.

More Important Performance Features —including True Bass Control, Precision Dial Calibration, Allwave Reception, Shadow Meter Tuning, 23 tubes.

Full Range Hi-Fidelity, 30 to 16,000 cycles, bringing you every breath-taking overtone of voice and violin, of trumpet and trombone, saxophone, clarinet, oboe and flute, every overtone audible to the human ear! Twice the tonal range of other high fidelity receivers.

Years ahead of mass production receivers. Strictly custombuilt. Engineered to the highest precision standards known. 5-year guarantee. Nationwide installation service. 30-day trial in your own home anywhere in U. S. A.

Send — NOW — for the most thrilling story of world-record breaking performance in the history of radio! No obligation whatever. Simply mail the coupon below.

SEND THIS COUPON TODAY-DETAILS FREE

E. H. Scott Radio Laboratories, Inc.
4440 Ravenswood Ave., Dept. 5C6, Chicago

Send "94 PROOFS" of the SCOTT'S superior tone and DX performance and particulars of 30-day home trial anywhere in U. S. A.

Name.....

Street.....

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

E. H. SCOTT RADIO LABORATORIES, INC.

4440 Ravenswood Avenue, Dept. 5C6, Chicago, Illinois

When in New York visit our beautiful permanent Salon at 630 Fifth Ave., Rockefeller Center

MILTON J. CROSS

GERTRUDE NIESEN

ALICE FAYE

BING CROSBY

By Samuel Kaufman

Backstage in Broadcasting

THE Saturday afternoon broadcasts of full-length operas direct from the Metropolitan Opera House, New York, are features that music-lovers from coast to coast habitually look forward to each year. The National Broadcasting Company is to be congratulated for arranging to bring these stellar presentations of the 1936 season to the public despite the fact that they are unsponsored. NBC stations from New York to Hawaii are conveying the series and, in addition, the programs are offered to the Canadian Broadcasting Commission. Listeners in other parts of the world have the opportunity of hearing America's premier opera troupe via the NBC short wave transmitters. Milton J. Cross, whom this writer rates as the best announcer of musical programs, has the narrator's assignment. Under the new leadership of Edward Johnson, the Metropolitan Opera Association will present many names familiar to air audiences; among them are Josephine Antoine, Helen Oelheim, Hilda Burke, Julius Huehn and Chase Baromeo.

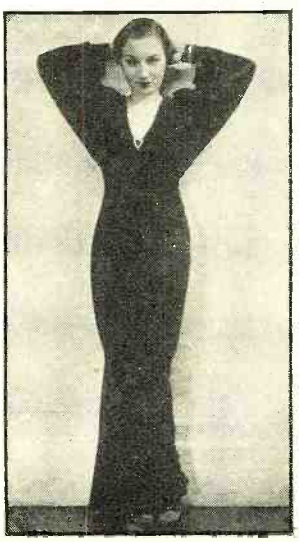
GERTRUDE NIESEN, the radio songster now rated as one of the leading night club stars, has been reunited with her program associate of last year, Lud Gluskin. She is now featured soloist of the "On the Air With Lud Gluskin" series heard the Wednesdays over CBS. Since her previous appearances on Gluskin air shows, Miss Niesen has appeared in musical stage productions.

AN unusual repertoire of Latin-American music is presented on the new Sunday afternoon CBS program sponsored by the Ford Motor Company. The series features Jose Manzanares and his South American Orchestra. The program supplements the two other features of the same sponsor also heard on CBS—the Sunday Evening concert hour and the Tuesday Fred Waring hour. The Manzanares unit is composed chiefly of women. Manzanares himself and a young singer billed as Dolores do the solo bits.

NEWSPAPER cartoonists have long had their fingers in the radio pie. Many of them capitalized on the idea of selling rights to dramatizations of their comic strips. Now, two of the best known creators of pen-and-ink characters—Rube Goldberg and Harry Hirshfield—have come to the air in person. Rube Goldberg, whose crazy cartoon inventions made funny-page readers guffaw aplenty, has brought the idea to the CBS microphone by having a mechanical stooge named Gadget. Abetting Goldberg, is Vera Van, the songstress, and Waldo Mayo's orchestra. The Goldberg feature is heard Tuesdays and Thursdays under the sponsorship of the Schulte Retail Stores. Harry Hirshfield, creator of Abe Kabibble, Desperate Desmond and Homeless Hector, is presented on WEAF, Fridays, with the Fox Fur Trappers, Birtrand Hirsch's orchestra and vocalists contributing the musical interlude to his humorous chatter.

PHILLIPS LORD, who is a versatile fellow, indeed, has had a bit of difficulty in shaping a commercial program that would obtain the equal following of his old Seth Parker features. But he is always coming back with new ideas. Before his brief "G-Men" series was forgotten by listeners, he leaped right back into the program limelight with a series of real-life thrills, told on the air by persons who faced death in strange circumstances. The latest Lord idea has been embodied in the Philip Morris program presented over NBC, Tuesdays. Lord

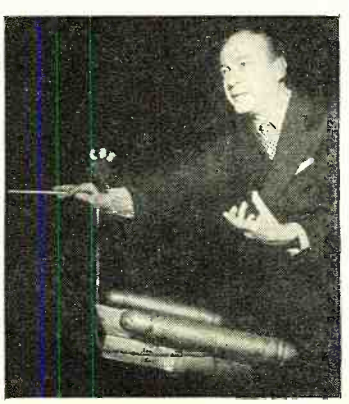
AT RIGHT: SALLY SINGER



AT LEFT: JOSE MANZANARES

RUBE GOLDBERG AND HIS "STOOGE"

LOUIS GRESS



VERA VAN

even enlisted the services of a detective agency to search over the world for persons with spine-chilling experiences to narrate on the cigarette program. Leo Reisman and his orchestra, Phil Duey, Sally Singer, the Eton Boys and others in the earlier Philip Morris presentations have been retained to supplement the Lord thrill stories.

AFTER all these seasons Paul Whiteman has bid adieu to the Kraft Music Hall feature of NBC. The new permanent star of the Thursday full-hour presentation is none other than Bing Crosby. Prior to the vocalist's taking over full control of the period he was co-featured with Whiteman for a month. The Crosby series originates in Hollywood. Jimmy Dorsey's orchestra supplies the music and a gala array of guest talent is presented every week. Bob Burns, who earned a wide following as a comedian on guest spots has been signed with the show for a long period.

THE talkies of Hollywood continue to scour the ranks of broadcasting for new material. The list of radio stars who contributed to the offerings of the cinema capital in recent months includes, among others, Jack Benny, Fred Allen, Dave Rubinoff, Gladys Swarthout, Lily Pons, James Melton, Jane Froman and Alice Faye. And still the movie moguls make flattering offers to additional radio names.

(*Turn to page* 569)

GLADYS SWARTHOUT

Servicemen's PRIZE CONTEST

Announcement of Awards

Zeh Bouck
Service Editor

FIRST PRIZE

There's No Ill Wind in Rural Radio!

"We are traveling around the countryside making a real go of the new Zenith farm radios and the 'Wincharger.' Our main sales talk is the superior 'line power' quality of the receiver itself, and the fact that the farmer need never worry about his battery going dead just when radio means the most to him, and when it is most difficult for him to have it charged in town—when snow blocks the mountain roads between himself and the nearest service station. Due to our circulating around the farms, we make a lot of contacts which enable us to do business on other than a money basis. If cash is short, but the farmer is willing to trade in a bull that we know we can sell to somebody 'down the line'—why, it's okay with us. In Figure 1 you will find the writer getting acquainted with the down payment on a complete new Zenith Wincharger installation!"—*McCalla Brothers.*

TUBES ACCESORIES DELIVERED
KEN. 7109

Call ROHM *for*
Super RADIO *Repair*
SERVICE

THIS CARD ENTITLES YOU TO ONE SERVICE FREE

FIGURE 2

SECOND PRIZE

A Complete Advertising Campaign

"Advertising, primarily, is a system of reminders. Obviously, no single reminder can be as effective as several. Hence, in publicizing my radio service, I avail myself of every reasonable form of advertising, with an ad in the local telephone directory as the keynote. In practically all my other advertising, mention is made—'See our ad in the telephone book.' By splurging a bit in the directory. I can take less space in my three-times-a-week newspaper ads by referring readers to my main advertisement. I find a one-inch, thrice-weekly ad more effective than a much larger display published once a week.

"I continually circularize my clientele and new prospects with mailing cards and circulars. This literature is of a nature to promote good-will—thanking steady customers for previous jobs, reminding them that the 90-day guarantee expires, offering free tube tests, etc. I mimeograph this material, the process being inexpensive, and it is possible to draw in amusing illustrations. No attempt is made at real art work, but the simple, homely sketches, without pretence, do the trick.

"I have two types of business cards—shown in Figures 2 and 3. I distribute the card in Figure 2 to the proprietors of taverns, etc., for the privilege of tacking up a similar card, less the free service ad—which latter card is my regular business card. Figure 3 is a more ritzy card, and is printed on a superior linen stock. I use this when calling on clients, particularly those of the better class. It makes a good impression with them."—*Dave Rohm.*

WALNUT 2967

ROHM RADIO

DAVENPORT, IOWA

FIGURE 3

FIGURE 1

THIS MONTH'S WINNERS

FIRST PRIZE—To McCalla Brothers, Mercer, Pa.—$10.00 for literally taking the bull by the horns (see Figure 1) and making something out of rural radio!

SECOND PRIZE—To Dave Rohm, of Rohm Radio Service, Davenport, Iowa—$5.00 for a complete demonstration of the fact that it "pays to advertise"!

THIRD PRIZE—To Edwin Lovick, Jr., 2502 Harlan Street, Falls City, Nebr.—$4.00 for originality—the development of sales through the organization of school radio clubs!

FOURTH PRIZE—To Merril Lindley, 2659 Napoleon Street, Indianapolis, Ind.—$3.00 for an added service that appeals to every customer!

FIFTH PRIZE—To Murl E. Beauchamp, Murl's Radio Service, Muskogee, Oklahoma—$2.00 for promoting confidence with a fair-and-square guarantee.

THIRD PRIZE

Boosting Sales with a Radio Club

"I have recently become a serviceman in a town with a population of five thousand. I have four competitors, all well established and well known. I overcame this handicap by organizing a radio club among boys of school and high-school age. We have weekly meetings at which some experienced amateur speaks, followed with an open forum. All-wave sets are demonstrated, and interesting radio experiments performed. I encourage set building, and supply used parts at a cost that, while very low and within the pocketbook limits of the members, assures me a profit on parts which would otherwise be worthless. There are no dues. Parents occasionally attend these meetings (as do faculty members), and I have sold several sets through demonstrations at the get-togethers, and as a

(*Turn to page* 554)

The Service Bench

(*Continued from page* 535)

four small nails. Turn the dial to 1500 kc. Remove the end screw that holds the dial strip. Then raise the dial strip and you will have ready access to the bulb. This eliminates the removal of two knobs, about a dozen screws and bolts, not to mention tubes. My method takes about ten minutes."

Trouble Light and Ground Tester

"One of the handiest items in my tool kit is diagrammed in Figure 5. Essentially it is a trouble lamp—socket, adequate length of cord, on-off switch and plug for inserting into any convenient 115-volt receptacle. It is invaluable in nosing around the inside of a cabinet without borrowing a couple of piano or floor lamps from the lady of the house. (Folks almost invariably locate their radios as far as possible from an overhead light source.)

"The unusual feature is the third lead,

(*Turn to page* 576)

RADIO PHYSICS COURSE

ALFRED A. GHIRARDI

Lesson 50. True Power

THE *true power* in a resistive circuit is equal to the product of the effective volts and effective amperes. In a reactive circuit, the effective power as found by simply multiplying volts times amperes, is reduced by the power returned by the device to the generator, so that the product of effective volts times effective amperes does not give the *true power* but gives what is known as the *apparent power*. The true power is given by:

$$P = E \times I \times \text{Cos}\,\theta$$

Where θ is the angle of lag or lead between the e.m.f. and current variations, and cos θ is the trigonometric cosine function of this angle. The angle θ is represented in the vector diagrams shown in (B) and (C) of Figure 1. Diagram (B) represents the case of an inductive circuit and that at (C) represents the case of a condensive circuit.

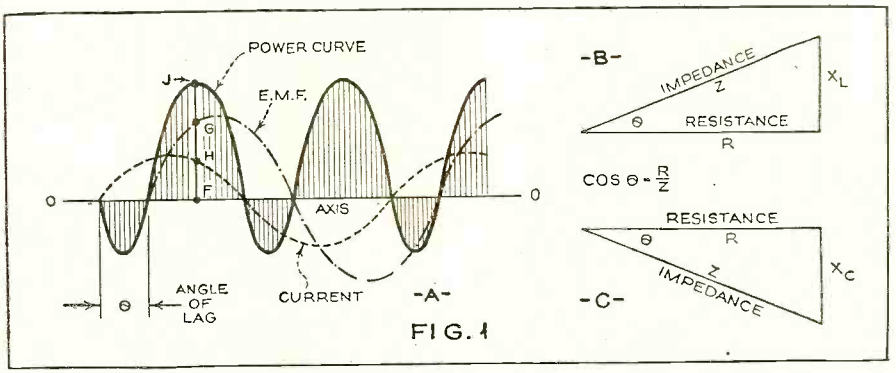


FIG. 1

Figure 1—(a) Curves of e.m.f., current, and power in a circuit containing capacitance and some resistance. (b) Vector diagram showing angle of lag in an inductive circuit. (c) Vector diagram showing angle of lead in a condensive circuit.

By trigonometry in either case, Cos θ is equal to the base divided by the hypotenuse, or

$$\text{Cos}\,\theta = \frac{\text{Resistance}}{\text{Impedance}} = \frac{R}{Z}$$

Therefore:

$$\text{True power} = \text{Apparent power} \times \frac{\text{Resistance}}{\text{Impedance}}$$

Example:

A voltmeter connected across a coil in an a.c. circuit reads 110 volts and an ammeter indicates that a current of 10 amperes is flowing through the coil. The angle of lag is 30°, the corresponding Cos θ being equal to .866. How many watts of power are being consumed by the coil from the line?

Solution:

$P = E \times I \times \text{Cos}\,\theta = 110 \times 10 \times .866 =$ 952.6 watts. *Ans.*

Example:

What is the true power in a coil having a resistance of 200 ohms, a reactance of 100 ohms and an e.m.f. of 110 volts applied to its terminals?

Solution:

$$\text{Impedance, } Z = \sqrt{R^2 + X^2} = \sqrt{200^2 + 100^2} = 223.6 \text{ ohms}$$

$$\text{Current, } I = \frac{E}{Z} = \frac{110}{223.6} = .49 \text{ ampere}$$

$$\text{Power factor, } \text{Cos}\,\theta = \frac{R}{Z} = \frac{100}{223.6} = .44$$

Power, $P = E \times I \times \text{Cos}\,\theta =$ $110 \times .49 \times .44 = 24$ watts (approx.) *Ans.*

The product of the volts and amperes is called the *apparent power*. Since this apparent power must be multiplied by Cos θ to find the *true* or *actual power*, this factor is called the *power factor* of the circuit. When the current and voltage are in phase (resistive circuit), the power factor is equal to 1. This is the maximum value it can have, and the circuit is said to have *unity power factor*. If inductance or capacitance are present, the power factor will be less than 1.

When electrical power is measured by means of the electrical instrument called the "watt-meter," the true power is obtained directly. When power is measured by means of an ammeter and voltmeter in the circuit, the product of E × I gives the apparent watts. This must be multiplied by the power factor (Cos θ) to obtain the true watts.

Prize Contest

(*Continued from page 553*)

result of the enthusiasm of the members who have carried home the story of superior performance. Naturally, the club is discussed at home, and it is logical that the parents turn to me for radio service.

"The principal and science instructor of any school will be glad to co-operate in the organization of a radio club."—*Edwin Lovick, Jr.*

FOURTH PRIZE

Just Another One of These Little Things That Count

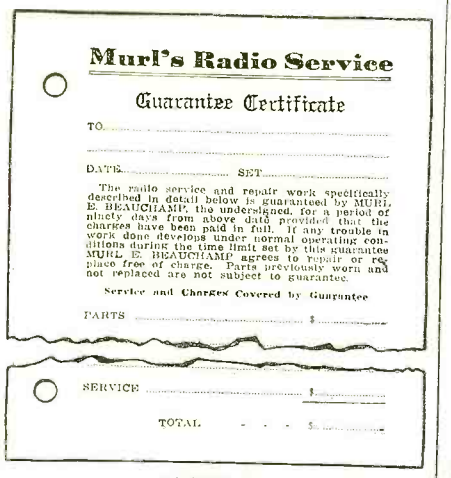
"I believe that in order to drum up new service business it takes new ideas. I conceived the plan of offering a complete chassis cleaning and dial mechanism lubrication free of charge with every service call. The chassis cleaning appeals to the housewife, and I find that only about one out of ten radios have been so cleaned since the original installation.

"The chassis is blown clean with compressed air, and the tuning assembly lubricated with a light oil. The improvement in tuning action is invariably appreciated. The scheme has definitely brought results."—*Merrill Lindley.*

FIFTH PRIZE

Confidence in One's Work Creates Confidence in the Worker

"Though many radio servicemen are coming to appreciate the desirability of guaranteeing their work, the idea cannot be overemphasized until every serviceman follows this practice. My business took an upward swing with the publication of the



Murl's Radio Service

Guarantee Certificate

TO.....

DATE..... SET.....

The radio service and repair work specifically described in detail below is guaranteed by MURL E. BEAUCHAMP, the undersigned, for a period of ninety days from above date provided that the charges have been paid in full. If any trouble in work done develops under normal operating conditions during the time limit set by this guarantee MURL E. BEAUCHAMP agrees to repair or replace free of charge. Parts previously worn and not replaced are not subject to guarantee.

Service and Charges Covered by Guarantee

PARTS ..... $.....

SERVICE ..... $.....

TOTAL - - - $.....

FIGURE 4

following advertisement in the local papers —'Guaranteed radio service work at reasonable prices. A guarantee certificate given with each radio repair or installation. Murl's Radio Service stands back of their workmanship and materials. Phone 2090 for a prompt response.' A copy of my guarantee certificate is shown in Figure 4." —*Murl E. Beauchamp.*

Output Meters

(*Continued from page* 533)

screen and only its thin edge intercepts the beam. Thus the dark area decreases until only a thin line is visible.

The circuit of the Weston moving coil, copper-oxide rectifier type of output meter is shown in Figure 3. The sensitivity of this type is such that it may be used directly across voice coils. Since a series condenser is supplied, it may also be connected from the plate of an output tube to ground, or across the plates of push-pull output tubes. For aligning, the last method of connection will require the lowest signal voltage but is not always the most convenient way to hook up an output meter. For power output measurement, it has a constant impedance of 4,000 ohms.

It is not generally realized that a d.c. milliameter may be used as an output meter with any set having a.v.c. A method of connecting same is shown in Figure 4. A meter giving a full scale deflection for 8 milliamperes may be used for most r.f. or i.f. amplifier tubes. Or, if desired, a more sensitive meter may be employed in conjunction with a variable shunt. This is likewise an ideal tuning meter. Its use in this connection was described in the October 1935 issue of this magazine in an article on the Battery operated Super. In operation, with no signal being received, the meter indicates the plate current of the tube with its fixed grid bias. When a signal is received additional grid bias is supplied through the a.v.c. system, decreasing the plate current reading on the meter. When the receiver is properly aligned the signal reaching the detector is a maximum and likewise the a.v.c. voltage, is a maximum. Therefore when the tuned circuits have been so adjusted that the plate current reading has reached its minimum value with a given signal input, the alignment is correct. This type of receiver adjustment procedure is recommended by the manufacturer of at least one high-fidelity receiver. Since only the carrier wave is required, the test signal need not be modulated. Likewise, a broadcast signal may be used.

In detector systems not employing diodes, whether or not a.v.c. is used, a d.c. milliameter may be used as an output meter by connecting same in series with the cathode resistor, or a high resistance voltmeter may be connected across the bias resistor. With plate detection, the meter reading will increase with an increase of signal input. With grid detection, the meter may be placed in the plate circuit. The reading will decrease with an increase in signal voltage.

SHORT-WAVE PAGE

MANY years ago when we first became interested in short-wave radio, people told us that through the medium of this international hobby better relationship between the nations could be accomplished. Is this correct? In some cases the answer is yes, but in the majority we cannot see that any belligerent feelings have been forgotten or put to one side because of short waves.

SHORT-WAVE listeners have a splendid opportunity to broaden their views on topical events by listening to the news bulletins from short-wave broadcasting stations. One can take the English versions of the present European controversy and then tune to Rome and hear just what *they* have to say. Providing the Ethiopian stations are active, it is not difficult to tune in the "E" stations and hear the war news direct from the "front," as it were.

Other matters of world-wide interest, such as the seemingly forgotten war debt, the armament conference and employment conditions, are discussed through the outlet of short-wave transmissions. But all this does not, in our opinion, "solder" the nations together any closer. But the truest, strongest and most lasting relationship has been established by the amateurs. Many short-wave fans have asked me "what is an amateur." For the benefit of these readers we will quote from the "Rules and Regulations" governing amateur radio stations. "The term amateur radio operator means a person holding a valid license issued by the Federal Communications Commission who is authorized under the regulations to operate amateur radio stations."

Amateur radio communications are solely with a personal aim and without pecuniary interest. This last rule, which is strictly adhered to by the amateurs, causes the majority of the amateur communications to arouse the interest of the short-wave listeners. The "programs" are of a spontaneous nature and although music is rarely heard on the American amateur bands, every conceivable topic is brought up and discussed in detail.

The short-wave listener cannot participate in the discussions, but we certainly can listen in to the "pros" and "cons" as they waft their way across the ether to us.

Let us listen together to these amateur bands and see what there really is to hear! The frequency that the average amateur operates on when he gets his first license is between 1800 to 2000 kc. There he can "work" on voice and make personal contacts. If the licensee is "sold" on code he is permitted to operate on various other bands. If an amateur living on the East Coast works a station on the West Coast on this band it is considered very good DX. The majority of these coast-to-coast contacts are established by what is known as "networks." Several amateurs operating on or about the same frequencies "gang up" and operate under the guidance of a "key station." If it is an East Coast group trying to work "West," they try to round up one station after the other until they have cleared a channel from coast to coast. Complete co-operation is the motto! When you have an attack of insomnia, listen to these boys "work" their fairly low-powered outfits to their full extent.

Another band assigned to the amateurs is 40 meters. We blandly admit that our more than limited knowledge of code forces us to say that 40 meters is a closed "book" to us.

From there we will go to 75- and the 20-meter bands. The exact frequencies are 3900 to 4000 kc. and 14,150 to 14,250 kc., respectively. Both bands are used exclusively for phone and c.w. operations. The former has DX possibilities but not as great as the latter. Neither of these bands are allowed to be used except by holders of a Class A license. This license is issued after an amateur has held a Class B ticket for one year or more and then he must undergo another examination.

To continue with our tale of what can be heard on these frequencies. The 14-meg. amateur band is one of the most interesting on the ether channels. Here are just a few of the amateurs that we have heard.

VO1I, St. Johns, Newfoundland, has his transmitter located three miles away from the point of operation. The transmitter is operated by remote control and five miles of telephone or land wire are involved in this clever idea.

TI2EA, San Jose, Costa Rica, is operated by a soft-spoken gentleman who says that he has never been away from his home town but learned all his English from the radio and by talking to English-speaking amateurs.

ON4CSL, Kasai, Belgian Congo, has been in that portion of the world on missionary duty for over twenty years. The operator,

Carroll Stegall, contacts the United States every week, and keeps abreast the times by this means. Mail from Kasai goes by "native runner" over a great distance and it takes several months for a letter to reach him, whereas by amateur radio it is only a matter of a few seconds for him to hear all the news from home.

Then you may hear CO2AU, Cuba; K4SA working ZL1AR, New Zealand, who was on 7 meg.; HI5X, Santo Domingo; HK1Z, Colombia; VK2UP calling HI5X; VP2CD, St. Johns, Antiqua, asking a New York amateur to find out why his QSL cards had not arrived; G5ML, England, complaining that a New York amateur's signals were "washing out" his reception of an English amateur; VU7FY, India, informing HI7G that he was receiving him 100 percent; HI7G complaining that VU7FY did not hear him; XS2A, South Africa, talking to a "W4" and informing him that the South African amateur would be transmitting on 10 meters very shortly and would appreciate reports.

When listening to the American amateurs it is extremely interesting to hear the various and absolutely different pronunciations of words that are used in our everyday conversation. It is a simple matter to distinguish between the New England, Southern and the Western amateur once you hear them talk. All continents can be heard within a short length of time if you tune carefully on this band. But remember that the foreign amateur generally operates higher or lower in frequency than the American amateur or on what is known as "outside" the American band.

We are really pleased at the tremendous amount of interest displayed by short-wave listeners towards the amateurs. Thousands of fans send reports of real value to amateur stations; in fact, one station that we know receives 700 short-wave listeners' reports a month. The majority of the amateurs "QSL" or verify such reports when return postage is enclosed. But surely no one could expect anyone to answer a letter and send a verification card (that costs money) without postage enclosed. Remember that amateur stations are all operated at the sole expense of the amateur and all available cash is generally put into parts or supplies to improve the transmitting and receiving equipment. Gone is the day when an amateur literally threw a few "junky" parts together and called it a receiver. Now the best is not too good for the amateur who values his reputation highly.

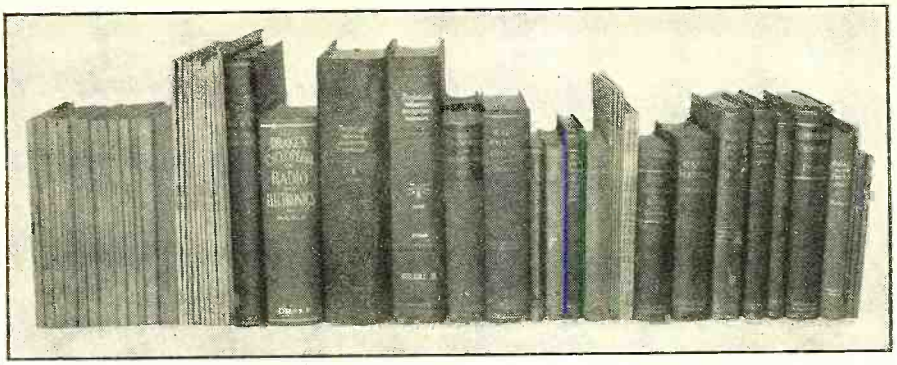
Electron Tubes

(*Continued from page 523*)

magnetic pick-up of an electric phonograph provided the energizing impulses, and the light thus generated, fluctuating in accordance with the recorded music, was focussed on the photo-electric element of the new tube which converted it into electrical energy and amplified it greatly. Output of 2 to 3 watts, for the direct operation of the loudspeaker through which the music was heard, was obtained. Such great amplification through a single tube can be accomplished at an extremely low noise-level.

Mr. Farnsworth's tube, described at Washington, is called the "Multipactor," the television expert giving it that name because the amplification attained is due to successive impacts of a stream of electrons on specially treated surfaces within the valve. He declared that electron multipliers have been made to perform every function now performed by the thermionic relay.

(*Turn to page 569*)



THE TECHNICAL REVIEW

CONDUCTED BY ROBERT HERTZBERG

The Cathode-ray Tube at Work, by John F. Rider; published by John F. Rider, 1935. A book for servicemen and others who wish to use the cathode-ray oscillograph. It is a reference book which explains the principles of the tube and its associated equipment, describes the available commercial models, and gives detailed information on the practical applications, how to perform the experiments and how to interpret the results. Mr. Rider's text will be easily understood by the average serviceman. More advanced readers may grow a little weary of some of his lengthy and detailed explanations, but others need them. The practical applications have been discussed in sufficient detail to be readily understood. The book is profusely illustrated with reproductions of the traces obtained on the screen.

The opening chapter deals with the tube itself. Here the operation of the tube is described and data on commercial tubes are given. This is followed by a chapter on sweep circuits. Chapter III deals with a.c. voltages on both sets of plates, showing the development of Lissajous' figure. Another chapter describes the commercial cathode-ray oscillographs now available. This is followed by applications of the oscillograph to servicing receivers and amplifiers. The use of the equipment for the observation of resonance curves takes a whole chapter by itself. The different systems used and their mode of operation are discussed exhaustively. It is also possible to have the tube sweep out the overall frequency characteristic of a receiver or amplifier; this subject is also described in a separate chapter. Auto-radio vibrator testing, transmitter adjustment and miscellaneous applications complete the volume.

The Radio Amateur's Handbook, 1936 Edition; published by the American Radio Relay League. This famous Handbook has grown considerably since the previous edition. The number of editorial pages is now approximately 380. The title already indicates that it is a handbook for the amateur, telling him what he needs to know of the theory of radio and giving constructional data on transmitters and receivers for short-waves and ultra-short waves. The additional space is largely devoted to a more extended treatment of antennas and to ultra-shortwave equipment.

The chapters dealing with the theory of radio are more in the nature of a review since they cover their ground rather quickly. The chapter on tubes, besides containing descriptions of typical tube circuits, includes a complete table of tube characteristics with socket connection diagrams. This list contains both receiving and transmitting tubes and is as up-to-date as metal tubes. Next follows a chapter on receiver circuit design and one on receiver construction. Here the reader will find the problems of receiver design and descriptions of receivers from the simplest to the largest. Transmitter design, operation and building is described in a similar vein which takes five chapters. Ultra-short-wave equipment, power supplies, antennas —are some of the other subjects. Included are also numerous tables, charts and chapters on operating a station.

Radio Data Charts, by R. T. Beatty, second edition, published by Iliffe & Sons, London. This is a collection of alignment charts which have previously appeared in *The Wireless World.* There are 30 of these charts with explanations on how to use them, solving many of the equations often employed in radio engineering. The charts are of a large enough size to insure reasonable accuracy. The subjects covered begin with such simple conversions as frequency to wavelength, decibels to power-ratio, and include charts for tuned circuit design, reactances of coils, Ohm's Law, resistances in parallel, design of pads, design of power-transformers, and others.

Sound Amplifier Circuits, a 24-page book published by The Standard Transformer Corporation, Chicago, Ill., contains technical data on a dozen audio amplifier circuits ranging in output from three to thirty watts. Various tube combinations have been selected, showing the possibility of a compromise between high quality and low cost.

Complete parts values are given in every case. All the amplifiers illustrated have actually been built and thoroughly tested, and the builder who follows the diagrams and uses good parts is assured of good results.

Review of Articles Appearing in the December, 1935, Issue of the Proceedings of the Institute of Radio Engineers

Automatic Selectivity Control, by G. L. Beers. A receiving system is described in which the selectivity varies automatically with the sensitivity. This effect is obtained through the use of several triodes whose plate-to-cathode impedance is shunted across a number of the receiver's tuned circuits. The abbreviation "a.s.c", employed for the first time in this paper, will undoubtedly come into common use.

Photoradio Apparatus and Operating Technique Improvements, by J. L. Callahan, J. N. Whitaker and Henry Shore. An interesting and complete description of half-tone transmission methods as successfully employed today in commercial practice. While television languishes in the laboratory, photoradio is an established commercial service.

Notes on Intermediate Frequency Transformer Design, by F. H. Scheer. Receiver design engineers will find this paper of value. It describes a method of determining coil or condenser merit, the more usual types of i.f. transformer assemblies, formulas for predicting gain and selectivity and a method of obtaining high fidelity.

The Ionosphere, Skip Distances of Radio Waves and the Propagation of Microwaves, by E. O. Hulburt. From ionosphere data gathered by the Bureau of Standards and associated scientific organizations, the skip distances of radio waves are calculated for temperature and tropical zones, with the diurnal and seasonal changes. Theory indicates that the observed bending of microwaves over the horizon is due to diffraction of the waves over the bulge of the earth and to temperature gradients in the lower atmosphere.

Ultra-Short-Wave Propagation Over Land, by C. R. Burrows, Alfred Decino and L. E. Hunt. In this paper an approximate theory of short-wave propagation over land is propounded, and various formulas involved the antenna height, the wavelength and the received field are given.

A Quantitative Study of the Dynatron, by F. M. Gager and J. B. Russell. This paper describes two methods of predicting the performance of a dynatron oscillator.

Review of Contemporary Literature

Waveform Errors in the Measurement of Power Transformer Losses. General Radio Experimenter, November, 1935. A method of determining these losses, which are held to be important, is described for the benefit of communications engineers.

An Improved Carrier-Interference Eliminator, by W. Baggally. The Wireless Engineer, December, 1935. (London.) Technical details of a circuit that eliminates carrier "whistles" without interfering with the reproduction of frequencies both above and below the whistle frequency.

Cathode-Ray Technique Abroad, by Bernard H. Porter. Radio Engineering, December, 1935. The achievements of various foreign laboratories in the cathode-ray field are discussed in this article, and various departures from American practices are described.

Propagation of Ultra-Short Waves, by Charles R. Burrows. Bell Laboratories Record, December, 1935. This well-written article embodies the results of numerous experiments on the ultra-short waves made by engineers of the Bell Labs. and is of special value to amateurs who are investigating the five-meter band and the still shorter ones.

Transmitters for Ten Meters, by George Grammer. QST, January, 1936. The amateur 10-meter band has been more or less a neglected orphan, but interest in it is developing quickly. The author describes several simple transmitters for this band and points out some of the peculiarities of 10-meter operation.

The Detector Input Circuit, by W. T. Cocking, The Wireless Engineer (London), November, 1935. The practice of operating a diode detector with large inputs is receiving considerable attention. The author discusses various circuit arrangements and pays particular attention to the input connections. The All-Around 14 Megacycle Signal Squirter, by M. P. Mims, QST, December, 1935. Details of a rotatable, directional amateur antenna, somewhat fearsome in appearance but providing decided advantages to the advanced "ham". Oscillators Using 14 Megacycle Quartz Crystals, by J. M. Wolfskill. QST, December, 1935. A dependable 20-meter crystal has long been wanted by amateurs. It is available at last as the results of some recent development work by the author.

Functions of C and R in A.V.C. Circuits. The Aerovox Research Worker, October, 1935. A clearly written, easily understood explanation of a.v.c. circuits and how they work.

Free Bulletins

Catalog of Sound Equipment

A 16-page booklet listing public-address systems, microphones, loudspeakers, tubes, and other parts and accessories for "sound" work. A good catalog for the P.A. specialists, brought out by Inter-World Trading Corp. Copies may be obtained free of charge from RADIO NEWS, 461 Eighth Avenue, New York, N. Y.

Catalog of Radio Parts

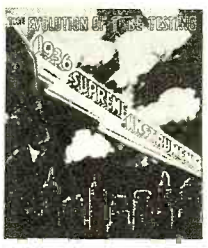
The new 1936 catalog of Bud Radio, Inc., is a 20-page affair, listing an unusually large assortment of radio parts and accessories for all purposes. A good book for radio amateurs, experimenters and service men. Copies may be had free from RADIO NEWS, 461 Eighth Avenue, New York, N. Y.

Amateur Catalog

A new 68-page catalog devoted exclusively to amateur radio equipment has just been issued by Wholesale Radio Service Co., Inc. This includes the first available information on a number of new receivers and transmitters, and also a technical "editorial" section containing data for amateur operators. Copies are available free of charge to amateurs from RADIO NEWS, 461 Eighth Avenue, New York, N. Y.

Tube Tester Booklet

The Evolution of Tube Testing is a booklet published by the Supreme Instrument Company and describing their Model 89 Standard and De Luxe tube testers. It includes circuits and discussion of the methods used for testing the quality of tubes, detecting leakage with a neon lamp, and providing a circuit which will test all glass and metal tubes with but five sockets and no adapters. The special features of the De Luxe model are also described. Readers can obtain a copy of this booklet by addressing their requests to RADIO NEWS, 461 Eighth Ave., New York City.



Radio News Booklet Offers Repeated

For the benefit of our new readers, we are repeating below a list of valuable technical booklets and manufacturers' catalog offers, which were described in detail in the August, September, October, November, December, 1935 and January and February, 1936, issues. The majority of these booklets are still available to our readers free of cost. Simply ask for them by their code designations and send your requests to RADIO NEWS, 461 Eighth Avenue, New York, N. Y. The list follows:

S1—Analyzer booklet, published by Supreme Instruments Corp. Free.

S2—Transformer bulletins, issued by Kenyon Transformer Co. Free.

S3—Bulletin of sound equipment, issued by Sound Systems, Inc. Free.

S4—Amateur equipment catalog of Wholesale Radio Service Co., Inc. Free.

O1—Dial Bulletins, issued by Crowe Name Plate & Mfg. Co. Free.

O2—Carbon Resistor folder, published by Ohio Carbon Co. Free.

O3—Muter Catalog of "Candohm" wirewound resistors. Free.

O4—Cardwell condenser catalog. Free.

N1—Resistors folders, issued by Erie Resistor Corporation. Free.

N2—Latest resistor catalog of Electrad, Inc. Free.

N3—Folder on resistance bridge, issued by the Muter Company. Free.

N4—Free code charts, offered by Dodge's Institute. Free.

D1—Yaxley Replacement Manual. Free to servicemen and dealers, only.

D2—Latest Sound Equipment Bulletin of Webster Co. Free.

D3—Catalog of Resistors and Condensers, of the Aerovox Co. Free.

D4—Free booklet on servicing instruments, Radio Products Co.

J1—1936 Allied Radio Corp. Catalog—114 pages listing radio receivers, service and amateurs' parts, P.A. equipment, etc. Free.

(*Turn to page* 575)

QRD? QRD? QRD?

CONDUCTED BY GY

THE life of a columnist is indeed hard, for there are times when he must print news which might hurt those he actually and impartially likes. But the motto is "hew to the line and let the chips fall where they may."

IN the very beginning of the organizing and solidifying of the American Radio Telegraphists Association, every parcel of news that came forth from those dinky headquarters in the basement of the hotel on Irving Place, New York, was given out to the members, unadulterated and without any special dressing to brighten it up. Truth and straightforwardness was the watchword at that time. There was an attitude of camaraderie and shoulder-to-shoulder action which brought out the best that was in each one. Every thought and effort was pressed toward an ultimate goal. That goal of unity of an entire professional industry, Radio Operating, was "one for all and all for one," "for, by and of radiomen."

The picture has now changed. From the basement it has elevated itself to a nice office building in rooms that are light and airy. But a change has taken place in the faces of the men sitting about reading or playing. There isn't that attitude of thought, of action, of intense building. Perhaps it is that the basic foundation of the organization is not there, the man who planned everything, who, with his own hands, dug the first ditches. There are some men there who do not even know him personally. Is it because he's grown so big that they cannot reach him or is it because he has removed himself from their midst? Perhaps this latter is the truth, because he has taken other offices in another part of the building. There isn't real honest news or info forthcoming; there are only rumors and gossip. Shall we print only that news which we believe to be good for the men to know, or shall they know everything truthfully and so help in keeping that solid foundation of strength and help from "one for all and all for one," which is actually the life blood of the organization?

In the very beginning, this column and ye editor were constantly advised of every bit of news and every move that was to be made. Everything that was written in this column was the truth, and, being consistently impartial and always carrying forward a standard emblazoned "for the ultimate good of the Radio Operator," gave the credit to the one who deserved it. Sometimes the IBEW was condemned and at other times lauded for their various maneuvers to get operators to enroll with them. For the same reason was the ARTA berated or extolled, as the case might have been. We aided the ARTA because we believed in one man and because we knew that if this man were left alone to direct the destinies of the organization, it would be done honestly without any personal emoluments or profit. We went to such extents that some of our fan mail remarked that perhaps we might be fathering the organization. But today . . . this column and ye editor are only given the news that they seem to think is fit to print. At the last meeting of the National Convention of the delegates of the organization Ye Editor was, at the time, in the offices of the president of the ARTA and was not invited to sit in with the delegates. Was it because there was some news that might leak out to the proletariat which might not be good for their digestive organs or was it because secret meetings must be kept from prying eyes and ears? Regardless of the reason, this was very bad taste. This column was the first means to inform the nation of radiomen of the organization and of its various moves and thoughts. At that time ye editor printed all the news, whether for or against. It came direct from its source. But today it must first be scrutinized by advisers before it is given out. Whether this meets with the radio ops' approval or whether it will bring a flood of denunciations upon those responsible will be seen later on.

The illustration in our heading this month pictures the new hydrophone equipment developed and installed on the survey ship *Pioneer* to rechart the ocean depths of the Pacific. Captain O. W. Swainson and wireless operator Stier are shown operating the device.

We all have heard of the new law which went into effect January first about all ocean-going passenger vessels of 2500 gross tons having to install radio-telegraph equipment in their motor lifeboats capable of communicating at least fifty miles on the international distress frequency. In

anticipation of it, a test was conducted by the RMCA with the equipment installed in motor lifeboat Number 4 of the *S.S. Pennsylvania*. This test indicated the possibilities of communicating at least 150 miles from lifeboats at sea. This will add new duties to the radio ops aboard and perhaps will put more radiomen to work installing and keeping the new apparatus in continual working condition. Something to look forward to for the coming year, eh?

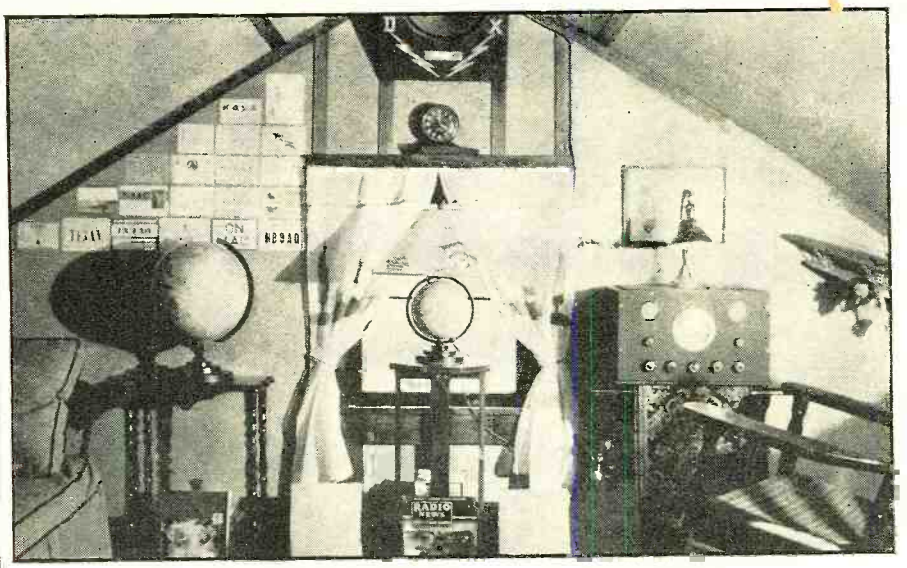
Recently a letter was directed to us bawling us out for not being able to answer a question which had to deal with a matter which only a Congressman could know. Therefore, we insist that this reply must come from a source which cannot be given out until ready for general publication. We endeavor to answer all questions and problems that the best of our knowledge and our resources permit, but insist that we are not G-men or Houdinis. We will, at the first opportunity, convey to this subscriber the proper answer when it is available.

Last year this column wrote of the possibility of having weather maps transmitted in facsimile to ships at sea. This possibility has now turned into a reality and this new service will be put into operation in a short time. The development of terminal apparatus has been completed and will be placed on four chosen vessels as they make their next call at the port of N'Yoik. The ships are of American, German, Norwegian and Spanish registry, arrangements having been previously made by Mr. Pannill when he was in Brussels last summer. This step toward extension of the RMCA service to vessels of other nations is natural, since the American company is the first in the world in this field to have developed radio facsimile for marine service. Short waves will be employed for transmission as in the present commercial transoceanic service of picture transmission. That part of the radio spectrum is best suited to long-distance work. The U. S. Weather Bureau will supply the radio company daily with maps of the Atlantic and these will be sent to the ships on two different frequencies, one adapted to transmission up to about 1500 miles and the other suited to transmission over greater distances. The ops will thus be able to select the frequency of most efficient reception for their position. Just another duty for the overworked op.

Amongst the batch of mail comes a remark from an embryonic radio op, "How do some of the eastern schools obtain jobs for their graduates with so many experienced ops on the bench?" Just one of those questions we would like the answers to! What matters right now is, will the new year bring the advances and advantages we expect to receive by reason of our past efforts in '35 or will it just be another year rolling by, bringing the same talks, the same arguments and the same "info"? It all sums up to this, "We get out of the jar that which we put into it"—except when we put sweet apple cider in and let it stand too long and then we get vinegar. . . . 73 . . . ge . . . GY.

Alnico

SCHENECTADY, N. Y.—A new alloy, alnica, which can be made ino an exceptionally powerful permanent magnet, has been announced by the General Electric Co. Some magnets will lift 60 times their own weight. It is much harder to magnetize than other materials but once magnetized, is better able to retain its magnetism. The Simonds Saw and Steel Co. of Lockport, N. Y., has been licensed to manufacture and sell magnets of alnico.



A SHIPSHAPE DX CORNER IN AN ATTIC

Earl Wickham of Bloomingdale, New Jersey, Official Listening Post Observer for that State, is proud of his receiving rig. He is now getting his amateur license and will soon have a transmitter on the air.

The DX Corner (Short Waves)

(*Continued from page* 548)

W2XDV, 31600 kc., heard Saturdays and Sundays, 2-5 p.m., and daily, 7-9 p.m., E.S.T. (Portman.)

Official Listening Post Observer Craft conducts a mighty fine short-wave tip program, dedicated to RADIO NEWS, every Friday evening at 12:45 a.m. (really Saturday morning) on station KGGC, San Francisco, 1420 kc. (This is fine business and we hope other Listening Post Observers who conduct short-wave tip programs will do the same thing and let us know so that we can publish data in the DX Corner.—Editor.)

W9XBS, Chicago, Ill., 6425 kc., reported heard at 5:30 p.m., E.S.T. (Adams, Jr.)

WOEH, aboard the "Philippine Clipper," is an N.B.C. transmitter installed aboard the flying ship and operates on 2670, 4797, 6425, 8655 and 12862.5 kc. The set was reported heard 2100 miles from Alameda, California. (Gallagher, Jensen, Moore, Parker.)

KEE, 7715 kc., may be heard relaying programs to Honolulu evenings. (Hull.)

W2XBJ, 9450 kc., may be heard at 8:30 p.m., E.S.T., testing with music. (Hull.)

KKQ, 11970 kc. (some say it is 11950 kc.) may be heard rebroadcasting to Honolulu on Sundays 2-2:30 p.m., E.S.T., and also at 7:45 p.m., E.S.T. Ellsworth, Saubereich, Jones.)

KKP, Kahuku, on 16030 kc., has been heard testing at 1 p.m. and from 6-6:30 p.m., E.S.T. (Wilson.)

KKH, Kahuku, on 7520 kc., has been heard rebroadcasting to the Columbia chain at 11:30 p.m. to 1 a.m., E.S.T. (Hull, Kentzel, Bews, Jensen, Gallagher.)

KIO, 11680 kc., may be heard on 25.67 meters, 11:30-12 midnight, E.S.T. (Kentzel.) Observer Gallagher says the frequency is 11710 kc.

W1XAB is a new American short-wave relay station for WNAC. (Bower.)

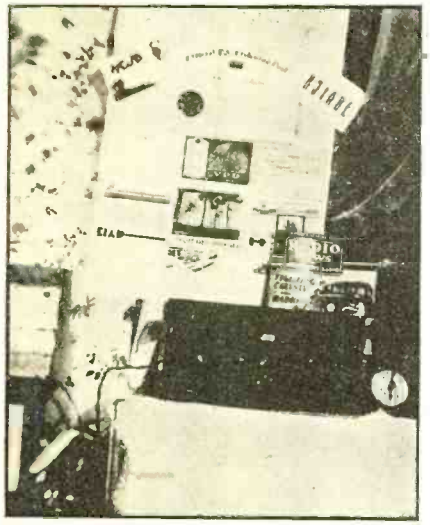
XEFT, Vera Cruz, Mexico, 6120 kc. reported heard 11 a.m.-4 p.m., E.S.T., and 7:30 p.m.-12:30 a.m., also sometimes heard on 9600 kc. (Gallagher, Meade, Evans, Hammersley.)

XEVI, Mexico City, Mexico, 5970 kc., transmits Mondays, Wednesdays and Fridays 4-5 p.m., Tuesdays 9-10 p.m., Thursdays 9-10 p.m., and 11 p.m. midnight, Saturdays 2-3 p.m., E.S.T. (Butcher, Winand.)

XBJQ, Mexico City, Mexico, 1000 kc., does not broadcast any more, but is heard occasionally testing with W2BSD. They have been reported heard daily, except Suwndays, at 10:30 a.m. and at 4:30 p.m. (Holt, Davis,

OUR CALIFORNIA OBSERVER

Meet R. J. McMahon, is an active Observer on the Short-Waves, and uses a Superskyrider and a Philco All-Wave Receiver. Notice the certificate in the place of honor.



EFFICIENT BUT SIMPLE

This is the DX Corner of F. A. Pilgrim, Official RADIO NEWS *Observer for California whose home is at Oakland. Yes, he certainly pulls in some fine DX, especially the Asiatics.*

Villar, Craft, Ortiz, Coover, Miller, Whittaker, Messer.)

XEXA, Mexico City, Mexico, 6180 kc., reported heard 9-10 p.m., E.S.T. (Portman.)

CMA3, Havana, Cuba, 15505 kc., reported heard Sundays 4-4:30 p.m., E.S.T. (Hull.)

CM6XJ, Havana, Cuba, 15440 kc., reported heard testing with phonograph music. (Davis.)

VRR3, Kingston, Jamaica, 3841 meters reported testing and giving news 5-5:15 p.m., E.S.T. (Baier.)

HI5N, Santo Domingo, D. R., 6130 kc., 48.8 meters, reported heard 6 p.m.-11:30 p.m., E.S.T. (N. C. Smith, Young.)

HIL, Santo Domingo, D. R., 6505 kc., heard at noon and from 6:30-7:30 p.m. (Portman, Johnson, Betances, Wilkinson.)

HI(6Z?), San Napier, D. R., reported heard on about 6130 kc., late evenings. Does anyone know the proper call and the correct frequency and schedule? (Davis.)

HIZ, Santo Domingo, D. R., 6340 kc., 47.5 meters, reported heard 7:30-9:30 p.m., E.S.T. (N. C. Smith, Ellsworth, Dickes.)

CENTRAL AMERICA

YNVA, Managua, Nicaragua, reported heard on approximately 8600 kc., 8 p.m. (Betances.)

HP5F, Colon, Panama, 6070 kc., reported heard 11:45 a.m.-1 p.m. and 7:45-10 p.m. Reported heard Sundays 4-6 p.m. (Partner.)

TI5HH, San Jose, Costa Rica, 5500 kc., 54.5 meters, reported heard 2:30-4 p.m. and from 7-11:30 pm., E.S.T. (Betances, Villar, Holt.)

TIPG, San Jose, Costa Rica, 6410 kc., 46.8 meters on the air 6:30-11:30 p.m. (Dooley, Craft, Holt, Libby, Young, Wolf, Miller, Dickes, Foshay, Whittaker Skatzes, Akins, Hynek.)

HIW, Honduras, 27.15 meters, reported heard testing at 11 a.m. (Holt.)

HRN, Tegucigalpa, Honduras, 5875 kc., 500 watts, reported heard daily 12 noon-1 p.m., 6-7:30 p.m. and 8-9:30 p.m. They are also reported heard on Sundays 3-5 p.m. and 10:30-11 p.m. (Norman, Johnson, Bower, Chambers, Akins, Dunn, Partner, Ortiz, Craft, Wolf, Butcher, Holt, Foshay, Sauberlich, Dickes, Frost, Nosworthy, Lopez, Evans.)

TG1X, Guatemala City, Guatemala, 9450 kc., heard irregularly. (Holt.)

TG2X, National Police, Guatemala, reported heard 4-6 p.m. and 10 p.m.-12 midnight, E.S.T. (Butcher, Holt, Dickes, Winand, Seright, Craft.)

SOUTH AMERICA

VP3MR, Georgetown, British Guiana, 7080 kc., 42.4 meters, reported heard 7-10:10 p.m. by some listeners. Other observers say daily 9-10 a.m. and 7-8 p.m., with additional programs on Wednesdays, Thursdays and Saturdays from 5-7:30 p.m. (Hull, Skatzes, Reilly, Winand, N. C. Smith.)

HJ3ABH, Bogota, Colombia, 5970 kc., 1200 watts, reported heard. (Holt.)

HJ5ABC, Cali, Colombia, 6153 kc., reported heard 11 a.m.-12 noon, 7-10 p.m., E.S.T., except Saturdays and Sundays. (Chambers.)

HJ5ABD, Cali, Colombia, 6487 kc., reported heard 9-10 p.m., except Sundays. (Chambers.)

HJ4ABC, Medellin, Colombia, 6135 kc., reported heard 6:30 p.m. (Betances.) These call letters have also been reported as at Ibaque, Colombia, on 6451 kc., and also at Pereira, Colombia, on 6065 kc. or 6080 kc., transmitting at 10-11:15 p.m. Another station, HJ4ABC, was reported on 6548 kc., 7-10 p.m. One listener says this station was formerly HJ4ABJ at Pereira. Evidently here is a decided mix-up and our readers would appreciate it if our observers or anyone else could straighten out the mess. (Betances, Chambers, Wilkinson, Johnson.)

HJN, Bogota, Colombia, approximately 5950 kc., heard 8-11 p.m. (Craft, Gallagher, Chambers, Butcher, Wilkinson.)

HJ4ABD, Medellin, Colombia, reported heard at different times on the following frequencies: 5750, 5760, 5785, 5790, 6060, 6080, 6140 kc. They transmit irregularly from approximately 7:30-11 or 11:30 p.m., E.S.T., daily. (Hynek, Chambers, Libby, Meade, Gallagher, Portman.)

HJ2ABD, Bucaramanga, Colombia, 5980 kc., reported heard 11:30 a.m.-12:15 p.m. and from 5:30 to 7 p.m. Also heard testing 1:30-2 a.m., E.S.T. (Chambers, Libby.)

HJ4ABA, Medellin, Colombia, has changed frequency from 11710 kc. to 11820 kc. They are reported heard 11:30 a.m.-1 p.m. and from 6:30-10:30 p.m., E.S.T. Atkinson, Libby, Holt, Betances, Skatzes.)

HJU, Buenaventura, Colombia, 33.1 meters, reported heard Wednesdays and Saturdays, 11-11:45 p.m., E.S.T.

YV5AM, Maracay, Venezuela, 7105 kc., reported heard 10-1 a.m. regularly and from 6-10 p.m., E.S.T. On some nights has been heard acknowledging letters and talking to amateurs. (Pickering, Wickham, Portman, Butcher.)

YV8RB, Barquisimeto, Venezuela, 5880 kc., reported heard daily 5-7 p.m., E.S.T., Thursdays 5-8 p.m., E.S.T. (Wilkinson says the last letter of this call is B instead of a V, as listed in previous months.) (Ortiz, Chambers, Butcher, Libby, Foshay.)

YV12RM, Maracay, Venezuela, 6300 kc., 47.6 meters, heard testing and broadcasting between the hours of 7 and 11 p.m., E.S.T. (Kentzel, Foshay, Skatzes, Craft, Akins, Pasquale, Betances, Butcher, Lawton.)

(Turn to next page)

YV4RV, Venezuela, reported heard 6675 kc., irregularly 8-9 p.m. (Jones.)

HC2RV, Guayaquil, Ecuador, reported heard on 45 meters. (N. C. Smith.)

HCJB, Quito, Ecuador, has changed its frequency to 8900 kc. (Betances, Akins, Messer.)

OCEANIA

"Radio Oceanie," Tahiti, 7-1 megacycles, is reported as a new station transmitting Tuesdays and Fridays, 11 p.m.-midnight. (Wilson, Pasquale.)

Readers Who Are Awarded "Honorable Mention" for Their Work in Connection with This Month's Short-Wave Report

Juan Manuel Salazar, L. C. Styles, Robert Loring Young, A. T. Hull Jr., J. W. Nelson, Charles Holt, Paul V. Trice, C. K. McConnan, R. Lawton, Isaac T. Davis, Arthur Immicke, Ferry Friedl, Milton Prashaw, Jack Perry, Richard O. Lamb, Thomas P. Jordan, Jose L. Lopez. Dr. Evelio Villar, Lewis F. Miller, Frank Nosworthy, Paul J. Mraz, Earle R. Wickham, Werner Howald, George James Ellsworth, Orval Dickes, Walter W. Winand, Francis T. Reilly, J. T. Atkinson, Howard T. Newpert, Fred Cox, Manuel E. Betances, Caleb Wilkinson. J. E. Moore Jr., B. L. Cummins, Roger Jensen, Louis Horwath Jr., H. H. Parker, Thomas R. Dunn, J. E. Wilson, George J. Pasquale, George C. Akins, Robert B. Hammersley, Arthur Evans, Jerry M. Hynek, Walter F. Johnson, Walter L. Chambers, H. Westman, C. H. Skatzes, John G. McConomy, Harry E. Kentzel, Edward De-Laet, Merton T. Meade, J. Wendell Partner, Jack Bews, L. M. Jensen, Manuel Ortiz G., G. C. Gallagher, R. Messer, Albert Pickering Jr., V. D. Seright, W. Bernard Kinzel, Jose Rodriguez R., Claude H. Dalyrymple, Paul Fayes, Fred M. Craft, L. M. Jensen, Eric Butcher, Howard Adams Jr., Reeve Owen, George W. Osbahr, A. Fabius, Oliver Amlie, Gideon Brainard, Morgan Foshay, Frank J. Flora, J. Leslie Berts, Preston C. Richardson, Wheeler T. Thompson, M. Keith Libby, Bruce Holmgren, Arthur B. Coover, Clarence Norman, John F. Fritsch, W. C. Reichardt, Rene Arickx, George L. Loke, Mike Kruger, Howard Sauberlich, Wm. J. Roberts, Ellsworth Dumas, E. L. Frost, Lyman F. Barry, A. J. Hull Jr., E. W. Turner, Charles C. Dooley, N. C. Smith, A. H. Dalal, R. H. Graham, Pierre A. Portmann, Terry A. Adams, Gabriel M. Costes, C. McCormick, Kenneth R. Boord, Edward Pohlig, Carleton L. Whittaker, L. F. Gallagher, Charles E. Pellatt, Harry Wolf, Robert A. Curtis, Paul W. Craven, Vincent S. Cigoj, J. L. Torres, A. T. Hull, James Floyd, J. V. Caneghem, Forrest W. Dodge, W. W. Gaunt Jr., R. N. Putnam, Francisco Fossa Andersen, Omega Verzecchi, Frank E. Baier, Robert F. Gaiser, Harold W. Bower, J. S. Phillips, L. Hintzbergen, David H. Henderson, Charles C. Norton, J. P. Baas, L. C. Healey, Steven P. Veres, Isidro Palacio, Earle R. Wickham, Fred A. Pilgrim, Edgar J. Vassallo, W. E. Frost.

S. W. Club News

Army Amateur Radio System

The Second Corps Area of the Army Amateur Radio System publishes a monthly bulletin in which Army Amateur news is given, with announcements of contests, hamfests, report cards and items of interest to the organization in general. Reports of the Jersey and Hudson District Nets as well as the Adirondack and Western New York sections are printed. Requests for information about the Net should be made to Col. Alvin C. Voris, Governor's Island, New York.

Society of Wireless Pioneers

The society of wireless Pioneers members will please send photographs of their shacks to HQ for possible publication in RADIO NEWS. Data should be included. The Vice-President asks why we can't get a bit of coöperation between radio manufacturers and the electrical concerns making nerve-wracking interference-producing devices that create such havoc with short-wave reception. Automobiles are among the worst offenders. British and European members, please send news items to H. B. Shields, 25 Bluestone, Moston, Manchester 10, England.

The Globe Circlers' DX Club

Officials of the club welcome Mrs. Ibbie Smith of Carroll, Ohio, to their ranks.

No More Verifications

An announcement by W8XK of importance to short-wave club members the world over is an announcement recently received from W8XK and W1XK. They have received so many letters daily saying that their transmissions are considered as local by listeners all over the world that they are discontinuing short-wave reception reports.

Short-Wave Institute of America

An announcement was recently received regarding the formation of the Short Wave Institute of America, organized at Washington, D. C., with offices in the National Press Building, and with O. F. Schuett as President. One of the purposes of the Short Wave Institute will be to provide a clearing house for schedules of stations and the distribution of these schedules to set owners.

Monongahela Radio Club

The Monongahela Radio Club elected officers for 1936: President—Willis Hodgson —(Station W8IQX); First Vice Pres.—W. N. Reimensnyder, of the Bell Telephone Co., Second Vice Pres.—Frank Pedrosky—(Station W8NUS); Third Vice Pres.—Clyde Crookham—Coshocton Iron Co.; Sec.—L. C. Healy—Monongahela Publishing Co.; Treas.—Lee Hagerty—(Station W8MTT).

Club Bulletins will be published each month and mailed to every member in good standing. Code Practice will be held each week at a place designated. The station and time of each practice will be printed in the monthly bulletin. Honorary membership is accepted at 25 cents a year along with QSL card and self-addressed envelope with postage will bring the monthly bulletins to any place in the world.

The club meets every Friday at 8 o'clock. Plans are in progress to hold a RADIO BANQUET some time in March. The club has 15 Amateur Radio Station owners enrolled; 12 Servicemen; 5 Engineers; 18 S.W.L.; 2 Police operators; 3 Television engineers; 2 Broadcasts announcers.

International DX'ers Alliance

The officers of the International DX'ers Alliance announce that this is the start of the fourth year of the existence of the Globe Circlers' Official Publication organ of that association. Members are requested not to forget that the membership drive is still on.

Radio News Listening Post Observers welcome to the I.D.A. fold, and as readers of *Radio News* thirty-two new members for the past month.

The New Zealand DX Radio Association

The President of this association announces twenty-four new members bringing the total to 903 by the end of the year. Prospective members should send in their membership applications, care of *Radio News* and they will be forwarded.

North Manchester Radio Society

The North Manchester Radio Society was inaugurated at a meeting held at the British Legion, Whitefield, Manchester, England on Friday, 25th October, 1935. The officers are Mr. R. Lawton, Secretary-Treasurer and Short-Wave Director, Mr.

A. Wimtanley, Technical Adviser, and Mr. L. Hoyle, Chairman. Meetings are held every Friday at 8 p.m., the room being open for the use of members from 7 p.m. For those interested Morse instructions are given from 7:30 to 8 p.m. Lectures and demonstrations are given from time to time by representatives of the various manufacturers, also visits are made to places of interest, such as Radio factories, Power Stations, B.B.C. Studios, Control room, etc. The society endeavors to cater to beginners as well as the keen "DX" and short-wave "fans". All meetings are open to anyone interested in radio. Further particulars can be obtained from the Secretary, Mr. R. Lawton, 10, Dalton Avenue, Thatch Leach Lane, Whitefield, near Manchester, England.

International 6000-12,500 Mile Club

We are having new membership cards made up; these cards will be for both the S.W. and B.C. listeners, the cards will be well designed, and anyone owning one of these can be PROUD of same.

New 9 by 12 membership certificates may also be had, only members holding a 20 point verification over 6000 miles on S.W. or 3,500 miles on B.C. and 40 point verification will receive one of these certificates; 20 point makes any one a PROFESSIONAL DX ACE, 40 veries DOCTOR OF DEGREES CERTIFICATE. Mr. W. Warren of North Island, N. Z. becomes District manager for that zone, Mr. F. Ridler of England becomes District manager of that zone, the club is gaining members fast, let's see what kind of a DX'er you are.

Get Going!

(*Continued from page 529*)

40 to 100 kc. wide. Such selectivity as is desired is then obtained in the r.f. circuits ahead of the intermediate amplifiers.

It is a common practice to use the autodyne system of frequency conversion. To accomplish this the first detector is used in an oscillating condition and instead of being tuned to peak on signals it is tuned enough off the signal frequency to beat the signal to the intermediate frequency. To make this practical, the intermediate frequency selected is of a very low order, usually in the neighborhood of 20 or 30 kc. so that the detuning of the first detector will not materially reduce signal strength. Many experimental superheterodynes are provided with a preselector stage with the object of improving the signal-to-noise ratio and also of preventing radiation from the oscillating detector. There are, in some instances, a resulting improvement in signal selectivity and in sensitivity. The one weakness of the superheterodyne is that it lacks the noise-reducing characteristic of the super-regenerative receiver.

Unquestionably the ideal receiver installation for a 5-meter amateur station would consist of two receivers, one of each type. With a low prevailing noise condition the superheterodyne receiver could be employed for weak signals; or at times, when the 5-meter band is crowded with signals, advantage could be taken of the superior selectivity of the superheterodyne. When the noise conditions grow bad or where high selectivity is not needed the super-regenerative receiver can be switched in. It is more than likely that some manufacturer will produce a receiver in which are combined these two circuits with a switch to permit either one to be selected as required. In fact recent experimental developments at headquarters of the American Radio League have produced a superheterodyne receiver employing a super-regenerative second detector. This experimental circuit is said to combine the sensitivity and selectivity of the superheterodyne with the noise eliminating qualities of the super-regenerative circuit.

In 5-meter reception, the antenna plays an extremely important part and for best results the antenna should be one which resonates at 5 meters and should be a vertical rather than a horizontal wire.

The most common practice is to employ an 8-foot length of ¼-inch copper tubing mounted in a vertical position and supported by means of stand-off insulators on a wood mast. This type of mounting not only holds the copper tubing rigid but also provides a firm anchorage for the lead-in.

The lead-in is a parallel pair with the wires spaced two inches apart as shown in Figure 1. In such a combination, the two wires are fanned out beginning at a point 30 inches from the antenna, and spreading to a distance of 28 inches where they connect to the antenna rod. This type of lead-in should be continued at a right angle to the antenna rod for a ¼-wave (4 feet) and from that point on may be run to the receiver at any desired angle.

Another excellent receiving antenna system employs an 8-foot copper rod with the single wire lead-in taken off the top end as shown in figure 2.

There are numerous other effective types of 5-meter receiving antennas but the two mentioned have the advantage of high efficiency and simplicity. Incidently, the 8-foot length is selected not as a matter of convenience, but because this length resonates (½-wave) at 5 meters and therefore, provides extremely effective pick-up for 5 meter signals. Any type of antenna, including a broadcast receiver antenna, will provide a certain amount of pick-up at 5 meters but such antennas are very definitely less effective than the types shown.

The foregoing is not intended to be a real comprehensive discussion of 5-meter equipment but rather to bring out a number of fundamental ideas gleaned from observation and experimentation to date and it is hoped that the information given will prove helpful to many who are becoming interested in 5-meter work for the first time.

Next month the second article of this series will include descriptions of several 5-meter receivers now on the market, including those of both the superheterodyne and super-regenerative types.

Antenna Mast

(*Continued from page 527*)

After the collapsed mast has been mounted on the roof or parapet, guy wires are attached to the top of the base section and securely fastened to points of support on the roof. Guy wires of suitable length are then attached to the perforated collar at the top of the top section and left dangling, to be attached to anchorages on the roof after the mast is raised. A pulley is also wired to this top collar and a rope or other halyard run through it. The mast is then elevated by first pulling out the top section and by locking it by means of an ingenious screw lock which does not require the use of any tool. The second section is then pulled out, raising the top section with it and locking it. Finally the third section is raised and locked, bringing the mast to its full height. The loose ends of the top guys are then firmly anchored and the job is finished, the whole thing having taken little more time than it takes to describe the process. An outstanding feature of the mast is that a ladder is not required, the entire job being accomplished by one man with his feet firmly planted on the roof.

The manufacturers of the mast also have a complete line of mast and antenna accessories available. These include guy-wire anchors, with thumb-screws to adjust the tension of the wire, insulator brackets, truss braces (for use where the mast is erected at the edge of a roof and a backstay is therefore impossible), antenna tension insulators (for keeping the antenna taut). Mast sections are available, singly, or in groups up to four sections, the latter providing a height of 13 feet. An extension section is also available to provide a maximum height of 16 feet.

In addition to the ease of erection, these masts are pleasing in appearance and surprisingly rigid. A 4-section mast installed in the City Listening Post is used to support two doublet antennas, both with long, heavy, twisted-pair lead-ins and in spite of this double strain there is not the slightest bend or distortion of the mast. Finally the cost is so low as to pay for itself in the labor saved over that required in erecting an ordinary iron pipe or wood mast.

The DX Corner (Broadcast-band)

(*Continued from page* 542)

1935 season. The Japanese stations and XGOA are the only Trans-pacific stations that can be depended upon for daily reception. Quite a few of the Australians have been heard, but rarely. IYA is the best of the New Zealand stations heard, but the signal strength is about half of that noted last season. Signals from the eastern part of the United States and Cuba are much better than last year, many of the eastern stations are well received at 4:00 p.m. PST. The DX'es from the Cubans are being heard from 90 to 100% readable, but middle Westerners on DX are hard to read 50%.

I have received the following information covering Australian stations from the Postmaster-General's Department at Melbourne under date of November 4th:

New Stations

3GI, Gippsland Regional (Longford near Sale, Vic), 830 kc., 7 kw.

2GZ, Country Broadcasting Services Ltd., P. O. Box 3650 S, Sydney, 990 kc., 2 kw.

3MB, Mallee Broadcasting Pty Ltd., Cumming Ave., Birchip, Vic., 1470 kc., 100 watts.

4PM, Amalgamated Wireless Ltd., 47 York St., Sydney (station location—Port Moresby, Papua), 1360 kc., 100 watts.

7BU, Findlays Pty Ltd., Wilson St., Burnie, Tasmania, 1390 kc., 50 watts.

Changes

3AR, changed frequency from 630 kc. to 580 kc.
7NT, changed from 750 kc. to 710 kc.
3MA, 900 kc., increased power from 50 watts to 100 watts.
3WR, 1260 kc., reduced power from 1000 to 500 watts.

Observer Gordon (Pennsylvania): XEAQ was a new station testing on 1090 kc. and will probably be in regular operation sometime in January. Reports should be addressed to the station in care of Rosario Beach Country Club, Rosario, Mexico.

Francis L. McCray (Pennsylvania): Am still using the All Star Senior with a 138 foot antenna but have added the RADIO NEWS Tenatuner and find that it brings in stations that I have never heard before.

Observer Routzahn (Pennsylvania) is working 10 hours a day; playing in an orchestra at night and trying to study a radio course in between times, which doesn't leave him very much time for DX. In spite of this he has found time to add a few stations to his log, bringing the total to 898. He passes along a report from Observer Mathie in which it is stated that the new French station in New Caledonia, Oceania on 600 kc. closes down Wednesdays and Saturdays at 4 p.m., EST with the French National Anthem.

Observer Grosvenor (Kansas) reports that his log now stands at 833 stations. Of these 347 are verified. He writes for verifications only on low power or real DX stations and has been accumulating these verifications for only two years. He sends in a beautiful chronological report of his recent DX'ing and it is regretted that space prevents its presentation here.

Observer Golson (Louisiana) Engineer and DX Announcer of WJBO qualifies for a vote of thanks for his cooperation in putting on the special DX programs from WJBO which have been dedicated to RADIO NEWS Listening Post Observers.

Observer Olive Johnson (South Dakota): Our sympathy to Mrs. Johnson who has recently been suffering from a bad cold—not to the complete exclusion of DX activities, however.

Observer Covert (California) is doing a fine job in preparing the script for the KGGC weekly tips broadcasts dedicated to RADIO NEWS. He and Andy Potter, manager of that station, are planning some new features which should be mighty interesting to DX listeners. Observer Covert reports that KFOX, 1250 kc., is on Sunday mornings until after 4 a.m., EST; KMTR on until 4 a.m. Sunday mornings. KSFO rebroadcasts evening programs from KNX; also KJBS and KQW rebroadcast each other from time to time. Requests for verifications on these stations should therefore include quotations from announcements, as a report on program material doesn't serve as proof of reception.

Observer Ellis (California) is again editing "The Circlette", official organ of the IDA, Second District.

Observer Butcher (Wyoming) started collecting verifications in 1934 and now has them from stations in 34 countries with a total of 125 foreign verifications. He has recently been appointed Vice-President of the International 6000-12500 Mile DX Short-Wave Club (Broadcast Band section). Congratulations and best wishes.

Observer Law (Alberta) was laid up in the hospital and has just recently returned home. He writes that during his absence Mrs. Law carried on the DX work. Glad to know he has recovered sufficiently to return home and we feel sure that the other Observers join us in wishing him a speedy recovery.

Observer Pellatt (England): Paris P.T.T. and Lyons P.T.T. have increased power to 80 kw. Reports on Fecamp and Poste Parisien are wanted. Send them to the International Broadcasting Company, 11 Hallam Street, London WI, England. Luxembourg reports should go to the same address. The I.B.C. programs are carried by Luxembourg, Athlone, Poste Parisien and Fecamp, and are not carried by Frankfurt as implied by Observer Tomlinson.

Observer Coales (England): Have been testing out the RADIO NEWS Tenatuner on a receiver employing 1 r.f., detector, and audio tube and, with an indifferent antenna, the tenatuner produced a big gain and the wave trap circuit functioned very well. The next test was on a receiver having an untuned r.f stage. In this case the tenatuner brought about a large gain in both selectivity and signal strength. The final test was made on his big superhet and it was an unqualified success not only in increasing signal strength but also, when used as a wave trap, it cut the most powerful transmitters down to a whisper. The tenatuner tunes nice and sharply. He winds up his report with the statement "I can thoroughly recommend this Tenatuner to all DX'ers and RADIO NEWS is to be congratulated on an excellent job."

Observer Jurd (Australia) writes that a "Radio Listeners League" has been formed in Townsville and already has a membership of 400. He has been elected Vice President and would like to correspond with similar clubs in the United States in order to exchange views on radio matters in general. Letters should be addressed to Aubrey R. Jurd, Livingstone St., West End, Townsville N. Q.; Australia.

Observer Tucker (Alaska) in a letter (via dog sled) dated December 9th reports European stations just starting to come in. On that date he heard 21 stations in England and Germany. U. S. west coast stations are heard beginning at 2 p.m. Mexicans are heard during the evening. He reports that from sunrise to sunset there is absolutely no static; during the evening there is sometimes a little, increasing towards midnight. In the early morning the static is so intense that only the very strongest signals can be heard.

ERIC BUTCHER WINS NEW HONORS

Eric, shown here with his Scott All-Wave, has been appointed vice-president of the 6000-12500 Mile DX Short-Wave Club, in charge of broadcast-band activities.

Impedance Match

(*Continued from page* 538)

Substituting in the formula, we have

$$\text{DB loss} = 10 \log \left[1 + \left(\frac{40000}{3768\text{C}} \right)^2 \right]$$

$$= 10 \log [1 + 1.18]$$

$$= 10 \log 2.18 = 10 \times .32387$$

$$= 3.24 \text{ decibels approximately}$$

Formula (1) is useful in design work for predicting the low-frequency loss of a transformer. For example, when $\omega L_p = Z_a$

$= Z_b$, the response curve will be down almost exactly 1 decibel. Similarly, when $\omega L_p = Z_a/2 = Z_b/2$, the response will be down 3 decibels, etc.

Over the middle frequency range (i.e., from about 200 to 6000 cycles), none of the elements shown in Figure 1 are apt to show much frequency discrimination. This statement must be qualified, of course, by the type of unit under consideration. In a line-to-line transformer, for example, C_d is apt to be relatively unimportant because the value of Z_b is of the order of a few hundred ohms. Hence, the high-frequency response of this type of unit will probably be controlled almost exclusively by L_L. In a line-to-grid transformer, on the other hand, both L_L and C_d, as well as resonance between the two, will set the limit for high-frequency response. This is due primarily to the fact that Z_b for the grid of a tube is very high. From the standpoint of circuit analysis, it may often be considered infinite.

Figure 3 is an equivalent circuit for leakage reactance, considered by itself. It enters as a series impedance to the transfer of energy from Z_a to Z_b. Its loss-producing effects will be important only when it becomes of the same order of magnitude as Z_a and Z_b. Then it acts just as a series inductance between them. Formula (2) gives this loss in decibels.

$$\left.\begin{array}{c}\text{Decibels loss due only}\\ \text{to reactance of } L_L\end{array}\right\} = 20 \log \left(\frac{\sqrt{(Z_a + Z_b)^2 + (\omega L_L)^2}}{Z_a + Z_b} \right) \qquad (2)$$

Now let us calculate the loss due to L_L when we have the following constants:

$Z_a = 200$ ohms
$Z_b = 200$ ohms
$L_L = .01$ henry
$f = 10{,}000$ cycles

Substituting in the formula, we have

$$\text{DB loss} = 20 \log \left(\frac{\sqrt{16 + 39.44 \times 100}}{400} \right)$$

$$= 20 \log \frac{7.446}{4}$$

$$= 20 \times .26951$$

$= 5.4$ decibels approximately

The effects of C_d by itself can be studied from Figure 4. Formula (3) is an expression for the loss due to this shunt capacity.

$$\left.\begin{array}{c}\text{Decibels loss due only}\\ \text{to shunting effect of } C_d\end{array}\right\} = 10 \log \left[1 + \left(\frac{\omega C_d Z_a Z_b}{Z_a + Z_b} \right)^2 \right] \qquad (3)$$

It serves to illustrate the amount of C_d that can be tolerated in cases where a definite value can be assigned to Z_b. Suppose we have the following case:

$Z_a' = 500$ ohms
$Z_b = 100{,}000$ ohms
$N^2 = 200$
$C_d = 200$ mmfd.
$f = 10{,}000$ cycles

Reducing our value of Z_a' to its corresponding value for a unity ratio transformer, we have

$$Z_a = Z_a' N^2$$

$= 100{,}000$ ohms

Now, substituting in Formula (3) and cancelling before squaring any terms gives us:

$$\text{Decibels loss} = 10 \log[1 + (.628)^2]$$

$$= 10 \log 1.3944$$

$= 1.44$ decibels approximately

Formula (3) by itself is inadequate for predicting the high-frequency response of line-to-grid transformers for the following reasons:

1. Z_b is practically equivalent to an open circuit.
2. L_L may also be an important factor in the same frequency region.
3. The ultimate characteristic will probably be determined by resonance between L_L and C_d.

In cases where Z_b approaches open circuit conditions, the transformer is said to be "unloaded." Our equivalent circuit is then the same as Figure 1 without Z_b. Note that the loss for this condition is 3 decibels when any one of the following relations exist for the unity ratio transformer.

$$Z_a = \omega L_L$$

$$Z_a = \frac{1}{\omega C_d}$$

$$Z_a = \omega L_p$$

In our next installment we hope to discuss some additional problems of the application of audio-frequency transformers to impedance matching and relating problems.

Erratum in Part IV

Equation (3) as printed:

$$I_s Z_s + I_s Z_p + I_p Z_m = 0$$

Equation (3) as it should read:

$$I_s Z_s + I_s Z_L + I_p Z_m = 0$$

24-Tube Super

(*Continued from page 539*)

resistors are mounted on the same shaft and this control is known as the micro-tenuator. When no resistance is in the tuned circuit, that is, when the lever of the micro-tenuator has been turned all the way to the right as far as it will go, the i.f. amplifier has the greatest selectivity and the greatest sensitivity. Turning this lever toward the left will increase the resistance in the tuned circuit and thereby make the amplifier broader and at the same time less sensitive, for passing a wider audio range for high-fidelity reproduction providing better quality. For best high-fidelity reception, this lever should be turned all the way to the left.

The 6H6 tube serves as second detector only and has no connection with the a.v.c circuit. The signal for the automatic volume control is taken from the plate circuit of the first i.f. amplifier tube and fed to the grid of a special 6K7 a.v.c. amplifier tube. After being amplified, the signal is coupled to another 6H6 tube which serves as a rectifier for the automatic volume control. This is a delayed a.v.c. system because the bias resistor in the cathode circuit of both a.v.c. tubes makes the cathode of the 6H6 positive with respect to the diode plates. Therefore, a minimum signal of a given value has to be applied to the diode plates before the system begins reducing the sensitivity of the receiver. It will also be seen that some of the controlled tubes receive only a portion of the a.v.c. voltage while the first r.f. tube has the total a.v.c. voltage applied to its control grid.

A 6C5, is used as a heterodyne beat oscillator. Then there is another extra 6C5 which operates the dimming pilot light. The rectified signal in the diode circuit of the 6H6 second detector is applied to the grid circuit of this 6C5. When a signal is being received, this grid will become negative with respect to the cathode, thereby increasing the plate-resistance of the tube which is connected across the d.c. winding of the saturable reactor. This has the effect of increasing the reactance of the a.c. winding which is in series with the pilot light. Therefore, the pilot light dims when a signal is tuned in and the main dial should be adjusted for the dimmest light.

A 6J7 tube is employed to reduce noise between stations. This system is in operation only on the broadcast band and on the long-wave band. It is really an automatic tone control which places a tube in series with the condenser. When a signal comes in, the tube grid becomes negative, increasing the plate resistance of the tube which has the same effect as turning the tone control so as to receive high notes. When no signal is coming in, the plate resistance of the tube becomes considerably less and the tone control becomes effective, thereby reducing hiss and other noises.

Two 6C5 tubes are employed to change the signal from a single-ended amplifier into a push-pull amplifier. These tubes feed into two 6F6 driver tubes, connected as triodes which in turn excite the final amplifying stage consisting of six 6F6 tubes in a push-pull parallel circuit. These tubes are also connected as triodes.

The power supply employs three different rectifiers. Two 5Z4 tubes are employed to supply the power for the output stage while a single 5Z4 is used to supply power to the other tubes.

The audio system employs three speakers, one low-frequency speaker and two high-frequency speakers

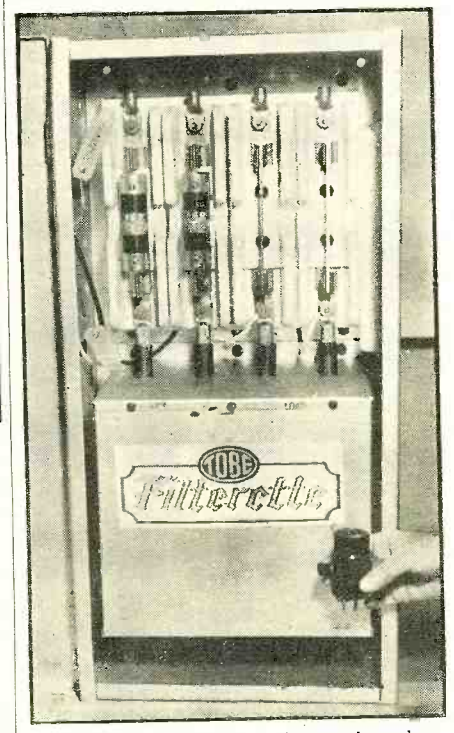
WHAT'S NEW IN RADIO

WILLIAM C. DORF

(*Continued from page* 521)

A Giant Filter for Power Jobs

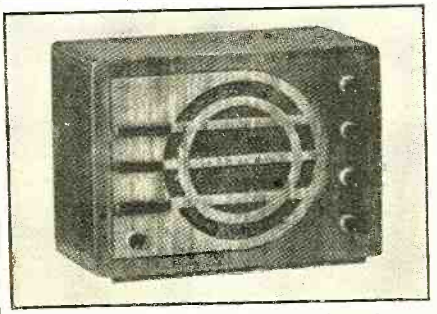
The Tobe Deutschmann Filterette rated at 50 kilowatts, is of the inductive-capacity type and contains heavy-duty inductances designed to carry the full load current of



a 50-kilowatt machine without introducing an objectionable voltage drop. This type filter was installed in connection with a motor operating the vacuum cleaning plant of a large hotel. For comparative size a small junior Filterette is shown in the photograph.

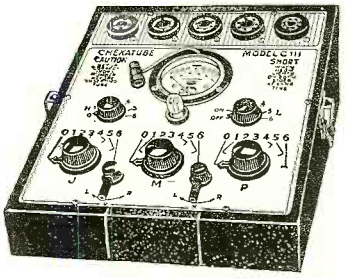
A New Call System

An inter-communicating system of wide adaptability for office and factory executives, called the Selective Speech Relay, is now being manufactured by the Turner Company. The master station, which is contained in a small cabinet to be placed on the desk, is provided with push-buttons for each branch station. One or more branches may be simultaneously called, which is of great advantage when it is desired to locate a person whose whereabouts are unknown or to issue a warning in case of fire, accident or other emergency. The system is ruggedly constructed to give efficient, trouble-free operation.



A New Tube Tester

Thorough engineering and high-grade construction are salient features of the new Chekatube Model C111 tube tester manufactured by the J-M-P Manufacturing Company, Inc. Silver contacts are used on all selector and lever switches. The trans-



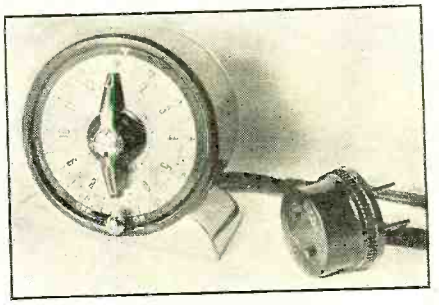
former employed has a high-voltage secondary and rectified current is provided for all tests, affording a closer approach to normal operating conditions than is obtained in more common designs. Short-circuit and leakage tests of high sensitivity are provided. All tests are quickly and conveniently made with self-resetting lever switches.

Crystal Microphone

Sound engineers will be interested to hear of the Shure model 77E desk type crystal microphone, designed to meet the high-fidelity requirements of public address, broadcast and sound recording systems. Its associated remote pre-amplifier is enclosed in a telephone style wall box, which can be mounted in any convenient location.

Radio Time Switch

Herewith is an illustration of a portable "Mark-Time" switch manufactured by M. H. Rhodes, Inc. This switch contains a clock which is wound by setting the time. The unit will turn on or off any radio set



or electrical appliance at the desired time. It can be set up to 12 hours in advance.

A New Socket for Acorn Tubes

The illustration below shows the Hammarlund Isolantite socket for the ultra high-frequency Acorn tubes, types 954 and

955. The socket has five double-grip prongs of tinned phosphor bronze. It measures 1⅞ inches in diameter and has an alignment plug to insure proper insertion of the tube.

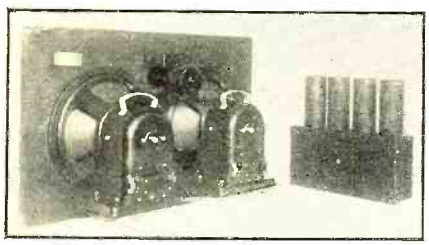
New Capacity Meter with Four Ranges

This Weston model 780 multi-range capacity measuring instrument provides full scale ranges of 10; 1.0; and 0.01

microfarads, thus covering all capacity ranges that are commonly employed in radio sets. It is a.c. operated and measures 5½ by 3¾ by 2½ inches.

Special Speaker System

The Pacent high-fidelity speaker system consists of 2 dynamic cones for low response and a dynamic tweeter for high-frequency reproduction. The speakers are



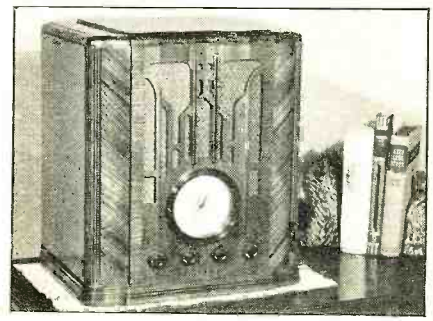
connected to operate as a single unit and have their own power supply.

Easily Installed Sound System

The Remler public-address system features easy installation and operation. In addition to the amplifier the system includes a floor-stand condenser microphone, 2 tone-equalized speakers and the necessary connecting cables, plugs, etc. It is available for either 110 volt alternating current or battery operation.

Features Three-Band All-Wave Tuning

The Belmont 7-tube receiver employs the metal type tubes in the r.f., mixer and i.f. stages and the conventional glass tubes in the less critical positions. It has a fre-



quency range of 535 kilocycles to 18 megacycles. A mechanical band-spreading ar-

(*Turn to page* 574)

Electron Tubes

(*Continued from page* 557)

He asserted that, while it is improbable that all of the functions now performed by the thermionic tube will be replaced by this new cold-cathode device, it was evident to those who have worked with secondary electron multiplication that this new art will have a revolutionary effect on the science of radio communication. Noiseless amplification was claimed for the "multipactor."

That the tube is not limited to television application was emphasized by the inventor. He said there were many quite unexpected new applications. It was declared that "multipactors" may be used as a source of electrons for purposes other than amplification, this being due to the very high multiplications obtainable.

"Backstage"

(*Continued from page* 551)

One of the choicest juvenile roles in the films went to Billy Mauch, 10-year old dramatic actor heard on many CBS and NBC programs. He was signed by Warner Brothers to portray the role of "Anthony Adverse" as a boy—Fredric March will portray the adult character. Billy's twin brother, Bobby, also a radio star, accompanied him to the West Coast. A Twentieth Century-Fox contract recently was awarded Helen Troy, diminutive comedienne who portrays Susie on NBC's Saturday Carefree Carnival. Carol Deis, co-featured with Conrad Thibault on the Log Cabin Revue over NBC, Wednesdays, is another radio star making headway in the talkie field.

IN selecting Louis Gress as permanent conductor for his Sunday CBS broadcasts, Eddie Cantor has brought a new name to stellar radio ranking. For the start of his new season's Pebeco programs, the comedian used a different guest conductor every week, but he soon decided to pick a permanent musical setup. Gress and Cantor previously worked together in stage productions. Gress, a native New Yorker, conducted three editions of the Ziegfeld Follies and Cantor's starring vehicle "Kid Boots." Supplementing his instruments for tonal effects are bottles, glasses and megaphones. He also employs eight voices to produce sounds and tones in addition to song lyrics.

Service Applications of the Super-Sensitive V. T. VOLTMETER

(As described in the August, October and November, 1935, issues)

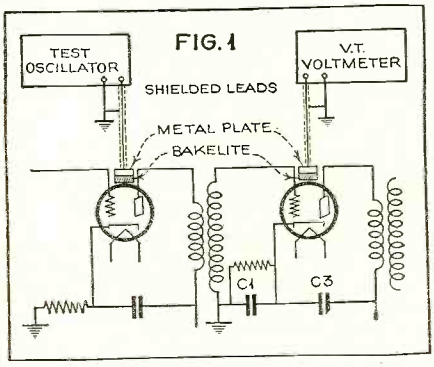
By John H. Potts

Part Four

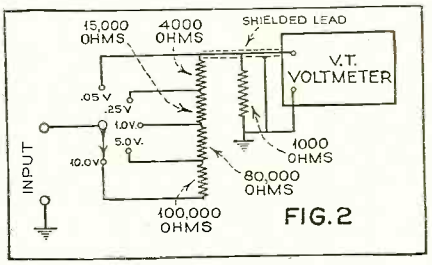
EFFICIENT servicing of sets afflicted with intermittent fading conditions constitutes one of the most difficult problems facing every serviceman. Many methods have been proposed for handling such troubles. All work in some cases; none in all cases.

Usually, abrupt intermittent fading is caused by a poor mechanical or electrical contact in some portion of the set or its associated equipment. When the trouble is purely mechanical, often little difficulty is experienced in locating the cause. But when the trouble is induced by heat expansion and occurs only when the chassis is under tension or enclosed in a cabinet, obviously trouble-shooting is rather difficult. Gradual fading rarely occurs under such conditions and is ordinarily far easier to handle. Some other causes of gradual fading, such as leaky coupling condensers or plate resistors changing under load give a characteristic sound in the speaker readily recognized by experienced radio men.

In the more difficult cases of abrupt fading, even touching a test prod to the chassis will often temporarily restore normal operation. Such conditions are frequently caused by by-pass condensers which develop intermittent "opens." The super-



sensitive tube voltmeter, used in conjunction with a test oscillator, permits the stage affected to be quickly isolated *without making a metallic contact to the chassis.* Using the set-up shown in Figure 1, the oscillator is coupled to the input circuit of the stage under test through a special capacity coupling test prod and the tube voltmeter similarly to the output circuit. Sufficient oscillator voltage at the frequency to which the circuit is tuned is applied to give a good deflection on the tube voltmeter. A comparison reading is made of a similar stage. If either of the condensers C1 or C3 are defective, a far higher oscillator input will be required than that for a similar stage with good by-pass condensers. Shorted trimmers and transformer defects will likewise show up by this test, but the latter may be readily located without such an elaborate set-up. In all fading cases, the use of analyzers, volt-ohmmeters or condenser testers should be avoided until the defective stage is isolated. In making the above tests, there is less reaction on the set if the coupling is made from plate to plate rather than from grid to plate. In i.f. stages, one may couple from grid to grid without serious detuning due to the high sensitivity of our tube voltmeter, which requires relatively little coupling with even the ordinarily low output voltages given by the average service oscillator. With a superheterodyne re-



ceiver, for instance, simply bringing the tube voltmeter test lead near the oscillator condenser gives an immediate indication if it is functioning.

The design of the capacity coupling test prods will depend on the oscillator output available. With some service oscillators, sufficient output may be obtained so that only a short piece of insulated wire will provide enough coupling. With others a 1-inch metal plate, or even a small coupling coil, may be required.

An attenuator, to adapt the tube voltmeter to measurements up to 10 volts at 20,000 ohms per volt, is shown in Figure 2. The ratios will be accurate only at low frequencies, up to about 20,000 cycles, but it will be found quite useful in testing public-address amplifiers, pick-ups and preamplifiers.

Radio Workshop

(Continued from page 532)

is the use of a Yaxley rotary switch with a single deck of eight points or one with a double deck, four points each.

NOEL CHASE,
New York, N. Y.

Two Soldering Kinks

Strange to say, few irons have been produced with a rest attached. The one shown in the diagram, Figure 1, is similar to the folding rest on a carving fork and can be constructed in a short time from odds and ends of hardware.

Make a band to fit around the iron, from flat brass and clamp together below with a small bolt. Then from stiff wire bend the rest as shown in detail. The legs spread out at the bottom and the two eyes fit around the bolt; the cross bar between them serv-

ing as a stop bar when the legs are in a vertical position. This bar straddles the clamp and the eyes go between the clamp and washers as shown. By using lock washers the tension can be regulated and held by the tension of the nut on the bolt. Thus your iron can be rested above the bench or the rest folded back against the shank when not in use.

String solder wound on spools is awkward to hold and it is much easier to rack

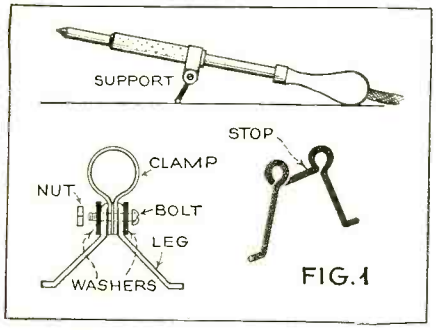


FIG. 1

it, as shown in the little holder in the sketch, Figure 2. Take a piece of suitable copper tubing about 8 inches long and split down one end, for a third of the distance with a hack-saw. Open this split and drill the ends. Then insert the spool of solder and hold it with a metal pin inserted in the holes in the ends of the prongs.

Run the solder through the tubing until it projects from the end. By wrapping the

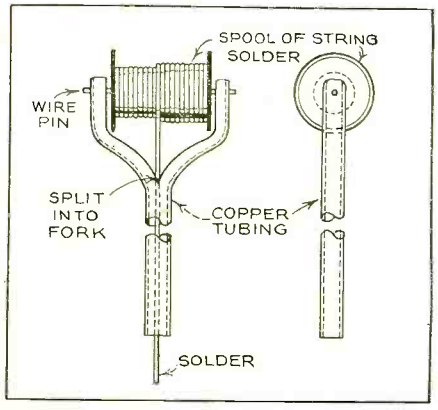


FIGURE 2

tubing with a layer of electricians' tape or felt it can be used as the solder holder in lengthy jobs without the heat of the solder being imparted to the hand.

L. B. ROBBINS,
Harwich, Mass.

Overcoming Refrigerator Interference

Quite often radio interference can be traced to static discharges from the motor belt of electric refrigerators. To eliminate this type of interference simply connect a wire from the motor frame to the compressor and continue this lead to a good ground.

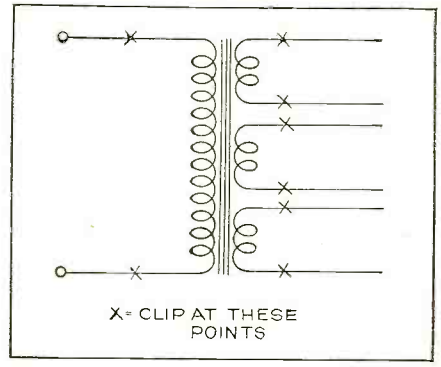
ELWOOD S. FAULS,
Oneida, N. Y.

Identifying Replacement Connections

In replacing transformers, condenser blocks, and similar parts with numerous leads, the problem of reconnecting the wires to the proper points may be greatly simplified and a great deal of time saved if the old leads are clipped off close to the defective component.

After the defective part has been removed, the color-coded loose wires remaining will indicate where the leads from the replacement unit are to be connected.

If an exact duplicate replacement part is used, one need only replace the old leads



with each new lead having the same color coding, one by one. If a different replacement part is used, the slip accompanying same will enable one to identify the corresponding lead.

W. D. PAYNE,
Buffalo, N. Y.

Polishing and Cleaning Old Bakelite

The following information was received from Mr. Allan Brown of the Bakelite Corporation in reference to an item entitled "Renewing the Appearance of Bakelite and Hard Rubber Parts" which appeared in the Experimenter's Department.

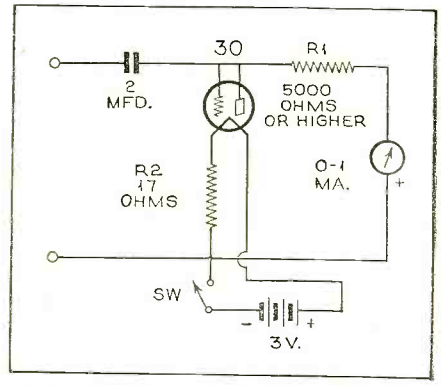
"We have carried on a number of experiments and recommend the following: To keep a panel in good shape sponge it off with alcohol occasionally. The only dirt that sticks is greasy dirt, like fingerprints, and these could be washed off with alcohol better than they can with soap and water.

If a high lustre is desired on a polished surface, a little Butcher's floor wax may be applied and rubbed; or with dull panels, where a rich matte finish is desired, a little light lubricating oil may be wiped on and then carefully rubbed off.

A Simple Vacuum-Tube Voltmeter

Here is a diode-type vacuum-tube voltmeter that can be used for a wide variety of tests, where a slight circuit load is not objectionable. Being substantially independent of frequency it is adaptable to either a.f. or r.f. circuit.

The value of R1 will depend upon the sensitivity desired. For full-scale deflection with 100 volts input the value of this resistor should be about 75,000 ohms. For greater sensitivity R1 can be decreased so



as to cover any desired range. The device has a fairly linear scale and it may be calibrated on an a.c. 60 cycle supply line by connecting it in parallel with an a.c. meter. This calibration will hold for radio frequency as well as audio frequency.

JOHN POTTS,
New York City, N. Y.

The "Ham" Shack

(*Continued from page 527*)

after the sun-spot activity which causes them. Therefore, with this additional influencing factor, the problem of predicting conditions is made more difficult.

Now, about transmitters for 10-meter operation. A number of the 20-meter 'phone men have found it possible to operate their rigs on the higher frequency with reduced inputs with effective results. As we have already said, power on 10 meters seems to be one of the least important factors. Good results may be expected from 50 to 100 watts input. The chief problem in getting a transmitter operating on 10 meters is obtaining sufficient excitation for each of the stages.

Several suggested layouts are illustrated here. Each of them have been in use at different Eastern amateur stations and have provided excellent results. The one which seems to provide the greatest all-around stability and effectiveness is that shown at Figure 1. It is a conventional layout. The tube line-up is a 53 used as 40-meter oscillator—20-meter doubler; an 802 for doubling into 10 meters and an 800 type tube in the final. It was possible to run up to 100 watts input in the final amplifier with a high degree of efficiency.

A few points about this particular rig might be interesting. The 53 oscillator-doubler is being used by a majority of the stations on the 20-meter band, and therefore, a large number of stations have this portion of equipment available. With a 40-meter crystal, it is possible to get more output on 20 meters than with any other type of oscillator. The output is more than sufficient to drive the 802 on 10 meters with as high as 5 milliamperes rectified grid current, the normal rating suggested by the manufacturer.

With normal input on the 802 (about 600 volts with 60 milliamperes) it was possible to drive the 800 with 25 milliamperes grid current, with normal bias. If more power were to be desired on 10 meters, an additional amplifier might be added. However, at 10 meters, it will be found that the low-capacity tubes such as the 800, 50-T, 852, 150-T, RK-18 and RK-354 will provide the greatest efficiency. The higher capacity tubes may be used, but it will be found that reduced inputs will be necessary to avoid excessive heating. The radio-frequency current does curious things at these high frequencies. At one station where a 203-A was used in the final amplifier with reduced input. The tube showed excessive heating despite an apparent high plate efficiency, i.e., ratio of power input to power output. However, the tube elements ran exceptionally hot, apparently due to some freak effect of the radio-frequency current. Such a condition is not good for a tube and will result in a short life.

Another suggested layout is shown at Figure 2. It consists of a 59 tri-tet oscillator using a 40-meter crystal, with the output tuned to 20 meters, a 46 amplifier, an 841 doubler and an 801 in the final. This arrangement proved quite effective with 50-watts input to the 801.

A third suggested layout is shown at Figure 3. This consists of a 53 oscillator, quadrupler, a 46 buffer and an RK-20 amplifier. By using regeneration in the 53 amplifier—it is possible to obtain sufficient excitation to drive the 46 at low input in 10 meters. Of course, the output from the 46 will be sufficient to drive the pentode final amplifier on ten meters, as 5 milliamperes grid current is more than sufficient to operate this tube at normal input. A high c.w. output and a 15 to 20-watt carrier, with suppressor grid modulation, may be obtained.

Receivers for 10 meters are another problem. Few of the all-wave receivers that perform exceptionally well on frequencies of 14,000 kilocycles or lower are proportionally as efficient on 10 meters. Some will give satisfactory results, but the chief problem on 10 meters is that most all-wave receivers tune so many kilocycles per dial division that only very careful tuning will reveal signals. Ten-meter signals seem to be much sharper than those of lower frequencies. This, of course, is only apparent, as it requires only a small amount of capacity change in an L.C. circuit to cover several kilocycles, with a result a far greater degree of band spreading is necessary than available for lower frequencies. In receivers with changeable coils, the band-spreading problem is simplified by the fact it is possible to change the tuning ratio more in keeping with the frequency. The 10-meter band, however, covers 2,000 kilocycles, and even with a receiver designed to spread the whole band over a 180 degrees of a dial, tuning will be found to be exceedingly sharp.

This tuning problem has resulted in a majority of the stations operating in the lower half of the band, that is, from 28,000 to 29,000 kilocycles. Therefore, a number of amateurs who have undertaken to construct special receivers for 10-meter operation have designed them to cover the lower 1,000 kilocycles on 180 degrees of tuning. This partly solves the sharp-tuning problem, but leaves the high-frequency half of the band uncovered, and with the increasing number of stations using the band, it is desirable to make use of the whole band. Two band-spreading settings might therefore be built into the special 10-meter receiver, one for the lower and one for the higher halves.

The super-regenerator receiver that performs so well on 5 meters has been found "not too good" on 10 meters. Its broad tuning characteristic is not particularly desirable when listening to crystal-controlled signals.

On the other hand, a number of amateurs have obtained quite good results with 5-meter superheterodynes, equipped with 10 meter coils. Those with transformer-type intermediate circuits are the best for selectivity, of course, although resistance-coupled i.f. circuits will give excellent gain at this frequency. If a special receiver is used, it will be found that good results will be obtained by using an intermediate-frequency of the order of 2,000 kilocycles. Several amateurs have constructed adaptors for 10 meters and are working them into autodyne receivers tuned to 2,000 kilocycles, and are obtaining exceptionally good results. The autodyne receiver is simple to construct and easy to operate, and provides good sensitivity, but does not usually compare with a good standard super-heterodyne. However, 10-meter reception is more susceptible to ignition interference than the lower frequencies, and in locations where automobile traffic is heavy, it will be found that the autodyne may out-perform the super-heterodyne.

Returning to the subject of transmitters, due to the sharp tuning effect of the receivers used on 10 meters, only crystal-controlled transmitters should be used. They, of course, will hold to their frequency, while other types will be more apt to drift and shift in frequency, making it difficult for the operator on the receiving end to hold on to a signal.

This in a general way covers the problems of 10-meter operation. It is hoped with the increased activity, more will be learned about the band, and just what may be expected of it. As we said before, in addition to providing good DX possibilities, it also is an excellent band for local communication.

Calls Heard

By Norman C. Smith, Forge House. High Street, Foots Cray, Kent. England, on 40-meter 'phone: LU8DR and TI2EP. On 40-meter CW: EA6AM, LU1EP, HB9AQ, ZL2GN, OE1CM, ZL3DJ. W4UP, EA2JJ, ZL1HY, ZL2FY, VK2BV, VK2PT, VK2ZC, W4AXA, ON4VDB, VJ3JO and XD4BOZ.

By T. E. Lowe, 28 Allenby Road, Cadishead, M/C, England, on 20-meter 'phone: W2HMY, W2BS, VE9DT, W4DGC, W1GND, W2FDW, W2DSD, W2AMD, W1CND, W2YD, W8CFT, W1CMD, W4CDC, F8FU, W1AF, SN5WK, W2AN, W4DB, W3COV, F8NH and W2BSD.

RADIO NEWS Sponsors New Opportunity for Code Practice at Home

RADIO NEWS takes pleasure in publishing the following schedule of code transmissions in the United States especially for those who wish to learn the code over the air. All one has to do is to tune in to the proper frequency as specified at the proper time and day and start copying the special code transmission for practice. A daily schedule is given for the present month (beginning February 1st and ending March 1st.). In the first column is the time (a.m. or p.m.); in the second column are the symbols, E, C, M and P (where E is used for E.S.T., C for C.S.T., M for M.S.T. and P for P.S.T.). In the third column are the call letters of the transmitters of amateur members of the Guild and the fourth column contains the frequencies of transmission in all cases, except where otherwise noted. Each CSCG transmitting station will begin his program at stated time by sending "CSG" 6 times, followed by his station call repeated 3 times, slowly. At intervals of 5 minutes, he will repeat "CSG" 6 times and his call letters 3 times. All who listen to CSCG programs are requested to write a card to the transmitting station telling him how his signals come in and, if possible, sending him copies of transmissions.

MONDAY

8:30 A.	E.	WIAMH	56,100-3536½

9:00 A.	ED.	W2HZJ	3577
10:00 A.	E.	W3AEJ	3785
4:00 P.	E.	N1FNM	3510
5:00 P.	P.	W7WE	3637-7274
6:00 P.	E.	W8MHE	3830
6:00 P.	E.	W8EEZ	3598
6:30 P.	C.	W9LKK	3757
6:30 P.	E.	N1DUZ	3638
6:50 P.	E.	W2HCP	3785
7:00 P.	C.	W9SFT	3585
7:00 P.	E.	W8NUO	7250
8:00 P.	E.	W8MCP	3580

TUESDAY

8:15 A.	E.	VE3UU	3865
9:00 A.	ED	W2HZJ	3577
4:00 P.	E.	N1FNM	3510
6:00 P.	E.	W8MHE	3830
6:00 P.	E.	W8EEZ	3598
6:30 P.	C.	W9LKK	3757
6:30 P.	C.	W9RPD	3514.5
7:00 P.	M.	W9HHW	7276
7:00 P.	M.	W6IQY	14380
7:00 P.	E.	W8NUO	7250
7:30 P.	C.	W8HKT	3750
8:00 P.	C.	W5CPV	7149
8:00 P.	E.	W8MCP	3580
8:00 P.	M.	W7DBP	3607
8:15 P.	M.	W7DWI	3620

WEDNESDAY

6:00 A.	C.	W5DDC	7200
9:00 A.	E.	W2HZJ	3577
10:00 A.	E.	W3AEJ	3785
4:00 P.	E.	N1FNM	3510
5:00 P.	P.	W7WE	3637-7274
6:00 P.	E.	W6MHE	3830
6:00 P.	E.	W8EEZ	3598
6:30 P.	C.	W9LKK	3757
6:30 P.	C.	W9RPD	3514.5
6:30 P.	E.	W2HCP	3785
7:00 P.	E.	W3AEJ	3785
7:00 P.	C.	W9SFT	3585
7:00 P.	M.	W9HHW	7276
7:00 P.	E.	W8NUO	7250
8:00 P.	M.	W7DBP	3722

THURSDAY

8:15 A.	E.	VE3UU	3865
9:00 A.	E.	W2HZJ	3577
6:00 P.	E.	W8MHE	3830
6:00 P.	E.	W8EEZ	3598
6:30 P.	C.	W9LKK	3757
6:30 P.	C.	W9RPD	3514.5
7:00 P.	M.	W6IQY	14380
8:00 P.	M.	W7DBP	3607
8:15 P.	M.	W7DWI	3620

FRIDAY

10:00 A.	E.	W3AEJ	3785
9:00 A.	ED.	W2HZJ	3577
5:00 P.	P.	W7WE	3637-7274
6:00 P.	E.	W8MHE	3830
6:00 P.	E.	W8EEZ	3598
6:30 P.	E.	N1DUZ	3638
6:30 P.	C.	W9LKK	3757
6:30 P.	E.	W2HCP	3785
7:00 P.	E.	W8NUO	7250
9:50 P.	E.	W4BHR	3867

SATURDAY

6:30 P.	C.	W5BXA	3610
8:15 A.	E.	VE3UU	3865
8:30 A.	E.	W1AMH	56,100-3536½
9:00 A.	ED.	W2HZJ	3577
6:00 P.	E.	W8MHE	3830
7:00 P.	E.	W8NUO	7250
11:50 P.	P.	W7WE	3637-7274

SUNDAY

6:30 P.	C.	W5BXA	3610
8:15 A.	E.	VE3UU	3865
9:00 A.	ED.	W2HZJ	3577
10:30 A.	E.	W3EEY	3628
10:30 A.	C.	W5DDC	7200
11:00 A.	E.	W8KGM	3807
1:00 P.	P.	W7WE	3637-7274
6:00 P.	E.	W8MHE	3830
6:30 P.	C.	W9RPD	3514.5
7:00 P.	C.	W9LUS	3631
7:00 P.	E.	W8NUO	7250
8:00 P.	M.	W7DBP	3722

Active Members Candler System Code Guild

W1AMH—Harold J. Morse, 48 Hebron St., Hartford, Conn.

N1DUZ—J. E. Vermeiren, 137 Middlesex St., Springfield, Mass.

N1FNM—G. W. Wabrek, New Hartford, Conn.

W2HCP—A. P. Boser, 82 Dove St., Albany, New York.

W2HZJ—Walter G. Germann, 905 E. 169th St., New York, N. Y.

W3EEY—Dr. H. A. D. Baer, BAER HOSPITAL, Allentown, Penna.

W3AEJ—Geo. W. Knowles, 82 Elgin Avenue, Westmont, N. J.

VE3UU—Gordon Murray, 53 Elm Grove Ave., Toronto, Ont., Canada.

W4BHR—James D. Randolph, Warren Plains, N. C.

W5BXA—H. Trosper, Box 225, Whittenburg, Texas.

W5DDC—Herbert Leo, 1420 Hawthorne St., Houston, Texas.

W5CPV—Grady L. Hardin, 132 Oak St., Hot Springs, Ark.

W6IQY—E. L. Troutman, Box 85, Flagstaff, Ariz.

W7WE—Loren C. Maybee, 3516 Hudson St., Seattle, Washington.

W7DBP—F. W. Stuart, R. F. D. 2—Boise, Idaho.

W7DWI—R. J. Gunning, Wendell, Idaho.

W8HKT—F. T. McAllister, 807 Michigan Ave., St. Joseph, Mich.

W8MCP—Chas. Hedrich, 30 DeKalb St., Tonawanda, N. Y.

W8MHE—Charles L. Gibson, 9 Sycamore St., Natrona, Pa.

W8EEZ—Tauno M. Alanen, 512 New Street, Fairport Harbor, Ohio.

W8KGM—E. J. Goodison, 300 E. Edward St., Endicott, N. Y.

W8NUO—J. A. Ditmyer, 2541 Kress St., Toledo, Ohio.

W9HHW—Denzel Begley, Box 46, Ft. Meade, S. Dak.

W9RPD—R. J. Lawrence, Fort Lincoln, N. Dak.

W9SFT—Gerald Broughton, CCC Co. 735, Scammon, Kansas.

W9LKK—Sidney Schulz, 3132—4th St. S. E. Minneapolis, Minn.

W9LUS—Clarence Read, 3401 Parnell Ave., Chicago.

Armstrong's Invention

(*Continued from page 525*)

presence of the carrier). The point to be noted is that only the noise originating within, say, 10,000 cycles-per-second to either side of the carrier can produce an audible beat with the carrier in the audio-frequency circuits. Beats are also produced by noise originating more than 10,000 cycles-per-second from the carrier, but these are inaudible and, in fact, will not be passed by most audio channels. The noise originally present and distributed over the entire 100-kilocycle band-width will still be present, but this noise is greatly overshadowed by the noise introduced by the addition of the carrier.

Referring to Figure 8, it is seen that the principal noise components, as introduced by the carrier, occupy a band only 10 kilocycles to either side of the carrier, or 20 kilocycles in all. In addition, as mentioned before, the current limiter has introduced a "mirror-image" frequency for each disturbing frequency present in the output of the amplifier. If a noise component, for example, of 410 kilocycles is present in the input to the current limiter, the limiter introduces a companion frequency of 390 kilocycles, and so on for each disturbing frequency. The action of the current limiter is such that when the two disturbing frequencies are co-linear with the carrier, they are opposite in phase.

In the position shown in Figure 8, with the carrier at 400 kilocycles and the disturbing frequency and its mirror image at 410 and 390 kilocycles respectively, the response due to the 410 and 390 kilocycle signals are equal and opposite (when the disturbing signal is co-linear with the carrier). Consequently, at that instant, the noise components are cancelled, except for the small amount of noise originally present before the introduction of the carrier. If the disturbance components are not co-linear with the carrier, their effect on the carrier is still small since they are out-of-phase with the signal, but some of the noise does not balance out.

Also, the carrier is swinging over the entire 100 kilocycle band, and, even with the noise and its image in direct opposition, they can cancel exactly only at the 400 kilocycle point. At any other frequency a part of the noise remains. With these effects taking place simultaneously, if the frequency deviation is made wide enough, a considerable improvement in signal to noise ratio obtains, and, the wider the frequency deviation, the greater will be the improvement. Armstrong has obtained an improvement in signal-to-noise ratio of something more than 30 d.b., with a deviation of 100 kilocycles, or a total band width of 200 kilocycles.

By reducing the noise inherent to his receiver, Armstrong is enabled to increase the reception range of his frequency-modulated signals beyond the limits of ordinary ultra-high frequency signals. The amount of static, while very small at these frequencies, is made still smaller by the noise-reduction process. As far as man-made disturbances are concerned, the system is effective so long as the signal is somewhat stronger than the noise. If the interference is stronger than the desired signal then the frequency modulation method cannot offer any improvement over the usual method of communication. At the very high frequencies, ignition interference is objectionable, if automobiles can approach within, say, 50 feet of the antenna. Other electrical noises are usually not severe enough to prevent com-

munication and, in any event, they can be brought to a level lower than that of the signal by the normal noise-suppression means, with the cure applied at the source of the interference. Professor Armstrong looks toward the complete elimination of automobile ignition interference by the eventual use of suppressors and similar devices in all automobiles.

Selective fading is not present to any extent at ultra-high frequencies. In addition, the new system eliminates periodic fading of the common form, if the signal strength does not drop below the minimum level of the current limiters. In this respect the action is similar to that of an automatic-volume-control. It should be noticed also that interference between stations is minimized. An interfering station, even if it is operating on the same carrier frequency, if its level is lower than that of the current limiters, becomes another noise (so far as the receiver is concerned) and its amplitude is reduced just as that of a noise would be.

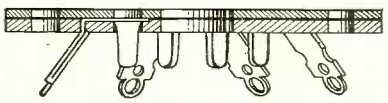
What's New

(*Continued from page* 569)

rangement is provided and the set operates on 110 volt 60 cycle a.c. supply.

A New Positive-Grip Type Socket

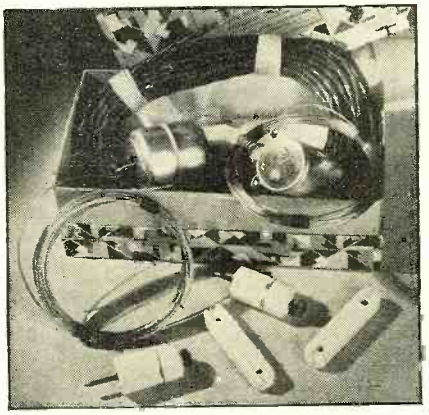
A new spring type socket, known as the Torsion Grip, has just been announced by the Torsion-Grip Manufacturing Company. Special study has been given to the problem of securing a tight grip on the tube prongs, making for increased efficiency and



therefore improved performance in tube operation. The contacts are short, grasping firmly the upper portion of each tube prong. With this design, the usual tendency toward loosening contact due to vibration is completely absent. The socket is of substantial yet low-loss construction, using high-grade bakelite insulation.

A New Antenna Kit for All-Wave Receivers

The Technical Appliance "Taco" all-wave doublet antenna system includes 60 feet of wire for the top span, 75 feet for the downlead and the necessary coupling



transformers and insulators. A novel circuit arrangement provides automatic electrical switching from long to short waves, eliminating the usual manual switch.

High-Fidelity Receiver

The American-Bosch 1936 line of receivers, equipped with metal tubes, features a Centromatic unit, which is a new type of assembly and construction to guard against electrical interference and losses.

INDEX TO ADVERTISERS

RADIO NEWS "BLUEPRINTS"

COMPLETE sets of construction "blueprints" including full-scale picture wiring diagrams, chassis specifications, drilling layouts, etc., are available on the following:

"DRAGNET"—A 2-tube battery operated short-wave receiver providing 1 stage untuned r.f. (34 tube) and a dual purpose type 19 tube which serves as a regenerative detector and 1 audio stage. Described in August, 1934, issue. Price 25c.

"SKYSCRAPER"—A fully shielded, short-wave receiver. Includes 6D6 tuned r.f. stage, 6C6 regenerative detector and a 41 pentode audio stage. It operates from a.c. power supply unit or batteries. Features single dial band-spread tuning with standard plug-in coils. Described in November and December, 1934, issues. Price 25c.

"SCOUT'S OWN"—A simple, modern 1-tube (type 30) regenerative receiver for short-waves. Described in the September, 1934, issue. Price 25c.

"RADIO NEWS TRAP-CIRCUIT TENATUNER"—An inexpensive, easily constructed device for use with standard broadcast-band receivers. It incorporates 5 different circuits; 3 antenna tuning circuits for boosting signal voltage, and 2 wave-trap circuits. No tubes or exciting voltages are required. Described in July, 1935, issue. Price 25c.

"2-VOLT DX'ERS SUPER"—A 7-tube battery operated broadcast receiver, of special interest to the rural listener and DX fan. It utilizes the latest 2-volt tubes, three of which are dual purpose tubes (1A6, 1B5 and 19), thus permitting 7 tubes to perform the function of 10. The set is equipped with automatic volume control, tone control and a signal-strength meter. Described in August and October, 1935, issues. Price 50c.

"RADIO NEWS DX HOPPER-UPPER"—This 4-tube converter complete with its own power supply, can be used with any tuned r.f. or superheterodyne broadcast band receiver to provide tremendously increased selectivity and sensitivity on broadcast-band reception. Described in October, 1935, issue. Price 50c.

"TAYLOR-COCKADAY OCEAN HOPPER"—A single-range short-wave superheterodyne receiver covering the principal European and domestic short-wave broadcast bands from 19 to 49 meters. The circuit uses 9 metal type tubes which includes 2-6K7's, 1-6A8, 2-6C5's, 1-6H6's and 1-5Z4 rectifier. The set features air-tuned i.f. transformers, a dual ratio airplane type tuning dial and other latest developments. Described in November, 1935, issues. Price 50c.

"P.C.A. OBSERVER"—A 3-tube preselector, converter and amplifier unit, covering the broadcast and short-wave ranges from 550 to 18,000 kc. in 3 bands. A 6K7 metal type tube is used in the r.f. stage, followed by a 6A8 tube functioning as a combined detector and oscillator. The device has its own power supply, using an 84 for rectification. Described in December, 1935, and present issue. Price 25c.

The Technical Review

(*Continued from page* 559)

J2—Radio Parts Catalog, of Insuline Corporation of America. Free.

J3—Book Circulars of Alfred A. Ghirardi. Free.

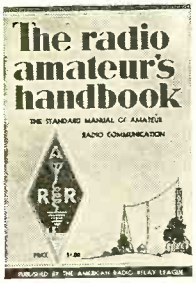
J4—Latest Wholesale Radio Service Co. Catalog—listing receivers, sound equipment, amateur and service replacement parts, etc. Free.

F1—Catalog of Radio Parts. The National Co., Inc. Free.

(*Turn to next page*)

Radio Amateur's Handbook

AMATEURS, short-wave enthusiasts, experimenters and others, will be interested to know that copies of the A.R.R.L. Handbook which is reviewed above can be obtained by forwarding check or money order for $1.00 to: RADIO NEWS, 461 Eighth Ave., New York City.



Thordarson Transmitter Guide

THE Thordarson Transmitter Guide is a 32-page book containing complete technical data on more than a dozen different transmitter units ranging in power from 6 to 1000 watts. Both the beginner and the advanced amateur will find it interesting and instructive reading. Circuit constants, coil data and parts lists are included. Because of the size of this booklet and the work involved in its preparation, it is not offered free, but costs 15 cents. It is well worth several times this slight amount. Copies may be ordered from RADIO NEWS, 461 Eighth Avenue, New York, N. Y.

The Service Bench

(*Continued from page* 553)

which must be taken from the bulb side of the lead in which the switch is connected—which, incidentally, explains why the switch is there, rather than utilizing the simple expedient of plugging the line in or out. This lead, ending in a test prod, is used for ground tests. By opening the switch, after having first tested for juice in the receptacle the bulb will light whenever the prod hits ground. (It may, of course, be necessary to reverse the plug.) The test prod is mounted in the handle of a five-and-ten fountain pen. When the prod is not being used, the cap is screwed on, thus keeping it from getting someone

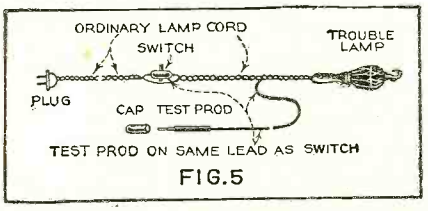


FIG. 5

into trouble in case it should fall afoul of the chassis when the light is merely being used for illumination.

"I find the ground test most useful. It will show up a poor ground or an open. It will identify antenna and ground if they have been reversed or disconnected from the set, when tracing might be difficult. It will also show up a grounded antenna."—Earl Kane, Livingstonville, N. Y.

SERVICE NOTES

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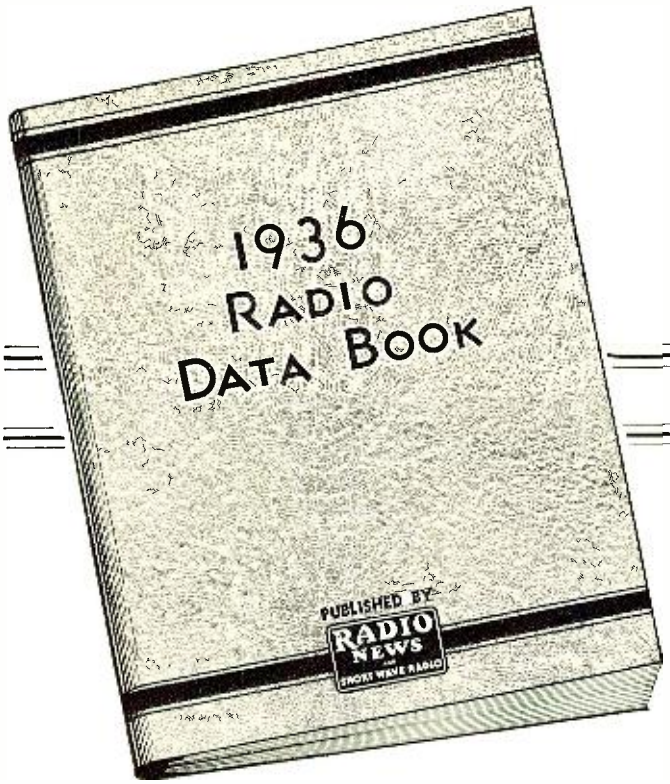

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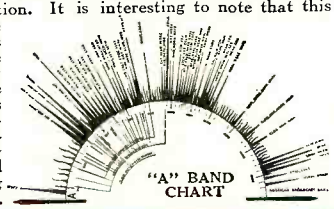

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